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# Electronic trading and stock market participation in Africa: Does technology induce participation?

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## ABSTRACT

This study examines the effect of migrating to electronic trading platforms on stock market participation among African stock exchanges. Using Bayesian estimations, we demonstrate that transitioning from a physical to an electronic stock exchange decreases trading activity on the stock exchange whilst increasing listing. Our findings further reveal that the impact of migration is more pronounced for non-Sub-Saharan African countries relative to Sub-Saharan countries. In terms of policy, the results imply that African exchanges cannot optimise the efficiency of their stock markets simply by migrating to electronic trading platforms.

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## 1. Introduction

Prior studies in the financial economics literature have explained factors that foster stock market development (for example, Freund et al., 1997; Stoll, 2006; Liao et al., 2008). However, the question of whether the level of individual and institutional participation in the stock market is boosted by the presence of electronic trading is yet to be addressed, especially in the context of emerging markets where there is visibly lacklustre market participation.<sup>1</sup> In response to the ailing liquidity of most exchanges, several African countries have migrated to electronic trading platforms over the last two decades. However, the benefits of electronic trading for African countries can be constrained by the prevailing socio-economic conditions in the region such

as poverty, poor governance, weak education systems, unemployment, and the absence of technical skills. Considering these impediments, the level of stock market participation could be adversely affected by migration to electronic trading platforms. This provides compelling motivation for our study.

The link between electronic trading and stock market performance has been assessed from different perspectives in previous research. For example, a strand of the literature explores the impact of electronic trading on market efficiency (Freund et al., 1997; Stoll, 2006; Dutta et al., 2017) while others investigate how electronic trading induces market liquidity and volatility (Liao et al., 2008; Dutta et al., 2017). Drawing from the finance-growth literature, relatively little attention has been given to electronic trading platforms as an innovation-technology channel via which stock market development can stimulate economic growth, particularly in developing countries (Kanga et al., 2022). Our study extends the literature on stock market development by investigating whether the migration of African exchanges to electronic platforms has stimulated participation in the stock markets.

The implications of increased market participation are profound for policymakers, regulators, and market participants as

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<sup>1</sup> For instance, the average number of trades per year in African stock markets is 8,362 (WFE, 2021). This value is trumped by the NASDAQ stock exchange which averages about 30 million trades a day (Nasdaq, 2022).

**Table 1**  
Electronic trading platform and stock market participation.

	Participation turnover		Listing	
	(i)	(ii)	(iii)	(iv)
Electronic Trading	-1.085	-0.038	3.811	1.539
Access to Finance	0.228	-0.002	2.794	13.157
Political Stability	0.171	0.206	2.112	-0.302
Access to Internet	0.085	-0.001	0.055	41.765
Gross Savings	-0.018	0.001	-0.289	25.96
GDP Per Capita	0.06	-0.025	-26.1	10.87
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
$\alpha$	-0.485	-0.184	200.973	1.288
$\sigma$	5.708	2.68	48.466	2E+10
$\zeta$	1.762	0.004	204.781	6E+10
Number of Chains	3	3	3	3
Iterations	52500	52500	52500	52500
Burn-in	2500	2500	2500	2500
Sample size	50000	50000	50000	50000

The table presents the results of Bayesian random effect panel data estimation. The constant, variance and sigma are denoted by  $\alpha$ ,  $\sigma$  and  $\zeta$ . Convergence is achieved in all our models.

they can provide the necessary yardstick for risk management and overall market development. This study, therefore, fills the vacuum by offering novel insights into how individual and institutional participation in African stock markets is impacted by the presence of electronic trading platforms. To do so, we use unique stock market data on 18 African exchanges from 1980 to 2020. Across Bayesian and Frequentist estimations, our findings reveal that migrating to electronic trading platforms decreases participation turnover (i.e. activity) whilst increasing listing in African exchanges. Our results demonstrate that the payoff from migrating to electronic trading platforms is more pronounced for non-Sub-Saharan African countries. We argue that migrating to these platforms without addressing macroeconomic posturing, infrastructure gaps and governance concerns offers limited benefits.

The remainder of the paper is structured as follows. The next section (Section 2) describes the data and methodology, Section 3 reports the empirical findings, and the paper is concluded in Section 4.

