TRADE INTENSITY IN DIGITALLY DELIVERED SERVICES AND ECONOMIC COMPLEXITY

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EXTENDED ABSTRACT

Purpose Digitally delivered services have become a pivotal component of global trade, accounting for over 50% of total services exports worldwide as of 2020 (Mourougane, 2021). But how is this digital trade related to the structure of an economy? Despite the growing significance of digital trade, the relationship between trade intensity in digitally delivered services and the structure of an economy remains underexplored (Mourougane, 2021; Dong and Xu, 2022; Zhou *et al.*, 2023; Chiappini and Gaglio, 2024). In this paper, we fill this research gap by examining how exports per capita of digitally delivered services relate to multidimensional economic complexity, encompassing measures for the trade and research structure of an economy (Stojkoski *et al.*, 2023). Understanding this relationship is crucial for policymakers and stakeholders aiming to enhance competitiveness in the digital economy (Hidalgo and Hausmann, 2009; Hausmann *et al.*, 2014; Hartmann et *al.*, 2017; Hidalgo, 2021; Romero and Gramkow, 2021).

Design/methodology/approach We employ a panel regression analysis with time-fixed effects to control unobserved heterogeneity and temporal dynamics across countries and over time. We follow the Handbook on Measuring Digital Trade (Mourougane, 2021) and define digitally delivered services as all international trade transactions that are delivered remotely over computer networks. These range from providing online educational services to cloud computing subscriptions (Stojkoski et al., 2024). Using this definition, we collect data from the BATIS WTO dataset on services (Fortanier *et al.*, 2017) and Eurostat mappings (European Commission. Statistical Office of the European Union., 2021) to calculate per capita exports of digitally delivered services for over 120 countries from 2005 to 2020. We also use data on the Economic Complexity Index (ECI) for the research and trade dimensions from the Observatory of Economic Complexity (Simoes and Hidalgo, 2011). These indexes compare the economic structure of a country to an ensemble of other countries, with higher values

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implying that the country is more sophisticated compared to the ensemble. We then employ panel regression analysis on average data segmented into four four-year periods: 2005-2008, 2009-2012, 2013-2016, and 2017-2022 in which the dependent variable is the log of the digitally delivered services exports per capita. This methodological approach allows us to investigate the correlation between exports per capita and the economic complexity indices derived from trade and research data, and to study their interaction in explaining digital trade.
Findings The analysis reveals a robust positive relationship between economic complexity and digitally delivered services exports per capita (see Table 1 for the regression results). Specifically, according to our final model (including all covariates, Table 1, column 7), a one-unit increase in trade ECI is associated with a 0.733 increase in the log of digitally delivered services exports per capita ($p<0.05$), while a one-unit increase in research ECI corresponds to a 0.172 increase ($p<0.05$). The significant positive interaction between trade and research ECIs (coefficient 0.361, $p<0.05$) suggests that countries with both advanced trade sectors and strong research outputs experience a synergistic boost in digital services exports.

Table 1: Regression results for the relationship between trade intensity in digitally delivered services and economic complexity

	Dependent variable: log of Digitally delivered services exports per capita (2005-2008, 2009-2012, 2013-2016, 2017-2020)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ECI (trade)		1.939***	0.841***			0.805***	0.733***
		(0.074)	(0.099)			(0.098)	(0.103)
ECI (research)				1.259***	0.422***	0.243***	0.172**
				(0.085)	(0.077)	(0.074)	(0.075)
ECI (trade) x ECI (research)						0.252***	0.361***
						(0.059)	(0.068)
log of GDP per capita	-0.474***	-1.024***	-0.724***	-0.665***	-0.550***	-0.747***	-0.659***
	(0.095)	(0.100)	(0.094)	(0.097)	(0.087)	(0.092)	(0.094)
log of Natural resources exports per capita	1.077***	1.023***	0.623***	0.896***	0.463***	0.620***	0.523***
	(0.093)	(0.093)	(0.089)	(0.102)	(0.087)	(0.091)	(0.093)
log of Fixed broadband connections per capita			0.765***		1.004***	0.945***	0.601***
			(0.100)		(0.092)	(0.093)	(0.109)
log of Internet access per capita			0.516***		0.633***		0.679***
			(0.127)		(0.138)		(0.154)
Observations	531	477	467	455	448	436	433
R^2	0.303	0.710	0.799	0.511	0.785	0.806	0.819
Adjusted R^2	0.296	0.706	0.796	0.505	0.781	0.802	0.815
F Statistic	51.612*** (df=5; 525)	179.252*** (df=6; 470)	185.944*** (df=8; 458)	98.969*** (df=6; 448)	166.156*** (df=8; 439)	198.360*** (df=9; 426)	172.985*** (df=10; 422)

Note: Robust standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01.

Originality/value This study contributes to the literature by integrating the structure of an economy through multidimensional economic complexity into the analysis of digitally delivered services trade—a nexus that has been largely overlooked. By developing a novel dataset and combining trade and research ECIs, we provide a comprehensive understanding of their joint impact on digital trade. The findings suggest that enhancing both trade and research sectors can significantly boost a country's digital services exports. Limitations to our work include potential unobserved variables and data constraints for certain regions. Future research

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could explore causal relationships and the impact of specific policy interventions on economic complexity and digital trade performance.

Keywords: *Digital trade, Economic complexity, ICT, Panel data analysis.*

JEL classification: *F10, F13, F14, C23, F63.*

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