Trade openness and digital technologies in African and non-African countries

ABSTRACT

Aims: The main objective of this paper is to examine whether digital technologies explain the differences in the achievement of trade openness between Africa and other parts of the world.
Methodology: Using OLS and two-stage instrumental variables (IV-2SLS) methods with data from 117 countries.
Results: Sub-Saharan African countries are less advanced in terms of trade openness than the rest of the sub-region (South Asia; North America; Latin America and the Caribbean; East Asia and the Pacific; and the Middle East and North Africa). In fact, imports of digital tools into African countries are still low due to customs duties on these products. the low use of ICT tools in African countries can be explained by subscription costs (internet), which remain very high in the region compared to developed countries.
Conclusion: African countries speed up the digital transformation of their economies, such as the digitization of information and customs procedures. It would also be a good idea to speed up the roll-out of fiber optics and improve access to electricity to connect people and cities in African countries, which would considerably reduce the cost of doing business on the continent

Keywords: trade openness, digital technologies, African and non-African countries, OLS.

1. INTRODUCTION

Digital transformation could be a game-changer for the African continent. It represents an opportunity to boost economic growth and industrialization, reduce poverty and improve people's lives. reduce poverty and improve people's lives. The use of digital technologies and services will contribute to the African Union's Agenda 2063.

Africa's poor trade performance can be explained by the growth and level of development of their economies, the fall in commodity prices, the business climate and the quality of infrastructure and institutions (Njinkeu et al., 2008). Indeed, the existing trade infrastructure is unsuitable for the challenges of international trade (Sakyi & Afesorgbor, 2019) as banks do not extend enough credit and the trade finance gap is a significant non-tariff barrier to trade, particularly for African countries compared to other regions (up Trade, 2016).

Furthermore, the lack of rail and maritime connectivity between African and non-African countries and the poor state of transport and communication infrastructure make the exchange of goods and access to markets difficult.

Finally, interregional trade is hampered by insufficient trade infrastructure and the complexity of the economic fabric of countries, such as the high level of informal trade, weak market integration and the existence of several national currencies. The complexity of regulations, the time required for administrative procedures, the inefficiency and high cost of public transport systems further increase transaction costs and payment times. Furthermore, despite trade agreements, the corruption of officials in charge of border control compromises the free movement of goods and people (Dovi, 2018).

What can be done to address these trade barriers? Massive investments in trade infrastructure are essential for most African and non-African countries. This will involve establishing modern transport networks (roads, ports, bridges, airports, transit) and information and communication technology (ICT) systems that have a significant impact on trade.

In the digital age, Africa could leverage digital technology to boost its trade policy. In recent years, digitalization has changed our habits and even our way of doing business. Digitalization is the use of digital technologies such as mobile phones, portable or non-laptop computers, or any other digital technology in economic and commercial activities, financial or banking transactions and public administration or public services (Kere & Zongo, 2023).

In reality, digitalization has appeared in Africa since 2007 through the use of ICT, the internet and mobile money; this is the case of M-PESA in Kenya with mobile banking accounts, mobile insurance, money transfers and digital payments. It is therefore about the use of digital technology to facilitate payments, reduce transaction times and increase revenues for African countries and global trade. Besides(González & Jouanjean, 2017), believe that digital transformation changes the structure of international trade and provides opportunities and benefits for economic activities.

According to the work of (Azmeh et al., 2020), digitalization helps solve three major problems: (i) auditability and place of provenance: companies lack visibility throughout the supply chain. Digitalization can therefore increase transparency, which can be essential for product differentiation; (ii) efficiency and cost reduction: visibility provides insights to increase efficiency and automation, while better collaboration reduces costs; (iii) access to financing: by allowing donors to access transaction information, financing is more likely to be approved.

All this leads us to major reflection. What is the impact of digital technologies on trade between African and non-African countries?

The aim of this article is twofold. On the one hand, to verify whether the type of digital technology influences trade openness. Secondly, to test the hypothesis that a digital tool accompanied by an ICT anchor (Mobile cellular, fixed telephone, Internet user) has a positive effect on trade openness.

