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COMPARATIVE STUDY OF DIGITALIZATION IMPACT ON GLOBAL GOODS AND SERVICES MARKETS IN ADVANCED AND DEVELOPING ECONOMIES

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ABSTRACT

In the era of rapid technological progress, the influence of dizitalization on different aspects of international economic activity can't be overstated. The aim of this article is to conduct a comprehensive comparative study of digitalization's impact on global goods and services markets, with a specific focus on advanced and developing economies using multiple linear regression. The research methodology involved comprehensive data collection for 35-38 advanced economies and 52-66 developing economies depending on the availability of data. The analysis included depended variables (18 export and import goods sectors and 18 export and import services), independent variables (digitalization, consisting of ICT deployment, ICT export and import, ICT investment variables), control variables such as GDP growth, CPI, trade openness, exchange rate and political stability. The findings demonstrate the ICT infrastructure and ICT exports positive impact on export of technology-intensive goods, such as ores and metals, machinery and equipment, and tools and devices in advanced economies. Digitalization's positive impact on trade in goods appeared weaker in developing economies, potentially due to lower levels of ICT adoption or differing export focuses. ICT export has positive impact on financial services imports, indicating a reliance on imported financial services while exporting ICT capabilities. The model shows a high success rate depending on variables. The study highlights digitalization's varied impact on advanced and developing economies, emphasizing its importance for trade, competitiveness and policymakers in the global market.

Keywords: *digitalization, ICT export and import, ICT deployment, ICT investment, world goods market, world services market, trade, GDP, CPI*

1. INTRODUCTION

In today's interconnected world, the digitalization of economies has become a driving force behind the transformation of global trade dynamics. As nations continue to embrace digital technologies, the effects on international markets for both goods and services are profound and multifaceted.

The digital revolution has reshaped the landscape of international trade, ushering in an era of unprecedented connectivity and efficiency (Chen & Zhang, 2020). As businesses across the globe embrace digitalization, the effects on global goods and services markets are profound and far-reaching.

Current practice suggest that enhanced access to modern Information and Communication Technology (ICT) infrastructure, coupled with the integration of e-commerce tools, yields favorable outcomes across various contexts (Xing, 2018). It is underscored the important role of effective ICT utilization in unleashing e-trade capabilities, particularly for developing and least-developed nations. Moreover, digitalization of services trade highlights the rapid growth of digital service trade amid global economic integration. Improved digital technology significantly increases digital service trade (Zhang & Wang, 2022).

Understanding the differential impact of digitalization on advanced and developing economies is crucial for policymakers, businesses, and researchers seeking to navigate the complexities of the modern global economy.

The aim of this article is to conduct a comprehensive comparative study of digitalization's impact on global goods and services markets, with a specific focus on advanced and developing economies. By examining trade dynamics, patterns, and outcomes across different sectors and types of economies, we seek to uncover insights into the varying effects of digitalization on international trade.

To achieve our research objectives, we employ a quantitative approach utilizing multiple linear regression analysis. This method allows us to analyze the connections between digitalization, consisting of ICT deployment, ICT trade and investment, and exports and imports across different sectors. Spanning from 2006 to 2022, our study encompasses economies at various stages of development. Data for analysis is drawn from esteemed international sources such as the World Bank, International Monetary Fund (IMF), United Nations Conference on Trade and Development (UNCTAD), and World Trade Organization (WTO).

In the following sections, we will (2) review existing literature on digitalization's impact on international trade, (3) outline our research methodology, (4) present our findings, (5) discuss the finding, implications and recommendations, (6) make conclusions. By examining digitalization's influence on global goods and services markets, we aim to contribute to a better understanding of the evolving nature of international trade in the digital age.

2. LITERATURE OVERVIEW

The subject of digitalization impact on international markets has been studied by significant number of researchers.

Certain researchers propose that enhanced access to contemporary ICT and the integration of e-commerce tools yield favorable outcomes on bilateral trade dynamics across various contexts (Xing, 2018). It's underscored that the effective utilization of ICT, encompassing elements like high-speed internet and secure servers, stands as a pivotal factor in unleashing the e-trade capabilities for developing and least-developed nations.

Other studies, such as the one by Liu & Nath (2013), suggest similar findings albeit with varying factors. Notably, empirical evidence suggests a significant boost in both exports and imports within emerging market economies due to increased Internet subscriptions and hosts. This underscores that the trade-boosting influence of ICT extends beyond mere infrastructure or capability, emphasizing the importance of its efficient utilization. Moreover, these conclusions hold firm even under rigorous sensitivity analyses.

In a study conducted by Liu & Nath (2016), the effects of ICT on various service trade categories were analyzed using panel data. The findings indicate a significant positive correlation between overall ICT development and the exports of business services, transportation services, as well as the imports of insurance services, telecommunication services, and travel services. Moreover, the study highlights that the utilization of ICT holds more importance than mere

access and skills in facilitating trade across several service sectors. Furthermore, it suggests that ICT development plays a crucial role in boosting exports from advanced economies and imports by emerging market economies. Notably, the study emphasizes the heightened significance of ICT use in emerging market economies compared to advanced economies, particularly concerning imports.

An alternative methodology was employed in a study conducted by Aryani & Andari (2021), focusing on bilateral analysis between countries and their trade partners. The analysis unveils that both the IDI (Internet Development Index) and B2B (Business-to-Business) indexes wield a notable positive influence on augmenting trade value between a country and its trading counterparts. Furthermore, factors such as economic growth, economic distance, and market size also exhibit significant impacts on trade dynamics within these partnerships.

The study of Ahmedov (2020) explores how digitalization fosters cross-border commerce, unseen job opportunities, and streamlines operations in a globally interconnected digital landscape. Factors such as the exponential growth of digital commerce among companies, households, and businesses, coupled with emerging regulatory frameworks governing transboundary virtual transactions, are also discussed.

Several studies research the impact of digitalization of trade of services. The study of Oliinyk, et al. (2023) investigates the influence of the ICT services market on the ICT-enabled services market across advanced and developing economies through multiple linear regression analysis and the findings suggest that the ICT services market exerts a positive influence on most components of the ICT-enabled services market in advanced nations, whereas its impact on developing countries appears to be limited and heterogeneous.

At the same time Zhang & Wang (2022) explore the rapid growth of digital service trade amid global economic integration and technological advancements, alongside challenges like policy barriers. Using panel data from 40 countries or regions spanning 2014 to 2020, they analyzed the impact of digital technology and policy restrictions on digital service trade. Their findings reveal that improved digital technology significantly increases digital service trade, while higher policy restrictions inhibit its development, particularly in exports. Moreover, policy restrictions positively moderate the relationship between digital technology and digital service trade, mainly benefiting emerging economies.

While Touati & Aljazea (2023) examine ICT's impact on service trade across 19 MENA countries from 2005 to 2019. Using the ICT Development Index, they find it negatively affects exports of IT services but positively influences imports and total trade in financial services. The study highlights the ICT access sub-index's significant impact on total trade in IT services and transport, while the ICT use sub-index affects imports of travel services and exports of both travel and IT services. The ICT skills sub-index positively impacts total trade in IT services and travel but negatively affects transport.

Zhang & Yang (2024) highlight the profound impact of digital technology on services trade, particularly the rapid growth of international Information and Communications Technology (ICT) services trade. Using UN COMTRADE data, they analyze ICT services trade networks from 2004 to 2020 through complex network analysis methods. Their findings reveal a trend where central countries increasingly dominate trade relationships, while middle and lower-tier nations engage in bilateral trade or form alliances with major economies. Early adopter countries like the United States, Ireland, and the United Kingdom have solidified competitive advantages. The study provides recommendations to enhance competitiveness in ICT services trade, offering valuable insights for policy formulation and understanding cooperation and conflicts in this realm.

Another approach of analysing digitalization effect on trade is to take into account business activity analysis. For example, Añón & Bonvin (2023) investigate how digitalization impacts small and medium-sized enterprises' (SMEs) participation in international trade. Using data from Spanish manufacturing SMEs (2001-2014), they developed a digitalization index and analyzed its direct and indirect effects on firms' export and import activities. Their findings show that digitalization increases SMEs' likelihood of exporting and importing, both directly and through productivity improvements.

The study of Hoekman (2021) discusses how digitalization and the shift towards services are driving structural transformation. Arab countries have opportunities to diversify production and trade, especially in travel and transport services, but success depends on supportive regulatory frameworks for MSMEs. While some Arab countries show robust service export growth, others lag due to inadequate policies. Digital trade growth requires meeting regulatory standards. Unlike other regions, many Arab countries haven't engaged in international discussions on digital trade regulation, risking missed opportunities in digitalization.

Liu, Chiu, Chu, and Zheng (2022) analyze the interplay between digitalization, supply chain integration, and firm performance. Employing partial least square structural equation modeling (PLS-SEM), the study uncovers several key relationships. It finds that digitalization within the supply chain and external integration positively impact company performance. Additionally, supply chain external integration partially mediates the relationship between supply chain digitalization and firm performance. The study also reveals divergent paths to enhanced financial performance for large enterprises and SMEs. While large enterprises improve financial performance through supply chain integration following digitalization efforts, SMEs directly enhance financial performance through supply chain digitalization. These insights offer valuable guidance for managers and policymakers in both large enterprises and SMEs, aiding in the formulation of effective strategies for digital transformation implementation.

