

Research on the Impact of Economic Policy Uncertainty on China's ICT Service Export

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Abstract. In recent years, economic policy uncertainty has been a hot topic in the world, and the development level of service trade is one of the symbols to measure a country's economic strength. Nowadays, the world economy is transforming to the globalization of digital economy, in which information and communication technology (ICT) plays an important role in the process of digital development. Taking service trade as the starting point, using the economic policy uncertainty index and taking the data of China's ICT service exports from 2001 to 2019 as a sample, this paper studies the impact of economic policy uncertainty on China's ICT service exports. The study found that China's economic policy uncertainty is conducive to the export of ICT services, while the global economic policy uncertainty has a restraining effect on it. Based on this, this paper puts forward policy suggestions on China's ICT service trade from the perspective of strengthening multilateral cooperation and increasing policy support of exporting countries.

Keywords: ICT services, Economic Policy Uncertainty, Service Export.

1. Introduction

Information and communication technology (ICT) has become an important supporting point for the development of digital economy. The rapid development of information technology and network technology makes the information service industry expand rapidly to various fields. At this stage, China's ICT services are mainly exported in the form of integrating new information technology through software, e-commerce platform, cloud service, artificial intelligence and blockchain (Wang Xiaohong, Fei Jiaoyan, 2021). There are many uncertain factors. The outbreak of COVID-19 has brought the global economy into a haze. While the whole team is fighting against the epidemic, the ICT service industry has shown its advantages. Telecommuting, remote diagnosis and treatment, online education show that the ICT service industry has penetrated into all aspects of life. The emergence of new growth points will definitely promote the innovation and growth of ICT services trade. However, in recent years, the turbulence of international economic form, especially the intensification of Sino-US trade friction, has led to the increased uncertainty of import and export policies, which will inevitably have an impact on the development of China's foreign trade, and the development of ICT service industry has become the backbone of the growth of China's service trade surplus. Therefore, it is of great practical significance to explore the impact of economic policy uncertainty on China's ICT service export.

2. Literature review

When reading the existing literature, it is found that many scholars' research on economic policy uncertainty mainly focuses on analyzing its impact on China's import and export of goods trade. Qu Lina and Liu Junting (2021) found from the perspective of ternary margin that China's economic policy uncertainty will have a restraining effect on the export of China's high-tech products, which is reflected in the decline of expansion margin and quantity margin, but significantly promote the export price margin^[1]; through empirical analysis, Chen Shaojian and Feng Zongxian (2020) found that in foreign trade, the increase of economic policy uncertainty in the destination country will significantly reduce the value of China's exports^[2]; Lang Lihua et al. (2021) found that the increase of economic policy uncertainty will significantly improve the domestic sales participation probability and

domestic sales scale of complete export enterprises from the perspective of micro enterprises^[3]; based on the perspective of trade intermediary agglomeration, Liu Qing et al. (2022) found that the economic policy uncertainty of the destination country will significantly reduce the export share of enterprise processing trade and increase the export share of enterprise general trade^[4]. When measuring the uncertainty of economic policy, most scholars use the uncertainty index of economic policy constructed by Baker et al. (2016) based on the relevant keywords in news reports^[5].

Some scholars subdivide economic policy uncertainty into trade policy uncertainty and study its impact on China's manufacturing exports, agricultural trade and exports of manufactured goods to the United States. Handley and Limão (2015) proved that trade policy uncertainty has significant inhibition on investment and participation in export behavior^[6]; Osnago et al. (2015) quantified the impact of trade policy uncertainty on exports by using empirical evidence and found that if the trade policy uncertainty decreases by 1%, the export volume will increase by 1% and the export possibility will increase by 12%^[7]. Su Limei et al. (2016) identified that the decline of trade policy uncertainty will lead to the decline of export quality through the double difference method^[8]; Handley and Limão (2017) took China's accession to the WTO as the background and believed that the trade policy uncertainty faced by China after its accession to the WTO would decrease significantly, which would promote China's exports to the United States^[9]; Li Junru, Shi Zizhong and Hu Xiangdong (2020) studied that the uncertainty of US trade policy is conducive to the export of China's agricultural products, but will inhibit their import^[10].

