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MODELLING THE IMPACT OF DIGITALIZATION DETERMINANTS ON THE TRANSFORMATION OF MERCHANDISE AND SERVICES TRADE

Digital technologies have become an important driver of international trade, yet empirical evidence on their impact on merchandise and services trade remains limited. This study aims to identify and quantify the effects of key digitalization indicators on international trade using econometric modelling. The analysis is based on cross-country data and ten digitalization indicators defined by the International Telecommunication Union. Four multiple regression models were estimated for merchandise exports, merchandise imports, services exports, and services imports. Descriptive statistics, correlation analysis, multicollinearity diagnostics, and regression validation tests were performed, while the final models were obtained using backward elimination. The results show that digitalization affects merchandise and services trade through different mechanisms. Merchandise exports are primarily driven by household Internet access and active mobile broadband subscriptions, whereas merchandise imports are positively influenced by mobile broadband penetration but negatively affected by higher mobile Internet costs. For services trade, Internet affordability plays a much stronger role. Service exports increase with broader Internet use but decline as mobile Internet costs rise, while service imports are constrained by both mobile and fixed broadband prices. Active mobile broadband subscriptions were identified as the only indicator that remained statistically significant across most estimated models, highlighting their role as a universal driver of international trade. The findings confirm that digital infrastructure is particularly important for merchandise trade, whereas Internet affordability is a key determinant of services trade. The results provide empirical evidence that can support the development of digital policies aimed at enhancing countries' international trade competitiveness and reducing digital barriers.

Keywords: *digitalization; international trade; exports of goods; imports of goods; exports of services; imports of services; regression analysis.*

Табл. 8. Рис. 4. Літ. 11.

DOI: 10.32752/1993-6788-2026-1-301-249-260

Peer-reviewed, approved and placed: *05.07.2026*

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МОДЕЛЮВАННЯ ВПЛИВУ ДЕТЕРМІНАНТ ЦИФРОВІЗАЦІЇ НА ТРАНСФОРМАЦІЮ ТОРГІВЛІ ТОВАРАМИ ТА ПОСЛУГАМИ

Цифрові технології стали важливим рушієм міжнародної торгівлі, проте емпіричні дані щодо їхнього впливу на торгівлю товарами та послугами залишаються обмеженими. Це дослідження має на меті визначити та кількісно оцінити вплив ключових показників цифровізації на міжнародну торгівлю за допомогою економетричного моделювання. Аналіз базується на міжкраїнних даних та десяти показниках цифровізації, визначених Міжнародним союзом електрозв'язку. Було оцінено чотири моделі множинної регресії для експорту товарів, імпорту товарів, експорту послуг та імпорту послуг. Було реалізовано описову статистику, кореляційний аналіз, діагностику мультиколінеарності та валідаційні тести регресій, а остаточні моделі були отримані за допомогою зворотного виключення. Результати показують, що цифровізація впливає на торгівлю товарами та

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послугами через різні механізми. Експорт товарів в основному зумовлений доступом до Інтернету для домогосподарств та активними підписками на мобільний широкосмуговий доступ, тоді як імпорт товарів позитивно залежить від проникнення мобільного широкосмугового доступу, але негативно – від значних витрат на мобільний Інтернет. У торгівлі послугами доступність Інтернету відіграє набагато більшу роль. Експорт послуг зростає з ширшим використанням Інтернету, але скорочується зі зростанням вартості мобільного Інтернету. З іншого боку, імпорт послуг обмежується цінами як на мобільний, так і на фіксований широкосмуговий доступ. Активні підписки на мобільний широкосмуговий доступ були визначені як єдиний показник, який залишався статистично значущим у більшості оціночних моделей, що підкреслює їхню роль як універсального рушійного фактору міжнародної торгівлі. Результати підтверджують, що цифрова інфраструктура особливо важлива для торгівлі товарами, тоді як доступність Інтернету є ключовим фактором торгівлі послугами. Дослідження надає емпіричні докази, які можуть підтримати розробку цифрової політики, спрямованої на підвищення конкурентоспроможності країн у міжнародній торгівлі та зменшення цифрових бар'єрів.

