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ICT Characteristics and Trade

Bilgi ve İletişim Teknolojisi Özellikleri ve Ticaret

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ÖZ

Son yıllarda yapılan literatür çalışmaları bilgi ve iletişim teknolojisi ve uluslararası ticaret arasındaki ilişkiyi detaylı bir şekilde incelemektedir. Söz konusu makale, bilgi ve iletişim teknolojisinin ihracat üzerindeki güçlü etkisini birçok farklı ülke için panel sabit etki modeli kullanarak göstermiştir. Modelde, internet erişimi, bilgisayar erişimi ve genişbant aboneliği göstergeleri kullanılarak ülke seviyesinde servis ve ürün ihracatındaki değişimler incelenmiştir. Bulunan ampirik sonuçlara göre bilgi ve iletişim teknolojisi kullanımı ticaret akışlarını canlandırmaktadır.

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ABSTRACT

In recent years, empirical studies in the literature have emphasized the relationship between information and communication technology (ICT) adoption and international trade. Using a fixed effect model we measure the impact of various country level information and communication technology characteristics on export flows. We particularly investigate the role of country level metrics on internet access, computer access, and fixed broadband subscriptions in fostering both service and manufacturing goods exports. Our results show that access to ICT stimulate trade flows at various levels.

1. Introduction

Trade is one of the most important factors for economic growth and productivity, especially for emerging countries. In an internationally competitive world market, firms gain potential benefits by exporting their goods and services. Trade allows firms to adopt high level of technology, to access to new and larger markets, to expand their output scale and customer portfolio, and to develop new strategic business models. Today's globalised environment defines a new trade landscape motivating countries to adopt Information and Communications Technology (ICT) for e-trade development. The international e-trade refers to internet based cross-border transactions among different countries for the exchange of goods and services (Zhongwei, 2017). The ICT adoption is an important technological progress contributing to the economic growth, allowing countries to have an access to new goods and services through internet based cross-border transactions, and providing a convenient environment for countries to monitor

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transaction costs such as travel and administration costs. A country's level of technology is a significant factor for ICT adoption, and the internet technologies play a critical role for ICT enhancement.

This paper investigates the impact of internet access, computer access, and fixed broadband subscriptions on export of goods and services with a panel data of 32 countries (illustrated in the appendix) by employing fixed effect model estimation strategy.

The rest of the paper is organized as follows: Section 2 provides a literature review on the international trade and ICT adoption linkages. Section 3 discusses the data and empirical strategy used for the analyses of ICT and e-trade relationship. Section 4 reports the empirical results and Section 5 concludes.

2. Literature Survey

In recent years, large body of empirical studies in the literature have emphasized the relationship between ICT adoption and international trade. These studies especially show the benefits of ICT adoption for economic growth and productivity through technical efficiency gains in exporting and importing countries. Among those, Hardy (1980) using a cross-sectional time series data for several years finds that economic growth in GDP per capita is improved by the higher usage of telephones in both emerging and developed countries. Freund et al. (2002) investigate the effect of the internet adoption on export and import in services and document that exports of services increase by 1.7% following a 10% increase in the growth of internet usage. Freund et al. (2004) also investigate the impact of internet use on trade flows for goods in various countries between 1997 and 1999. They conclude that trade in goods increases by 0.2% following a 10% increase in the adoption of internet and this improves economic growth by 1%. Tang (2006) examines the relationship between use of telecommunications and imports of goods in the US between 1975 and 2000 and finds that exporting countries using telecommunication technology affect US imports of goods significantly, and a 10% increase in exporter's internet usage improves exports of goods to the US by 1%. Clarke et al. (2006) use cross-sectional data on the exports of goods in 2001 for different countries, and find that higher internet adoption improves trade flows from developing countries to developed countries. Vemuri et al. (2009) use a panel data for various countries and analyse the impact of ICT penetration and internet usage on international trade flow for 20 years starting from 1985. They find that flow of trade increases by 2% following a 10% increase in internet usage. Choi (2010) investigates various emerging and developed countries spanning over 17 years and concludes that an improvement in internet penetration affects the export of services positively at a significant level. Liu et al. (2013) based on a sample of 40 emerging countries between 1995 and 2010 find that internet adoption has a significant and positive impact on trade flows. Yushkova (2014) estimates the impact of the internet use on exports of goods for a sample of 40 countries and states that internet penetration in exporting and importing countries positively affects the trade performance. Bojnec et al. (2015) use the gravity model to examine the effect of internet usage on the manufacturing exports among different country groups. The empirical findings suggest a significant positive impact of the internet evolvement on manufacturing export. In a more recent study, Zhongwei et al. (2017) investigate the role of internet adoption on trade flows using a panel data for various emerging countries and conclude that ICT adoption encourages trade flows significantly.