In the study of ICT service trade, Wang Xiaohong and Fei Jiaoyan (2021) proposed that China's ICT service trade has formed a strong international competitiveness and become the largest surplus source of China's knowledge intensive service trade, and proposed to focus on promoting international service outsourcing to promote ICT service export^[11]. There are few studies on the relationship between economic policy uncertainty and service trade export in existing studies. Nguyen et al. (2020) found that higher economic policy uncertainty leads to more outbound tourism and more total expenditure, but the expenditure per tourist will be reduced^[12]; Liu Xiuling and Hong Can (2020) showed that the decline of economic policy uncertainty will significantly increase the export scale of service enterprises, but have no significant impact on the choice of export behavior of enterprises^[13]; Chen Qifei and Zhang Qun (2021) found that the uncertainty of economic policy of exporting countries will reduce the intensity of technology spillover through the comparison of trade in goods and trade in services, and high-tech service trade is more affected by the uncertainty of economic policy^[14].

Through the above analysis, it can be seen that most of the existing literature is the research on the uncertainty of economic policy and commodity trade. There are few articles linking the uncertainty of economic policy with the import and export of service trade, and there is a lack of targeted research on the export of ICT services. Therefore, this paper will analyze the impact of economic policy uncertainty on China's ICT service export from the theoretical and empirical aspects, and put forward policy suggestions.

3. Analysis on the current situation of China's ICT service export

Under the background of "new infrastructure", the development of China's ICT industry has accelerated. Especially with the development of 5G, artificial intelligence, big data and other ICT technologies, China's ICT service industry has achieved qualitative and quantitative transformation and growth in recent years. However, in the data analysis of the world's top 500 companies in 2020, it is found that the top 12 profit margins of China's top 500 companies are only Ali and Tencent, which are ICT companies. As the growth pole of the world economy, all countries are competing to develop first. Therefore, to enhance China's competitiveness in high-profit industries, we need to make further progress in ICT service industry.

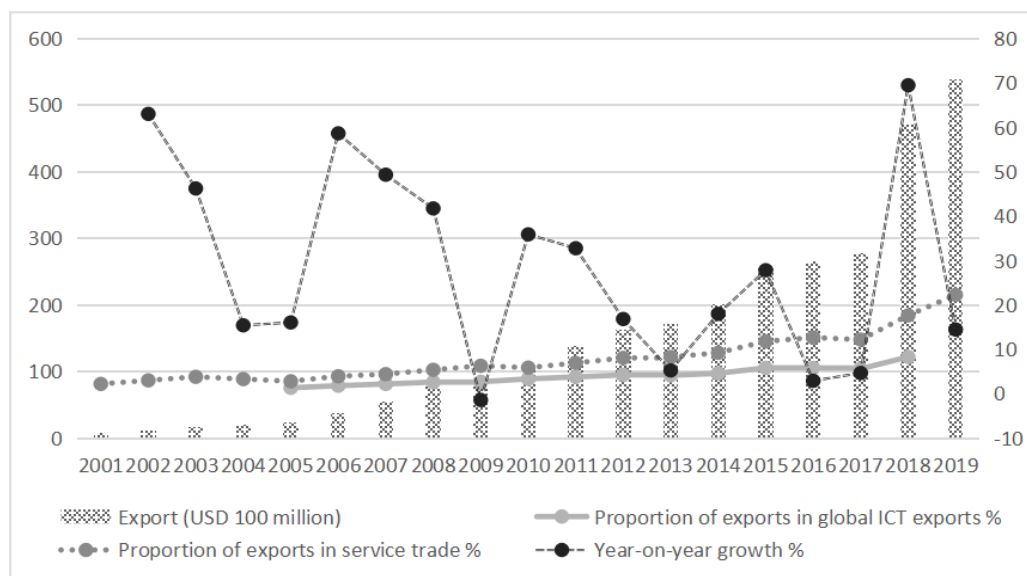


Figure 1. Overview of China's ICT service trade export from 2001 to 2019 Data source: Ministry of Commerce; UNCTAD database

3.1 The export of ICT services increased rapidly

Since the 13th five-year plan was put forward, we have focused on promoting the supply side structural reform of service trade. Under the severe development environment at home and abroad, the proportion of China's ICT service exports in the global ICT service exports has generally shown an upward trend. During the decade from 2010 to 2019, the value of China's ICT service exports increased from US \$10.476 billion to US \$53.860 billion, with an average annual growth rate of 41.4%. The proportion of ICT service exports in China's total exports of service trade has also been rising in addition to a slight decline in some years, and has increased significantly in recent years, which is closely related to the development of China's digital economy in recent years, making ICT service trade a new leading force in China's service trade. By 2019, ICT service trade exports accounted for 22.26% of China's total exports of service trade, we can see its vigorous development trend.

