Research on Trade Patterns in the ICT and IP Services: An Empirical Study of the US during the Period of 2005-2017

Fei WANG¹, Yang YU²,∗ and Hui-long Li³

¹Department of Economics and Management, Jilin Police College, Changchun, 130117, China
²College of Humanities and Sciences, Northeast Normal University, Changchun, 130117, China
³Pressing Center, FAW-VW, Changchun, 130117, China

*Corresponding author

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Abstract. The United States is the ultimate top leading service exporter in the world. Telecommunications, computer, information (short as ICT below) services and Intellectual Property (short as IP) services are essential contributors to America’s service export. However, whether the big trade surpluses in accordance with their comparative advantages of the above mentioned services, or the net export income coming from strategic policies are problems to be solved. Analyzing NXR, RSCA and H indicators which measured America’s ICT and IP service exports pattern from 2005 to 2017, this study has found that in ICT category, there exits distortions among the above three measurements, which hints the US government has adopted policy stimulus to prompt ICT service exports, however, the same measurements show consistency in IP category, which reports IP export of the US featured with free trade mode. Further researches based on this paper have been undertaken.

Introduction

The United States is becoming more of a services-oriented economy and has been the top leading service exporter and importer in the world since 1981. The total trade value of the US exceeded US$1000 billion in 2001, and in 2017, the trade surplus reached US$781 billion, taking up 15% of global exports and accounting for 71% of US jobs. The export of ICT and IP services play an important role in service exports of the US, which represent nearly one third of world’s service export. All ICT and IP services are technology-intensive and with high added-value. According to traditional international trade theories, countries should participate in international specialization according to their factor endowments or we say the comparative advantages.¹ The US government has carried on supportive-policies one after another to stimulate export of ICT services, and the intervention may trigger distortion between the comparative advantages and the country’s real net export ability. Some researchers take the distortion as a kind of upgrading cost, Nevertheless, the matter is whether the cost is worthwhile, in other words, will it bring technical progress or comparative advantage improvement by “learning by exporting”¹, which is also the focus study of this paper.

Measurements, Data Sources and Classification

Measurements

RCA( revealed comparative advantage) index is an measurement to obtain the comparative advantage of a certain product or a category of products. The index is assumed to be figured out by the following equation:

\[ \text{RCA}_{ie} = \frac{X_{ie}/X_i}{X_{w}/X_w} \]  \hspace{1cm} (1)

Where \( X_{ie} \) represents the value of export of product e in country i during the empirical period, \( X_i \) stands for the value of total export of country i during the same period, \( X_{w} \) represents the value of
export of the whole world of product e and \( X \) reports the total value of world’s export of all kinds during the empirical period.

This index proposed by Balassa\(^2\), is adopted to compare country i’s export ability of product e with the world’s export ability of the same product. The value of it ranges from \([0,8]\), and the interval of the index presents as a deficit when the comparison is essential with other indexes. So the improved symmetric measurement put forward by Laursen\(^3\) is as follows:

\[
RSCA_{ie} = \frac{(RCA_{ie} - 1)}{(RCA_{ie} + 1)}
\]  

(2)

The improved formula with an interval of \([-1,1]\), and when \( RCA > 1 \), we have a corresponding \( RSCA > 0 \) while the opposite is also tenable.

The real net export ability is usually measured by the following modeling:

\[
NXR_{ie} = \frac{(X_{ie} - M_{ie})}{(X_{ie} + M_{ie})}
\]  

(3)

In the above formula, \( NXR_{ie} \) reports the net export ratio of product e in country i, \( X_{ie} \) stands for the value of total export of product e in country i during the sample period, while \( M_{ie} \) represents the import value correspondingly. When \( NXR_{ie} > 0 \), we may conclude comparatively that country i has real net export ability in product e, and when \( NXR_{ie} < 0 \), we know the trade deficit exits and the country has net import ability in product e.

Formula (2) and (3) have the same value interval which is from \(-1\) to \(1\), and the same average that is \(0\). According to Hechsher-Olin’s theory\(^4\), different countries have different factor endowments, and a country should produce specifically goods that use the factor with which the country is heavily endowed, and import goods lack of factor endowments. As for Ricardian comparative advantage theory\(^4\), a county would benefit from exporting products with high domestic productivity while importing products with low domestic productivity. So, this paper holds that when free trade occurs, a country’s net export ability should be corresponding with its comparative advantage of a certain product or a certain category, that is, \( RSCA_{ie} = NXR_{ie} \). The equilibrium will be achieved when \( RSCA_{ie} - NXR_{ie} = 0 \). Inversely a distortion may occur when \( RSCA_{ie} > NXR_{ie} \) or \( RSCA_{ie} < NXR_{ie} \).

\[
h_{ie} = RSCA_{ie} - NXR_{ie}
\]  

(4)

\( h \) index could be used to measure policy interference. Concerning each category of services we investigated includes a number of service products, we improved the \( H \) index to calculate a category service products by weighted average as follows:

\[
H_j = \sum_{t} (H_{t \cdot i} \cdot w_t)
\]

where \( t \in j \) and

\[
w_t = \frac{(X_t + M_t)}{\sum_{t}(X_t + M_t)}
\]  

(5)

**Data Sources and Classification**

All the sample data are collected from the website of Conference on Trade and Development of United Nations, sample period is from 2005-2017. The categories of services of exports and imports by economies are classified according to BPM6, which was released in 2008, the sixth edition of the IMF’s Balance of Payments and International Investment Position Manual. BPM6 allocated commercial services into 4 main categories: goods-related services, transport, travel, and other services. Thereinto other services include construction, insurance and pension services, financial services, charges for the use of intellectual property n.i.e., telecommunications, computer, and information services, personal, cultural, and recreational services etc. The second level of subsection
of telecommunications, computer, and information services consist of 4 third-level subsections which are telecommunications services, computer services, information services and other services.