## 2. Data and methodology

We test our conjecture by collecting country-level data for Algeria, Angola, Botswana, Cote d'Ivoire, Egypt, Ghana, Kenya, Libya, Mauritius, Morocco, Namibia, Nigeria, South Africa, Sudan, Tanzania, Tunisia, Zambia, and Zimbabwe from the World Federation of Exchanges (WFE) and World Bank Database (World Development Indicators) for the period 1980 to 2020. Further details on data sources and definitions are provided in [Appendix A](#).

### 2.1. Model specification

We start our analysis by specifying a Bayesian panel regression model of the following form:

$$y = X\mathbf{A} + \epsilon, \text{ where } \epsilon \sim \mathbf{N}(0, \tau^{-1}I_{NT}) \quad (1)$$

Where  $y$  is of the form  $N \times T$ .  $X$  is the matrix of the explanatory variables of the size  $NT \times (K + N)$ . The vector  $\mathbf{A}$  is of length  $K + N$ . The parameters are estimated using the Markov Chain Monte Carol (MCMC) method where the simulation sample is drawn from the comparable posterior model and the Gibbs sampler is employed for carrying out our MCMC sampling. Our diagnostic analyses indicate that convergence is achieved, and in total, we run 52500 iterations per model where 2500 burn-in iterations were discarded. The results of our diagnostic tests are reported in [Appendix B](#).

For robustness, we also specify a normal panel regression of the form:

$$SMP_{ct} = \alpha_0 + \beta_1 ET_{ct} + \beta_2 Controls_{ct} + \epsilon_{ct} \quad (2)$$

Where SMP refers to stock market participation. We employ four measures of stock market participation: (i) the value of domestic shares traded on an exchange deflated by the total market capitalisation of the stock exchange (ii) the market value of electronic book orders deflated by the total market capitalisation of the exchange, (iii) the total number of listed stocks on the exchange in a given year and (iv) the total market capitalisation of the stock exchange scaled by the GDP of the country for the given year. ET refers to electronic trading, a dummy variable that captures the existence of an electronic trading platform in a country. The vector "controls" accounts for the control variables considered in our model (i.e. energy generated, access to finance, political stability, access to the internet, gross savings and GDP per capita),  $\epsilon$  is the error term, and  $c_t$  indexes country and year. Furthermore, we also specify a generalised linear model (GLM) and account for cross-sectional and temporal correlation in our panel model using the Driscoll and Kraay standard errors. Results from our robustness estimations are presented in [Appendix C](#).

## 3. Findings

### 3.1. Migrating to electronic trading platforms and stock market participation

In [Table 1](#), we report the results of the impact of electronic trading (ET) on stock market participation. Models (i) and (ii) demonstrate how ET influences participation turnover and share turnover velocity. Across both measures of activity in the stock market, the results imply that ET reduces participation. The findings complement the work of [Freund et al. \(1997\)](#) who demonstrate that automation does not necessarily improve the efficiency of markets.

In models (iii) and (iv) of [Table 1](#), we evaluate how ET affects the inclination to list and market capitalisation of listed firms. The results demonstrate that transitioning from physical to electronic stock exchanges increases listing and total market capitalisation. Our results provide a coherent response to the policy argument made by [Yartey and Adjasi \(2007\)](#). Governments in Africa cannot stimulate activity in their stock markets simply by migrating to electronic trading platforms. However, it does appear there is a case for increased interest because of the migration. Our results also corroborate that of [Jain \(2005\)](#) who posits that migrating to

**Table 2**  
Regional Dichotomy and stock market participation.

	Participation turnover		Listing	
	SSA	Non-SSA	SSA	Non-SSA
Electronic Trading	-0.104	-0.446	5.141	87.317
Access to Finance	0.144	0.36	1.716	3.137
Political Stability	1.145	0.287	-10.61	-5.212
Access to Internet	0.066	-0.016	-0.074	1.261
Gross Savings	-0.015	-0.052	-0.063	1.456
GDP Per Capita	-0.518	1.291	-8.529	-40.16
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
$\alpha$	5.532	-10.304	54.612	168.762
$\sigma$	21.904	83.125	227.298	1137.395
$\zeta$	1.278	1.908	150.895	375.078
Number of Chains	3	3	3	3
Iterations	52500	52500	52500	52500
Burn-in	2500	2500	2500	2500
Sample size	50000	50000	50000	50000

The table presents the Bayesian panel estimate for splitting the sample into Sub-Saharan Africa and otherwise. The constant, variance and sigma are denoted by  $\alpha$ ,  $\sigma$  and  $\zeta$ . Convergence is achieved in all our models.

electronic venues enhances the informativeness of stock markets, ultimately reducing the cost of capital. In [Appendix B](#) we report consistent results using various frequentist estimations.

