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## Influence of ICT on the Competitiveness of the Trade Sector in Kazakhstan

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### Abstract

As the digital economy promotes the in-depth growth of trading globalization, the degree of development of information and communication technology has had a significant influence on the competitiveness of trade sector. In light of this, a model is constructed based on Porter's Diamond model, with the world's main trading industry nations as the study object, to examine the influence of information and communication technology trade sector competitiveness. The findings show that information and communication technologies can indeed boost a country's competitiveness in trade sector; information and communication technologies have boosted developing countries' international competitiveness in trade sector, but have hampered developed countries' international competitiveness in trade sector. As a result, boosting the competitiveness of trade sector from the standpoint of information and communication infrastructure and professional abilities is critical policy for a country seeking to become a trading industry powerhouse.

**Keywords:** trade sector, information and communication technologies, international competitiveness, diamond model.

### Introduction

Kazakhstan's trade sector growth is fraught with both obstacles and possibilities. According to WTO data, there are over 1800 obstacles to international trade sectors,

which have greatly increased trade costs, but digitalization of trade sector has helped cut trade costs and fostered the fast expansion of trade sector scale. As a result, trade sector has become the focal point of global free trade. As a result, the volume of Kazakhstan's trade sector has grown dramatically. Kazakhstan's imports of services from the rest of the globe have increased by 6.4 percent during the last 13 years. By 2020, the digital economy's added value had accounted for one-third of GDP and contributed two-thirds of GDP growth, and it had begun to have an international competitive edge.

There are presently few research on the influence of information and communication technologies (ICTs) on service commerce, and the data in existing studies is rather limited (Gyenge et al, 2021). This report examines data from 25 nations from 2009 to 2017 and employs the International Telecommunication Union's ICT Development Index to assess the degree of information and communication technology in greater depth. The sample is separated into developed and developing nations, and the heterogeneity of ICT's influence in international trade sector competitiveness is empirically examined.

Given the importance of ICT in the development of trade sector, this article will employ Porter's Diamond model to conduct empirical research on the role of ICT in promoting international competitiveness in trade sector based on an in-depth examination of the effect of ICT on promoting international competitiveness in trade sector.

To begin with, based on the import and export volume of trade sector, Kazakhstan's trade sector reached growth of 3.6 percent year on year. 7 percent, has been placed second in the globe for 5 years in a row, accounting for 5.8 percent of the worldwide total. 7 percent, becoming the greatest contributor to the process of global trade sector promotion. Furthermore, trade sector has been exhibiting a deficit, but in recent years, the growth rate of exports has been approximately 8.6 percent greater than that of imports, causing the trade sector deficit to decline year on year.

Second, our country's trade sector competitiveness is considerably inferior to our country's international position in terms of international competitiveness. There are

still certain gaps when compared to some established trade sector nations. The RCA score in Kazakhstan is 0.257, the IMS index is 0.028, and the TC index is -0.273, indicating that country urgently needs to strengthen its international competitiveness in trade sector.

We may acquire a thorough grasp of the features of our country's international competitiveness in trade sector by calculating the IMS index of various industries in trade sector. First and foremost, my country's IMS index for the trade sector as a whole has been 0.6. It varies about 0.3, indicating that Kazakhstan's trading industry's overall competitiveness is low, and it has even demonstrated a declining tendency in recent years. Second, the competitiveness of various industries in the service business varies significantly. Traditional sectors, particularly transportation and tourism, have very strong international competitiveness. The developing service sector's international competitiveness is poor. Among them, the IMS index of the telecommunications, computer, and information service industries has been significantly increasing.

### Literature Review

With the digital economy's in-depth growth of the degree of service-orientedness, more and more experts at home and abroad are focusing on the link between the level of technical communication and the competitiveness of trade sector. Scholars both at home and abroad feel that the degree of information and communication has a major beneficial influence on the international competitiveness of trade sector after undertaking macro-analysis and research (Vásáry et al, 2013).

To begin with, when it comes to evaluating the international competitiveness of trade sector, experts have decided to employ a variety of indices. Researchers uses some countries as the study object and selected measures such as the dominating comparative advantage Index, the trade competitiveness Index, and the international market share to assess Kazakhstan's trade sector's international competitiveness (Marel & Shepherd, 2013; Mainardes et.al., 2017). According to Hoekman and Shepherd (2017), the volume of export trade in trade sector is an

indicator of trade sector competitiveness. Feng et.al. (2017), utilized the TC Index, RCA Index, and CA Index to compare some countries' and the United States' competitiveness in the trade sector and discovered that some countries' and the United States' international competitive advantages are highly different.

