



Mobile money innovation and global value chain participation: Evidence from developing countries

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ABSTRACT

This study provides empirical insights on the effect of mobile money innovation on global value chain participation. Applying quantile estimation technique on the data of 90 developing economies between 2011 and 2018, we document that mobile money innovation has significant positive effect on participation in global value chains. Furthermore, our results reveal that economic and governance factors such as financial development, human capital development, tariff and distance are crucial variables that influence participation in global value chain. We recommend that friendly trade policies and investment in socioeconomic infrastructures and human capital development would help in facilitating the wide-spread adoption of mobile money innovations and enhance GVC participation.

1. Introduction

This study extends the growing body of knowledge on global value chains (GVCs) by examining whether mobile money innovation stimulates GVCs' participation in developing countries. Most studies proclaim that financial innovations should stimulate entrepreneurial development, firm productivity, and efficient allocation of financial resources (Donovan, 2012; McGowan et al. 2018). Another stream of research also asserts that financial services and innovation should foster capital accumulation and total factor productivity (Dorfleitner, et al., 2019; Levine & Warusawitharana, 2021). Given recent studies describing the benefits of financial innovation, it seems plausible to argue that mobile money innovation would increase firms' backward and forward participation in GVCs.

Over the past decades, GVCs have dominated major transactions in the world (OECD, 2013; Donova Del Prete et al., 2018). GVC refers to a situation where different stages of production are processed at different nations, mainly, to add value to the products or services. Firms or countries are considered to have participated in GVCs if they take part in any stage of the production process (Antras, 2019). With GVC, trade and international investments are better planned, whilst firms also benefit from the fragmentation of production activities (Dovis & Zaki, 2020). Several studies have examined various aspects of GVCs including its association with foreign direct investment and employment (Donova Del Prete et al., 2018; Ignatenko et al., 2019; Efogo et al. 2020; Ajide, 2023). However, no attention has been given to the role of mobile money innovations in enhancing seamless GVCs' transactions. This study reacts to this

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lacuna found in the literature.

Mobile money innovation entails the delivery of financial products and services via innovative devices such as mobile money. In recent years, there has been a tremendous increase in the global adoption of mobile money and its prevalence is particularly peculiar to developing countries with limited financial access (Donovan, 2012; Demirgüç-Kunt et al., 2018). Indeed, SMEs, farmers, unbanked individuals, those in rural areas and the low-income population utilise mobile money agents because they are simpler to access than the conventional financial system. In the majority of developing nations, mobile money agents outnumber automated teller machines (ATMs) and traditional bank branches. notes that since the introduction of Kenyan M-PESA in 2007, the mobile money sector in the country has undergone a dramatic transformation to become ubiquitous. Similarly, across the world, over one billion accounts have been activated with more than 750 functional operators in over 95 nations (Dorfleitner et al., 2019).

Deviating from related studies (such as Efogo, 2020), we employ data of 90 developing nations between 2011 and 2018 and provide fresh contributions on the possibility of using mobile money innovation to improve country's participation in GVCs. The empirics of this nature are rarely discussed in the context of less-developed nations. Unlike the traditional financial system examined in previous studies, mobile money is an essential financial technology innovation in developing countries where mobile money activities and mobile ownership have continued to grow significantly (GSMA, 2017). Essentially, monetary transactions are conducted through an SMS-based monetary transfer and storage system which is readily available to mobile phone users (Konte & Tetteh, 2023). Unlike traditional financial institutions with expansive banking halls, mobile money agent centres, which are often itinerant, serve as outlets for the registration of mobile money. In addition, cash-in and cash-out services have become widespread compared to the traditional branch banking system (Suri, 2017; Konte & Tetteh, 2023), thus making mobile money more favourable to customers in developing nations where there are limited financial infrastructure.

Our analysis considers the heterogeneous nature of the countries including the different variants of GVC participations among the nations. Methodologically, we employ quantile regression that estimates the parameters at different levels of conditional distribution of GVCs. The estimation is efficient and more flexible compared to the traditional least square regression often used in previous studies. Results show that mobile money positively enhances participation in GVCs, and that economic and governance factors also encourage global value chain participation. While our findings would assist policymakers in formulating appropriate policies on mobile money innovation management, it also seeks to provide valuable information to firms participating in GVC transactions. In addition, our study provides vital inputs for policymakers in designing and formulating financial inclusion policy as well as providing a yardstick for assessing its impact in macroeconomic contexts for the case of developing nations.

The rest of the paper is structured as follows. The next section presents the relevant theories and hypothesis of the study. In section 3, we present the data and empirical strategy, followed by the results in section 4 and the paper is concluded in section 5.

2. Theoretical underpinning and hypothesis

From a theoretical perspective, the theory of international fragmentation and outsourcing posits that technological advancement, financial liberalisation and international dialogs bring about lower prices in the production of goods thus encouraging fragmented production technologies in different countries. Furthermore, production fragmentation may also occur due to differences in required labour skills as well as differences in production inputs that may be cheaper in other regions. This, according to the Heckscher-Ohlin theory, suggests that labour intensive production process be situated in regions with abundant labour resources while capital intensive process be located in places where capital is cheap. GVC, a central element in world trade, is the distribution of the different production process of a product to different countries such that each country contributes to the final end product, thus bringing about an international fragmentation production process (Acemoglu et al., 2001; Dervis and Zaki, 2020).