The rest of the article is organized as follows. In the following section, we discuss the background and related literature. In Section 3, the data and our empirical strategy are described. The results are presented in Section 4 with robustness checks. Section 5 concludes.

2. TRADE OPENESS AND DIGITAL TECHNOLOGIES: THEORITICAL BACKGROUND AND TRANSMISSION CHANNEL

Digital technologies can stimulate innovation, economic growth and job creation in many key sectors of the economy. They enable interconnection between African markets and with the rest of the world. They can strengthen access to markets and financing for all, particularly in marginalized areas neglected by traditional financial institutions. Promoting digital transformation in Africa will optimize our influence in areas such as health, energy, transport, agriculture, education and facilitating access to basic social services, in line with our broader strategies and programs for good governance and development.

African countries are highly dependent on exports of raw materials and natural resources. The region's share of global manufactured exports is very low (Adams & Akobeng, 2021). However, the economies

of African countries are increasingly adopting ICTs, even if it remains low compared to other regions of the world. Moreover, the number of Internet users is positively correlated with the terms of trade in Africa.

(Sawadogo & Wandaogo, 2021) study the effects of the adoption of mobile money services on trade between 48 African countries from 1995 to 2018[1]. Using propensity score matching (PSM), they show that countries that adopt mobile money services have a significant share of trade in goods in GDP, 0.6 percentage points higher than countries that have not adopted them. Furthermore, they find that the adoption of mobile money services significantly increases imports of goods more than exports, and is more beneficial for trade in food. The results are similar when using the generalized method of moments (GMM) as estimator.

(Abendin et al., 2022) examine the role of digitalization in trade in ECOWAS countries[2]for the period from 2000 to 2018. Using a gravity model, they estimate the impact of digitalization on bilateral trade using ordinary least squares (OLS), generalized least squares (GLS), and the Poisson pseudo-maximum likelihood (PMVP) as estimators. Their results show that digitalization has a positive and significant effect on bilateral trade in the ECOWAS zone. An increase in the digitalization of the economy leads to a significant increase in trade between ECOWAS member countries. These results are compatible with the work of (Epo & Nguenkwe, 2020), who found that ICTs have positive and significant effects on intraregional trade in the ECOWAS zone between 1994 and 2014.

(Choi, 2010) examines the effects of digital technologies on trade in services. It uses panel data for 151 countries between 1990 and 2006. Using a fixed effects model and the GMM. He finds that the use of the Internet has a positive and significant impact on trade in services. Thus, a 10% increase in Internet use leads to an increase in services trade from 0.23% to 0.42%.

3. EMPIRICAL APPROACH

In this section, we discuss the data and econometric strategy that will allow us to estimate the impact oftrade openness to the digital technologies.

3.1 Data sources

The dependent variable of this study is taken from the United Nations Conference on Trade and Development(https://www.unctad.org/). It is measured by the trade/GDP ratio and is frequently used to measure the importance of international transactions in relation to domestic transactions. This indicator is calculated for each country as the simple average (the mean).

This ratio is often referred to as the trade openness ratio, although the term 'openness' can be ambiguous, since a low ratio does not necessarily imply high barriers (tariff or non-tariff) to foreign trade, but may be due to factors such as the size of the economy and geographical distance from potential trading partners.

[1]They use a dummy variable that equals one if at least one MM service is available in the country and zero otherwise.