Special attention should be paid to studies, analyzing impact of digitalization on different economic and investment aspects of countries, as there methodological approach is of a scientific interest.

For this example, Oliinyk (2023) examines how countries' participation in the ICT services market impacts their economic growth, consumer price indices (CPI), and exchange rates. Using Pearson's r regression model, the study provides empirical evidence of the ICT services market's impact on countries' economic parameters, highlighting a stronger correlation between ICT trade and GDP for economies with lower GDP per capita.

Banga (2019) assesses India's readiness for digital international trade, comparing its digital infrastructure with other countries. Using the World Input-Output Database, the study finds that while India ranks high in global digital service exports, its value-added in non-ICT sectors lags. Despite initiatives like Digital India, there's a need to improve trade competitiveness. The paper suggests a Digitally Informed Foreign Trade Policy to enhance digital infrastructure, boost digital content in exports, develop digital skills, promote digital technologies in manufacturing, and use big data analytics for policy. It emphasizes the importance of preserving policy space in trade agreements, particularly regarding cross-border data flows.

Some research has spotlighted the impact of ICT investment on national economies. Liljevern, & Karlsson (2017) indicate that heightened investment in ICT significantly contributes to output growth in the world's wealthiest nations, although this effect varies in middle-income countries when controlling for fixed effects. Control variables such as growth in non-ICT capital services, labor quality, and exports were considered. Moreover, Bahrini & Qaffas (2019) underscores the importance of increasing investments in ICT infrastructure, particularly for au-

thorities in developing countries, to harness the potential of ICT for driving economic growth.

Based on the literature review, this study explores the lack of comprehensive studies focusing specifically on the comparative impact of digitalization on global goods and services markets.

This study emphasizes the issue regarding the digitalization and variables included to this term. As researches propose different indexes, like e-commerce tools (Xing, 2018), internet subscriptions and hosts (Liu & Nath, 2016), specific indexes like the Internet Development Index (IDI) (Aryani & Andari, 2021) and Business-to-Business (B2B) index (Zhang & Wang, 2022), it is important to have some comprehensive approach.

While the review research covers various aspects of digitalization's influence on trade, including bilateral dynamics (Xing, 2018), service trade (Liu & Nath, 2016), firm performance (Liu, Chiu, Chu, & Zheng, 2022), and economic growth (Oliinyk, 2023), there is a need for more targeted research that directly compares the effects of digitalization on goods and services trade at a global scale and regards advanced and developing economies.

Existing studies tend to examine digitalization's impact on either goods or services trade separately, with limited comparative analyses between the two. However, understanding how digitalization affects the dynamics, patterns, and outcomes of both goods and services trade of different type of economies is essential for policymakers, businesses, and researchers alike.

The article contributes to the existing literature on the impact of digitalization on global goods and services markets. It addresses the gap in existing research by directly comparing the effects of digitalization on both goods and services trade. The article proposes a methodological approach that incorporates various digitalization aspects (ICT development, trade, investment) into a single analysis framework. This offers a more comprehensive understanding compared to studies that rely on separate digitalization indexes. Another contribution is the research design that specifically looks at advanced and developing economies separately. This reveals the potential differentiating effects of digitalization on these economic groups.

3. METHODS

The methodological approach consists of the next stages: data collection (dependent variables, independent variables, control variables), countries set defining, data normalization, multiple linear regression utilization.

3. 1. DATA COLLECTION

Dependent variables. The study focuses on the exports and imports of different goods and services sectors, including:

1. *Goods*. The study examines the trade dynamics of various goods and services sectors, encompassing both advanced and developing economies. The data, sourced from the International Trade Centre (2024) utilizing UNCTADstat (2024) and ITC statistics, is structured as the average change in the ratio of goods export/import to GDP in percentage. Here's an overview of the sectors studied:

1.1. Agricultural products export (AP Export) and import (AP Import), consisting of goods of 01–24 chapters of Harmonised Commodity Description and Coding System (HS).

1.2. Ores and metals export (OM Export) and import (OM Import), consisting of goods of 25, 26, 72–83 chapters of HS.

1.3. Mineral fuels and oils export (MFO Export) and import (MFO Import), consisting of goods of 27 chapters of HS.

1.4. Chemicals export (Chem Export) and import (Chem Import), consisting of goods of

28–40 chapters of HS.

1.5. Light industry products export (LIP Export) and import (LIP Import), consisting of goods of 41–43, 50–67 chapters of HS.

1.6. Wood industry products export (WIP Export) and import (WIP Import), consisting of goods of 44–49 chapters of HS.

1.7. Machinery and equipment export (ME Export) and import (ME Import), consisting of goods of 84–89 chapters of HS.

1.8. Tools and devices export (TD Export) and import (TD Import), consisting of goods of 90–93 chapters of HS.

1.9. Other goods export (OG Export) and import (OG Import), consisting of goods of 68-71, 94–99 chapters of HS.

2. *Services*. These variables are taken according to Balance of Payments and International Investment Position Manual (2009). The research includes the following markets, based on the availability of data: financial services export (Fin Export) and import (Fin Import), insurance and pension services export (I&P Export) and import (I&P Import), charges for the use of intellectual property export (UIP Export) and import (UIP Import), personal, cultural, and recreational services export (PCR Export) and import (PCR Import), transport services export (Trans Export) and import (Trans Import), travel services export (Travel Export) and import (Travel Import), construction services export (Const Export), and import (Const Import), maintenance and repair services export (Maint Export) and import (Maint Import), other business services export (OBS Export) and import (OBS Import). Data sourced from the UNCTADstat (2024) database are measured as the average change in the share of GDP in percentage for each year.

Independent variables. The regression models categorize the independent variables into three main groups to assess *digitalization*:

1. ICT development. This includes the deployment of Information and Communication Technology (ICT) as measured by the technology readiness index sourced from the UNCTADstat (2024) database.
2. ICT services trade. This involves ICT services export (ICT Export) and import (ICT Import), measured as a ratio of ICT services export or import to GDP in % according to UNCTADstat (2024) database.
3. ICT investment. The Solow's neoclassical model is frequently employed to analyze how investments in ICT influence output growth (Solow, 1956). Central to this model is the notion of technological advancement, encapsulated by the Solow residual, which denotes production factors extending beyond capital and labor. Even in the digital age, this model retains its relevance for comprehending GDP growth. Solow's production function encompasses three primary factors:

$$Y = AK^{\alpha} L^{1-\alpha} \quad (1)$$

In the equation, Y represents the output stock, while K and L denote the stocks of capital and labor, respectively. A represents the technological parameter influencing the productivity of both capital and labor. Additionally, the function illustrates constant returns to scale, indicating that a 1-unit increase in both capital and labor results in a 1-unit increase in the output level. Consequently, the values of α and (1 - α) sum up to one.

Derived from the Solow production function, the independent variables utilized in this study are indicators of ICT investment. These include (The Conference Board, 2024):

1. Growth in capital services provided by ICT assets (ICT CS)

2. Change in the contribution of capital services provided by ICT assets to real GDP growth (Cont. ICT CS)
3. Change in the share of ICT capital compensation in nominal GDP (ICT Compensation Share).

Control variables. In order to consider additional factors that may impact global markets for goods and services, various control variables are integrated into the regression models. These variables encompass:

1. Trade openness. This measures the extent of economic openness and trade liberalization. Data spanning from 2006 to 2022 are sourced from the UNCTADstat (2024) database.
2. Consumer price index (CPI). Offering insights into inflationary pressures, CPI is a classical control variable expressed in percentage. Data is obtained from the World Bank Open Data (2024).
3. GDP growth. Serving as indicators of economic development, GDP growth rates are measured in percentage, sourced from UNCTADstat (2024).
4. Nominal Exchange Rates (ER). ER reflects the amount of national currency per 1 US Dollar, collected from the IMF eLibrary-Data (2024).
5. Political stability and Absence of Violence/Terrorism (Political Stability). This variable seeks to capture the potential influence of political factors on global goods markets, measured on a scale from -2,5 (indicating the lowest political stability) to 2,5 (indicating the highest political stability). Data covering the period from 2006 to 2022 are sourced from the World Bank Open Data (2024).

3. 2. COUNTRIES SET DEFINING

The dataset utilized in this study spans from 2006 to 2022, offering a comprehensive historical record of variables across multiple countries. Prior to analysis, a meticulous country selection process was conducted, encompassing both advanced and developing economies. The advanced country cohort comprises 38 nations as delineated by the Organisation for Economic Co-operation and Development (OECD, 2024), while the number of developing countries ranges from 52 to 66 economies.

3. 3. DATA NORMALIZATION

Following data collection, normalization was conducted to ensure comparability across all indices. To achieve this, each dataset pertaining to a specific market was transformed into its yearly percentage change (YPG). This method illustrates the annual growth rate, calculated according to the equation:

$$YPC_{i+1} = \frac{x_{i+1}}{x_i} \quad (2)$$

To ensure consistency across variables, all historical data series underwent a normalization procedure. This entailed computing the average values for each variable over the 2006-2022 timeframe for each country. By standardizing the data in this manner, meaningful comparisons are facilitated, thereby mitigating potential biases arising from variations in scale or magnitude.