Most firms participate in the fragmentation process because trade and investments are better organised, and they enter the market as service providers without the need to construct the whole product's value chain (OECD, 2013; Alhassan et al., 2021). Nonetheless, these firms must contend with financial constraints in becoming part of the process due to underdeveloped financial institutions and markets especially in developing countries, consequently limiting their participation in GVCs (Reddy et al., 2021). Interestingly, studies have shown how financial innovation impacts on wellbeing and standard of living (Asongu, 2017; Dorfleitner & Nguyen, 2022). Empirically, Asongu (2017) shows that mobile money innovation plays substantial roles in addressing the challenges of inequality and poverty in developing nations. Explaining factors that hinder mobile money innovation, Asongu et al. (2021) and Lashitew et al., (2019) document that rule of law is critical while Asongu and Odhiambo (2022) reveal that economic growth moderates the relationship between mobile money innovation and financial inclusion. However, literature also suggests that the financial constraints challenge may be addressed by the prevalence of mobile money and its innovation in the developing countries. This occurs when innovations in mobile money increase financial inclusion as well as reduce transaction costs (Asongu et al., 2021). This becomes more prominent when institutional governance is factored into the innovation process and goes a long way in promoting economic development in developing countries (Reddy et al., 2021). With the innovation in place, firms can gain easy access to finance that would enable them to participate in the GVC process. We thus hypothesize that mobile money innovations in developing countries could increase participation in GVC process.

3. Data and methodology

3.1. Model specification and analytical techniques

This study employs the quantile regression (QR) estimation approach to analyse the influence of mobile money innovations on the

participation of developing nations in global value chains (GVCs). The aim is to provide reliable insights into the conditional distribution of the GVC variables (Asongu & Odhiambo, 2017; Asongu et al. 2021). That is, from low to higher GVC participating economies when GVCs and its variants (forward and backward GVCs) are the dependent variables. This estimate technique generates parameters for different conditional distributions of the explained variable, specifically the Global Value Chains (GVCs), based on the conditional determinants (Billger & Goel, 2009; Koehler & Hallock, 2001; Ajide, 2023). In contrast to prior research, our study contributes to the existing body of literature by employing GVC models to estimate parameters under different quantile conditions (Efogo, 2020; Efogo et al., 2021). The QR relaxes the assumption of ordinary least square of normal distribution of the variables and the error terms (Koehler & Bassett, 1978). The technique enables us to unveil the role of mobile money innovation in the best and worst performing developing economies. The QR estimator of GVC participations can be represented by θ th quantile which could be obtained by optimizing the problem in Eq. (1):

$$\min_{\beta \in R^k} \left[\sum_{i \in \{i: y_i \geq x_i' \beta\}} \theta |y_i - x_i' \beta| + \sum_{i \in \{i: y_i < x_i' \beta\}} (1 - \theta) |y_i - x_i' \beta| \right] \tag{1}$$

In Eq. (1), $\theta \in (0, 1)$ and the intention is to minimize the weighted sum of absolute deviations. The conditional quantile of GVC (that is, y_i given x_i) is specified in Eq. (2):

$$Q_y(\theta / x_i) = x_i' \beta_\theta \tag{2}$$

For each θ th, a specific slope parameter is modelled. The explained variables y_i is the GVC participation indicators (GVC, FVA, DVX) and the explanatory variables are the constant term, mobile money (MAcct, MPay, MStore), human capital development (HC), financial development (FD), GDP per capita (GDPPC), tariff, political institutions (Polity), foreign direct investment (FDI) and Distance. The GVC indicators, mobile money innovations and the set of control variables introduced in our model are summarised in Table 1.

3.2. Data

Following previous studies (Asongu & Odhiambo, 2017; Lashitew et al. 2019; Asongu et al., 2021), this study employs the average data of 90 developing economies between 2011 and 2018 collected from different sources. The selection of countries was based on data availability for the period of study. Our dependent variable is *global value chain* measured using three separate proxies: (i) indirect value added DVX (forward GVC participation component of the GVC), (ii) foreign value added FVA (backward GVC participation component), and (iii) global value chain GVC, computed by adding FVA and DVX.

Our main explanatory variable is *mobile money innovation*, proxied by three separate indicators. We use MPay which represents the proportion of adults using mobile money to pay bills; MStore which denotes the proportion of adults who store money using mobile account and MAcct which stands for the proportion of adults who have mobile money accounts. Furthermore, we introduce some literature-acknowledged control variables in our model such as distance, tariff, GDP per capita, FDI, human capital proxied by human capital index, political institutions proxied by polity2 and financial development. Further details on data sources and definitions are

Table 1
Definition of variables.