[2]Economic Community of West African States

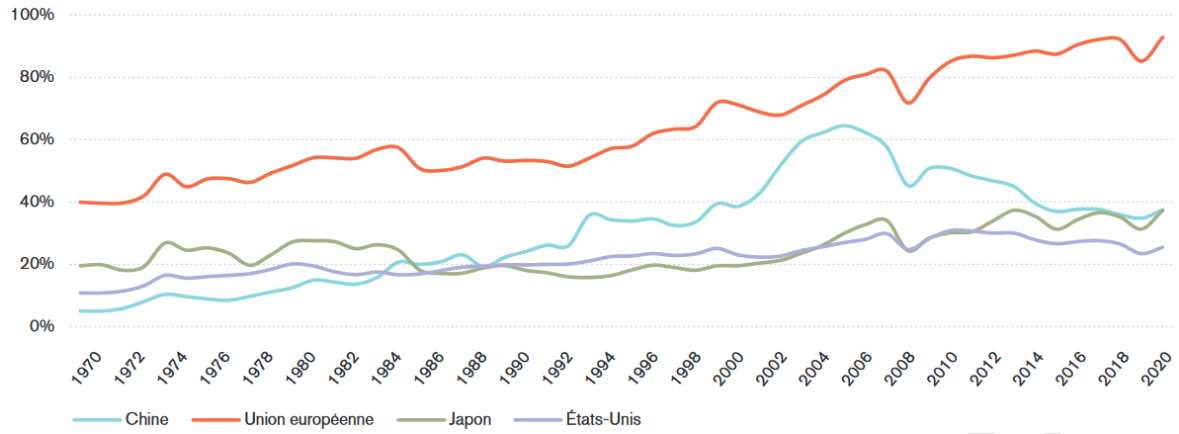

Fig 1. *Share of trade in GDP of selected economies, 1970-2021. Source: World Bank.*

The independent variable is the digital technology measured by the number of secured internet servers (per 1 million people), according to officially-recognized international sources compiled by the World Bank. It should be noted that the number of secure Internet servers has been rising continuously in recent years in African and non-African countries.

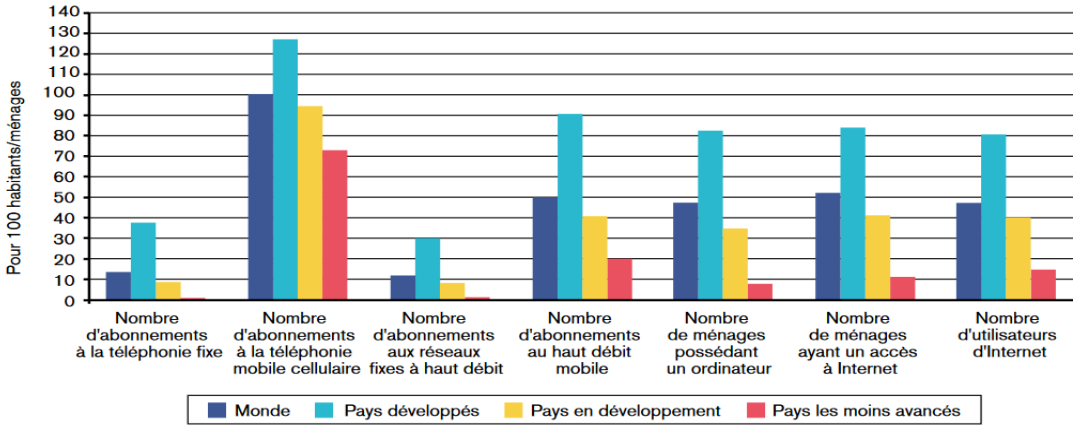

Fig 2. *ICT by level of development. Source: IUT.*

Table 1. Descriptive statistics

Variables	Obs	Mean	Std.Dev.	Min	Max	Source
Trade openness	117	46.23	12.7	30.53	79.1	UNCTADstat
Digital technologies	117	40.01	6.45	31.9	58.2	World bank, WDI
GDP per capita	117	.100	.245	0	.89	World Development Indicators
Official exchange rate	117	.005	.051	0	.80	International Monetary Fund
Financial depth	117	.038	.138	0	1	Global Economic Prospects
Corruption	117	-5.112	.961	-10.1	-5.1	Worldwide Governance Indicators
North America	117	.011	.11	0	1	World bank classification 2023
South Asia	117	.031	.159	0	1	World bank classification 2023
Sub-Saharan Africa	117	.234	.401	0	1	World bank classification 2023

Middle East and North Africa	117	.105	.302	0	1	World bank classification 2023
Latin America and the Caribbean	117	.102	.319	0	1	World bank classification 2023
East Asia and Pacific	117	.101	.304	0	1	World bank classification 2023

Sources: authors' construction

3.2 Methodology

The following model in Cross section is regressed to investigate how trade openness is related to the digital technologies in country i:

$$Tradeopenness_i = \beta + \alpha.Technologies_i + \sigma.K_i + \varepsilon_i$$

Where $Tradeopenness_i$ is an indicator of a measure of effective trade openness in country i;$Technologies_i$measures by the number of secured internet servers i; K_i is a vector of control variables and ε_i is an unobserved error term. β is the coefficient of interest and is expected to have a negative sign in African countries and positive signs in the rest of the world.