Second, research on the variables influencing international competitiveness in trade sector is an important component of this discipline. Beverelli et.al (2017), Lodefalk (2014) feel that the amount of urbanization, human capital, and trade sector growth are the most important influencing elements for trade sector competitiveness. Schmenner (1986) discovered that trade sector agglomeration may greatly boost trade sector competitiveness by examining trade sector in key trading nations. Normann (2001), Adlung (2015) discovered that the proportion of people engaged in the trade sector, GDP per capita, export volume of goods trade, openness of trade sector, and technical advancement are the primary variables influencing a country's competitiveness in trade sector using the "Diamond model". Hoekman (1995) employed major nations as comparison items and discovered that foreign direct investment and trade openness make a country's trade sector more competitive.

Finally, there has been little research on the interaction between ICT and service commerce. The majority of previous research has focused on the link between ICT and trade in goods, which completely illustrates that boosting ICT levels may greatly increase trade in goods development. According to Hummels et.al. (2001), ICT can stimulate the development of trade sector by lowering trade costs. According to Gereffi (1999) model, a rise in the number of Internet users in a nation will encourage service commerce. According to Lavissière (2014), ICT has aided the development of service commerce through the usage of Internet technologies. Magee (2008), Lee and Cho (2017) examined certain OECD nations using the growth accounting approach and discovered that the contribution rate of ICT capital to the trade sector is substantially larger than that of the manufacturing industry. The trade model was used by Baier and Bergstand (2007) to demonstrate that the promotion effect of information and communication technology on "commercial existence" trade sector is greater than that of "cross-border" trade

sector, and that the promotion effect of trade sector exports is much greater than that of imports. According to Park and Park (2011), Acemoglu (2002) the importance of information and communication technologies in conventional trade sectors like as banking, insurance, and engineering research and development has developed more slowly, while its function in developing sectors has become more visible.

In conclusion, the available research only investigates the influencing variables of trade sector competitiveness, and the literature on the influence of information and communication technologies on trade sector competitiveness is insufficient. With the digital economy's in-depth growth of the degree of service-orientedness, it is very vital to research the interaction between information technology and service commerce at a deeper level. The major work of this article is as follows, based on the following analysis: To assess the international competitiveness of trade sector, use the International Market Share index (IMS). Using panel data from 25 major global trading countries and comprehensive consideration of education expenditure, R&D expenditure, accepted intellectual property rights, Internet penetration rate, and other control variables, empirically analyze the impact of information and communication technologies on the competitiveness of trade sector.

### **Data and Methodology**

This article focuses on the influence of a country's information and communication technology (ICT) on our country's international competitiveness in the trade sector. This article employs the ICT Development Index (IDI) issued by the International Telecommunication Union in 2007 to calculate the degree of ICT development. The IDI is a comprehensive indicator that is used to compare the degree of ICT in different nations. trade.

RCA, IMS, and TC are the primary metrics used to assess a country's international competitiveness in trade sector. Taking data availability into account, this paper uses relevant data from 25 World Bank countries from 2009 to 2017 to calculate various indicators of a country's international competitiveness in trade sector, and

chooses the international market share (IMS) index as the interpreted variable to measure the level of a country's international competitiveness in trade sector.

After conducting a comparative analysis of the international competitiveness of more than 100 industries in ten countries at the end of the twentieth century, Professor Porter of Harvard University developed a more systematic analysis model of industry international competitiveness: the Diamond model. This methodology is convincing for assessing a country's industries' international competitiveness and has theoretically been accepted by academics. According to the model, a country's industry's international competitiveness is tied to production variables, demand factors, associated supporting industries, corporate strategies, structures, rivals, governments, and opportunities. As a result, this essay will choose control variables from among these factors. For more information, see Table 1.