3.2 The growth rate of ICT service exports is different

From 2001 to 2019, although China's ICT service export showed an overall growth trend, it can be seen from the year-on-year growth data that the growth rate was very different in different years (as shown in Figure 1). In 2006 and 2017, the year-on-year growth was 58.63% and 69.47% respectively, but the growth rate was slow in other years, and even negative growth occurred in 2009. The increase of economic policy uncertainty will lead to the change of international economic form to a certain extent, which may have a certain impact on foreign trade. Service trade has its own particularity. The purpose of this paper is to analyze whether economic policy uncertainty will affect the export of ICT services.

3.3 Software enterprises have enhanced the international competitiveness of ICT service exports

China has become the world's largest ICT producer, consumer and exporter. With the promotion of emerging technologies such as artificial intelligence and big data, all walks of life are pursuing digital transformation. Among them, software enterprises have accelerated the development of China's ICT service industry through information technology R&D services, operation and maintenance services, new generation information technology development and application services and other forms (Yuan Huishu, 2021)^[15]. China's top 100 software enterprises use years of technology accumulation to provide customers with stable, reliable, safe and reliable cloud services. Enterprises

such as Huawei, Alibaba and Tencent have not only contributed to China's relevant business income, but also made a strong contribution to the development of ICT services. It is worth mentioning that the domestic brand Huawei has become the world's leading provider of ICT infrastructure, and successfully launched the Harmony OS2 operating system in 2021, which marks that Huawei mobile phones and other ICT products will officially switch from Android system to Hongmeng system. This is a historic change from 0 to 1, opening up a new era. Software and ICT service trade are inseparable. In 2019, China's software enterprises accounted for more than 40% of ICT service exports in the same year. In terms of ICT services, China has become the second largest exporter in the world in 2018. Therefore, the development of software enterprises has enhanced the international competitiveness of China's ICT service exports.

4. Theoretical mechanism of economic policy uncertainty affecting China's ICT service export

As ICT service is an industry integrating information and technology, its export is significantly different from other trade in terms of trade mode and technology content. Therefore, when studying the impact of economic policy uncertainty on it, it is mainly expounded through these two aspects. In this paper, the global and China's economic policy uncertainties are taken into account respectively to explore the impact mechanism of the two on China's ICT service export.

4.1 Analysis on trade mode

From the perspective of trade mode, different from trade in goods, trade in services is mainly carried out in four ways, namely cross-border delivery, overseas consumption, commercial existence and the flow of natural persons. Because services are non-storable and need to be produced and consumed at the same time, once the channels for developing service trade are blocked, it will inevitably affect the export of service trade. ICT services are mainly carried out through technology introduction, technology information outsourcing, active use of foreign capital and foreign direct investment, which are vulnerable to the uncertainty of economic policies of various countries. Li Fengyu et al. (2015) also confirmed the inhibitory effect of economic policy uncertainty on enterprise investment^[16]; the increase of economic policy uncertainty increases the waiting value of investment and the sunk cost of export, and enterprises usually take a wait-and-see attitude (Bloom et al., 2007)^[17]. When a country's economic policy changes, it will cause changes in the attitude of investors towards foreign direct investment. This wait-and-see attitude will make enterprises late in entering the export market. For example, the financial crisis in 2008 has caused trauma to the world economy, the US presidential election has caused turbulence to the world economy, and the global epidemic has also caused trade inconvenience. The above examples can prove that the uncertainty of global economic policy will hinder the channels of service trade. Therefore, it is speculated that the uncertainty of global economic policy will inhibit the export of ICT services in China.

4.2 Analysis on technical content

From the perspective of the technical content contained in the ICT industry, ICT services belong to the service trade with high-tech content, and the international services provided thereby are likely not to be completed at one time, which means that in the process of transaction, they may face the risk of policy changes and are more vulnerable to the uncertainty of economic policies. Secondly, ICT services involve many important information security, and some countries will have strict control in this regard. When some factors threatens its own interests or security, it will restrict the import and export of some products or services by changing trade policies. On the contrary, when an encouraging economic policy emerges, it may have a favorable impact on the service export. The tertiary industry has become an important symbol to measure a country's modernization level. Because China's service trade started late and there is still a certain gap with international developed countries and regions, China has continuously adjusted its industrial structure and formulated many economic policies

conductive to the development of the service industry in recent years, such as the outline of the 11th five-year plan formulated in 2006. Among them, it clearly puts forward the economic measures of "expanding producer services". In 2012, the first China (Beijing) international trade in services fair was held to provide a window for the discussion of international trade in services policies. Since 2010, China's representative cities have successively introduced policies and measures to develop high-tech service industry, encouraging the industry to use the R&D and application of software services; in 2018, innovative pilot sites of service trade were launched in China, making the national service trade export reach the highest growth rate since 2012; in 2019, it is proposed to accelerate the development of information technology services and cloud. During the epidemic period, we also made full use of the technical services of the new system and the fields of medical treatment, education and office to make continuous progress and innovation in the challenges. Gu Xiaming et al. (2018) concluded that economic policy uncertainty has an incentive effect on innovation from the perspective of innovation input and innovation output^[18]. Feng He (2020) et al. found that EPU is positively correlated with enterprise innovation on the whole^[19]. All the above measures have promoted the development of China's service export. Therefore, it is speculated that China's economic policy uncertainty will promote the export of ICT services.