3. Data, Methodology, and Model Specification

The data set in this study compiled from different sources. The data set includes export and import volumes of a panel of 32 countries for the years between 2005 and 2017, as well as country specific metrics on information and communication adoption. As the impact of country-level ICT characteristics on exports may be different across sectors, we have used both service and manufacturing goods exports. All export figures are taken from OECD database. Data on ICT characteristics have been taken from World Banks's World Development Indicators database. Particularly, we have employed the following ICT variables:

(i) Computer access at home per 100 people (CA)
(ii) Households with internet access at home per 100 people (IA)
(iii) Households with broadband internet access at home per 100 people (FBS)

Using a panel fixed effects model, we examine the impact of these ICT characteristics on export of goods and services with a panel of 32 countries.

Table 1. Descriptive Statistics

	mean	N	sd	min	max
G&S	25.76	408	1.28	22.35	28.5
Services	24.33	396	1.31	21.51	27.35
Goods	25.4	396	1.37	21.78	28.12
FBS	23.99	395	10.04	1.42	45.13
IA	69.5	404	20.82	7.66	99.5
CA	71.3	323	17.13	18.56	97.61
LPI	3.55	164	0.5	2.3	4.44
GDP	26.61	396	1.58	23.26	30.46

Source: Authors' calculations

The model is stated as follows:

$$\ln Export_j = \beta_0 + \beta_1 X_J + \beta_2 \log gdp_j + \beta_3 LPI_J + \beta_4 t + \mu_j + \varepsilon_{jt} \quad (1)$$

where j indexes countries, t shows time (years). Export denotes country level exports. X includes country specific ICT characteristics including fixed broadband subscriptions, internet access and computer access at home, log gdp denotes source country's GDP as a control of domestic demand, LPI denotes logistic performance index, t is the time trend, μ_i shows non-time-varying country-specific idiosyncrasies, ε_{jt} is the error term of the regression. Table 1 provides descriptive statistics on the variables that we will use in our empirical estimation.

Table 2. Panel Fixed Effect Result

VARIABLES	(1) logexgs	(2) logexs	(3) logexg	(4) logexgs	(5) logexs	(6) logexg	(7) logexgs	(8) logexs	(9) logexg
FBS	-0.0117**	-0.000480	0.0212***						
	(0.00524)	(0.00527)	(0.00539)						
LPI	0.0816*	0.0281	0.127***	0.0923*	0.0591	0.136**	0.0885	-0.0770	0.0457
	(0.0472)	(0.0475)	(0.0486)	(0.0528)	(0.0473)	(0.0547)	(0.0652)	(0.0679)	(0.0789)
IA				-3.74e-05	-0.00122	0.00292*			
				(0.00160)	(0.00143)	(0.00165)			
CA							0.00256	0.00765**	0.00534
							(0.00323)	(0.00336)	(0.00390)
loggdp	0.245*	0.836***	0.630***	0.364**	0.845***	0.490***	0.474**	0.717***	0.508**
	(0.144)	(0.145)	(0.148)	(0.150)	(0.134)	(0.155)	(0.196)	(0.204)	(0.237)
Constant	19.09***	1.920	7.745*	15.65***	1.657	11.73***	12.60**	4.957	11.40*
	(3.853)	(3.874)	(3.962)	(3.960)	(3.547)	(4.104)	(5.189)	(5.402)	(6.279)
Observations	163	163	163	153	153	153	100	100	100
R-squared	0.614	0.685	0.595	0.581	0.705	0.566	0.671	0.617	0.568
Number of countrycode	33	33	33	33	33	33	33	33	33

