Internet Search and the Ternary Margin of China's Export Trade

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Abstract: *The Internet search function has become more and more common, creating the necessary conditions for China's trade and export. In this context, China's export trade has undergone certain changes, but what kind of relationship is there between the two specifically. Based on China's panel data from 2011-2021, this paper empirically analyses the impact of Internet search on China's foreign trade through multiple linear regression. It is found that the increase of Internet search has a positive impact on China's total exports, category margin, intensive margin, quantity margin and price margin, and finally the article puts forward corresponding policy recommendations based on the empirical results of the Internet and China's foreign trade.*

Keywords: *Internet Search, Baidu Index, Ternary Margins, International Trade*

1. Introduction

In order to realize sustained and stable growth in exports, the 19th Party Congress Report proposed to promote the deep integration of the Internet, big data, artificial intelligence and the real economy, promote the development of new trade forms and new modes, and advance the construction of a strong trading nation. China Internet Network Information Center (CNNIC) released the 53rd Statistical Report on the Development Status of the Internet in China in Beijing, and the Report showed that as of December 2023, the number of Internet users in China reached 1.092 billion, with an increase of 24.8 million new Internet users compared with that of December 2022, and the Internet penetration rate reached 77.5%. China is a big country in the development of the Internet, but the degree of trade exports to partner countries is very different, probably due to the uneven economic development, etc., so that the Internet infrastructure and Internet penetration between different countries there are obvious differences in the amount of trade exports, etc. There is also a certain degree of difference. So, what is the relationship between Internet search and foreign trade development? What is the impact of Internet search on a country's export of goods? Under the current situation of political and economic uncertainty in the world, how to improve the ability of China's export trade to cope with external shocks such as financial crises, trade wars and new crown epidemics through the digital economy is one of the necessary answers to realize the high-quality development of trade[1].

2. Literature Review

2.1. State of the Art in Internet Search Research

Internet search is a function we can't get around but often unconsciously ignore when surfing online. In June 2016, the State Internet Information Office issued the Provisions on the Administration of Internet Information Search Services; in June 2017, the National People's Congress approved the adoption of the Network Security Law of the People's Republic of China, which regulates the power of citizens, legal persons, and network operators to use the network; since March 1, 2020, with the content of network information as the main object of governance, the Provisions on the Eco-Governance of Network Information Contents implementation; in 2021, the Data Security Law of the People's Republic of China and other centralized introduction; in 2022, the Internet User Account Information Management Provisions and other policies continue to ramp up. The scale of China's Internet users continues to grow, and the utilization rate of search engine users has continued to rebound in recent years. According to the data shown in CNNC's "Statistical Report on the Development of the Internet in China" over the past years, China's search engine users were 602 million in 2016.

2.2. Current Status of Research on the Internet and International Trade

In recent years, different scholars quantitatively analyze the impact of the Internet on China's international trade from different perspectives. Domestic scholars believe that the form and content of international trade are changing with the trend of digitalization and the booming of Internet-related industries, and there is an urgent need to expand the traditional international trade theory, multinational corporations' theory, and international trade regulations and policies to adapt to the ever-changing form and content of international trade[2]. 2020-2021, although facing the impact of the new Cunxin pneumonia epidemic, China's export trade has reached an average annual growth rate of 13%, including a 21.2% growth in goods exports in 2021[1]. Jin Xiangyi and Shi Bingzhang's study involving Internet search and international trade is mainly based on the quality of the enterprise's export products, while involving the Internet search, the Internet search in a near-zero-cost way for the enterprise to provide massive amounts of information to significantly reduce the cost of enterprise information, increase the marginal benefit of the enterprise's quality upgrading and its corresponding optimal marginal cost, and ultimately improve the quality of the product[3]. Shi Bingzhang and Jin Xiangyi used China's daily Baidu search index for more than 200 economies in the world from 2006 to 2016 to construct an attention allocation index, which is a useful attempt to apply this data system in the field of trade[4].