4. EMPIRICAL RESULTS

In this section, we present the global baseline results and sensitivity test to the sub-index of trade openness.

4.1 Overall baseline results

The overall baseline results are presented in Table 2 below. We examine multiple specifications to ensure that results are not based on any particular model specification, reducing the risk of obtaining false estimates. First, we include in all regressions the characteristics (GDP per capita, official exchange rate, financial depth, corruption) that (Bah et al., 2021) and (Sawadogo & Wandaogo, 2021) identify as powerful trade openness determinants and patterns (North America, South Asia), Sub-Saharan Africa, Middle East and North Africa, Latin America and the Caribbean, and East Asia and the Pacific). Our hypothesis is that overall the digital technologies can improve countries' trade openness. The OLS estimates in Table 1 support this hypothesis.

Table 2. Overall baseline results

	(1)	(2)	(3)	(4)
Depends on variable: Trade openness				
Method	OLS	OLS	OLS	OLS
Digital technologies	**1,201*** **	**1.14*** **	**0.832*** **	**0.701*** **
	(0.077)	**(0.081)**	**(0.067)**	**(0.069)**
GDP per capita		-2,248		-0.825
		(3.153)		(3,335)
Official exchange rate		-9.35***		-3.41*
		(1,738)		(1,801)
Financial depth		-0.770		4,514
		(3.401)		(3.342)
Corruption		-0.727		-2.004***
		(0.650)		(0.390)
North America			5,690***	7,535***

			(1.001)	(0.771)
South Asia			-11.506***	-12.030***
			(3.345)	(3.303)
Sub-Saharan Africa			-15,646***	-17.101***
			(1,570)	(1,529)
Middle East and North Africa			-6.404***	-6,777***
			(1,558)	(1,349)
Latin America and the Caribbean			-3,500**	-4,227**
			(1,634)	(1,540)
East Asia and Pacific			-10.154***	-9.413***
			(2.423)	(3.365)
Constant	-6.125	-10,706*	17,085***	9,345
	(3,447)	(6.041)	(4.9217)	(5,443)
Comments	117	117	149	117
R2	0.48	0.49	0.75	0.71
Fisher	232.01***	167.5***	123.59***	1447.05***

Source: *author's construction.* ***Notes:*** *This table shows the correlation between digital technologies and trade openness. Consistent with our prediction, the results suggest that a higher level of the digital technologies is associated with high score in trade openness. The results are robust to the inclusion of GDP per capita, official exchange rate, financial depth, corruption and continental fixed effects. Robust standard errors are used and t-statistics are reported in parentheses. *, ** and *** significance indicated at 10%, 5% and 1% levels, respectively.*

Thus, differences in digital technologies can explain a reasonable fraction of trade openness variation across countries. The coefficient is positive and highly significant. This suggests that observed trade openness differences across countries can be explained by cumulative changes in the digital technologies. Indeed, the coefficient plots with 95% confidence intervals from the baseline results below show that the effect of the digital technologies is positive.

Sub-Saharan African countries are less advanced in terms of trade openness than the rest of the sub-region (South Asia; North America; Latin America and the Caribbean; East Asia and the Pacific; and the Middle East and North Africa). Indeed, the digital technologies plays a crucial role in the implementation of economic policies.