3. 4. MULTIPLE LINEAR REGRESSION UTILIZATION

This study utilizes multiple linear regression analysis as its primary statistical method. This approach allows for the estimation of relationships between dependent and independent variables, while also considering the influence of control variables. The regression models are computed

using suitable statistical software, and various diagnostic tests are performed to evaluate model fit and validity (Oliinyk, 2023). The equation employed for this analysis is as follows:

$$y_i = b_0 + b_1x_{i1} + b_2x_{i2} + ... + b_px_{ip} + \epsilon \quad (3)$$

where, for i=n observations: y_i = dependent variable, x_i = independent (explanatory) variables, b_0 = y-intercept (constant term), b_p = slope coefficients for each explanatory variable, ϵ = the model's error term (also known as the residuals).

We utilized multiple linear regression analysis to estimate the relationships between the dependent and independent variables, taking into account control variables. Using appropriate statistical software, we estimated regression models and conducted diagnostic tests to ensure the fit and validity of the models.

4. RESULTS

4. 1. DESCRIPTIVE STATISTICS ANALYSIS

This section analyzes the descriptive statistics presented in Table 1, which summarizes economic indicators, digitalization factors, and trade flows for advanced economies between 2006 and 2022. The analysis aims to identify central tendencies, dispersion, and potential outliers within the data, providing a robust foundation for further statistical exploration.

The average GDP growth rate (2,17%) suggests a moderate economic expansion over the analyzed period, with notable variations across countries indicated by a standard deviation of 1,303. Similarly, the mean CPI (2,88%) indicates a moderate level of inflation, but with varying pressures among countries, highlighted by a standard deviation of 2,170.

The average change in trade openness (2,09%) signals a relatively open trading environment, albeit with some variation (standard deviation: 1,066), suggesting differing levels of integration into global trade networks among countries.

In terms of digitalization, the average change in ICT deployment (3,39%) indicates moderate technology adoption, yet with notable disparities across countries (standard deviation: 3,053). Notably, ICT exports and imports have significantly higher averages compared to other digitalization indicators, underlining the advanced economies' substantial role in the global ICT trade market. However, there's potentially greater variation in import patterns (standard deviation for imports: 11,808).

Investment in ICT, measured by the growth in capital services provided by ICT assets (ICT CS), exhibits a mean of 14,09%, suggesting relatively stable levels with some variation (standard deviation: 0,495).

While most goods sectors show positive average growth in exports, indicating overall increased trade activities, significant variation exists across countries, as evidenced by high standard deviations for many sectors. Likewise, trade flows across different service sectors demonstrate considerable variation, reflecting the diverse nature of global trade.

Table 1 suggests a normal distribution of data, but the presence of high standard deviations implies potential outliers, especially in variables like construction exports. Identifying and analyzing these outliers is crucial for ensuring the reliability of future statistical inferences.

Overall, advanced economies showcase moderate economic growth, inflation, and trade openness, with varying degrees of ICT deployment. ICT trade plays a significant role, with both exports and imports demonstrating high average values, while trade flows across service sectors exhibit substantial variation.

Table 1. Descriptive statistics of dependent, independent and control variables of advanced economies

Variable	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness	Min	Max	Count
GDP growth	2,170	0,211	2,001	1,303	0,553	0,525	-0,701	5,533	38
CPI	2,882	0,352	2,344	2,170	18,690	3,762	0,392	13,977	38
Exchange Rate	-0,529	1,587	1,226	9,785	19,002	-3,809	-50,435	17,404	38
Trade Openness	2,092	0,173	2,118	1,066	-0,062	0,049	0,095	4,332	38
Political Stability	0,311	0,478	-0,239	2,948	30,629	5,293	-1,782	17,151	38
ICT deployment	3,388	0,495	3,488	3,053	2,595	1,329	-1,073	13,131	38
ICT Export	7,762	1,756	7,215	10,823	6,838	2,155	-8,802	50,413	38
ICT Import	9,889	1,916	5,612	11,808	5,028	2,062	-2,804	55,100	38
ICT CS	14,090	0,495	13,577	3,051	-0,625	0,562	9,351	20,762	38
Cont. ICT CS	0,459	0,027	0,434	0,165	-0,381	0,596	0,242	0,828	38
ICT Compensation Share	2,022	0,559	1,174	3,448	13,996	3,206	-2,952	18,489	38
AP Export	2,677	0,434	2,969	2,675	0,387	-0,454	-4,916	7,476	38
AP Import	2,541	0,298	2,447	1,839	2,792	0,567	-1,653	8,668	38
OM Export	2,208	0,478	2,075	2,946	0,032	0,328	-3,186	8,607	38
OM Import	2,352	0,328	2,789	2,022	-0,088	-0,223	-2,293	6,271	38
MFO Export	8,736	4,224	4,458	26,036	34,216	5,713	-10,641	161,276	38
MFO Import	3,350	0,497	2,940	3,062	0,581	0,684	-2,138	11,860	38
Chem Export	2,341	0,457	2,063	2,814	-0,441	0,048	-3,865	7,704	38
Chem Import	2,241	0,286	2,388	1,760	1,129	0,494	-1,151	7,552	38
LIP Export	-1,294	0,561	-0,796	3,455	2,427	-1,083	-12,967	4,498	38
LIP Import	0,037	0,293	0,276	1,807	0,799	-0,393	-4,603	3,874	38
WIP Export	-0,568	0,476	-0,820	2,935	0,934	0,394	-6,834	7,028	38
WIP Import	-0,747	0,269	-0,799	1,661	0,056	-0,218	-4,804	2,925	38
ME Export	0,280	0,553	0,367	3,408	0,080	-0,261	-8,816	6,434	38
ME Import	0,547	0,281	0,709	1,731	0,981	-0,600	-4,634	3,630	38
TD Export	3,535	0,567	2,899	3,494	0,184	0,943	-1,480	12,540	38
TD Import	1,505	0,276	1,538	1,703	-0,139	-0,110	-2,168	4,945	38
OG Export	4,418	1,565	2,623	9,647	17,604	3,711	-7,772	52,916	38
OG Import	4,397	0,917	3,227	5,651	5,263	1,809	-5,601	25,611	38
I&P Export	12,417	3,488	7,123	21,502	8,872	2,839	-16,068	94,450	38
I&P Import	6,559	2,208	4,009	13,609	23,266	4,404	-5,679	79,594	38
Fin Export	23,376	15,853	4,980	97,722	37,246	6,076	-4,053	607,217	38
Fin Import	7,670	1,431	4,260	8,824	1,445	1,439	-2,622	31,912	38
UIP Export	13,684	2,164	9,473	13,338	9,069	2,625	-1,591	71,466	38
UIP Import	4,544	1,124	2,664	6,930	9,211	2,382	-8,570	34,787	38
PCR Export	7,641	3,617	6,886	22,298	16,547	-2,389	-100,000	73,608	38
PCR Import	13,813	4,717	6,856	29,075	21,915	4,373	-9,189	167,181	38
Tran Export	0,940	0,662	1,421	4,082	0,479	0,039	-7,864	11,560	38
Tran Import	1,784	0,558	1,436	3,442	4,601	1,437	-3,436	14,975	38
Travel Export	-1,833	0,646	-2,395	3,983	0,607	0,724	-9,301	8,925	38
Travel Import	-2,473	0,516	-1,942	3,178	1,304	-0,987	-11,109	2,953	38
Const Export	156,901	150,830	4,151	892,322	34,931	5,908	-100,000	5282,815	35
Const Import	12,967	5,817	5,537	34,416	4,232	0,204	-100,000	98,464	35
Maint Export	32,114	14,887	6,377	89,321	16,468	3,906	-7,630	463,592	36
Maint Import	21,661	5,555	10,447	33,329	5,401	2,334	-11,179	142,765	36
OBS Export	8,149	2,398	4,867	14,782	14,562	3,862	-1,435	70,480	38
OBS Import	4,971	0,687	3,896	4,235	2,640	1,548	-1,603	17,922	38

Source: Authors' calculations

This table 2 summarizes various statistics for the variables used in the study, focusing on developing economies.

Many variables have high standard deviations, indicating significant variation across countries in developing economies. This highlights the diverse economic situations within this category.

Several variables show positive skewness (e.g., Const Export, Const Import, WIP Export, TD Export, OG Export, UIP Export). This suggests more data points towards higher values for these variables.

For most goods categories (AP, OM, MFO, etc.), export values tend to be lower than import values (except WIP Export). This might indicate a net import dependency for many goods in developing economies.

Travel Export and Construction Export have particularly high averages compared to their imports, suggesting these sectors might contribute more to exports in developing economies.

Both ICT deployment and investment indicators (ICT CS, Cont. ICT CS, ICT Compensation Share) have positive means, suggesting some level of digital technology adoption in developing economies.

The average GDP growth (4,0%) suggests a positive economic trajectory for developing economies during the study period.

