DO BARRIERS TO DIGITAL SERVICES TRADE HAMPERECONOMIC GROWTH? EVIDENCE FROM A CROSS-COUNTRY ANALYSIS

Bhushan Praveen Jangam
Indian Institute of Management Bodh Gaya, India., bhushanjp1@gmail.com

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ABSTRACT

This study examines the relation between trade barriers on digital services and economic growth for a panel of 44 nations from 2014 to 2020. Using the system generalised method of moments estimator and accounting for other factors, we find that trade restrictions on digital services negatively impact economic growth. This finding is consistent and robust across various digital service types and income levels. To boost economic growth, policymakers must ease trade barriers on digital services.

Keywords: Economic growth; Digital services trade restrictions; GMM.
JEL Classifications: C23; F1; O4.

I. INTRODUCTION

The fast pace of digital transformation has significantly impacted the services industry. Globally, digitally deliverable service exports have increased more swiftly than overall service exports. From 2005 to 2019, the value of globally accessible digital services doubled (from $1.2 trillion to $3.2 trillion). The percentage of digitally delivered services in the whole services trade increased from 45% to 52% (World Development Report, 2020). Because digital technologies foster innovation, provide employment possibilities, and increase productivity, they benefit society and improve economic growth. Existing and rising trade barriers threaten to disrupt the gains of digitization. These restrictions may stifle innovation and impede the cross-border flow of digitally enabled services. The mounting trade barriers, particularly those affecting digital services trade, motivate us to study their influence on economic growth.

The purpose of this paper is threefold: First, the study looks at how trade restrictions on digital services affect economic growth in 44 countries from 2014 to 2020. Second, to gain a better understanding, the study investigates the impact of various types of digital service trade barriers (such as infrastructure and connectivity, payment systems, and others) on economic growth. Third, we divide the sample of countries into high- and middle-income countries to ensure the robustness of our findings. The term 'digital economy' refers to a wide range of economic activities that rely heavily on digitally transformed knowledge and information. Internet, fintech, cloud computing, and other developing digital technologies are used to gather, analyse, store, and distribute information digitally. Differences in nations' levels of digital readiness may explain the disparities in digitally delivered services across income groups. Countries with adequate Information and Communication Technology (ICT) infrastructures that are generally digitally ready are better positioned to capitalise on the opportunities created by service digitization (UNCTAD, 2021). The number of commodities and services a country exports positively relates to its internet connection (United Nations, 2021). To empirically examine the impact of digital trade service restrictions on economic growth, we use the system Generalized Method of Moments (GMM) estimator. For the robustness of the results, we divide the whole sample of 44 countries into two groups: a high-income group and a middle-income group. The resulting findings help policymakers understand the scale of economic growth forgone by a country owing to the imposition of trade barriers on digital services.

Since Solow's (1956) classical growth model, which used the traditional Cobb-Douglas production function to estimate economic growth by adding up labour and capital, many researchers have added many other interesting variables, such as the flow of goods and services, to the production functions. Sridhar's (2016) empirical analysis of a large panel data set demonstrates a high positive correlation between trans-border data flow and economic growth, particularly in low- and middle-income nations worldwide. The 20th century was dominated by capital- and labor-intensive flows of tangible, physical goods, which occurred largely between industrialised countries. Moreover, the majority of the flows comprised of monetised transactions. Intangible data and information flows, growing participation by developing nations, knowledge-intensive flows, and the exchange of free content and services have emerged in the 21st century.

Increasingly prevalent and expensive for firms and economies are restrictions on the flow of data. Well-known research by Dollar (1992), Ben-David (1993), Sachs and Warner (1995), Edwards (1998), Vamvakidis (1998), and Frankel and Romer (1999) demonstrates a negative correlation between trade barriers and economic growth. The expenses of international trade in services are much greater than those of international trade in goods. According to a recent assessment, trade costs for final services were 277% *ad valorem* and 194% for intermediate services (Miroudot and Shepherd, 2016). Numerous studies have emphasised the significance of digital trade (Ferracane *et al.*, 2018). In a recent follow-up research, Marel van der and Ferracane (2021) employed a panel data set to show that data restriction rules do tend to reduce service trade volumes, particularly service imports. Limiting access to information may raise the cost of providing online services and, in certain situations, make it impossible (Ferracane *et al.*, 2018). Although there have been studies on the influence of cross-border data limitations on international trade volume (see Ferracane and van der Marel, 2021; UNCTAD, 2021), research on the impact of restrictions on the trade of digital services is scarce, and our study aims to fill this gap.