3. An Empirical Analysis of Internet Search on the Ternary Margins of Trade

3.1. Variable Selection and Data Sources

This paper selects the data of China's exports to 62 other countries from 2011 to 2021, so as to establish a regression model to explore the relationship between Internet search and the increase or decrease of China's export margin. As shown in table 1 below , among them, the total amount of China's exports to trading partner countries, the type margin, intensive margin, price margin and quantity margin of China's exports to trading partner countries are used as the explanatory variables of this paper; the core explanatory variable is the level of Internet search, which is represented by Baidu index in this paper; the control variables include the income level of the trading partner countries and the market size, followed by the fixed trade cost and the straight line distance between the two countries' capitals, and finally is the free trade agreement FTA.

Table 1: Variable name.

	variable name	data sources
variable	China's total exports	BACI database
	margin of appreciation	HS92 codes in the BACI database
	intensive margin	HS92 codes in the BACI database
	quantitative margin	HS92 codes in the BACI database
	price margin	HS92 codes in the BACI database
	Baidu index	Baidu search engine
	income level	WDI database
	market size	WDI database
	directrix distance	GEODIST database
	Fixed trade costs	American Heritage Foundation
	free trade agreement	China Free Trade Zone Service Network

3.2. Model Setup

The specific regression model is as follows:

$$lnY_{jmt} = \alpha_0 + \alpha_1 lnbaidu_{jmt} + \alpha_2 lnGDP\_O_{mt} + \alpha_3 lnPOP\_O_{mt} + \alpha_4 lnDistance_{jm} + \alpha_5 lnFreedom_{jmt} + \alpha_6 FTA_{jmt} + \lambda_{jm} + \mu_{jt} + \varepsilon_{jmt} \tag{1}$$

In the equation, α_0 represents the constant term, j and m represent China and trading partner countries respectively, t represents the year, λ_{jm} and μ_{jt} represent the individual fixed effect and time fixed effect respectively, and ε_{jmt} is the random term in the regression model. Y_{jmt} are the explanatory variables, including the total amount of China's exports to the trading partner countries (T_{jmt}), the type margin of China's exports to the trading partners (EM_{jmt}), intensive margin (IM_{jmt}), price margin (P_jmt) and quantity margin (Q_{jmt}). The $baidu_{jmt}$ is the core explanatory variable of this paper, which

represents the level of Internet search in year t. Other variables are control variables, including the income level (GDP_O) and market size (POP_O) of the trading partner countries; geographic distance ($Distance$) between China and the trading partner countries; fixed trade cost ($Freedom$), which is calculated as the ratio of the economic freedom of the trading partner countries to that of China's economy[5]; and whether or not a free trade agreement (FTA) has been signed between China and the trading partner countries.

3.3. Calculation of the Ternary Margin

Refer to the methods of Hummels and Klenow[6] and Shi Bingzhang[7].

First, define the category margin as shown in equation (2) below:

$$EM_{jmt} = \frac{\sum_{i \in I_{jmt}} v_{rmit}}{\sum_{i \in I_{rmt}} v_{rmit}} \tag{2}$$

where $v_{rmit} = p_{rmit} q_{rmit}$, V is the export value of a single product, p is the export price of a single product, and q is the export quantity of a single product. t stands for the year, i stands for a single product exported by China, I stand for the set of all products exported by China, j stands for China, m stands for the trading partner country, and r stands for the reference country.

Next define the margin of intensification, which is calculated as shown in equation (3) below:

$$IM_{jmt} = \frac{\sum_{i \in I_{jmt}} v_{jmit}}{\sum_{i \in I_{jmt}} v_{rmit}} \tag{3}$$

The price margin is calculated as:

$$P_{jmt} = \prod_{i \in jmt} \left(\frac{p_{jmit}}{p_{rmit}}\right)^{w_{jmit}} \tag{4}$$

The weights are calculated as:

$$w_{jmit} = \frac{\frac{s_{jmit} - s_{rmit}}{\ln s_{jmit} - \ln s_{rmit}}}{\sum_{i \in I_{jmit}} \frac{s_{jmit} - s_{rmit}}{\ln s_{jmit} - \ln s_{rmit}}} \tag{5}$$

The formula for the margin of quantity:

$$Q_{jmt} = \frac{IM_{jmt}}{P_{jmt}} \tag{6}$$

3.4. Regression Analysis

The descriptive statistics for each of the main variables are shown in the table 2 below, and taking logarithms of all the non-dummy variables involved in the empirical process removes the magnitude of each variable and provides a better measure of the marginal impact of changes in their size.