The relatively high average CPI (5,8%) indicates potential inflationary pressures in these economies.

High standard deviation and positive skewness suggest significant fluctuations and a tendency for stronger local currencies compared to the US dollar.

The positive average score (1,34) indicates a moderate level of political stability in developing economies on average.

Table 2. Descriptive statistics of dependent, independent and control variables of developing economies

Variable	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum	Count
GDP growth	4,015	0,241	3,726	1,961	0,536	0,311	-1,492	9,223	66
CPI	5,844	0,574	4,803	4,667	7,032	2,413	1,571	25,421	66
Exchange Rate	2,170	1,020	1,301	8,290	14,343	-2,560	-36,661	27,137	66
Trade Openness	1,586	0,224	1,854	1,818	5,227	-1,784	-5,647	4,332	66
Political Stability	1,336	0,692	0,333	5,619	27,084	4,576	-8,226	37,425	66
ICT deployment	13,348	1,611	11,573	13,086	5,202	1,313	-24,894	68,235	66
ICT Export	7,063	1,440	6,058	11,696	4,538	1,607	-21,318	49,991	66
ICT Import	10,156	1,614	6,490	13,113	5,072	1,932	-13,154	62,688	66
ICT CS	15,395	0,672	15,784	5,460	0,276	-0,481	-1,066	26,563	66
Cont. ICT CS	0,428	0,040	0,329	0,323	0,535	1,079	0,027	1,425	66
ICT Compensation Share	3,124	1,294	2,141	10,515	30,857	4,718	-13,190	73,321	66
AP Export	2,737	0,742	2,683	6,025	2,919	-0,221	-18,587	20,569	66
AP Import	1,987	0,605	2,225	4,916	7,363	-0,443	-16,043	21,537	66
OM Export	7,328	1,551	4,965	12,599	7,353	2,390	-12,099	58,233	66
OM Import	1,712	0,637	2,338	5,175	4,334	-1,465	-19,083	12,348	66
MFO Export	151,065	69,903	2,849	567,895	21,123	4,548	-14,493	3388,391	66
MFO Import	8,012	2,372	2,846	19,269	19,801	3,898	-15,338	123,215	66
Chem Export	5,896	1,223	3,562	9,932	13,258	2,607	-10,717	60,606	66
Chem Import	1,447	0,546	2,128	4,434	7,242	-1,915	-18,079	10,676	66
LIP Export	-0,494	1,015	-2,624	8,248	3,472	1,570	-14,276	29,492	66
LIP Import	2,022	0,933	0,684	7,580	5,238	1,655	-16,965	30,498	66
WIP Export	7,602	2,334	3,025	18,960	13,424	3,346	-10,893	106,637	66

Variable	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum	Count
WIP Import	41,024	32,822	-1,111	266,648	59,537	7,588	-15,538	2122,176	66
ME Export	11,578	3,077	4,357	24,995	9,040	2,879	-11,279	128,460	66
ME Import	0,294	0,509	0,514	4,133	2,649	-1,000	-14,108	8,921	66
TD Export	47,177	23,041	9,408	187,188	49,954	6,856	-7,161	1444,377	66
TD Import	1,874	0,629	1,897	5,113	7,126	0,871	-15,314	24,818	66
OG Export	39,691	19,831	5,034	161,110	40,521	6,178	-20,014	1171,667	66
OG Import	6,688	1,391	2,615	11,301	3,294	1,820	-9,417	46,177	66
I&P Export	12,464	6,572	5,806	53,794	19,088	3,575	-100,000	314,094	66
I&P Import	25,949	15,459	1,419	126,534	48,668	6,726	-9,467	968,734	66
Fin Export	18,900	4,352	7,219	34,816	5,810	2,171	-48,857	154,529	64
Fin Import	26,043	6,408	11,873	51,261	25,607	4,654	-10,280	346,136	64
UIP Export	26,430	17,465	11,706	129,525	44,871	6,376	-100,000	925,194	55
UIP Import	11,765	4,249	5,676	32,909	6,564	-0,018	-100,000	137,735	60
PCR Export	11,649	6,565	7,765	51,690	23,912	3,739	-100,000	328,610	62
PCR Import	11,136	3,047	5,578	23,800	1,242	0,650	-40,848	78,687	61
Tran Export	1,611	0,986	0,741	8,013	8,946	2,276	-11,361	41,431	66
Tran Import	0,409	0,464	0,238	3,801	2,630	0,752	-9,623	12,497	66
Travel Export	0,829	0,997	0,472	8,102	4,314	1,329	-15,521	35,917	66
Travel Import	32,130	32,005	-0,094	261,969	66,918	8,178	-15,967	2143,814	66
Const Export	95,393	45,939	4,749	346,829	17,991	4,288	-100,000	1769,417	57
Const Import	1415,723	1360,189	12,685	10269,205	56,984	7,548	-100,000	77581,230	57
Maint Export	70,041	36,452	6,940	262,860	15,863	4,027	-94,735	1371,383	52
Maint Import	19,971	8,239	7,790	59,981	9,144	2,732	-66,488	280,103	53
OBS Export	11,312	3,808	4,532	30,937	19,744	4,092	-21,338	190,830	66
OBS Import	19,692	14,698	2,296	119,404	64,887	8,024	-14,044	971,164	66

Source: Authors' calculations

4. 2. DIGITALIZATION AND GOODS MARKETS IN ADVANCED ECONOMIES

This section presents the analysis of the regression results for the impact of digitalization on the exports and imports of various goods sectors in advanced economies. The analysis is based on multiple linear regression models that estimate the relationships between these trade flows and a range of digitalization variables.

Table 3 summarizes the regression results for eight different sectors: agricultural products export (AP Export) and import (AP Import), ores and metals export (OM Export) and import (OM Import), mineral fuels and oils export (MFO Export) and import (MFO Import), chemicals export (Chem Export) and import (Chem Import).

The R-squared values range from 0,1946 (MFO Exports) to 0,8114 (Chem Exports) in Table 1, suggesting that the models explain a moderate to high proportion of the variance in trade flows for most sectors. The F-statistic tests whether the overall model is statistically significant, meaning that at least one of the independent variables has a significant impact on the dependent variable. All the models in Table 1 have a significant F-statistic (p-value < 0.05), indicating that the chosen variables jointly explain a statistically significant portion of the variation in trade flows.

Key findings state that the ICT deployment and ICT exports have a positive impact on some sectors' exports. The regression coefficients for ICT deployment and ICT exports are positive and statistically significant (p-value < 0,05) for some sectors, including ores and metals (OM)

(coefficient = 0,4513), machinery and equipment (ME) (coefficient = 1,2246), and tools and devices (TD) (coefficient = 0,0052). This suggests that economies with a more advanced ICT infrastructure and higher levels of ICT exports tend to have higher exports of these goods.

The impact of ICT investment indicators (ICT CS, Cont. ICT CS, ICT Compensation Share) on trade flows is mixed. There is no statistically significant impact on sectors.

Economic factors also play a role, as GDP growth, CPI, exchange rate, and trade openness are also included in the models and show mixed effects on sectoral exports and imports. For instance, GDP growth has a negative and significant coefficient (p-value < 0.05) for agricultural products (AP) and ores and metals (OM) exports (-1,2117 and -1,1838, respectively), indicating that as economies develop, they may export these goods less. On the other hand, CPI has a positive and significant coefficient (p-value < 0.05) for most sectors' imports, suggesting that higher inflation is associated with increased import demand.

Political stability is a factor for some sectors. The coefficient for political stability is positive and significant (p-value < 0.05) for MFO imports (coefficient = 0,5266), suggesting that political instability may lead to higher imports of mineral fuels and oils.

Overall, the results highlight the complex interplay between digitalization and trade in goods and services. While ICT deployment and exports appear to promote exports of some goods, the impact of ICT investment is less clear. Economic factors and political stability also influence trade flows.