4.2 Sensitivity to sub-index of trade openness

This subsection presents the benchmark results using the trade openness sub index. For the purposes of this sensitivity analysis, we use the last column of Table 3, which constitutes the full specification of our base model. In this specification, estimates include all control variables used in the baseline model. Table 3 below shows the results of our base specification with the trade openness sub index. It is clear that in the overall sample, there is a positive and significant correlation between digital technologies and the three standard ICT variables: (1) mobile telephone subscription rate, (2) fixed telephone subscription rate and (3) individual internet use rate (Adeleye & Eboagu, 2019; Myovella et al., 2020).

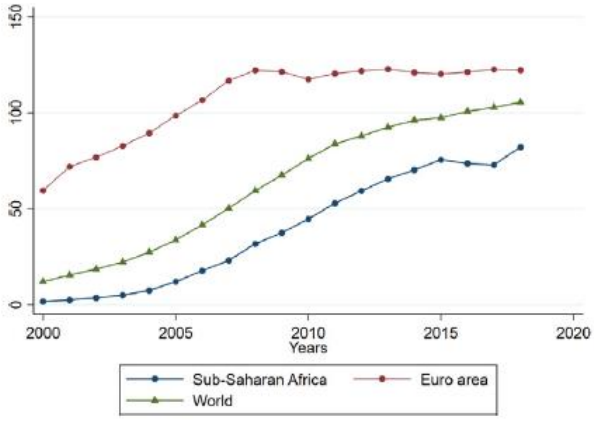

Fig. 3. Mobile cellular subscriptions (per 100 people) by region. *Source:* World Bank, WDI database

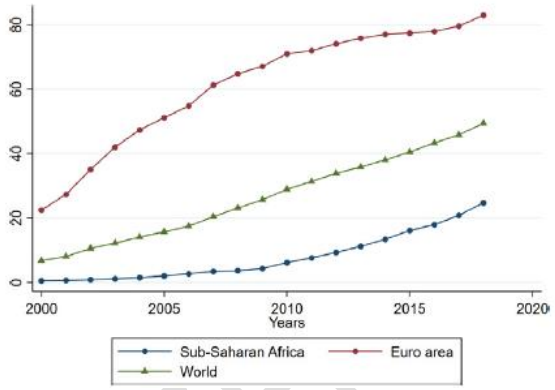

Fig. 4. Individuals using the Internet (% of population) by region. *Source:* World Bank, WDI database

Table 3. Effect of digital technologies on sub-index of trade openness

		(1)	(2)	(3)
Dependent Variable	Trade openness	Mobile	Fixed	Internet
Method	OLS	OLS	OLS	OLS
Digital technologies	**0.705*** **	**1.003*** **	**0.553*** **	**0.677*** **
	(0.072)	**(0.101)**	**(0.081)**	**(0.086)**
GDP per capita	-0.827	0.134	-1.321	-1,250
	(3.437)	(3,726)	(4.551)	(3,853)
Official exchange rate	-3,439*	-6,400***	-5.517***	2.003
	(1,801)	(2.305)	(1.507)	(2.139)
Financial depth	4.514	6,739*	1.0073	5,541
	(3.231)	(3.203)	(3.263)	(3.313)
Corruption	-2.001***	-1.885***	-2.001***	-1.032**
	(0.400)	(0.584)	(0.505)	(0.449)
North America	7,545***	7,052***	4,804***	4,035***
	(0.880)	(1,550)	(1,763)	(1,446)
South Asia	-13.030***	-10.442***	-15,250***	-14.271***
	(3.303)	(3.055)	(2,540)	(3.621)
Sub-Saharan Africa	-17.101***	-18,762***	-11.021***	-23.412***
	(1,534)	(2.042)	(1.605)	(1,760)
Middle East and North Africa	-6,760***	-5.554***	-12,500***	-2,724**
	(1.351)	(1,664)	(2.001)	(1.306)
Latin America and the Caribbean	-4.231**	-5.505***	-2,850	-4.622***
	(1,550)	(2.003)	(2.134)	(1,611)
East Asia and Pacific	-9.423***	-9.029**	-11.153***	-9,651**