### 3.2. Does the effect of migration differ by region?

To account for geographical variation in institutional development and basic infrastructure within Africa, we investigate if the payoff from migrating to an electronic trading platform differs by region. Prior research has highlighted considerable differences between financial institutions and markets in Sub-Saharan Africa and those in the Middle East and North Africa (MENA) region, with Sub-Saharan African nations being generally less developed ([Narayan et al., 2011](#); [Yartey and Adjasi, 2007](#)). In this spirit, we divide our sample into sub-Saharan Africa and non-sub-Saharan Africa.

In [Table 2](#) we report the results of splitting our sample into countries in sub-Saharan Africa or otherwise. The findings indicate that the positive and negative impact of electronic trading platforms is only pronounced among countries in non-Sub-Saharan Africa. The results imply that since the stock exchanges of most countries in non-Sub-Saharan Africa are significantly more developed than Sub-Saharan exchanges, information disclosures can be more easily priced in North Africa after the migration ([Jain, 2005](#)).

## 4. Conclusion and policy implications

This study evaluates if migrating to electronic trading platforms increases stock market activities in Africa. The results suggest that migrating to an electronic trading platform increases

listing but reduces the volume of activity. The negative and positive impact of transitioning to electronic trading venues is more pronounced for non-Sub-Saharan African exchanges. In terms of policy implications, the results indicate that although governments of developing countries can stimulate interest in their stock exchanges by migrating to electronic trading venues, electronic migration does not improve overall activity. Our study also opens new avenues for future research by highlighting the limitations of automation for improving stock market participation, especially in the absence of well-developed institutions and under the prevailing socio-economic circumstances in Africa.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request.

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### Appendix A

See [Table A.1](#): Variable Definition.

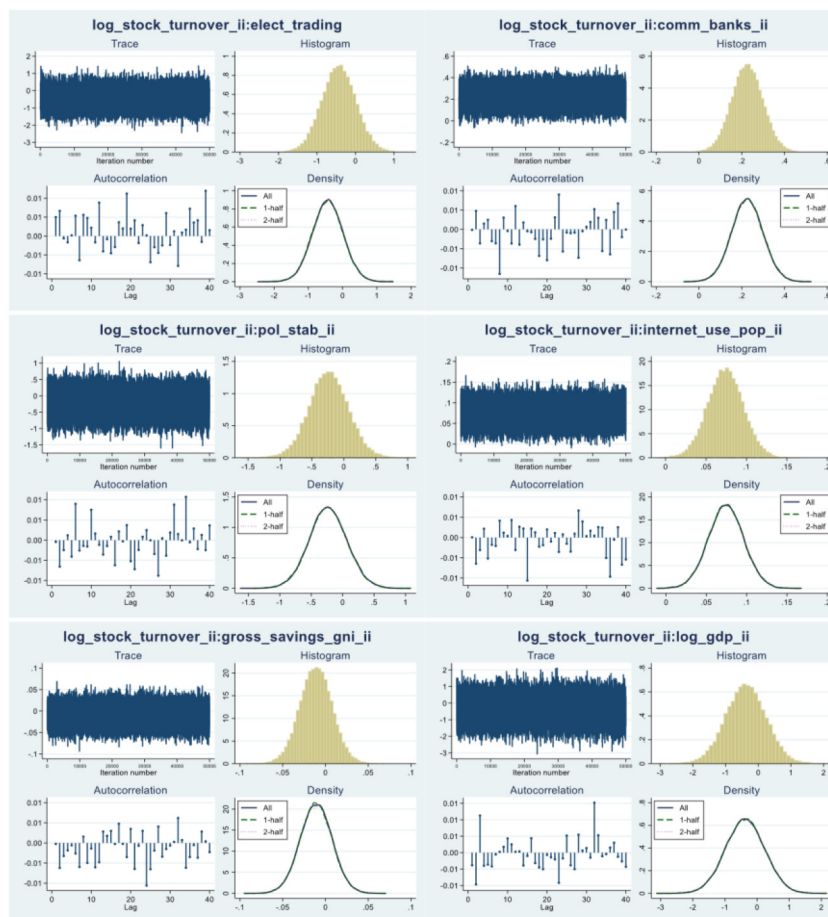
**Table A.1**  
Variable definition.