5. Empirical analysis

This section studies the impact of economic policy uncertainty on China's ICT service exports from an empirical perspective. Due to the difficult availability of bilateral data of service trade, it uses time series data for verification. Firstly, it introduces the selection of empirical model and variables, and then explains the results obtained by regression model.

5.1 Model setting

SPSS software was used for multiple regression test. Taking the indicator of economic policy uncertainty as the core variable and other factors that may affect the export of ICT services, the model is set as follows:

$$\ln X_t = \alpha_1 \ln CEPU_t + \alpha_2 \ln GEPU_t + \alpha_3 \ln GDP_t + \beta$$

Where X represents the export volume of ICT services in China in period t, the core variable CEPU represents the uncertainty index of China's economic policy in period t, the core variable GEPU represents the uncertainty index of global economic policy in period t, and GDP represents China's per capita GDP in period t, β is a constant term.

5.2 Explanation of variables

5.2.1 Economic policy uncertainty (EPU)

The core variables are China's economic policy uncertainty (CEPU) and global economic policy uncertainty (GEPU). The calculation of both refers to the economic policy uncertainty index constructed in Baker et al. (2016). Since it is monthly data, it is converted into annual data by arithmetic average method.

5.2.2 Economic scale (GDP)

Taking China's per capita GDP as the control variable, generally speaking, the larger the scale of China's economy, the more it can promote the export of China's products and services of high-tech products and quantity. Since it studies the total export of China's ICT services to the world, it is more convincing to choose China's separate per capita GDP.

5.3 Data source and processing

From 2001 to 2019, China's export of ICT services was obtained on the official website of the Ministry of Commerce and the UNCTAD database. In some years, the units are not unified, and the exchange rate of that year is used for processing. The economic policy uncertainty index comes from the official website¹, and take a unified pair of numerical values for empirical research.

5.4 Empirical results

5.4.1 Correlation analysis

After screening various influencing factors, CEPU, GEPU and GDP are selected for analysis (expressed with x). Firstly, the correlation test of x_1 , x_2 and x_3 is carried out. The results obtained by SPSS software are shown in Table 1. It can be seen that the Pearson correlation of x_1 , x_2 , x_3 , x_4 and y (dependent variable) is significantly correlated at the level of 0.01 (bilateral), and the test p value is less than 0.01, indicating that the correlation between each variable and dependent variable y is significant. In order to study the impact of various variables on China's ICT export, further empirical research will be carried out.

Table 1. Correlation coefficient and correlation test coefficient P value between various variables

	y	x_1	x_2	x_3
y	1	0.726**	0.750**	0.991**
x_1	0.726**	1	0.947**	0.704**
x_2	0.750**	0.947**	1	0.752**
x_3	0.991**	0.704**	0.752**	1

** . at the level of 0.01 (two tailed), the correlation is significant

Note: y is the logarithm of export volume, x_1 is $\ln$ CEPU, x_2 is $\ln$ GEPU, and x_3 is $\ln$ GDP

5.4.2 Multiple regression process

Since there may be collinearity between independent variables, the stepwise regression method has been adopted in the previous step to gradually eliminate a single insignificant variable from all available independent variables. Finally, CEPU, GEPU and GDP are selected as independent variables, and then SPSS software is used to test the model fitting and find the adjusted $R^2 > 90\%$, indicating that the selected model fits well, and the independent variables have a certain persuasion on the export of ICT services. Finally, the relevant multiple regression output results are obtained, as shown in Table 3.