	(3.375)	(3.157)	(2.410)	(4.229)
Constant	9,355*	-1.783	9,706*	21,873***
	(5.451)	(5,419)	(5.004)	(6.320)
Comments	117	117	117	117
R2	0.69	0.67	0.63	0.71
Fisher	165.57***	476.01***	165.47***	370.44***

Source: *author's construction.* ***Notes:*** *This table shows the correlation between digital technologies and the sub-index of trade openness. Consistent with our prediction, the results suggest that a higher level of the digital technologies is associated with high score in Mobil telephone, Fixed telephone and Internet user. Robust standard errors are used and t-statistics are reported in the parentheses. *, ** and *** significance indicate at the 10%, 5% and 1% levels, respectively.*

5. AFRICA AND NON-AFRICAN COUNTRIES RESULTS

In this section, we try to consider the peculiarity of African economies. As shown in figure 5 below, these African countries have the lowest scores in terms of digital technologies and trade openness compared with the rest of the world.

Table 4 below shows the sub-sample results. Overall, the digital technologies stimulate trade openness in Asia, America and Europe (columns 4, 5, 6, 7, 8, 9). In Africa, on the other hand, the coefficient associated with the digital technologies is negative and insignificant (columns 1 and 3). But these results only represent a correlation relationship, because they do not specify the sources of exogenous variation. This raises a high risk of endogeneity, especially since trade openness can explain certain factors that determine the digital technologies, such as the size of the economy and geographical distance. We therefore correct this problem in the next section. This should therefore be seen as a correlation between the digital technologies and trade openness.

Table 4. Results by continents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable: Trade openness								
	African countries	Non-African countries	African countries	Asian countries		American countries		European countries	
Digital technologies	**-0.205**	**1.015*** **	**-0.261**	**0.768*** **	**0.761*** **	**1,417*** **	**1,379*** **	**1,303*** **	**0.925*** **
	(0.225)	**(0.081)**	**(0.190)**	**(0.113)**	**(0.130)**	**(0.204)**	**(0.282)**	**(0.111)**	**(0.111)**
Baseline controls	*Yes*	*Yes*	*No*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
Constant	43,574***	-3,300	57.69***	11,060*	4.040	-7.822	-24,847	-2.781	1,775
	(9.601)	(3,450)	(8,600)	(5.202)	(14,271)	(9,450)	(20,327)	(6.224)	(4,537)
Comments	24	70	23	17	17	16	16	34	34
R2	0.08	0.62	0.03	0.42	0.49	0.67	0.74	0.74	0.72
Fisher	166.6***	120.84***	1.50***	38.37***	15.42***	43.53***	34.50***	131.7***	103.7***

Source*: author's construction;* ***Notes****: This table shows the correlation between the digital technologies and trade openness in African countries and another. Consistent with our prediction, the correlation between digital technologies and trade openness is negative and non-significant in African countries. However, the same correlation in non-African countries is positive and significant. *, ** and *** significance indicated at the 10%, 5%*

and 1% levels, respectively.

5.1 Dealing with endogeneity

The basic OLS results do not allow us to identify the precise effect of digital technologies on trade openness. To obtain a causal relationship between the two variables, exogenous sources of variation are imperative. Therefore, not all potential sources of endogeneity have been considered, which may reflect the fact that the results previously obtained are only correlational. There are three common sources of endogeneity in the literature. It can be caused by measurement errors in variables, omission of key variables in a model and simultaneity bias(Greene, 2011). Errors in variables generally stem from imperfect measurement. The omission of key variables in an econometric model will be noted in the disturbance term. Simultaneity bias, on the other hand, is the consequence of the causal relationship between one (or more) explanatory variable(s). These variables are co-determined and influence each other simultaneously.

