Economics Letters 155 (2017) 96–99

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

ICT's effect on trade: Perspective of comparative advantage

Yao Wang [a], Jie Li [b,*]

[a] School of Management, Zhejiang University, 866 Yuhangtang Rd., Hangzhou 310058, China

[b] Department of Economics, Faculty of Arts and Social Sciences, National University of Singapore, 1 Arts Link, Singapore 117570, Singapore

HIGHLIGHTS

- This paper demonstrates that ICT can be a source of comparative advantage in trade.
- Exporter's ICT data and bilateral industrial level trade data in year 2013 are used.
- We identify with interactions between industry and exporter characteristics.
- Results show that ICT promotes export more in industries using ICT intensively.

ARTICLE INFO

Article history:
Received 8 February 2017
Received in revised form
11 March 2017
Accepted 19 March 2017
Available online 22 March 2017

JEL classification:
D2
F1
O3

Keywords:
Information and communication technology (ICT) development
R&D intensity
Task complexity
Comparative advantage

ABSTRACT

This paper uses country-level ICT data and bilateral trade data in 2013 to test whether cross-country differences in ICT can be a source of comparative advantage in international trade. Empirical results show that a country's export in one industry increases 10 percent if the country's ICT development index increases 1 standard deviation (SD) and industry's R&D intensity increases 1 SD. The export increase is 25 percent in the case of task complexity.

1. Introduction

The rapid development of information and communication technology (ICT) has taken the world to the era of digital economy, bringing significant digital dividends (World Bank, 2016). ICT, usually regarded as one type of General Purpose Technology, can help improve productivity and resource allocation efficiency (Bresnahan, 2010). Countries with higher ICT development level can provide easier access to ICT to firms. Industries, on the other hand, differs in their demand for ICT in the production process. Consequently, industries using ICT intensively and located in ICT developed countries are abler to improve their productivity and output, thus generating the ICT-induced comparative advantage in international trade.

According to endogenous growth theory as well as network externalities theory, ICT positively affect productivity through ICT-leveraged innovations and ICT-induced externalities (Chou et al., 2014). The improved productivity mainly benefits R&D intensive industries and task complexity industries. Firstly, innovation is key to R&D intensive industries. Previous research showed that ICT investment can boost innovation by promoting knowledge sharing and distribution directly (Czernich et al., 2011) and serve as complements to R&D investment (Hall et al., 2012). Thus, ICT is more intensively used in R&D intensive industries. In countries with high ICT development level, R&D intensive industries can benefit more from the ICT's capacity as well as people's ICT skills such as workers' internet-savvy and information acquisition. Secondly, Industries with a high level of specialization face more severe organizational inefficiencies due to contract enforcement problems and higher transaction cost. Task complexity, which is defined as the number of tasks that must be performed before getting one final

* Corresponding author.
E-mail addresses: 11320020@zju.edu.cn (Y. Wang), a0109698@u.nus.edu (J. Li).