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4. Empirical Results

Estimation results for the fixed effects are presented in Table 2. We report alternative specifications using different export series as well as different ICT characteristics. Our results show that an increase in the number of households with a computer access at home has a positive and significant impact on service exports while this impact appears as insignificant when we use the goods or total exports series as a dependent variable. This is in line with our expectations.

The other ICT characteristics (internet access and fixed broadband subscriptions) do not appear as significant when we use the service exports as a dependent variable, in contrary to our expectations. On the other hand, these ICT variables have a positive and significant impact on goods exports. The coefficient of fixed broadband subscriptions appears as negative and significant when we use series on total export of goods and services, while this turns insignificant when we consider the exports of services only. This implies that higher number of fixed broadband subscriptions has a negative impact on exports of goods and services.

Our results also show that, as expected, logistic performance index does not have a significant impact on service exports. On the other hand, an improvement in the index has a positive and significant effect on goods exports. In all specifications the coefficient of GDP appears as significant and positive in line with our expectations.

5. Conclusion

ICT adoption is an important factor for export enhancement among countries. This paper uses fixed effect model estimation method to investigate the impact of ICT adoption on international trade with a panel of 32 countries. Our results suggest that diverse ICT characteristics affect trade flows of goods and services differently. We have documented that higher ICT penetration measured by higher fixed broadband subscriptions and computer access has a positive impact on trade flows of goods. On the other hand, computer access has a positive impact on service trade only. Overall, our findings suggest that ICT adoption affects trade flows positively only when computer and internet access increases.

In light of these findings, having an efficient and effective computer and internet usage by motivating countries to use digital technologies may have a potential to contribute e-trade activities. High level of telecommunication technology use improves the transmission of information on trade, diminishes trade costs, promotes competition, and thus encourages flow of exports. In the context of e-trade participation, access to technology and ICT is a crucial element, therefore, training on digital based processes should also be encouraged among countries particularly emphasizing logistic distribution, financial structure, output scale, and a connection between consumers and producers (Zhongwei, 2017). Political and economic institutions can build various digital platforms for an e-trade to encourage exporters, producers, and customers who are willing to face with advanced markets via global e-trade participation.

Due to the lack of data we were not able to measure the impact of ICT use specifically on e-trade. This is a possible extension of this study.

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Appendix.

Table A. List of Countries

Country	Freq.	Percent	Cum.
Australia	13	2.78	8.33
Austria	13	2.78	11.11
Belgium	13	2.78	13.89
Brazil	13	2.78	16.67
Chile	13	2.78	19.44
Czech	13	2.78	22.22
Denmark	13	2.78	25
Estonia	13	2.78	27.78
Finland	13	2.78	30.56
France	13	2.78	33.33
Germany	13	2.78	36.11
Greece	13	2.78	38.89
Hungary	13	2.78	41.67
Iceland	13	2.78	44.44
Ireland	13	2.78	47.22
Italy	13	2.78	50
Korea	13	2.78	52.78
Latvia	13	2.78	55.56
Lithuania	13	2.78	58.33
Luxembourg	13	2.78	61.11
Mexico	13	2.78	63.89
Netherlands	13	2.78	66.67
New Zealand	13	2.78	69.45
Norway	13	2.78	72.22
Poland	13	2.78	75
Portugal	13	2.78	77.78
Slokvak R.	13	2.78	80.56
Slovenia	13	2.78	83.33
Spain	13	2.78	86.11
Sweden	13	2.78	88.89
Switzerland	13	2.78	91.67
Turkey	13	2.78	94.44