Ключові слова: *цифровізація; міжнародна торгівля; експорт товарів; імпорт товарів; експорт послуг; імпорт послуг; регресійний аналіз.*

Problem statement. The rapid development of digital technologies has fundamentally transformed the nature of international trade by changing the way goods and services are produced, marketed, and exchanged across borders. The expansion of digital infrastructure, increasing Internet accessibility, and the widespread adoption of mobile broadband have created new opportunities for firms to participate in global markets while simultaneously reducing transaction costs and information barriers. At the same time, significant disparities in the level of digital development across countries have intensified the digital divide, limiting the participation of less digitally advanced economies in international trade.

Despite the growing importance of digitalization, its quantitative impact on different components of international trade remains insufficiently explored. Existing trade theories largely emphasize traditional determinants, while the role of digital infrastructure, Internet accessibility, and the affordability of digital services has received comparatively limited empirical attention. This creates a need for comprehensive econometric assessment of how specific digitalization indicators influence merchandise and services exports and imports.

Addressing this research problem is important not only from a scientific perspective but also for practical policymaking. Identifying the digital factors that stimulate or constrain international trade can support governments in designing effective digital transformation strategies, prioritizing investments in information and communication technologies, and reducing barriers to digital connectivity. Such evidence is particularly relevant for countries seeking to strengthen their international competitiveness and accelerate integration into the global digital economy.

Analysis of recent publications on the problem. Analysis of modern scientific research confirms that digitalization is a key driver of the transformation of international trade in goods and services, influencing both trade volumes and their structure. Particular attention is paid to digital infrastructure, digital regulation, information and communication technologies, human capital, e-commerce, and the institutional environment.

A substantial body of research focuses on international trade in services. Ma J., Lin G. & Zhan J. demonstrated that digital infrastructure, human capital, and efficient public administration strengthen the international competitiveness of trade in services, particularly in economically developed and open regions [1]. Bose S. & Chakraborty D. showed that digital connectivity promotes trade in digitally supplied services, while regulatory differences across countries weaken this effect [2]. Yin Z. H. & Choi C. H. found that digitalization has a stronger positive impact on service exports than on goods exports, especially in high-income economies [3].

Another research stream examines institutional and technological factors shaping international trade. Zhang W., Tawiah D., Fumey M. P., Asongu S. A. & Adam A. G. found that digitalization enhances export growth only under conditions of a well-developed institutional environment [4]. Regarding merchandise trade, Huang F., Li J., Shen J. & Wang H. showed that the digital economy strengthens countries' positions in global intermediate goods trade through technological innovation and trade openness [5]. Ma S., Shen Y. & Fang C. highlighted the role of ICT trade liberalization in accelerating digitalization by reducing trade barriers and expanding cross-border digital investment, while Aydin B. & Aydin R. emphasized the importance of Industry 4.0 technologies and high-tech products for international trade and economic integration [6–7].

Research also demonstrates the growing importance of advanced digital technologies for trade development. Criveanu M. M. showed that artificial intelligence, big data, the Internet of Things, and cloud computing significantly stimulate the development of e-commerce, although their effects depend on countries' levels of digital maturity [8].

Despite these advances, existing studies mainly examine individual dimensions of digitalization or specific trade segments, such as goods, services, e-commerce, or digital regulation. Comprehensive evidence on the combined effects of digitalization determinants on both merchandise and services trade, as well as on the strength and direction of these relationships, remains limited. Therefore, this study aims to develop econometric models to evaluate the impact of key digitalization determinants on international merchandise and services trade.

Research objectives. The objective of this study is to model the impact of digitalization determinants on international merchandise and services trade and to evaluate the strength and direction of these relationships.

Main results and their justification. To achieve the research objective, the study follows a six-stage research algorithm. First, the dataset is compiled by defining the study period, selecting the sample of countries, and collecting the required indicators. Second, the dependent and independent variables are specified. Third, descriptive statistics and normality tests are performed. Fourth, multicollinearity is assessed using correlation analysis and the Variance Inflation Factor (VIF). Fifth, multiple regression models are estimated, and finally, their validity is evaluated through statistical significance tests and diagnostic procedures, including heteroscedasticity and residual normality tests.