Table 2 Model fitting situation

Model	R	R^2	The adjusted R^2	Error of the standard estimates
1	0.994	0.988	0.985	0.15550

Table 3 Benchmark regression results

Variable	B	Significance	VIF
Constant	-7.594	0.000	
CEPU	0.435	0.021	9.725
GEPU	-0.702	0.045	11.311
GDP	1.594	0.000	2.307

According to the benchmark regression results and rank correlation coefficients obtained from the regression equation, these results show that there is no multicollinearity and autocorrelation in the

¹ <http://www.policyuncertainty.com>

model, indicating that the fitting effect of the model is good. Therefore, the multiple linear regression equation should be:

$$\ln y = -7.594 + 0.435 \ln x_1 - 0.702 \ln x_2 + 1.594 \ln x_3$$

Namely

$$\ln X_t = -7.594 + 0.435 \ln CEPU_t - 0.702 \ln GEPU_t + 1.594 \ln GDP_t$$

5.4.3 Analysis of regression results

From the coefficient of correlation index, it can be seen that the per capita GDP of exporting countries can promote the export of ICT services, because the height of per capita GDP means the improvement of China's economic development level and the consumption level of domestic consumers, which will promote the improvement of the quality of ICT services and expand its export market. The uncertainty of global economic policy has a negative correlation with the export of ICT services in China, that is, the increase of GEPU will reduce the export of ICT services in China, which is in line with the results of theoretical analysis. The uncertainty of China's economic policy is conducive to the export of ICT services, which is due to the strong support of China's policy for service export, so as to promote the export of ICT services, which is consistent with the conjecture of theoretical analysis.

6. Conclusions and policy recommendations

Using the data of China's ICT service exports from 2001 to 2019, this paper makes an empirical analysis of the impact of economic policy uncertainty on China's ICT service exports by using a multiple regression model. The study finds that China's economic policy uncertainty is generally good for China's ICT service exports, while the global economic policy uncertainty has an inhibitory effect on China's ICT service exports. According to the research results, the following suggestions are put forward for the future development of ICT services in China.

6.1 Establish multilateral cooperation to mitigate the impact of global economic policy uncertainty

As mentioned above, China's ICT services are mainly exported through software, e-commerce platform, cloud service, artificial intelligence and blockchain, which integrate new information technology. In the export of goods trade, it can be produced and sold locally in the host country through cross-border M&A or the establishment of overseas branches, which can not only reduce tariffs and transportation costs, and some trade barriers can be avoided to a certain extent. Therefore, in terms of trade in services, we can also learn from the mature practice of trade in goods, and set up overseas R&D centers and other similar institutions in some countries and regions with close contacts, which can not only facilitate the learning of local technology, but also understand the situation of consumers in the target market, and better provide ICT services for consumers according to local conditions, so as to promote the export of ICT services in China. In addition, due to the high technical content required by ICT services, more human resources required for innovation, long time and great difficulty, cross-border M&A can effectively reduce such obstacles, enable enterprises to obtain more core technologies in the short term and contribute to the better integration of Chinese enterprises into the global innovation chain. For example, Huawei has successively set up five R&D centers in France, including chip, mathematics, sensor and software development, and set up Lagrange R&D center in France in 2020, focusing on Mathematics and computer research, the purpose is to serve the whole communication industry with the achievements here. The research of mathematics is bringing a new breakthrough to the ICT industry. In addition, ZTE, Alibaba, Tencent and other enterprises have also set up R&D centers overseas. While China's technology has been innovated, they can also export Chinese standards and rules and improve China's influence. Therefore, establishing cooperation with

multiple countries can strengthen multilateral cooperation, maintain core business volume in case of economic turmoil and reduce the impact of global economic policy uncertainty on ICT service exports.

6.2 Increase China's policy support and improve ICT service quality and innovation ability

The core technology involved in ICT industry is not only the key to determine the competitiveness of ICT service trade, but also closely related to China's economic development and security. The technology obtained through purchase can temporarily improve the availability of technology, but it can be concluded from the product life cycle that new technologies are constantly innovating, and the technology obtained through other ways may be in a mature or declining period. Therefore, in order to master the core technology for a long time, we must firmly grasp the innovation ability in our own hands. The policy support of exporting countries can promote the development of industry. Therefore, we should strengthen the guarantee mechanism of financial investment and increase the introduction of talents. Gustavsson et al. (2014) confirmed that the amount of scientific research expenditure and the number of high-tech employees will promote the export of high-tech products in EU^[20]. Therefore, we should not only stand at the commanding height of the strategy in the early stage, but also closely follow the global ICT innovation chain in the middle stage of R&D. Finally, we should ensure the combination with practical application when achieving R&D results, and this series needs the support of national policies. On the other hand, as a special commodity, ICT services need high quality all the time, from equipment supply, request acceptance, problem handling, project delivery, network maintenance, business operation to talent training. Therefore, it is also very necessary to strengthen the high-quality management of ICT services and implement it in policy management to form a new development pattern of innovation and high-quality.

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