Table 3. Advanced economies regressions analysis for AP Export, AP Import, OM Export, OM Import, MFO Export, MFO Import, Chem Export, Chem Import

	AP Export	AP Import	OM Export	OM Import	MFO Export	MFO Import	Chem Export	Chem Import
Constant	6,1525*	2,4133	2,5726	3,9032	-7,9342	3,2667	3,8126	4,3818*
GDP growth	-1,2117*	-0,3117	-1,1838*	-0,9957*	6,2990	-1,4650*	-0,6527	-0,1687
CPI	0,4563	0,6300*	0,7015*	0,4437*	-4,6060	0,2592	0,5579*	0,2276
Exchange rate	-0,0636	0,0095	-0,0164	-0,0108	-0,0707	-0,0270	-0,0925*	-0,0810*
Trade Openness	0,0272	-0,0665	0,4306	-0,1326	4,1409	-0,0102	0,5933	0,1945
Political stability	0,0783	0,1040	-0,1322	0,1508	-0,1933	0,5266*	0,0468	0,0935
ICT deployment	0,0379	0,0504	0,4513*	0,2177	1,2246	0,0080	0,0052	-0,1409
ICT Export	0,0262	0,0232	0,1303	0,1112*	-0,5649	-0,0203	0,0965	-0,0051
ICT Import	0,0132	-0,0123	-0,0353	0,0149	1,1136	0,1368*	0,0025	0,0129
ICT CS	-0,1944	-0,0974	-0,0841	-0,1105	-0,8102	0,2371	-0,1818	-0,0660
Cont. ICT CS	-1,1407	0,1896	-2,9393	-1,2267	22,1276	-4,4433	-3,5526	-3,9525
ICT Compensation Share	0,2732	0,0763	-0,1542	0,0012	-0,4875	-0,0140	0,2411	0,1170
Observations	38	38	38	38	38	38	38	38
Multiple R	0,7336	0,7124	0,7516	0,7404	0,4411	0,7478	0,8114	0,6967
R Square	0,5382	0,5075	0,5649	0,5482	0,1946	0,5592	0,6583	0,4853
Significance F	0,0164	0,0304	0,0092	0,0133	0,8345	0,0104	0,0007	0,0455

* - indicates significance (P-value<0,05)

Source: Authors' calculations

Table 4 summarizes the regression results for light industry products export (LIP Export) and import (LIP Import), wood industry products export (WIP Export) and import (WIP Import), machinery and equipment export (ME Export) and import (ME Import), tools and devices export (TD Export) and import (TD Import), other goods export (OG Export) and import (OG

Import) of advanced economies. The R-squared values for the models range from 0,3177 (Machinery and Equipment Imports) to 0,8451 (Wood Industry Products Exports), indicating that the explanatory power of the models varies across sectors. Most of models, except for LIP Import, ME Import, OG Export and Import, have a statistically significant F-statistic (p-value < 0.05), implying that at least one of the independent variables has a significant impact on the respective dependent variable (exports or imports) for that sector.

ICT deployment and ICT exports have no statistically significant impact on exports or imports for most sectors. ICT investment indicators show mixed results, though. ICT capital services (ICT CS) has a negative and significant coefficient (p-value < 0.05) for exports of light industry products with a coefficient of -0,7625, implying that higher growth in capital services provided by ICT assets might decrease exports in this sector.

Change of share of ICT capital compensation in nominal GDP (ICT compensation share) has a positive and significant coefficient (p-value < 0.05) for both exports and imports of several sectors (LIP exports, WIP Export and Import, and ME Export with a coefficient of 0,5458, 0,2855, 0,1887 and 0,4520 respectively), suggesting that a larger share of GDP dedicated to ICT compensation may lead to increased trade in those sectors.

GDP growth shows a negative and statistically significant coefficient (p-value < 0.05) for several sectors' exports (WIP Export, WIP Import, TD Import with a coefficient of -1,0281, -0,7211, -0,9656 respectively) but a non-significant effect for others. This suggests that economic growth in advanced economies might be associated with a decrease in exports and imports of some goods.

Table 4. Advanced economies regressions analysis for LIP Export, LIP Import, WIP Export, WIP Import, ME Export, ME Import, TD Export, TD Import, OG Export, OG Import

	LIP Export	LIP Import	WIP Export	WIP Import	ME Export	ME Import	TD Export	TD Import	OG Export	OG Import
Constant	9,5429*	4,1319*	-1,6043	-1,8724	1,1865	2,4214	-5,0541	-0,3665	-6,7341	4,1523
GDP growth	-0,2932	-0,0019	-1,0281*	-0,7211*	-0,4793	-0,0907	-0,9268	-0,9656*	-2,4570	-1,3777
CPI	0,1238	-0,0995	0,8105*	0,3498*	0,6986*	0,1295	1,0970*	0,3468*	2,2063*	1,3370*
Exchange rate	0,0266	0,0407	-0,0369	-0,0572*	-0,0474	-0,0323	-0,0104	-0,0249	0,1711	0,0881
Trade Openness	0,0047	0,0761	0,4738	0,2179	0,8891	0,1684	0,8359	0,2479	-0,3539	-0,5831
Political stability	-0,0099	0,2030	-0,2137	0,1014	-0,1307	0,0758	-0,1386	0,0301	-0,2731	-0,1383
ICT deployment	-0,1482	-0,0644	-0,0735	-0,0197	-0,3487	-0,1424	0,2002	0,1029	1,4517	0,9521*
ICT Export	-0,0796	-0,0137	0,0584	0,0552	-0,0674	-0,0062	0,1579	0,0245	0,3736	0,1900
ICT Import	0,0458	0,0427	0,0331	0,0157	0,0056	0,0411	-0,1156	-0,0142	-0,6113*	-0,346*
ICT CS	-0,7625*	-0,3475*	-0,0628	0,0369	-0,1201	-0,1813	0,3453	0,1631	0,4257	-0,2591
Cont. ICT CS	-0,5129	0,5712	-0,3706	-0,4545	-2,8910	-0,3681	-0,3864	-1,1217	9,3832	6,4613
ICT Compensation Share	0,5458*	0,2820*	0,2855*	0,1887*	0,4520*	0,2199	0,1178	0,1201	-0,7417	-0,0861
Observations	38	38	38	38	38	38	38	38	38	38
Multiple R	0,7410	0,6685	0,8451	0,8180	0,7425	0,5636	0,7812	0,7759	0,6202	0,6464
R Square	0,5491	0,4469	0,7141	0,6691	0,5513	0,3177	0,6103	0,6021	0,3847	0,4179
Significance F	0,0130	0,0855	0,0001	0,0005	0,0124	0,3990	0,0029	0,0037	0,1994	0,1302

* - indicates significance (P-value<0,05)

Source: Authors' calculations

CPI has a positive and statistically significant coefficient (p-value < 0,05) for WIP Export, WIP Import, ME Export, TD Export, TD Import, with coefficients ranging from 0,3498 to 1,0970. This indicates that higher inflation is linked to increased import demand for various goods.

Trade openness and Political stability generally do not have a statistically significant impact on trade in advanced economies.

4. 3. DIGITALIZATION AND GOODS MARKETS IN DEVELOPING ECONOMIES

Table 5 provides the findings of multiple linear regression models employed to investigate the impact of digitalization on the exports and imports of goods: agricultural products export (AP Export) and import (AP Import), ores and metals export (OM Export) and import (OM Import), mineral fuels and oils export (MFO Export) and import (MFO Import), chemicals export (Chem Export) and import (Chem Import) in developing economies. The R-squared values for the models range from 0,1435 (Mineral fuels and oils) to 0,2892 (Agricultural Product Imports). However, only Agricultural Product Imports model has a significance F-statistic (p-value < 0.05).

For Agricultural Product Imports, CPI demonstrates significant positive correlation (0,4465). While GDP growth, Exchange rate, Trade Openness and digitalization factors have no significant impact.

Table 5. Developing economies regressions analysis for AP Export, AP Import, OM Export, OM Import, MFO Export, MFO Import, Chem Export, Chem Import

	AP Export	AP Import	OM Export	OM Import	MFO Export	MFO Import	Chem Export	Chem Import
Constant	3,1163	0,7072	7,3872	1,4870	-234,0689	10,0475	0,0929	2,3181
GDP growth	-1,0138*	-0,0141	1,5114	-0,7682	33,8674	0,4475	1,6888	-0,3387
CPI	-0,3129	0,4465*	-0,7240	-0,0765	-16,1488	-0,9862	-0,1953	0,0263
Exchange rate	0,1038	-0,0208	0,1966	0,0575	0,3185	0,1162	0,0865	0,0150
Trade Openness	0,3402	0,5613	1,9015*	0,1676	59,0635	2,0455	0,6177	0,2245
Political stability	0,2152	0,0594	-0,0560	0,2121	-10,5263	-0,0347	0,5008	0,0641
ICT deployment	-0,0938	-0,0876	-0,1746	-0,0636	9,5621	0,0593	-0,1610	-0,0902
ICT Export	0,1266	0,1047	0,1087	0,1152	-6,2398	0,0924	0,2896	0,0668
ICT Import	0,0044	-0,0367	0,0253	-0,0281	-1,6270	0,0662	-0,0527	-0,0300
ICT CS	0,3651	-0,0997	-0,0260	0,2064	26,6305	-0,3923	-0,1572	0,0267
Cont. ICT CS	-2,1806	-0,2303	-9,0449	0,0160	-423,3240	1,9409	0,4793	0,7448
ICT Compensation Share	-0,0091	0,0586	0,0593	0,0465	-7,9710	0,4514	0,3117	0,0449
Observations	66	66	66	66	66	66	66	66
Multiple R	0,5243	0,5378	0,3983	0,4611	0,4392	0,3787	0,5071	0,3821
R Square	0,2749	0,2892	0,1587	0,2126	0,1929	0,1435	0,2572	0,1460
Significance F	0,0659	0,0467	0,5231	0,2364	0,3270	0,6185	0,0984	0,6024

* - indicates significance (P-value<0,05)

Source: Authors' calculations

Table 6 summarizes the regression results for ten goods sectors light industry products export (LIP Export) and import (LIP Import), wood industry products export (WIP Export) and import (WIP Import), machinery and equipment export (ME Export) and import (ME Import), tools and devices export (TD Export) and import (TD Import), other goods export (OG Export) and import (OG Import) in developing economies.