In our context, the first problem for the results obtained from OLS estimation in equation (1) suffers from the potential bias arising from omitted variables. This problem is related to the possibility that the estimation has been carried out by excluding the relevant confounders in the baseline model. To address this problem, we need to include several important determinants of trade openness in the regression. Even if we control for many determinants of trade openness, it is impossible to determine whether digital technologies are orthogonal to the disturbance term. Therefore, we adopt the strategy of (Oster, 2019), which imposes the partial identification test of the stability of the coefficient. This method assesses the extent to which the failure to control for potential founders can exclusively affect the main results. In this case, the degree of selection on observable variables provides information on the selection of unobserved factors (Diegert et al., 2022). The use of this method in our work offers several advantages. The first is that it allows us to compare the R-squared values obtained by estimating a model with a full control estimator and a model with a restricted number of control variables. The second is the ability to ensure the stability of the coefficients. By following this methodology, the possibility of considering the empirical relevance of the observed confounders in explaining trade openness becomes efficient. the probability that unobservable factors are correlated with the main variable of interest can be done by increasing including the observed confounders in the R-squared.

The analysis of unobservable selection bias considers (ϑ) and (α^*), which are a proportionality coefficient and a bias-adjusted coefficient, respectively. More specifically, it captures how much stronger the correlation between digital technologies and unobserved confounders is relative to the correlation between digital technologies and observed controls, which is relevant in the ϑ coefficient and must attenuate the digital technologies coefficient towards zero ($\alpha = 0$). Respecting the assumption that the observed variables are not more important than the unobserved variables, our strategy also estimates the bias adjusted. This allows us to obtain our “α” representing the impact of digital technologies on trade openness, considering the importance of observed and unobserved confounders in the baseline

results. The statistical tests of this estimation are constructed around a value of Rmax. This variable represents the R-squared that captures the amount of variation in trade openness across countries, considering all relevant controls (Oster, 2019). The relevance of the (α*) coefficient of digital technologies depends on the fact that the interval does not contain zero. In this case, selection on unobservable drives the relationship between digital technologies and trade openness.

In order to have an ideal source of exogenous variation recognized by previous studies, there are several potential digital technology tools for correcting this endogeneity problem.

ICT goods imports (% total goods imports) include computers and peripheral equipment, communication equipment, consumer electronic equipment, electronic components, and other information and technology goods (miscellaneous).

Imports of digital tools into African countries are still low due to customs duties on these products (see Fig. 3). Finally, the low use of ICT tools in African countries can be explained by subscription costs (internet), which remain very high in the region compared to developed countries.

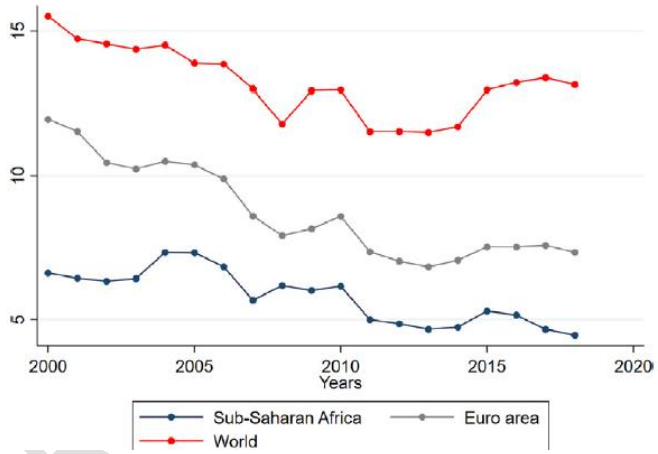

Fig 5. *ICT goods imports (% total goods imports) by region. Source: World Bank, WDI database*

With regard to ICT laws,(Solomon & van Klyton, 2020) have pointed out that in developing countries there is a lack of laws governing digital activities such as freedom of information, cybercrime and intellectual property rights. If a government wants to foster an enabling digital environment, the legal framework must reflect the new realities brought about by the use of digital technology (Lefophane & Kalaba, 2020). Furthermore, (Pick et al., 2015) have argued that ICT laws are a key component of all forms of ICT in Africa.

The results of the second stage of the IV-2SLS estimations are presented in Table 5. The Kleibergen-Paap Wald rk F statistic is significant at 1%, confirming the relevance of the instruments. So, there is no problem of weak identification. The P value of the under-identification test is carried out by the Kleibergen-Paap LM rk statistic, which tests that the under identification is good. The Anderson-Rubin P value test is significant at 1%, indicating that our results are robust to identification. Overall, there is no small instrument bias in this estimate. In this case, we can confirm our hypothesis that the digital technologies play a bad role in Africa by significantly reducing the continent's trade openness. In

the rest of the world, however, empirical analysis shows that the digital technologies significantly increase trade.