Several studies have been conducted on the relation between digitalization and economic growth, but thus far the empirical evidence is mixed. Only a few studies have shown that digitalization has a positive impact on economic growth (Samimi and Arab 2011; Vu 2011; Sassi and Goaied 2013; Jorgenson and Vu 2016; Jung and Lopez-Bazo 2020; Niebel 2018; Njoh 2018; Toader *et al.* 2018; Adeleye and Eboagu 2019; Haftu 2019; Vu *et al.* 2020; Ben Lahouel *et al.* 2021; Kallal *et al.* 2021). Other studies have found a negative impact of digitalization on economic growth (Thompson and Garbacz 2011; Bertschek *et al.* 2013; Haller and Lyons 2015; Ishida 2015; Ejemeyovwi and Osabuohien 2020; Mayer *et al.* 2020).

Modern development has placed digital technology at the forefront, giving nations a golden opportunity to accelerate economic expansion and link people to services and employment. Digital technologies keep governments, people, and businesses linked during times of crisis, such as COVID-19. Additionally, they have substantially increased how much we rely on the internet (International Telecommunication Union, 2021). They can enable nations to bypass conventional growth phases, from digital banking to telemedicine and blockchain, and uncover creative solutions to complex development difficulties. Financial technology has also spawned novel approaches to providing financial services, notably in streamlining payment and loan processes, which helps many developing nations achieve financial inclusion. In addition, digital and intelligent ICTs provide agility and increased flexibility. Access to high-quality services at low prices is made possible because digitization of services may lower transaction costs (due to fewer intermediaries) compared to the analog era. ICT availability, adoption, and usage affect competitiveness and economic growth (Toader *et al.*, 2018; Taalbi, 2019; Fernandez-Portillo *et al.*, 2020). ICTs allow complementary developments, thereby improving the economy (Czernich *et al.*, 2011). Services undergoing digital transformation may significantly impact industries critical to achieving the Sustainable Development Goals or Global Goals, such as health care, agriculture, and education. The trade in general that we identify consists mostly of physically delivered products and services. However, the expanding involvement of digital

technology has also enabled digital trade, which includes digitally-enabled transactions of trade in products and services that may be provided digitally or physically, and which involve consumers, firms, and governments. While all types of digital trade are enabled by digital technology, not all digital trade is delivered digitally.

The study considers the 'digital services trade restrictiveness index' provided by 'Organisation for Economic Cooperation and Development' (OECD), which represents and measures cross-cutting obstacles and a wide range of international regulations influencing digital services. The following are the novel aspects of our research: First, there is no empirical evidence in the literature on how trade restrictions on digital services affect economic growth. Studies (Furceri *et al.*, 2020; Ben Lahouel *et al.*, 2021; Kallal *et al.*, 2021) have solely looked at how digitalization and trade barriers affect economic growth. The present study provides evidence on how trade restrictions on digital services affect economic growth. Second, we identify trade restrictions on digital services using more precise metrics that consider the various aspects of services that are enabled by technology, including infrastructure and connectivity, payment methods, electronic transactions, intellectual property rights, and other restrictions. We find that trade restrictions on digital services reduce economic growth.

The remainder of this paper is organised as follows. Section II discusses the methodology and data source. Section III discusses the empirical findings. Section IV presents the conclusions and policy implications.

II. METHODOLOGY AND DATA SOURCE

Based on the conceptual framework given by Juhro *et al.* (2020; 2022), the study considers the following models to investigate the role of digital services trade barriers on economic growth.

$$GDP_{it} = \alpha_0 + \alpha_1 GS_{it} + \alpha_2 FF_{it} + \alpha_3 HTE_{it} + \alpha_4 DSTRI_{it} + \epsilon_t \tag{1}$$

$$GDP_{it} = \beta_0 + \beta_1 GS_{it} + \beta_2 FF_{it} + \beta_3 HTE_{it} + \beta_4 DSTRI\_Infra_{it} + \rho_t \tag{2}$$

$$GDP_{it} = \gamma_0 + \gamma_1 GS_{it} + \gamma_2 FF_{it} + \gamma_3 HTE_{it} + \gamma_4 DSTRI\_Payments_{it} + \theta_t \tag{3}$$

$$GDP_{it} = \delta_0 + \delta_1 GS_{it} + \delta_2 FF_{it} + \delta_3 HTE_{it} + \delta_4 DSTRI\_Others_{it} + \tau_t \tag{4}$$