**Empirical Analysis**

**Trade Pattern Analysis of ICT Services**

Figure 1 illustrates and compares RSCA, NXR with H index of the second level of category of ICT services from 2005-2017. The US is a big exporter in exporting computer, information related services, however, we can see clearly there is comparative disadvantage of export in the category, and the time path of RSCA remains stable. The NXR curve around the horizontal line tells us the US has the same ability both in export and import of ICT services, and the export ability shows the distortion against factor endorsement and comparative advantage theories. According to the theory, the US should import ICT services much more than what they did during the empirical period and shouldn’t export services in this category when the market is actually a free market. The H Columnar Section stands above or below 1 during the sample period and shows us strong policy interference of the export of this type of services.

ICT services are related to digital economy. The US congress has played an important role in shaping global digital trade policies, from oversight of agencies charged with regulating cross-border data flows to shaping and considering legislation implementing new trade rules and disciplines through trade negotiations. Congress also works with the executive branch to identify the right balance between digital trade and other policy objectives, including privacy and national security.[5]

However, the improvement of the export comparative advantages of ICT services has not been captured from the above figure.

**Trade Pattern Analysis of Information Services**

Fig. 2 demonstrates information services (which is sub-section of ICT category) export in the US from 2005-2017. In Fig.2, the RSCA curve remains stable and around 0.40, which tells us that America’s export in information service has comparative advantage with medium-level strength. Also we could observe the curve representing NXR is upper than that of RSCA, showing the distortion between export capability and its real export exits. The tendency and strength of H Columnar Section shows us positive polices may be adopted to boost information service exports.
Trade Pattern Analysis of Computer Services

Fig. 3 shows us that the export of computer services (which is also another sub-section of ICT category) of the US are featured with very strong distortion among the three indicators. The RSCA and NXR remain stable at -0.50 and about -0.25 separately, while the H Columnar Section stays quite high above 1.50. It may be concluded that critical policies would be manipulated even on services with little comparative advantage.

The U.S. government has been carrying out supportive export policies of services consistently and firmly. Since Clinton administration, the information superhighway was built, Obama administration promoted trade in services by The Trans-Pacific Partnership (TPP), Trump administration also deems stimulus for service exports as national strategy. The US export environment is much better than the other relevant economies, the exporters in service can get financial support, counseling and assistance support, R&D support and many other supports in their nation. However, except no improvement of export capability witnessed in these industries, a worsen comparative advantage can be captured.

![Figure 3. Trade indexes of computer services.](image)

Trade Pattern Analysis of IP Services

Fig. 4 illustrates the US export of IP service. We use the data of “charges for the use of IP n.i.e” from governmental website to measure the export situation of this type of service. Through Fig. 4 we see the curves of NXR and RSCA overlapped with each other and stay above or below 0.50, both medium-level strengths of comparative advantage and net export radio of this type of service can be obtained. The H Columnar Section stays stable at around 0.85 all the sample period.

![Figure 4. Trade indexes of IP services.](image)

The curves of NXR and RSCA have featured with free trade characteristics, although governmental stimulus has also been manipulated and applied by.

IP industry in the US has developed much earlier, the agreements like TRIPS and TPP rules are the international authoritative benchmarks for the other economies to comply with and refer to especially when amending their national laws. According to data on the website of Conference on Trade and Development of United Nations, IP service export contributed approximate 12 billion Dollars to the US export in 2007, which remained the third biggest contribution to America’s service export.
Conclusion

Using data from Conference on Trade and Development of United Nations’ website, this paper compared RSCA, NXR and H indicator of ICT and IP service export from 2005-2017. Through progressive and empirical analysis, the paper has received the following conclusions:

There are medium-level strengths of export comparative advantages in IP service and information service, which tells us that the US enjoys technology and productivity advantage, however, there are relatively strong comparative disadvantage in computer export.

H Columnar Section of both ICT and IP services stand high in their figures, indicating governmental support and protective policies in these sections, anyway, the relationship of NXR and RSCA curves in Fig.4 also show free trade feature in IP service export.

Technology improvements or we say advanced comparative advantages haven’t been seen in Fig.1 and Fig.3, the RSCA curve remain steady at disadvantage level, which is the proof of Lin [6], Hong [7] and the author’s view [8], economic development should be in accordance with its comparative advantage, not far from it; government intervention might be effective in a short time, but will be not applicable or even harmful in the long run.

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