http://dx.doi.org/10.1016/j.econlet.2017.03.022

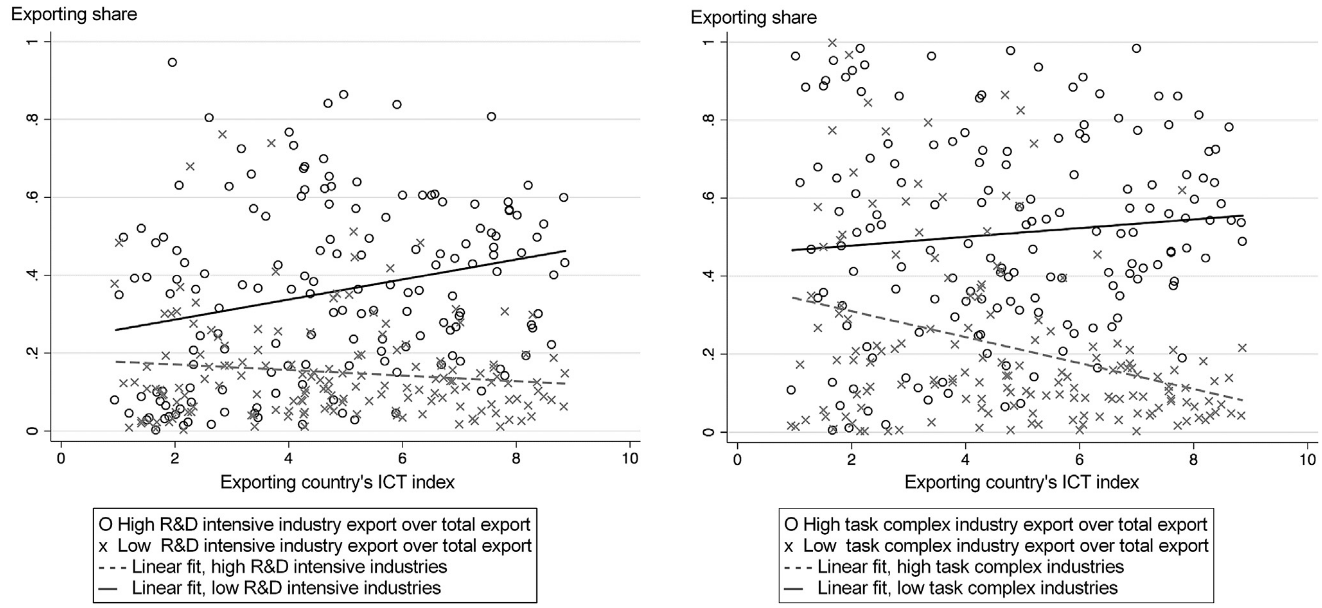

Fig. 1. Correlation between country's ICT development and exporting shares of industries.
Notes: 1. High R&D intensive industries are industries with R&D intensity above 75th percentiles while low-R&D intensive industries are industries with R&D intensity below 25th percentiles. Task complex industries are similar. 2. *X*-axis is country's ICT development index. *Y*-axis is the export share of industries.

unit, is commonly used to measure industry's specialization levels (Costinot, 2009). ICT can improve organizational efficiencies by IT-enabled organizational change (Bresnahan et al., 2002), tougher "people management" practices (Bloom et al., 2012) and transaction cost reduction. Thus, we expect countries with better ICT development to specialize in high task complexity industries. Fig. 1 shed light on our hypothesis. The figure shows that countries with higher ICT development index are more specialized in R&D intensive and more complex industries in international trade.

Previous researches show that labor force, human capital, physical capital, demographic structure (Cai and Stoyanov, 2016) and financial institution (Manova, 2013) all can be sources of comparative advantage. To our best knowledge, research on the ICT's potential to be a source of comparative advantage is rare. Choi (2010) tested the effect of the internet on trade but not on comparative advantage. Freund and Weinhold (2004) tested the effect of the internet but not ICT. The contribution of this paper to previous literature is that we make use of bilateral trade data to study whether ICT can be a source of comparative advantage.

2. Regression specification and data

We adopt the empirical strategy of Chor (2010), which identifies comparative advantage by the interactions between country characteristics and industrial characteristics. The interactions give us insights on how one industry's trade flow is affected by exporting country's characteristics. The regression specification is shown in Eq. (1).

$$\ln export_{ijk} = \beta_1\, Complexity_k \times ICT_i + \beta_2\, RD\ intensity_k \times ICT_i + \sum_n \theta_n I_k^n \times F_i^n + \mu_{ij} + \gamma_{jk} + \varepsilon_{ijk}. \quad (1)$$

The dependent variable is the log of trade volume from country i to country j in industry k. The variable of interest here is the interaction of task complexity with ICT development and the interaction of R&D intensity with ICT development. We control for importer–exporter fixed effect μ_{ij} to take into account bilateral trade cost factors such as bilateral distance, cultural differences, and historical colonial relationships. Another FE is importer-industry fixed effect γ_{jk}, which controls for industry size and productivity in the importer country. However, there are potential endogeneity concerns because exporting countries might adjust its investment in ICT according to certain industries' performance on the global market. To relieve such concern, we use ICT development data in 2000 as instruments for IV regressions. The reason for using year 2000's ICT data is that they are predictive of year 2013's ICT development level but not affected by trade in 2013.

The bilateral trade data is from CEPII's BACI dataset. We aggregate trade at HS6 level to NAICS 2002 four-digit level. The data for regressions consist of 152 countries and 86 industries in 2013. R&D intensity is calculated as R&D investment over total sales for each company in 2005 using Orbis dataset then averaged for each industry. Task complexity data is from Costinot (2009) which uses PSI survey from 1985 to 1993 that asks workers the number of months needed to be fully trained for the job in the industry.

Three proxies for ICT development are from International Telecommunication Union and World Bank. The first is ICT development index, which comprises the access, the use and the skill level of ICT. The second is ICT subscription index, which is measured by broadband subscribers per 100 persons. The third is ICT usage index, which is measured by internet users per 100 people. In addition, we control for another two standard Heckscher–Ohlin model comparative advantage factors, which are cross-country differences in physical capital and human capital. The country level physical capital and human capital data are from Penn World tables and the industry level skill intensity and capital intensity data are calculated from NBER-CES manufacturing dataset. Summary statistics are listed in Table 1.

3. Results

Table 2 shows baseline regression results. Column (1) includes the interaction between task complexity and ICT development indicator. Column (2) includes the interaction of R&D intensity and ICT development indicator. Column (3) includes both interactions. Column (4) uses log of internet users per 100 people to interact with R&D intensity and task complexity and Column (5) uses the log of broadband subscribers per 100 people. As shown in Table 2, the interaction terms of ICT index with R&D intensity and task