where GDP_{it} refers to real gross domestic product per capita for country *i* over time *t*. The variables *GS*, *FF*, and *HTE* refer, respectively, to government spending, financial freedom, and high technology exports. The variable DSTRI refers to digital services trade restrictiveness index, while *DSTRI_Infra*, *DSTRI_Payments*, and *DSTRI_Others* are the digital services trade restrictions in infrastructure and connectivity, payment systems, and other barriers (such as mandatory use of local software etc.), respectively.[1] The parameters α, β, γ, and δ are the coefficients to be estimated, while ϵ, ρ, θ and τ are the error terms. We consider the financial

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[1] For more information, please refer to Ferencz (2019).

freedom index because of the five factors contributing to the index. The first factor measures how the state governs many financial services. The second measures the degree to which the state intervenes in the financial sector via direct and indirect ownership of banks and other financial enterprises. The third measures the level of advancement in the financial and capital market system. The fourth measures the role of the government in the provision of credit, and the fifth measures the exposure of the local financial instititutions to foreign competition. The variables are in natural logarithms.

The system GMM estimator developed by Blundell and Bond (1998) is used to estimate the relation between trade restrictions on digital services and economic growth specified in Equations (1) to (4). We used lag explanatory variables as instruments. The small sample bias is reduced by moment conditions. The Sargan test is used in all of our models to validate over-identification and AR(2) is used to test for serial correlation. Blundell and Bond (1998) suggested a system estimator that employs moment conditions in which lagged differences are employed as instruments for the level equation in addition to moment conditions of lagged levels as instruments for the difference equation.

A. Data Sources
The study considers a panel of 44 countries over the period 2014–2020.[2] The selection of countries and time period is dependent purely on the availability of data for the Digital Services Trade Restrictiveness Index (DSTRI). The data for DSTRI are taken from the OECD. The data for real Gross Domestic Product per capita (*GDP*) and high-technology exports are extracted from the World Development Indicators (WDI) provided by the World Bank. The data for government spending and financial freedom is sourced from the Index of Economic Freedom provided by "The Heritage Foundation".

III. EMPIRICAL FINDINGS
In this section, we report and discuss the empirical findings obtained by estimating Equations (1) through (4) using the system GMM estimator. Before moving on to the main results, we emphasise the descriptive statistics for the important variables. Table 1 shows that the mean of HTE is the greatest when compared to GDP, GS, FF, and DSTRI. The standard deviation metric for most variables is closer to zero, suggesting that the values are nearer to the mean.

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[2] The list of countries is provided in Appendix

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Table 1.
Descriptive statistics

HIG and MIG refer to high-income group and middle income group respectively. SD refers to standard deviation. GDP refers to real gross domestic product per capita. GS, FF, and HTE refer to government spending, financial freedom, and high-technology exports. DSTRI refers to the digital services trade restrictiveness index. DSTRI_Infra, DSTRI_Payments, and DSTRI_Others are the digital services trade restrictions in infrastructure and connectivity, payment systems and other barriers.

Variable	Overall					HIG					MIG				
	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max
GDP	308	10.35	0.74	8.12	11.67	217	10.73	0.34	10.14	11.67	91	9.46	0.67	8.12	10.25
GS	303	3.74	0.83	-0.69	4.54	212	3.49	0.87	-0.69	4.54	91	4.32	0.16	3.93	4.52
FF	308	4.21	0.35	2.71	4.55	217	4.39	0.11	4.01	4.55	91	3.80	0.38	2.71	4.32
HTE	308	23.40	1.82	17.26	27.35	217	23.51	1.60	20.24	26.10	91	23.13	2.26	17.26	27.35
DSTRI	304	0.28	0.62	-1.56	1.87	213	0.04	0.46	-1.56	1.11	91	0.84	0.58	-0.49	1.87
DSTRI_Infra	292	-0.29	0.69	-0.92	1.56	207	-0.51	0.52	-0.92	0.87	85	0.22	0.77	-0.92	1.56
DSTRI_Payments	107	-1.44	0.44	-1.71	-0.60	43	-1.68	0.15	-1.71	-0.99	64	-1.28	0.50	-1.71	-0.60
DSTRI_Others	195	-1.08	0.53	-1.51	0.09	113	-1.35	0.30	-1.51	-0.82	82	-0.71	0.56	-1.51	0.09

Table 2.
Results of Services Trade Restrictions on Economic Growth

The dependent variable is real gross domestic product per capita (GDP). GS, FF, and HTE refer to government spending, financial freedom, and high-technology exports. L refers to lag. DSTRI refers to the digital services trade restrictiveness index. DSTRI_Infra, DSTRI_Payments, and DSTRI_Others are the digital services trade restrictions in infrastructure and connectivity, payment systems, and other barriers. *** and ** refers to significance level at 1% and 5%, respectively. *P*-values are given in the parenthesis. All the variables are in natural logarithms.