Variable	Definition	Source
<i>Electronic Trading</i>	Electronic trading captures the existence of an electronic trading platform each year.	Manually Collected by Authors.
<i>Participation Turnover</i>	The turnover ratio is the value of traded domestic shares divided by their market capitalisation.	World Bank
<i>Share Turnover Velocity</i>	This is the Electronic Order Book (EOB) value traded of Domestic Companies deflated by market capitalisation.	World Federation of Exchanges
<i>Total Equity Market Cap</i>	This is the total number of issued shares priced at closing prices at the end of the year.	World Federation of Exchanges
<i>Number of Trade</i>	This is the number of transactions which have on the relevant Exchange over a period.	World Federation of Exchanges

(continued on next page)

**Table A.1** (continued).

Variable	Definition	Source
Number of Shares Traded	This refers to the total number of shares traded in a year. The value accounts for both electronic and negotiated deals.	World Federation of Exchanges
Market Cap Listed	Market capitalisation is the total number of issued shares of Domestic Companies, including their several classes, multiplied by their respective prices at a given time	World Bank
Market Cap to GDP	This is defined as the total market capitalisation of a country deflated by its GDP.	World Bank
Access to Finance	This measures proximity and accessibility to commercial bank branches.	World Federation Financial Exchanges
Access to Internet	This measures Internet users who have used the Internet in the last 3 months.	World Bank
Political Stability	Political Stability measures the likelihood of political unrest.	World Bank
Gross Savings	This is the gross national income minus total consumption, including net transfers.	World Bank
Log GDP per capita	This is the GDP deflated by the midyear population.	World Bank



**Fig. B.1.** Diagnostic tests.

**Appendix B**

See [Fig. B.1](#): Diagnostic tests.

**Appendix C**

See [Table C.1](#): Alternative specification.

**Table C.1**  
Robustness test.

	Participation turnover				Listing			
	RE	FE	GLM	DK	RE	FE	GLM	DK
Electronic Trading	-1.0860** (-2.08)	-1.0860** (-2.08)	-1.0860** (-2.08)	-1.0860* (-1.87)	13.1727** (2.18)	13.1727** (2.18)	13.1727** (2.18)	13.1727** (2.38)
Access to Finance	0.2282*** (2.84)	0.2282*** (2.84)	0.2282*** (2.84)	0.2282** (3.06)	3.5154*** (3.79)	3.5154*** (3.79)	3.5154*** (3.79)	3.5154*** (3.17)
Political Stability	0.1710 (0.34)	0.1710 (0.34)	0.1710 (0.34)	0.1710 (0.94)	-6.2177 (-1.08)	-6.2177 (-1.08)	-6.2177 (-1.08)	-6.2177 (-1.62)
Access to Internet	0.0855*** (3.36)	0.0855*** (3.36)	0.0855*** (3.36)	0.0855*** (3.78)	-0.1859 (-0.63)	-0.1859 (-0.63)	-0.1859 (-0.63)	-0.1859 (-0.91)
Gross Savings	-0.0181 (-0.72)	-0.0181 (-0.72)	-0.0181 (-0.72)	-0.0181 (-1.00)	0.0881 (0.30)	0.0881 (0.30)	0.0881 (0.30)	0.0881 (0.53)
GDP Per Capita	0.0634 (0.08)	0.0634 (0.08)	0.0634 (0.08)	0.0634 (0.08)	-39.7729*** (-4.18)	-39.7729*** (-4.18)	-39.7729*** (-4.18)	-39.7729*** (-6.04)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	-0.4257 (-0.07)	1.0787 (0.18)	-0.4257 (-0.07)		281.6085*** (3.92)	317.9417*** (4.59)	281.6085*** (3.92)	
Observations	169	169	169	169	169	169	169	169
R-squared	0.376	0.376		0.765	0.22	0.23		0.940

The table presents the results of the impact of electronic trading platforms on stock market participation. The T statistics are reported in parentheses.

\*Significance at below 10% level.

\*\*Significance at below 5% level.

\*\*\*Significance at below 1% level.

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