In accordance with the proposed algorithm, the first stage involves compiling the dataset. The independent variables comprise ten digitalization indicators defined by the International Telecommunication Union [9]: dig1 – Individuals using the

Internet; dig2 – Households with Internet access at home; dig3 – Active mobile-broadband subscriptions per 100 inhabitants; dig4 – Population covered by at least a 3G mobile network; dig5 – Population covered by at least a 4G/LTE mobile network; dig6 – Mobile broadband Internet traffic per subscription; dig7 – Fixed broadband Internet traffic per subscription; dig8 – Mobile data and voice high-consumption basket price; dig9 – Fixed-broadband Internet basket price; and dig10 – Individuals who own a mobile phone. The dependent variables are exports of goods for 2023 (ExportProduct), imports of goods for 2023 (ImportProduct), exports of services for 2024 (ExportServices), and imports of services for 2024 (ImportServices) [10-11].

Descriptive statistics revealed substantial cross-country heterogeneity in the digitalization indicators. While several variables exhibited pronounced skewness, high kurtosis, and outliers, others were approximately normally distributed, confirming significant differences in digital development and the need for further diagnostic testing before regression analysis. Correlation analysis showed generally weak relationships between digitalization indicators and merchandise trade variables, indicating that their effects cannot be explained by pairwise associations alone. At the same time, strong intercorrelations among several explanatory variables suggested potential multicollinearity. Therefore, dig1, dig4, and dig10 were excluded, while the remaining seven indicators were retained for multicollinearity diagnostics and regression estimation.

Two regression models were then estimated using the selected indicators, with the logarithms of ExportProduct and ImportProduct specified as the dependent variables. The estimation results are presented in Tables 1–2.

Table 1. **Initial regression (ExportProduct model),** *calculated by the authors*

log_ExportProduct	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig2	0.036	0.018	2.03	0.046**	0.001	0.072
dig3	0.016	0.008	2.04	0.045 **	0	0.031
dig5	0.011	0.018	0.64	0.526	-0.024	0.047
dig6	-0.003	0.002	-1.67	0.098*	-0.007	0.001
dig7	0	0	-0.34	0.731	0	0
dig8	-0.076	0.056	-1.36	0.179	-0.187	0.036
dig9	0.01	0.027	0.38	0.702	-0.044	0.064
Constant	2.142	1.902	1.13	0.264	-1.645	5.929
Mean dependent var		6.752	SD dependent var		2.336	
R-squared		0.485				
F-test		6.795	Prob > F		0.000	
Akaike crit. (AIC)		355.104	Bayesian crit. (BIC)		374.551	
*** p<0.01, ** p<0.05, * p<0.1						

The regression results indicate that the log_ExportProduct model has satisfactory explanatory power and is statistically significant overall. Among the explanatory variables, dig2 and dig3 have positive and statistically significant effects, indicating that improvements in these digitalization indicators are associated with higher merchandise exports. In contrast, dig6 has a weak negative effect and is significant only at the 10% level.

Tables 2. **Initial regression (ImportProduct model),** *calculated by the authors*

log_ImportProduct	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig2	0.013	0.014	0.97	0.333	-0.014	0.04
dig3	0.012	0.006	2.04	0.045**	0	0.023
dig5	0.006	0.013	0.43	0.669	-0.021	0.032
dig6	-0.003	0.001	-1.99	0.05*	-0.006	0
dig7	0	0	0.01	0.994	0	0
dig8	-0.055	0.042	-1.30	0.196	-0.139	0.029
dig9	-0.018	0.02	-0.88	0.38	-.0059	0.023
Constant	5.964	1.43	4.17	0***	3.117	8.811
Mean dependent var		7.949	SD dependent var		1.732	
R-squared		0.467				
F-test		6.302	Prob > F		0.000	
Akaike crit. (AIC)		307.166	Bayesian crit. (BIC)		326.613	
*** p<0.01, ** p<0.05, * p<0.1						

The remaining variables (dig5, dig7, dig8, and dig9) are not statistically significant, nor is the intercept. Overall, dig2 and dig3 make the strongest positive contribution to explaining the variation in merchandise exports, whereas the other digitalization indicators do not exhibit a significant individual effect.

The log_ImportProduct model is also statistically significant and demonstrates satisfactory explanatory power. Among the explanatory variables, only dig3 and dig6 are statistically significant. The dig3 variable has a positive effect on merchandise imports, while dig6 exerts a weak negative influence. The remaining variables (dig2, dig5, dig7, dig8, and dig9) are not statistically significant. Thus, although the model is statistically significant overall, only dig3 and dig6 emerge as significant determinants of merchandise imports.

Given the regression results, the obtained VIF values ranged from 1.291 to 3.456, with a mean VIF of 2.222, indicating a low level of multicollinearity and confirming the suitability of the explanatory variables for regression modelling.