The R-squared values for the models range from 0,0945 (ME Export) to 0,3904 (TD Export), indicating that the explanatory power of the models varies considerably across sectors. However, all models, except for TD Export, have an insignificance F-statistic.

The analysis of tools and devices export demonstrates moderate level of correlation (R squared

is 0,3904). The ICT import has positive significant impact (coefficient is 3,703), which suggest that import of outsourced ICT services could be correlated with the development of local producers and enhancement of export. Positive significant impact is also detected for GDP growth, CPI, and Trade Openness with coefficients of 52,94, 10,98, 25,33 respectively.

Table 6. Developing economies regressions analysis for LIP Export, LIP Import, WIP Export, WIP Import, ME Export, ME Import, TD Export, TD Import, OG Export, OG Import

	LIP Export	LIP Import	WIP Export	WIP Import	ME Export	ME Import	TD Export	TD Import	OG Export	OG Import
Constant	3,8181	-5,5752	-10,128	353,46*	-6,0461	-1,1090	-215,7*	2,6407	-9,4540	5,1573
GDP growth	0,7566	0,4664	2,9517*	10,1117	2,7739	-0,6832*	52,94*	-0,0891	21,84	-0,1358
CPI	-0,5773	0,0523	0,1211	-7,8419	-0,0361	0,0817	10,98*	-0,1310	-1,7229	0,3640
Exchange rate	0,2315	0,1365	0,1984	2,7984	0,1544	-0,0827	0,9550	0,1184	2,6113	0,0844
Trade Openness	0,6953	0,9413	0,7409	16,9496	2,8823	-0,0040	25,33*	0,2505	6,3433	-0,4814
Political stability	-0,0742	0,1506	0,2808	-5,5973	0,1063	0,1534	-4,8775	0,2413	4,7211	0,0343
ICT deployment	-0,1497	-0,0023	-0,0508	-7,7283*	0,0660	-0,0260	-2,0806	-0,0657	-2,2424	-0,0427
ICT Export	0,0179	0,2014	0,4143	0,1424	-0,3319	0,1286*	-2,8487	0,1579	2,0212	0,3072
ICT Import	0,1000	-0,0587	-0,0444	2,1749	0,0617	-0,0695	3,703*	-0,0276	-0,5986	-0,2341
ICT CS	-0,2653	0,1629	0,4116	-14,6227	0,2583	0,2860*	-1,8469	-0,0147	-3,6418	0,0001
Cont. ICT CS	-2,6332	-0,4893	-15,1885	-74,0109	-2,6128	-1,6540	-32,24	-1,8570	37,01	3,6445
ICT Compensation Share	0,1459	0,0689	0,3934	0,5023	-0,0442	0,0193	0,4376	0,1053	3,2773	-0,1020
Observations	66	66	66	66	66	66	66	66	66	66
Multiple R	0,4272	0,4343	0,4732	0,5120	0,3074	0,4940	0,6248	0,4348	0,3269	0,3890
R Square	0,1825	0,1886	0,2240	0,2621	0,0945	0,2440	0,3904	0,1890	0,1069	0,1513
Significance F	0,3823	0,3493	0,1924	0,0883	0,8866	0,1300	0,0024	0,3471	0,8306	0,5689

* - indicates significance (P-value<0,05)

Source: Authors' calculations

4. 4. DIGITALIZATION AND SERVICES MARKETS IN ADVANCED ECONOMIES

This section dissects the findings of multiple linear regressions employed to investigate the impact of digitalization on exports and imports of various services sectors across advanced economies. The analysis explores the relationships between trade flows (exports and imports) and explanatory variables of digitalization indicators.

Table 7 summarizes the regression results for eight service sectors: financial services export (Fin Export) and import (Fin Import), insurance and pension services export (I&P Export) and import (I&P Import), charges for the use of intellectual property export (UIP Export) and import (UIP Import), personal, cultural, and recreational services export (PCR Export) and import (PCR Import) in advanced economies.

The R-squared values for the models range from 0,2779 (Insurance & Pension Services Export) to 0,8299 (Financial Services Export), indicating that the explanatory power of the models varies considerably across sectors. The models have a significance F-statistic except for I&P Import and Fin Export.

The influence of ICT deployment and ICT exports on trade flows are generally insignificant. Although, ICT deployment shows positive impact on I&P Import with a coefficient of 26,9367.

The contribution of ICT capital services to real GDP growth (Cont. ICT CS) has a negative and

significant coefficient (p-value < 0,05) for Financial Services Export (Fin Export) with a coefficient of -1,728, which requires further investigation to understand the underlying mechanisms.

GDP growth has a negative and significant coefficient (p-value < 0,05) for I&P Import with a coefficient of -5.6497. This suggests the negative impact of economic growth on the import of insurance and pension services.

CPI generally has a non-significant effect on service trade in advanced economies in Table 5. Trade openness and exchange rate demonstrate a negative and significant correlation with I&P Import (coefficients are -4,3249 and -0,6769 respectively).

Political stability does not appear to have a significant impact on trade in services for most advanced economies for Table 7.

Table 7. Advanced economies regressions analysis for I&P Export, I&P Import, Fin Export, Fin Import, UIP Export, UIP Import, PCR Export, PCR Import

	I&P Export	I&P Import	Fin Export	Fin Import	UIP Export	UIP Import	PCR Export	PCR Import
Constant	22,4421	-25,1148	81,2537	29,8649	-24,7932	-19,6909	-6,9793	49,0729
GDP growth	-3,1527	-5,6497*	9,6519	-0,2599	0,7315	1,4050	-0,1765	-5,7378
CPI	0,4893	1,3286	-1,8061	-1,6610	0,7492	0,7921	-0,2859	-1,9198
Exchange rate	-0,4033	-0,6769*	0,1891	0,0346	-0,0157	0,0655	-0,2668	0,4400
Trade Openness	-1,0635	-4,3249*	7,7913	1,3994	3,7584	1,1303	0,3365	-4,0911
Political stability	-1,0574	0,6380	-1,3274	-0,0702	-0,1911	0,5600	1,7242	-3,4301
ICT deployment	-58,5987	26,9367*	-45,4093	-26,6221	8,4468	19,0904	60,7335	-117,519*
ICT Export	1,3321	-0,0011	-0,1502	0,3385	0,6340	-0,0548	0,1124	2,0393*
ICT Import	-0,1267	0,7613	0,1852	0,4581	-0,3455	-0,1515	0,6813	-0,3029
ICT CS	2,4512	1,5951	-4,2782	-0,5155	1,4091	0,3800	-2,7194	4,9437
Cont. ICT CS	-0,0254	-0,0065	-1,1728*	-0,0666*	0,0516	0,0325	-0,0358	-0,1018
ICT Compensation Share	-2,0172	0,2253	0,8354	-0,1236	-0,1967	-0,3187	1,5687	-3,2097*
Observations	38	38	38	38	38	38	38	38
Multiple R	0,5272	0,7421	0,9110	0,6469	0,5527	0,5538	0,6251	0,6237
R Square	0,2779	0,5507	0,8299	0,4185	0,3055	0,3067	0,3907	0,3890
Significance F	0,5448	0,0126	0,0000	0,1290	0,4424	0,4382	0,1853	0,1892

* - indicates significance (P-value<0,05)

Source: Authors' calculations

The regression results for ten service sectors: transport services export (Trans Export) and import (Trans Import), travel services export (Travel Export) and import (Travel Import), construction services export (Const Export), and import (Const Import), maintenance and repair services export (Maint Export) and import (Maint Import), other business services export (OBS Export) and import (OBS Import) in advanced economies reveal some patterns, along with statistical details in Table 8.

The R-squared values for the models range from 0,2852 (Construction Export) to 0,7608 (Other Business Services), indicating that the explanatory power of the models varies considerably across sectors. Travel Export and OBS Export models have a significance F-statistic.

ICT services trade (imports) demonstrate significant positive impact on other business services export with a coefficient of 0,877.

Growth in capital services provided by ICT assets (ICT CS) and change in contribution of capital services provided by ICT assets to real GDP growth (Cont. ICT CS) have non-significant

effect on most service sectors, except for Travel Export with a coefficient of -0,572 and -0,024 respectively.

GDP growth revealed no significant impact in the models in Table 8.

CPI generally has a non-significant effect on service trade in advanced economies, with a few exceptions. For instance, a positive and significant coefficient for Other Business Services Export (2,636) suggests higher inflation might lead to increased exports in this sector.

Trade openness has a positive and significant coefficient (p-value < 0,05) for Travel Export with a coefficient of 1,1423. Political stability appears to have the same positive impact on Travel Export with a coefficient of 0,4597. While others trade sectors have no significant effect of the mentioned variables.