(1)	(2)	(3)	(4)	(5)
L.GDP	0.894***	0.887***	0.857***	1.697***
	(0.000)	(0.000)	(0.000)	(0.000)
GS	-0.017***	-0.021***	-0.030	-0.017***
	(0.000)	(0.000)	(0.231)	(0.000)
FF	0.072***	0.093***	0.158***	-0.017
	(0.000)	(0.000)	(0.001)	(0.167)
HTE	0.010***	0.014***	0.001	0.003
	(0.000)	(0.000)	(0.934)	(0.493)
DSTRI	-0.032***			
	(0.000)			
DSTRI_Infra		-0.021***		
		(0.000)		
DSTRI_Payment			-0.022***	
			(0.000)	
DSTRI_Other				-0.059***
				(0.000)
Constant	0.642***	0.543***	0.851**	0.569***
	(0.000)	(0.000)	(0.041)	(0.000)
Obs.	255	247	90	149
Number of Countries	44	43	16	35
Sargan	42	41.93	14.87	34.26
AR(2)	-2.042	-1.091	1.294	-1.785
Number of Instruments	65	65	25	79

Table 2 provides the estimated results from Equations (1) to (4). Column (2) reveals the following information. To begin, the GDP lag is positive and statistically significant indicating that the previous year's GDP has a positive impact on the current year's GDP. Second, the DSTRI coefficient is negative and statistically significant, implying that a 1 percent rise in digital services trade barriers reduces GDP by 0.03 percent. Third, the GS coefficient is negative and significant, showing that a 1 percent rise in GS reduces GDP by 0.02 percent. Fourth, the FF coefficient is positive and significant, indicating that a 1 percent increase in FF enhances GDP by 0.07 percentage points. Finally, the HTE coefficient is positive and significant,

implying that a 1 percent rise in HTE enhances GDP by 0.01 percent. The study will now look at several types of DSTRI. Columns (3), (4), and (5) show that the coefficients of DSTRI_Infra, DSTRI_Payments, and DSTRI_Others are all negative and statistically significant. In other words, a 1 percent rise in DSTRI_Infra, DSTRI_Payments, and DSTRI_Others reduce GDP by 0.02 percent, 0.02 percent, and 0.06 percent, respectively. The GDP decrease associated with DSTRI_Others is bigger than the GDP decline associated with DSTRI_Infra and DSTRI_Payments. The results of other variables are consistent and comparable to the previous ones. All the findings are robust to autocorrelation and over-identification issues.

The study's results are consistent with those found in the existing literature. The FF and GDP (Claessens, 2006; Kpodar and Andrianaivo, 2011; Kim, 2016); and HTE and GDP (Awokuse, 2006; and Yao, 2006; Islam, 2022); Trade barriers and GDP (Lee and Swagel, 1997; Furceri *et al*., 2020). The negative impact of GS on GDP might be attributed to inefficient or ineffective government spending pushing out profitable private investments (Blejer and Khan 1984; Afonso and Furceri 2010).

A. Robustness
For the robustness of our results, we divided the whole sample into two groups: the High-Income Group (HIG) and the Middle-Income Group (MIG). Tables 3 and 4, respectively, illustrate the outcomes for HIG and MIG. The results show that: First, the findings of HIG are similar to the whole sample, while most of the effects of MIG are statistically insignificant. Second, only in the case of HIG is the DSTRI coefficient negative and statistically significant. Finally, comparing the various DSTRI measures shows that only the coefficient of DSTRI_Infra is negative and statistically significant for HIG, while only DSTRI_Others is negative and statistically significant for MIG. In sum, trade restrictions on digital services negatively impact economic development across all income categories.

Table 3.
Results of Services Trade Restrictions on Economic Growth for HIG

The dependent variable is real Gross Domestic Product per capita (GDP). GS, FF, and HTE refer to government spending, financial freedom, and high-technology exports. L refers to lag. DSTRI refers to the digital services trade restrictiveness index. DSTRI_Infra, DSTRI_Payments, and DSTRI_Others are the digital services trade restrictions in infrastructure and connectivity, payment systems, and other barriers. *** and ** refers to significance level at 1% and 5%, respectively. P-values are given in the parenthesis. All the variables are in natural logarithms.