To improve the explanatory power and parsimony of the models, stepwise variable selection was applied. Since the initial models included all explanatory variables, the backward elimination procedure was selected. This approach sequentially removes statistically insignificant predictors while retaining those that contribute significantly to the model. The refined regression models obtained using backward elimination are presented in Tables 3-4.

Table 3. **Final regression (ExportProduct model),** *calculated by the authors*

log_ExportProduct	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig2	0.041	0.013	3.150	0.002	0.015	0.067
dig3	0.015	0.007	2.010	0.048	0.000	0.030
Constant	2.193	0.778	2.820	0.006	0.644	3.741
R-squared		0.53				
F-test		20.23	Prob > F		0.000	

Table 4. **Final regression (ImportProduct model),** *calculated by the authors*

log_ImportProduct	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig8	-0.099	0.032	-3.080	0.003	-0.162	-0.035
dig3	0.014	0.005	3.020	0.003	0.005	0.024
Constant	6.960	0.529	13.150	0.000	5.907	8.013
R-squared		0.50				
F-test		17.55	Prob > F		0.000	

Before interpreting the final regression models, diagnostic tests were performed to verify the main assumptions of regression analysis. Heteroscedasticity was assessed using the Breusch–Pagan test, while the normality of residuals was examined using the Shapiro–Wilk test. The Breusch–Pagan test indicated no evidence of heteroscedasticity, with χ^2=4.04 (p=0.054) for the export model and χ^2=1.54 (p=0.214) for the import model. The Shapiro–Wilk test also confirmed that the residuals were normally distributed (W=0.995, p=0.930 for exports; W=0.993, p=0.767 for imports). These results confirm that the estimated regression models satisfy the key assumptions of linear regression and are statistically reliable. The diagnostic findings are further supported by the residual plots presented in Figures 1–2.

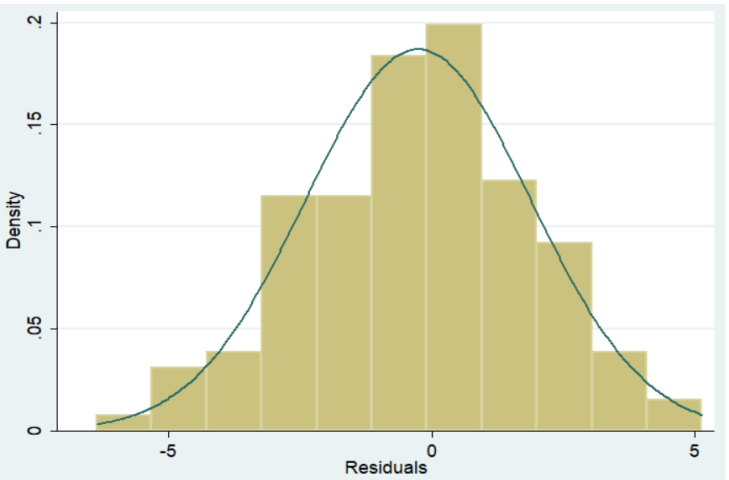

Fig. 1. **Residual normality (ExportProduct model),** *constructed by the authors*

According to the regression results for the ExportProduct model (Table 3), dig2 is statistically significant at the 1% level. A one-percentage-point increase in the share of households with Internet access is associated with a 0.041 increase in the logarithm of merchandise exports, corresponding to an approximate 4.1% increase, ceteris paribus. The dig3 variable is significant at the 5% level: an additional active mobile broadband subscription per 100 inhabitants increases the logarithm of merchandise exports by 0.015, or approximately 1.5%.

These findings indicate that, among the considered digitalization indicators, household Internet access and active mobile broadband subscriptions have the

strongest positive effect on merchandise exports. Household Internet access reflects digital inclusion and firms' capacity to participate in global digital markets, while mobile broadband improves business connectivity and access to international market information. In contrast, Internet cost and traffic indicators are not statistically significant, suggesting that the availability of digital infrastructure is more important than its intensity of use.