Table 5. Baseline results IV-2SLS

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Trade openness						
Method	IV-2SLS	IV-2SL	IV-2SLS	IV-2SLS	IV-2SLS	IV-2SLS
	African countries		Without Africa		Global sample	
Digital technologies	**-1.129*** **	**-1,280*** **	**1,660*** **	**1,370*** **	**2,183*** **	**1,559*** **
	(0.263)	**(0.340)**	**(0.174)**	**(0.155)**	**(0.179)**	**(0.221)**
GDP per capita		2,062		-2.333		1.070
		(3.263)		(3,762)		(3.504)
Official exchange rate		-14.65***				2,349
		(3,340)				(2,384)
Financial depth		13,305**		2,813		1,839
		(6,766)		(3,722)		(4.179)
Corruption						4,100**
						(2.108)
North America				3,026**		-4.567
				(1,466)		(4.702)
South Asia				-5.275		-9.03***
				(3.032)		(3,050)
Sub-Saharan Africa						-0.806
						(3,249)
Middle East and North Africa		0.699		-2.626		-0.532
		(2.030)		(2,763)		(0.910)
Latin America and the Caribbean				0.360		1,187
				(2.132)		(2.276)
East Asia and Pacific				-10,700***		-10.518***
				(3.130)		(3.035)
Constant	99,077***	97,533***	-28.021***	-11,860	-46.130***	-19,822**
	(15,660)	(22.139)	(9.101)	(9,249)	(9.031)	(8,720)
Comments	30	30	78	78	117	117
R2	0.35	0.31	0.35	0.73	0.22	0.70
Kleibergen-Paap rk LM P-val	0.001	0.013	0.000	0.000	0.000	0.000
Hansen over-identification p-value	0.39	0.60	0.071	0.16	0.069	0.42
Kleibergen-Paap rk Wald F	21.15***	12.84***	67.84***	23.55***	67.57***	11.41***
Anderson-Rubin endogeneity p-val	0.000	0.000	0.000	0.000	0.000	0.000

Notes : *This table reports IV-2SLS estimates of the effects of digital technologies on trade openness by making the difference between African countries and the rest of the world. We useICT goods importsand law relating to ICT, as an instrument to identify the causal effect digital technologies. The under-identification hypothesis is proven by the null hypothesis of the P-value of the Kleibergen-Paap rk LM test. the weak instrument or weak identification is proven by the null hypothesis of the Kleibergen-Paap rk Wald F test statistic. Robust standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01*

6. DISCUSSIONS AND CONCLUSIONS

This article analyzes the relationship between digital technologies and trade openness, distinguishing African countries from the rest of the world. After presenting a summary of the state of the scientific literature that synthesizes the different digital technologies used as an operating framework

for empirical studies devoted to the issue. To test the hypothesis that the type of digital technology affects trade openness, and the hypothesis that unlike the rest of the world, digital tools in African countries negatively affect trade openness.

The results obtained from a sample of 117 countries over the study period from 2003 to 2023 show that the negative impact of digital technologies on trade diminishes or disappears as the percentage of subscribers increases. These results highlight the low level of digital inclusion in African countries. Although the penetration rate of digital tools has been increasing in recent years in African countries, particularly in sub-Saharan Africa, it remains low compared to developed countries.

These conclusions are, however, subject to a number of reservations. Firstly, information on the variables relating to digital technologies is very difficult to obtain. Secondly, the problem of measuring the variables is likely to affect the results obtained. It would therefore be illusory to come out in favor of one digital tool over another. In view of the results obtained in the course of this work, the choice must be made on the basis of the specific characteristics of each country.

This article therefore recommends that African leaders encourage greater digital connectivity, coupled with an improved business climate, significant investment in education and health for the population, and good governance, in order to generate digital dividends (Group, 2016).

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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