(1)	(2)	(3)	(4)	(5)
L.GDP	0.903***	0.805***	1.848***	0.781***
	(0.000)	(0.000)	(0.005)	(0.000)
GS	-0.019***	-0.007***	-0.010	-0.043***
	(0.000)	(0.000)	(0.204)	(0.000)
FF	0.007	0.065***	0.362	0.218**
	(0.885)	(0.007)	(0.410)	(0.030)
HTE	0.024***	0.033***	0.026	0.013
	(0.000)	(0.000)	(0.205)	(0.357)
DSTRI	-0.040***			
	(0.000)			
DSTRI_Infra		-0.028***		
		(0.000)		
DSTRI_Payment			-0.053	
			(0.245)	
DSTRI_Other				0.003
				(0.592)
Constant	1.670***	1.062***	-1.465	1.248***
	(0.000)	(0.000)	(0.317)	(0.004)
Obs.	148	173	29	100
Number of Countries	31	30	6	23
Sargan	29.36	28	41.11	22.13
AR(2)	-2.626	-1.182		-1.200
Number of Instruments	61	65	31	42

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Table 4.
Results of Services Trade Restrictions on Economic Growth for MIG

The dependent variable is real Gross Domestic Product per capita (GDP). GS, FF, and HTE refer to government spending, financial freedom, and high-technology exports. L refers to lag. DSTRI refers to the digital services trade restrictiveness index. DSTRI_Infra, DSTRI_Payments, and DSTRI_Others are the digital services trade restrictions in infrastructure and connectivity, payment systems, and other barriers. ***, ** and * refers to significance level at 1%, 5% and 10% respectively. p values are given in the parenthesis. All the variables are in natural logarithms.

(1)	(2)	(3)	(4)	(5)
L.GDP	0.875***	3.326***	3.712***	0.937***
	(0.000)	(0.000)	(0.002)	(0.000)
GS	0.120	-0.949**	-0.903*	0.054
	(0.472)	(0.025)	(0.077)	(0.746)
FF	0.036	-0.154	0.006	0.019
	(0.369)	(0.143)	(0.856)	(0.776)
HTE	0.029	0.039	0.055	0.014
	(0.404)	(0.505)	(0.276)	(0.304)
DSTRI	-0.008			
	(0.728)			
DSTRI_Infra		0.150		
		(0.164)		
DSTRI_Payment			-0.094	
			(0.161)	
DSTRI_Other				-0.031**
				(0.031)
Constant	-0.128	5.881*	3.360*	-0.034
	(0.808)	(0.081)	(0.054)	(0.970)
Obs.	78	62	46	71
Number of Countries	13	13	10	12
Sargan	12	6.610	6.996	11.33
AR(2)	-0.325	0.597	1.414	-0.404
Number of Instruments	63	73	42	60

IV. CONCLUSIONS

This paper examines the relation between trade barriers on digital services and economic growth for a panel of 44 countries from 2014 to 2020. The paper discovers the following findings using the system GMM estimator. First, trade restrictions on digital services reduce economic growth. Second, financial freedom and high-technology exports boost economic growth, but government spending stifles it. Third, digital services trade constraints in infrastructure and connectivity, payment systems, and other obstacles impede economic growth. Fourth, the results remain consistent when the entire sample is divided into high- and middle-income groups. However, the results for the middle-income group

are mostly statistically insignificant. To promote long-term economic growth, policymakers should reconsider trade restrictions on digital services. As digital transformation accelerates, new privacy, trust, and openness issues emerge and could be investigated in the future.

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Appendix

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Table A.1.
Sample Details

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HIG and MIG refer to high-income group and middle-income group, respectively.

Full sample	HIG	MIG
"Australia, Austria, Belgium, Brazil, Cambodia, Canada, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Kazakhstan, Latvia, Lithuania, Luxembourg, Malaysia, Mexico, Netherlands, Norway, Pakistan, Poland, Portugal, Russia, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States of America and Vietnam."	"Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, United Kingdom and the United States of America."	"Brazil, Cambodia, China, India, Indonesia, Kazakhstan, Malaysia, Mexico, Pakistan, Russia, Thailand, Turkey, and Vietnam."

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