Table 8. Advanced economies regressions analysis for Tran Export, Tran Import, Travel Export, Travel Import, Const Export, Const Import, Maint Export, Maint Import, OBS Export, OBS Import

	Tran Export	Tran Import	Travel Export	Travel Import	Const Export	Const Import	Maint Export	Maint Import	OBS Export	OBS Import
Constant	2,3075	0,9101	8,5400	1,3900	1684,22	-15,499	-11,142	17,564	19,223	3,3691
GDP growth	-0,0704	-0,4089	-0,7222	-0,6447	29,0877	-2,4321	32,51*	-3,1564	-0,2441	-0,1871
CPI	-0,0036	-0,0980	0,1681	0,1061	-113,391	4,0398	-12,702	1,1485	2,636*	0,4484
Exchange rate	-0,0085	0,0110	0,0117	-0,0512	14,4025	0,1257	0,6309	0,5657	0,1163	0,0489
Trade Openness	1,2761	1,1335	1,1423*	0,6390	34,2983	0,9243	8,4220	13,88*	1,6681	0,6906
Political stability	0,0132	0,0053	0,4597*	0,3463	4,3057	-2,2738	1,2014	1,1072	-0,3434	-0,2864
ICT deployment	-4,3720	-4,1344	-7,4266	-6,6945	-3221,70	28,5272	-13,546	-77,366	-24,93*	-6,6586
ICT Export	0,0090	-0,0004	0,0099	0,0271	0,7615	-1,1872	3,6034	0,8184	-0,8284	-0,0524
ICT Import	0,2059	0,0691	0,0943	0,0246	5,8150	0,9977	4,4306	1,2007	0,877*	0,0624
ICT CS	-0,2167	0,1206	-0,572*	0,0010	76,3375	0,0656	-4,2610	1,5127	-0,4518	0,2933
Cont. ICT CS	0,0104	0,0122	-0,024*	-0,0074	-1,3346	-0,1417	-0,1105	0,0463	0,0239	0,0107
ICT Compensation Share	0,1853	0,1426	0,2713	0,0201	-70,2830	0,2354	-2,8441	-1,5692	0,3604	-0,1107
Observations	38	38	38	38	35	35	36	36	38	38
Multiple R	0,6558	0,5451	0,8409	0,5784	0,5340	0,5377	0,6584	0,6944	0,8722	0,5477
R Square	0,4301	0,2971	0,7072	0,3345	0,2852	0,2891	0,4334	0,4821	0,7608	0,2999
Significance F	0,1096	0,4731	0,0001	0,3420	0,6099	0,5962	0,1421	0,0711	0,0000	0,4627

* - indicates significance (P-value<0,05)

Source: Authors' calculations

4. 5. DIGITALIZATION AND SERVICES MARKETS IN DEVELOPING ECONOMIES

This section dissects the findings of multiple linear regressions conducted to explore the impact of digitalization on exports and imports of various services sectors in developing economies.

Table 9 presents the regression results for eight service sectors: financial services export (Fin Export) and import (Fin Import), insurance and pension services export (I&P Export) and import (I&P Import), charges for the use of intellectual property export (UIP Export) and import (UIP Import), personal, cultural, and recreational services export (PCR Export) and import (PCR Import) in developing economies.

The R-squared values for the models range from 0,0687 (Personal, Cultural & Recreational Export) to 0,4194 (Financial Services Import), indicating that the explanatory power of the models varies considerably across sectors. All models have a significance F-statistic except for I&P Import, UIP Import, PCR Export, and PCR Import.

Key findings of digitalization factors demonstrate positive significant impact of ICT Export on I&P

Export and Fin Import with coefficients 1,6083 and 2,0607 respectively. The ICT Import has positive significant impact on Fin Import (0,9131)

Although, growth in capital services provided by ICT assets (ICT CS) has a negative and significant coefficient (p-value < 0.05) for Financial Services Import (-4.3623).

The contribution of ICT capital services to real GDP growth (Cont. ICT CS) has a non-significant effect on sectors.

ICT compensation share has a positive and significant coefficient (p-value < 0.05) for I&P Export and Fin Import (1,2768 and 1,2111 respectively), suggesting a potential link between higher ICT labor costs and increased exports and imports in these sectors. While the impact on Fin Export is significant and negative (-0,9759).

ICT deployment has insignificant impact (p-value > 0.05) for all service sectors.

GDP growth is statistically significant (p-value < 0.05) for UIP Export with a negative impact (-2.2463).

CPI generally has a non-significant effect on service services trade in developing economies, with some exceptions. A positive and significant coefficient for UIP Export (7,5351) suggests higher inflation might lead to increased exports in this sector.

Exchange rate is significant and negative for UIP Export (-11,0360).

Trade Openness and Political Stability demonstrate non-significant effect of services trade in Table 9.

Trade openness has a negative and significant coefficient (p-value < 0.05) for Fin Import (-6,8389).

Table 9. Developing economies regressions analysis for I&P Export, I&P Import, Fin Export, Fin Import, UIP Export, UIP Import, PCR Export, PCR Import

	I&P Export	I&P Import	Fin Export	Fin Import	UIP Export	UIP Import	PCR Export	PCR Import
Constant	47,5356	63,9109	-6,2276	72,9375*	53,1175	10,0077	-4,3092	-2,8668
GDP growth	-2,2463	12,7995	2,8096	6,7007	-24,0010*	-0,4761	-3,8968	-0,5487
CPI	-0,0023	-0,0019	0,0079	0,0073	7,5351*	-0,0069	-0,0093	0,0096
Exchange rate	-0,7061	0,6706	1,1220*	-0,3398	-11,0360*	-0,2552	-0,2001	-0,4133
Trade Openness	-5,7585	-19,6529	-3,7600	-6,8389*	-12,1677	0,5914	0,0094	-0,4004
Political stability	0,9355	-1,6872	1,2362	-1,6666	-0,2165	2,1978	1,2082	1,4571*
ICT deployment	-26,3635	-38,5159	-8,7582	-53,6556	-12,0511	7,3086	15,3918	-4,4965
ICT Export	1,6083*	-1,2442	0,6753	2,0607*	0,0373	-0,5001	0,1777	0,1600
ICT Import	-0,4623	-0,1049	0,3450	0,9131*	1,5331	-0,1486	0,0229	0,0151
ICT CS	-1,2536	-2,9444	1,0001	-4,3623*	4,0662	0,2064	1,6956	1,0293
Cont. ICT CS	-0,1548	0,5436	-0,0748	-0,1367	0,2613	-0,0605	0,0093	0,0226
ICT Compensation Share	1,2768*	1,0647	-0,9759*	1,2111*	-4,3433	0,1962	-0,5982	-0,3524
Observations	66	66	64	64	55	60	62	61
Multiple R	0,6111	0,4818	0,6476	0,6972	0,6967	0,5195	0,2621	0,4364
R Square	0,3734	0,2321	0,4194	0,4861	0,4854	0,2699	0,0687	0,1905
Significance F	0,0036	0,1539	0,0013	0,0001	0,0010	0,1252	0,9736	0,4211

* - indicates significance (P-value<0,05)

Source: Authors' calculations

Table 10 presents the results of multiple linear regression analyses conducted to explore the impact of digitalization on exports and imports of service sectors in developing economies: transport services export (Trans Export) and import (Trans Import), travel services export (Travel

Export) and import (Travel Import), construction services export (Const Export), and import (Const Import), maintenance and repair services export (Maint Export) and import (Maint Import), other business services export (OBS Export) and import (OBS Import).

The R-squared values for the models range from 0,0742 (Maint Export) to 0,4122 (Other Business Services Export), indicating that the explanatory power of the models varies considerably across sectors. All models have a significance F-statistic except for Travel Export, Travel Import, Const Export, Const Import, Maint Export, Maint Import, OBS Import.

ICT services trade (exports and imports) show mixed results. ICT Export has a positive and significant coefficient Other Business Services Export with a coefficient of 0,714, suggesting a potential link between increased ICT exports and higher exports in these sectors.

ICT investment indicators and ICT deployment demonstrate insignificant impact in the models.

GDP growth has statistically significant impact for Tran Export (1,192), suggesting that higher economic growth might lead to increased exports in transport services export.

Trade openness has a negative and significant effect (p-value < 0,05) on some sectors, like Tran Export, Tran Import, and OBS Export with coefficients of -2,243, -0,783 and -8,231 respectively.

Political stability, CPI and exchange rate generally has a non-significant effect on service trade in developing economies refer to Table 10.