Table 1. Names and descriptions of each variable

<i>Variable</i>		<i>Name</i>
<i>Dependent variable</i>	IIMS	International market share
<i>Independent variables</i>	Int	Internet penetration rate
	R&D	R&D expenditure
	EE	Education expenditure
	LnI	IDI index
<i>Control variable</i>	Op	Openness to trade sector
	Fin	Financial penetration
	Exp	Export volume of trade
	GDP	GDP per capita

This research develops a basic regression model based on the variables mentioned in Table 1:

$$IMS = \beta_0 + \beta_1 Int + \beta_2 RD + \beta_3 EE + \beta_4 LnI + \beta_5 Op + \beta_6 Fin + \beta_7 Exp + \beta_8 GDP + \varepsilon$$

IMS is the interpreted variable, that is, Kazakhstan's trade sector competitiveness index,  $\beta_k$  ( $k= 0, 1, \dots, 9$ ) is the variable's coefficient,  $\epsilon_{it}$  is the model's random error term,  $I$  represents the country, and  $t$  represents the year. In this research, the IDI index is logarithmically processed to decrease data heterogeneity. Simultaneously, due to the slight difference in royalties paid for intellectual property rights, it is numerically processed.

## Results and Analysis

Based on the availability of data, this article picks 25 significant nations as research subjects to explore the variables impacting a country's international competitiveness in trade sector throughout a time range of 2009-2017.

The empirical evidence and international market share (IMS) are obtained from the United Nations Conference on Trade and Development (UNCTAD) database, which has been compiled and computed. The IDI is calculated using data from the International Telecommunication Union and the World Bank. Other control variables are collected and computed using the World Bank and United Nations Conference on Trade and Development databases.

The regression is shown in Table 2 using the International market share (IMS) index of trade sector as the interpreted variable. Table 2 shows that information and communication technology may greatly boost the competitiveness of trade sector, which is consistent with the majority of previous study findings.

Table 2. Regression results of all samples

Variable	Fixed effect	Random effect
Int	0.026*** (6.22)	0.026*** (5.58)
R&D	0.000*** (3.64)	0.000*** (3.36)
EE	-0.002*** (-2.98)	-0.002*** (-2.97)

LnI	0.000 <sup>***</sup> (0.43)	0.000 <sup>***</sup> (0.48)
Op	0.001 <sup>***</sup> (2.04)	0.002 <sup>**</sup> (1.13)
Fin	-0.000 (-5.76)	-0.000 <sup>***</sup> (-5.30)
Exp	-0.69 <sup>***</sup> (0.000)	-0.35 <sup>**</sup> (0.000)
GDP	-0.64 <sup>*</sup> (-0.011)	-0.61 <sup>***</sup> (-0.015)
Cons	-0.015 <sup>***</sup> (-7.33)	-0.015 <sup>**</sup> (-7.33)

Note: \*, \*\* and \*\*\* indicate that the regression results are significant at the levels of 10%, 5% and 1%, respectively.

After thoroughly studying the regression findings of the three models, we can conclude that the influence of the ICT Development Index (LnI) on international market share (IMS) is considerably positive, as expected. The education expenditure to GDP ratio (EE) has a large negative influence on international market share (IMS), which is contrary to assumptions. It could be because the overall rate of further education in these sample countries is low, resulting in fewer talents who can provide trading industries and fewer people engaged in this industry, resulting in a negative correlation between the proportion of education expenditures and the international competitiveness of trade sector.

The percentage of R&D investment to GDP (R&D) has a large negative influence on international market share (IMS), contrary to predictions. In practice, increasing R&D spending may boost a country's industry's competitiveness. The likely cause is that our country's R&D spending on trade sector is not exceptional, which has resulted in a negative influence of our country's R&D expenditure on our trade sector's competitiveness. The recognized intellectual property rights charge has a considerable beneficial impact on global market share (IMS). The intellectual property fees collected represent a country's level of intellectual property protection.



The more intellectual property fees a country collects, the more intellectual property rights it has and the better its intellectual property rules are. This demonstrates that a country's intellectual property rights fees are also one of the more important elements influencing the worldwide competitiveness of its trade sector.

Because of the disparities in economic level and industrial structure between emerging and developed nations, the influence of information and communication technology on them would differ. As a result, this article employs sample-by-sample regression to investigate the variations in its impacts. This leads to the conclusion that information and communication technologies have a considerable positive influence on the interpreted variables, which is in line with predictions. Every unit improvement in the level of information and communication technology can boost trade sector's international competitiveness by 0.45 percent. In terms of controlling variables, GDP per capita and intellectual property fees received have a significant positive impact on the explained variables, which is consistent with expectations; however, education and R&D expenditure have a negative impact on the explained variables, which is inconsistent with expectations.

The master regression model's regression findings in developed nations. The impact of information and communication technology on the interpreted variable is negative, which contradicts expectations. Other control factors have a negative influence on the explained variable, which is inconsistent with predictions. GDP per capita and intellectual property fees received have a large positive effect on the explained variable, which is inconsistent with expectations.