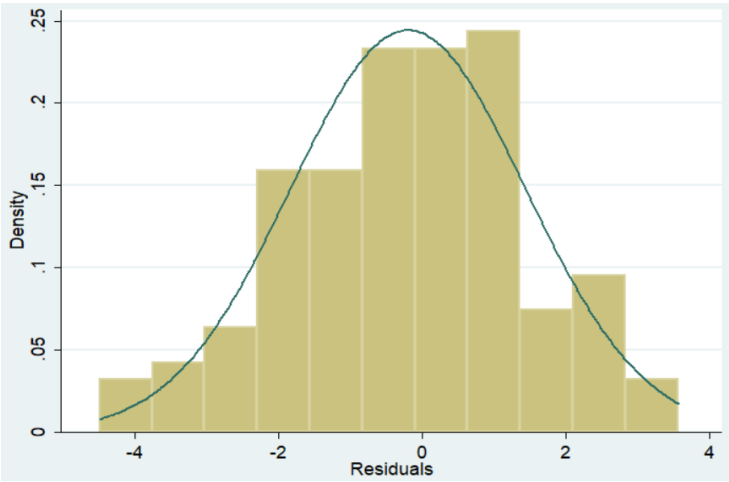

Fig. 2. **Residual normality (ImportProduct model),** *constructed by the authors*

For the ImportProduct model (Table 4), dig8 is statistically significant at the 1% level and has a negative coefficient. A one-unit increase in mobile Internet cost (as a percentage of GNI per capita) reduces the logarithm of merchandise imports by 0.099, equivalent to an approximate 9.9% decline. This finding suggests that higher Internet costs restrict businesses' access to digital platforms and foreign suppliers. The dig3 variable is also significant at the 1% level: one additional active mobile broadband subscription per 100 inhabitants increases the logarithm of merchandise imports by 0.014 (approximately 1.4%). Its significance in both export and import models highlights the pivotal role of mobile broadband in facilitating international merchandise trade.

Overall, the results confirm that digitalization is a significant determinant of international merchandise trade, although its effects differ by trade flow. Merchandise exports depend primarily on household Internet access, which supports producers' integration into global value chains and digital marketplaces, whereas merchandise imports are driven mainly by the affordability of mobile Internet, enabling firms to search for, compare, and purchase foreign goods through digital channels.

The next stage of the analysis extends the proposed methodological approach to international trade in services by estimating regression models with ExportServices and ImportServices as the dependent variables. Descriptive statistics for the 2024 data reveal substantial cross-country heterogeneity in digitalization indicators. While sev-

eral variables are approximately normally distributed, most exhibit pronounced skewness and kurtosis, reflecting differences in digital development and confirming the need for further econometric diagnostics.

Correlation analysis identified significant relationships between several digitalization indicators and international trade in services. Positive correlations were found for dig2, dig3, and dig5, whereas dig8 and dig9, representing Internet access costs, were negatively associated with both service exports and imports. As in the merchandise trade analysis, strong pairwise correlations among some explanatory variables suggested potential multicollinearity. Therefore, dig1, dig4, and dig10 were excluded, while the remaining seven indicators were retained for multicollinearity diagnostics and regression estimation.

The resulting regression models, estimated with the logarithms of ExportServices and ImportServices as the dependent variables, are presented in Tables 5–6.

Table 5. **Initial regression (ExportServices model),** *calculated by the authors*

log_ExportServices	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig2	0.018	0.017	1.01	0.317	-0.017	0.052
dig3	0.009	0.006	1.44	0.153	-0.003	0.022
dig5	0.052	0.021	2.48	0.015**	0.01	0.093
dig6	-0.004	0.002	-2.32	0.023**	-0.008	-0.001
dig7	0	0	1.23	0.224	0	0
dig8	-0.13	0.067	-1.95	0.055*	-0.263	0.003
dig9	-0.038	0.051	-0.76	0.451	-0.14	0.063
Constant	-0.274	1.95	-0.14	0.888	-4.157	3.608
Mean dependent var		6.196	SD dependent var		2.343	
R-squared		0.540				
F-test		13.097	Prob > F		0.000	
Akaike crit. (AIC)		338.630	Bayesian crit. (BIC)		358.265	
*** p<.01, ** p<.05, * p<.1						