Table 10. Developing economies regressions analysis for Tran Export, Tran Import, Travel Export, Travel Import, Const Export, Const Import, Maint Export, Maint Import, OBS Export, OBS Import

	Tran Export	Tran Import	Travel Export	Travel Import	Const Export	Const Import	Maint Export	Maint Import	OBS Export	OBS Import
Constant	2,0788	-1,6874	-0,4219	94,7439	200,48	-1708,8	292,17	-10,202	49,02*	74,923
GDP growth	1,192*	0,1917	0,6718	16,9752	37,8956	1166,50	-4,4945	8,2349	-1,0409	2,8325
CPI	-0,3038	-0,0010	0,1294	-0,0280	-7,9937	-454,06	-0,0425	0,0153	-0,0075	0,0099
Exchange rate	0,0529	0,0984	-0,0878	1,6770	4,3268	199,233	-1,2128	-0,1005	-0,1700	-0,5203
Trade Openness	-2,243*	-0,783*	-1,8432	-27,0318	0,6837	497,520	-36,634	1,4999	-8,231*	-33,03*
Political stability	-0,1573	0,0383	0,1112	-3,7415	-21,2783	833,727	2,8335	-1,1188	0,1229	-0,6501
ICT deployment	-3,4241	4,7532	3,5314	-29,5191	-316,341	12987,6	-141,25	-33,826	-39,458	75,482
ICT Export	0,1405	-0,0055	0,0436	-4,6336	-6,9203	-16,173	-1,6194	0,7561	0,714*	0,4258
ICT Import	-0,0624	0,0649	0,0492	-0,1005	-0,8490	101,303	-0,9412	-0,8649	-0,1285	-1,4189
ICT CS	0,0417	-0,0074	-0,0976	-3,8387	-5,3070	-409,77	-4,3806	0,6102	-0,7783	-1,6542
Cont. ICT CS	0,0282	0,0102	0,0315	0,9496	0,5558	25,6003	0,3971	0,1779	0,0966	-0,0888
ICT Compensation Share	0,0195	0,0082	-0,0351	1,7086	10,3208	17,7171	-0,5433	-0,2078	0,0604	0,2437
Observations	66	66	66	66	57	57	52	53	66	66
Multiple R	0,6349	0,5716	0,5332	0,3693	0,4696	0,4152	0,2723	0,4462	0,6420	0,5084
R Square	0,4031	0,3267	0,2843	0,1364	0,2206	0,1724	0,0742	0,1991	0,4122	0,2585
Significance F	0,0016	0,0153	0,0528	0,6491	0,3425	0,5910	0,9840	0,5250	0,0011	0,0956

* - indicates significance (P-value<0,05)

Source: Authors' calculations

5. DISCUSSION

Key findings for advanced economies demonstrate that the ICT deployment and exports positively impact exports of some goods. Increased ICT infrastructure and ICT exports positively impact exports of specific goods like ores and metals, machinery and equipment, and tools and devices. This suggests that advanced economies with a strong digital foundation are better positioned to export these technology-intensive products.

The study finds no clear link between ICT investment indicators (growth in capital services from ICT assets, contribution to GDP growth) and trade flows for most sectors in advanced

economies. This could be due to complex factors influencing investment decisions and their delayed impact on trade. The impact of ICT investment on trade flows requires further investigation.

Economic growth can have opposing effects on trade depending on the sector. For instance, growth might decrease exports of agricultural products and ores & metals as these economies shift focus. On the other hand, inflation (CPI) is linked to increased import demand across various sectors. Exchange rate, and trade openness show complex relationships with trade flows, varying across sectors.

Political instability can lead to higher imports of mineral fuels and oils, possibly due to disruptions in local production or supply chains.

The results for developing economies are less conclusive, with some sectors showing weak explanatory power from the models. The results show a weak association between digitalization and trade in goods for developing economies. This could be due to factors like lower levels of ICT adoption or a different focus on export goods in these economies.

An interesting finding is the positive correlation between ICT exports and financial services imports in developing economies. This might suggest that these economies rely on imported financial services while exporting their own ICT capabilities.

There seems to be a link between higher ICT labor costs (ICT compensation share) and increased exports and imports of some services in developing economies. This could indicate a growing ICT workforce and service sector in these countries.

Similar to advanced economies, economic growth in developing economies can have opposing effects on trade depending on the sector

ICT exports appear to be positively correlated with exports of insurance and pension services, and financial services imports. Higher ICT labor costs (ICT compensation share) are linked to increased exports and imports in some service sectors. Trade openness generally has a negative impact on service sector trade in developing economies.

The findings align with previous studies suggesting that enhanced access to ICT and e-commerce tools positively influences bilateral trade dynamics (Xing, 2018). This echoes the conclusions drawn by Liu & Nath (2016) regarding the significant boost in exports due to increased Internet subscriptions and the utilization of ICT.

The regression results corroborate the findings of studies such as those by Oliinyk et al. (2023) and Zhang & Wang (2022) regarding the positive impact of digital technology on services trade. Additionally, the findings concerning the heterogeneous impact of ICT on service trade in developing economies resonate with Touati & Aljazea (2023) observations regarding the varied effects of ICT on different service sectors.

The results provide further evidence supporting the positive impact of digitalization on SMEs' participation in international trade, as highlighted by Añón & Bonvin (2023). Particularly, the findings suggest that ICT exports have a significant positive impact on the exports of other business services, indicating the potential of digitalization to enhance the international competitiveness of SMEs.

The study has some implications. It utilized a specific timeframe (2006-2022) and data sources. Expanding the data scope and incorporating more recent trends could provide further insights. Alternative econometric techniques could be explored to complement the findings from the regression models.

Some forecasts and trends regarding digitalization's impact on global goods and services markets could be highlighted. Advanced economies with strong ICT infrastructure can expect to

see an ongoing rise in exports of technology-intensive goods like machinery and equipment. The unclear link between ICT investment and trade flows suggests a need for further research to understand how investments in ICT infrastructure and services ultimately affect trade patterns.

Building robust ICT infrastructure is crucial for developing economies to integrate into global value chains and participate more actively in international trade. The positive correlation between ICT exports and service sector imports suggests that developing economies may see a rise in ICT service exports while potentially relying on imports for financial services. As ICT labor costs rise in developing economies, we might see a growth in exports and imports of specific digital services, indicating a specialization in this sector.

The positive impact of digital technology on services trade is expected to continue across all economies. Digitalization is likely to empower more small and medium-sized enterprises (SMEs) to participate in international trade. The study highlights the need for more research to understand the long-term influence of ICT investments on trade patterns. The impact of digitalization on trade dynamics may also be influenced by evolving trade policies and regulations.

Future research could be focused deeper into the mechanisms through which digitalization shapes trade patterns, considering factors like trade regulations, skill development, and innovation within specific sectors.

Based on the analysis of digitalization's impact on goods and services markets in both advanced and developing economies, policymakers can derive different recommendations tailored to the specific needs and circumstances of each group.

Advanced economy policymakers must sustain investments in advanced ICT infrastructure to uphold competitiveness, particularly in sectors like machinery and equipment, where ICT deployment boosts exports. Encouraging innovation, especially in ores and metals, necessitates backing research, development, and industry collaboration. Moreover, widening digital service accessibility, notably in financial services and telemedicine, demands investment in digital infrastructure and technology adoption.

In contrast, policymakers in developing economies should prioritize digital infrastructure investments to integrate into global value chains, especially crucial in sectors like agriculture where digitalization yields significant impact. Allocating resources for digital health and financial inclusion initiatives is paramount, leveraging technology to enhance healthcare and financial services access. Encouraging imported ICT services bolsters local producer development and elevates export competitiveness, particularly in sectors like other business services.

6. CONCLUSION

The purpose of this paper is to conduct a comprehensive comparative study of digitalization's impact on global goods and services markets, with a specific focus on advanced and developing economies.

Existing research underscores the transformative impact of digitalization on global trade dynamics, emphasizing its role in shaping bilateral trade, services trade, international business activities, and economic growth. However, a gap remains in comparative studies focusing specifically on digitalization's effects on global goods and services markets.

This study aims to address this gap by synthesizing existing literature and employing robust quantitative methods, our research seeks to provide insights into how digitalization influences trade patterns and economic outcomes across different sectors and types of economies.

This research employs a robust quantitative approach to investigate the influence of digitalization on global markets for goods and services. Through comprehensive data analysis spanning

from 2006 to 2022, sourced from esteemed international organizations such as the World Bank, IMF, UNCTAD, and WTO, this study provides valuable insights into the interconnectedness between digital technologies and trade dynamics.

The methodology encompasses meticulous data collection, normalization, and multiple linear regression analysis. By categorizing variables into dependent (various export and import sectors), independent (digitalization, consisting of ICT development, ICT services trade, ICT investment), and control groups (GDP growth, CPI, exchange rate, trade openness, political stability), we assess the impact of digitalization on various sectors (goods and services markets) and economies at different stages of development (advanced and developing).

For advanced economies, the presence of robust ICT infrastructure and exports positively impacted the export of technology-intensive goods, such as ores and metals, machinery and equipment, and tools and devices. However, the study found no clear link between ICT investment indicators and trade flows, indicating a need for further investigation into the impact of ICT investment on trade dynamics. Economic growth has mixed effects: may decrease resource exports but increase import demand due to inflation.

In developing economies, the relationship between digitalization and trade in goods appeared weaker, possibly due to lower levels of ICT adoption or differing export focuses. Notably, a positive correlation was found between ICT exports and financial services imports, suggesting a reliance on imported financial services while exporting ICT capabilities. Higher ICT labor costs suggest a growing service sector (both imports and exports).

The study echoed previous conclusions regarding the positive influence of digital technology on bilateral trade dynamics and SMEs' participation in international trade.

Moving forward, policymakers can derive valuable recommendations from these findings. For advanced economies, continued investment in advanced ICT infrastructure, fostering innovation, and expanding access to digital services are crucial for maintaining competitiveness. Developing economies, on the other hand, should prioritize investments in digital infrastructure to integrate into global value chains, enhance access to digital markets, and promote digital health and financial inclusion initiatives. In both advanced and developing economies, the findings underscore the complex nature of the relationship between digitalization and trade. While ICT deployment and exports appear to promote trade in certain sectors, the influence of ICT investment and other economic factors is nuanced and context-dependent.

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