Table 2: Descriptive statistics.

variable	sample size	average value	(statistics) standard deviation	minimum value	maximum values
Ln Baidu	682	7.826	0.865	4.736	10.15
Ln T	682	16.23	1.413	13.04	20.09
Ln EM	682	-0.239	0.124	-0.770	-0.0225
Ln IM	682	-1.602	0.709	-3.172	-0.00116
Ln P	682	-0.0250	0.162	-0.909	0.629
Ln Q	682	-1.577	0.777	-3.605	0.330
Ln GDP O	682	12.71	1.449	9.128	16.96
Ln POP O	682	7.851	1.445	3.729	11.85
Ln Distance	682	8.956	0.565	6.862	9.868
Ln Freedom	682	0.177	0.158	-0.329	0.536
FTA	682	0.211	0.408	0	1

As shown in the OLS regression results in Table 3 below, the effect of Baidu index on the category margin, the margin of aggregation, the price margin and the quantity margin of China's exports to trading partner countries are all positive and significant. In terms of consumption status, the effect of income level of trading partner countries is very significant, and the effect of market size of trading partner

countries on the category margin of China's exports is not significant. In terms of trade costs, the effect of fixed trade costs on the category margin, the intensive margin and the quantity margin of China's exports is not significant. The signing of FTAs between China and its trading partners helps to promote the improvement of China's export category margins, margins of aggregation, price margins and quantity margins, and the effect is significant.

Table 3: OLS regression results.

variable	(1) Ln EM	(2) Ln IM	(3) Ln P	(4) Ln Q
Ln Baidu	0.016**	0.174***	0.007	0.167***
	(0.007)	(0.033)	(0.009)	(0.036)
Ln GDP_O	0.039***	-0.279***	0.071***	-0.35***
	(0.005)	(0.027)	(0.007)	(0.029)
Ln POP_O	-0.004	0.37***	-0.046***	0.417***
	(0.005)	(0.025)	(0.007)	(0.027)
Ln Distance	-0.057	-0.13	0.136***	-0.266
	(0.035)	(0.179)	(0.047)	(0.195)
Ln Freedom	0.019**	0.077**	0.004	0.074*
	(0.008)	(0.039)	(0.01)	(0.042)
FTA	0.123***	0.484***	0.028**	0.456***
	(0.01)	(0.053)	(0.014)	(0.058)
constant term (math.) Observations R-squared	Y 682 0.386	Y 682 0.515	Y 682 0.347	Y 682 0.522

4. Conclusions And Recommendations

4.1. Main Findings

Based on China's foreign trade data from 2011-2021, this paper empirically analyzes the impact of Internet search on China's foreign trade, and finds that the Internet has a significant role in promoting China's total import and export, export and import, and China's enhancement of Baidu index to trade partner countries can promote the types and quantities of China's exports; however, it has no significant effect on price. The combination of the Internet and international trade provides a more convenient channel for countries to trade, the smooth flow of circulation reduces transaction costs and stimulates consumer demand, the use of new technologies such as the Internet brings new markets and new trade content and creates new value, and the rational use of the Internet to expand the international market is a major part of China's future foreign trade development strategy.

4.2. Policy Recommendations

The construction and improvement of network infrastructure is a supporting condition for the development of Internet economy and the expansion of new foreign trade. The increase in the Baidu index, i.e., the improvement of the level of the Internet and the enhancement of Internet awareness, contributes to the development of China's foreign trade, and is conducive to getting rid of the difficulties faced by traditional foreign trade and the development of new competitive advantages. Although China began to implement the provisions of the network information content ecological governance, the People's Republic of China Data Security Law, etc., it is recommended that the government continue to establish and improve the relevant laws and regulations, policy supervision, information protection and other support systems, improve the service functions of the network platform, promote e-government in the process of registration, examination and approval, security inspection, taxation, etc., to help upgrade the government's management, and to provide better docking services for foreign trade enterprises.

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