Table 6. **Initial regression (ImportServices model),** *calculated by the authors*

log_ImportServices	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig2	0.006	0.019	0.29	0.774	-0.033	0.044
dig3	0.01	0.007	1.41	0.163	-0.004	0.024
dig5	-0.015	0.028	-0.54	0.589	-0.07	0.04
dig6	-0.001	0.002	-0.44	0.665	-0.005	0.003
dig7	0	0	0.51	0.611	0	0
dig8	-0.274	0.078	-3.49	0.001***	-0.431	-0.118
dig9	-0.069	0.036	-1.90	0.061*	-0.142	0.003
Constant	6.985	2.659	2.63	0.01**	1.692	12.279
Mean dependent var		5.951	SD dependent var		2.618	
R-squared		0.529				
F-test		12.680	Prob > F		0.000	
Akaike crit. (AIC)		363.806	Bayesian crit. (BIC)		383.533	
*** p<.01, ** p<.05, * p<.1						

The regression results for the log_ExportServices model indicate satisfactory explanatory power and overall statistical significance. Among the explanatory variables, three regressors are statistically significant. The dig5 variable has a positive effect, indicating that higher Internet usage contributes to increased service exports. In contrast, dig6 and dig8 have negative coefficients, suggesting that higher values of these indicators are associated with lower service exports. The remaining variables (dig2, dig3, dig7, and dig9) are not statistically significant, nor is the intercept. Overall, dig5 is the main positive determinant of service exports, whereas dig6 and dig8 represent the principal factors constraining their growth.

The log_ImportServices model is also statistically significant and demonstrates satisfactory explanatory power. Among the explanatory variables, only dig8 and dig9 are statistically significant, both exerting a negative effect on service imports. The strongest influence is observed for dig8, indicating that higher mobile Internet costs substantially reduce service imports, while dig9 also negatively affects imports, although to a lesser extent. The remaining variables (dig2, dig3, dig5, dig6, and dig7) do not exhibit statistically significant individual effects. Overall, the findings suggest that Internet affordability is a key determinant of international trade in services, particularly on the import side.

Given the regression results, the VIF values for all explanatory variables range from 1.462 to 3.474, with a mean VIF of 2.281. These values indicate a low level of multicollinearity and confirm the suitability of the selected explanatory variables for further regression modelling.

To improve the explanatory power and parsimony of the models, backward elimination was applied to remove statistically insignificant predictors. The estimation results for the refined regression models are presented in Tables 7–8.

Table 7. **Final regression (ExportServices model),** *calculated by the authors*

log_ExportServices	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig8	-0.148	0.058	-2.540	0.013	-0.264	-0.032
dig3	0.013	0.005	2.450	0.016	0.002	0.024
dig5	0.066	0.019	3.420	0.001	0.028	0.104
Constant	-0.888	1.826	-0.490	0.628	-4.521	2.745
R-squared		0.59				
F-test		26.94	Prob > F		0.000	

Table 8. **Final regression (ImportServices model),** *calculated by the authors*

log_ImportServices	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
dig9	-0.088	0.028	-3.150	0.002	-0.144	-0.032
dig8	-0.275	0.062	-4.480	0.000	-0.398	-0.153
Constant	7.203	0.241	29.900	0.000	6.724	7.682
R-squared		0.51				
F-test		43.05	Prob > F		0.000	

The adequacy of the regression models was further verified by testing the assumptions of homoscedasticity and residual normality. The Breusch–Pagan test confirmed homoscedastic residuals for both models (χ^2=0.03, p=0.863 for ExportServices;

χ^2=0.04, p=0.848 for ImportServices). The Shapiro–Wilk test likewise indicated no significant departures from normality, with W=0.981 (p=0.076) for the export model and W=0.989 (p=0.470) for the import model. These findings support the robustness of the estimated models and are consistent with the residual plots presented in Figures 3–4.

According to the regression results for the ExportServices model (Table 7), dig8 is statistically significant at the 5% level and has a negative coefficient. A one-unit increase in the cost of mobile Internet (as a percentage of GNI per capita) reduces the logarithm of service exports by 0.148, corresponding to an approximate 14.8% decline. This is the largest negative coefficient in the model, indicating that expensive mobile Internet substantially reduces the international competitiveness of digitally delivered services.