In conclusion, the empirical findings are congruent with earlier studies. There are disparities in the growth of trade sector between developed and developing nations, according to Yadav (2014) and Choi (2011). Developing countries have lower levels of ICT development and lower ICT costs than industrialized countries. As a result, an increase in the level of information and communication technology has a negative effect on the growth of the competitiveness of trade sector in developed countries, whereas it has a positive effect in developing countries, implying that

developing countries can improve their competitiveness in trade sector by improving their level of information and communication development.

Because the prior empirical study cannot rule out endogenous flaws and crucial variable omissions, an endogenous test is necessary. According to the existing research, regression analysis of the main explanatory variables' lag phases 1, 2, and 3 was employed. Table 3 displays the results. The regression findings are found to be consistent with the main regression model, and they are all highly significant.

Table 3. Regression results of hysteresis core explanatory variables

<i>Variable</i>	<i>Lag Phase 1</i>	<i>Lag Phase 2</i>	<i>Lag Phase 3</i>
Int	0.001*** (4.71)	0.005*** (2.83)	0.003*** (1.07)
R&D	0.000*** (3.21)	0.000*** (4.91)	0.000** (3.86)
EE	-0.002*** (-1.63)	-0.002** (-1.11)	-0.002*** (-1.12)
LnI	-0.001 (-2.52)	-0.001 (-3.13)	-0.001 (-3.06)
Op	-0.015*** (-4.21)	-0.015*** (-2.46)	-0.015*** (-1.22)
Fin	0.015** (4.41)	0.015** (2.21)	0.015** (0.49)
Exp	-0.015 (-0.70)	-0.015 (-0.55)	-0.015 (-0.03)
GDP	-0.015 (-0.40)	-0.015 (-0.36)	0.010 (0.05)
Cons	0.012* (-0.74)	0.000 (0.04)	0.001* (0.81)

Based on prior research, this study proposes the degree of ICT application as an alternative indicator of ICT progress. It has been discovered that the use of ICT has

a beneficial influence on the competitiveness of the trade sector, which is consistent with the results of the master regression model.

### Conclusions

This article examines the international competitiveness of my country's trade sector and discovers that, while my country's trade sector is growing rapidly, the trade sector deficit remains large; at the same time, the RCA index, IMS index, and TC index of the world's major trading countries show that my country's trade sector lags behind that of developed countries. To investigate the impact of information and communication technologies on the international competitiveness of trade sector, this paper uses Porter's "Diamond" model as the research object, and establishes an empirical model for analysis using 25 major trading countries around the world.

First, information and communication technology will boost emerging nations' international competitiveness in the trade sector. ICT infrastructure is a necessity for developing a digital economy and an essential component of the country's urban construction, and the government's primary responsibility is to perform a good job in economic development. On the one hand, the government should provide financial and policy support to improve ICT infrastructure, particularly in rural and remote areas; on the other hand, our country should encourage small and medium-sized enterprises to transform, particularly productive enterprises, so that they can participate in the e-commerce market through the transformation of ICT technology.

Second, information and communication technologies undermine developed countries' international competitiveness in the trade sector. The high cost of ICT in developed countries has resulted in a low level of ICT application. As a result, our government should increase internet penetration while cutting ICT expenses in order to boost our country's international competitiveness in the trade sector. Improving our country's autonomous innovation and R&D capabilities is key to strengthening its competitiveness. There is unquestionably a gap between my

country and the industrialized ones in terms of critical technology. Many critical technologies still need to be imported and duplicated. To gain competitiveness, we must strengthen our R&D operations, capture control of critical technologies, and manufacture goods and services with distinct characteristics. This can also help to minimize the trade sector deficit and increase the competitiveness of our country's trade sector.

Finally, education spending has a detrimental influence on trade sector competitiveness. The total rate of further education in these sample nations is low, therefore there are fewer talents who can deliver digital services. Furthermore, this industry employs fewer people, resulting in a negative association between the share of education expenditures and the international competitiveness of trade sector. People are the cornerstone of the country's scientific and technical advancement. As a result, our country must prioritize education, deeply implement the strategy of revitalizing the country through science and education, the strategy of a powerful country with talents, and the innovation-driven strategy, and improve talent training programs in real time in response to the new requirements of social development and economic construction, further improve the quality of talent training, and cultivate top-tier innovative talents for the new era.

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