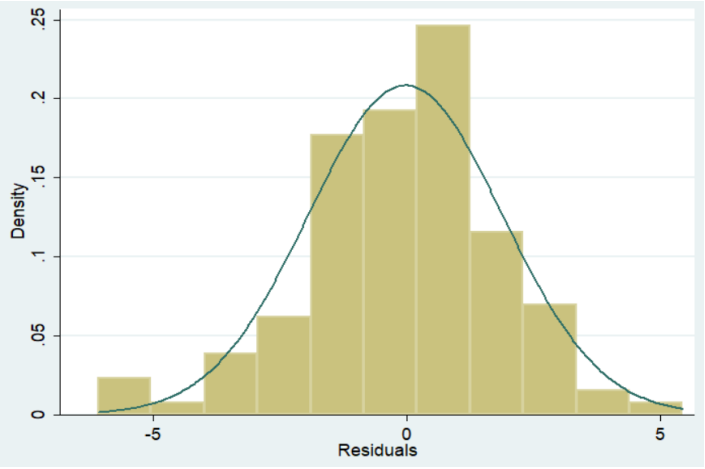

Fig. 3. **Residual normality (ExportServices model),** *constructed by the authors*

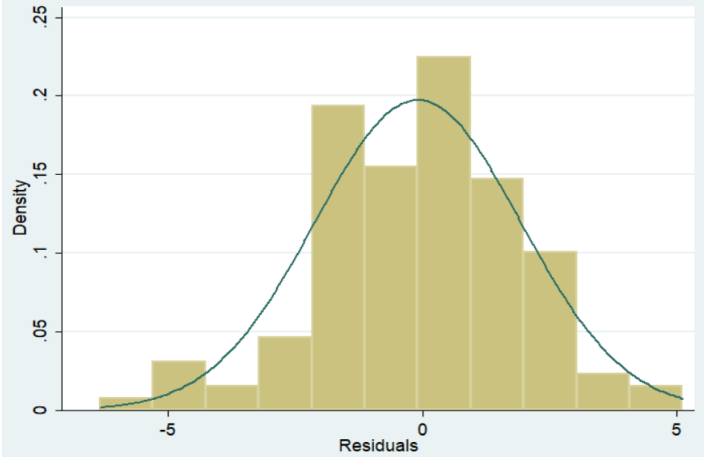

Fig. 4. **Residual normality (ImportServices model),** *constructed by the authors*

The dig3 variable is also significant at the 5% level: an additional active mobile broadband subscription per 100 inhabitants increases the logarithm of service exports by 0.013 (approximately 1.3%). Notably, dig3 is significant across all estimated trade models, confirming its role as a universal driver of international trade. The dig5 variable is statistically significant at the 1% level and has the strongest positive effect: a one-percentage-point increase in Internet use raises the logarithm of service exports by 0.066, or approximately 6.6%, highlighting the importance of widespread Internet adoption for internationally traded services.

For the ImportServices model (Table 8), dig9 is statistically significant at the 1% level, with a one-unit increase in fixed broadband Internet cost reducing the logarithm of service imports by 0.088 (approximately 8.8%). The dig8 variable is significant at the 0.1% level and has the largest absolute coefficient among all estimated models: a one-unit increase in mobile Internet cost decreases the logarithm of service imports by 0.275, equivalent to a 27.5% decline. This indicates that mobile Internet affordability is the strongest constraint on international trade in services.

Unlike the previous models, the ImportServices model retains only Internet price variables, while infrastructure and access indicators are not statistically significant. This suggests that international trade in services is more sensitive to Internet affordability than merchandise trade, with service imports exhibiting the highest price sensitivity among all analyzed trade flows.

Conclusions and prospects for further research. This study examined the impact of digitalization on international merchandise and services trade using multiple regression models estimated for a cross-country dataset. The empirical results confirm that digitalization is an important determinant of international trade, although its effects differ across merchandise and services and between exports and imports. For merchandise exports, household Internet access and mobile broadband subscriptions were identified as the main positive drivers, while merchandise imports were primarily influenced by mobile broadband penetration and the affordability of mobile Internet. In the case of services, Internet use and mobile broadband subscriptions positively affected exports, whereas the cost of mobile and fixed broadband Internet emerged as the main factors constraining service trade, particularly imports. The diagnostic tests confirmed the validity of the estimated models, indicating no serious multicollinearity, heteroscedasticity, or deviations from the normality of residuals.

The findings highlight that both the availability and affordability of digital infrastructure play a crucial role in shaping international trade patterns. At the same time, the importance of specific digitalization indicators varies depending on the type of trade flow, suggesting that digital transformation affects merchandise and services through different mechanisms. Further research may extend the analysis by employing panel data covering a longer time period, incorporating additional institutional and macroeconomic determinants, and exploring potential nonlinear or country-specific effects of digitalization on international trade.

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