Variable	Measurement	Source of data
Indirect value added (DVX)	It is the forward participation component of GVC which is embodied in the exports of other countries. Natural logarithm is taken	UNCTAD-Eora Global Value Chain database
Foreign value added (FVA)	It is the backward GVC participation component of the GVC participation index and embodied in a nation's exports. Natural logarithm is taken	UNCTAD-Eora Global Value Chain database
Global Value Chain (GVC)	GVC participation index for a nation is computed by adding DVX and FVA (that is, DVX+FVA). Natural logarithm is taken	UNCTAD-Eora Global Value Chain database
Distance	The natural logarithm of distance	CEPII database
GDPPC	GDP per capita (constant 2015 US\$), natural logarithm is taken	World Development Indicator
FDI	Foreign direct investment, net inflows (% of GDP)	World Development Indicator
FD	Financial Development Index. The index ranged between 0 and 1. It covers Bank and non-bank financial institutions, and financial market development.	IMF Database
Tariff	Tariff rate, applied, weighted mean, all products (%)	World Development Indicator
HC	Human capital index, computed based on schooling years and educational returns	Pen World Table version 10.1 (PWT10.1).
Polity2	Score ranges: +10 (most democratic countries) and -10 (most autocratic countries).	Polity IV database
MPAY	It is the proportion of adults using mobile money to pay bills	Financial inclusion Indices database (Findex)
MSTORE	It is the proportion of adults who store money using mobile money account	Financial inclusion Indices database (Findex)
MACCT	It is the proportion of adults who have active mobile accounts to pay, receive or send money	Financial inclusion Indices database (Findex)

provided in Table 1.

4. Results and discussion of findings

4.1. Summary statistics

Tables 2 and 3 show the descriptive statistics and pairwise correlation among the variables. The key variables of interest and the control variables have their standard deviation values being moderate with the exception of *foreign direct investment* and *GDP per capita*. Also, *human capital index* demonstrates lower level of volatility. The pairwise correlation coefficients are positive and significant for all the variables, except between tariff, school, and the mobile money innovation proxies. It is also observed that coefficients of the control variables are moderate; implying that there is no evidence of multicollinearity. However, the GVC figures and its variants demonstrate high level of collinearity. The same applies to all the mobile money innovation variables. To avoid the issue of multicollinearity in the estimations, we do not include all these variables at the same time.

4.2. Mobile money innovation and global value chain

Global value chain has become one of the major topics in economics literature specifically for middle- and lower-income economies, as there are agitations for developing economies to upgrade their productive capacities to enhance sustained growth and inclusive developments in order to benefit from GVCs participation (Naito et al. 2021; Ajide, 2023). However, this can only be achieved if private investors and business firms have adequate access to finance required to upgrade their production techniques to meet international standards.

In this section, we provide estimated results of QR technique on the effect of mobile money innovation on global value chain. Overall, our analysis shows that mobile money services can help developing nations to improve participation in GVCs. In specific, as shown in Table 4, we use *MPay* - the proportion of adults using mobile money to pay bills – to represent mobile money innovation. Across the four indicators of global value chain, the results indicate that posterior mean of *MPay* has significant and positive influence on global value chain. A 1% increase in the use of mobile money increases GVC participation within the range of 0.050% and 0.299%. Likewise, an increase in the use of mobile money to pay bills increases country's participation in domestic and foreign value added by 0.268% and 0.531% respectively. We also run the models for the other indicators of mobile money innovation -*MStore* and *MAcct*- and find no material difference from the baseline regression (see results in Tables 5 and 6). For instance, the use of mobile money store (*MStore*) as a proxy shows significant improvements in both backward GVC participation (*FVA*) and forward GVC participation (*DVX*). However, the results are heterogeneous as we move from lower GVC participations to higher GVC participations' countries. Our results demonstrate that the technology that comes with the use of online payments stimulates the international fragmentation of product from producers to the ultimate consumers.

Through mobile phone facilities, mobile money account algorithm (*MAcct*), as shown in our results can help to improve efficiency in GVC participations. Firms and individuals that formerly face financial constraints due to inability to provide annual reports and accounts or collateral for credit facilities are now feeling a sigh of relief (Suri, 2017; Aker et al. 2016). With mobile money technologies, opening accounts with the traditional bank system is not necessary before getting credit facilities. The adoption of mobile money innovations has brought a new light into the modern financial system. Furthermore, mobile money system facilitates international trade and, access to short-term credit whilst also assisting in improving investment decisions to ensure full participation in GVC system. The combination of mobile money payment system (*MPay*) and its storage facilities (*MStore*) improve financial risk sharing which are cheaper and secure, and provide a long-range international remittances within the global value chain hubs. Additionally, mobile money system enhances better allocation of finances and savings among the households and business firms to ensure better investment decision. With mobile money account (*MAcct*), transparency of financial records of customers are accessible, fostering trust in GVC's transactions and further promoting the growth of GVC's participation.

The QR results also show that *MAcct* is more effective in the overall GVC participation compared to *MPay* and *MStore*. Furthermore,

Table 2
Descriptive Statistics.

Variable	Mean	Std. Dev.	Min	Max	Obs
FVA	1.20e+07	3.70e+07	7144.02	3.40e+08	90
DVX	2.02e+07	6.75e+07	46264.3	6.80e+08	90
GVC	5.23e+07	1.85e+08	123787	1.90e+09	90
MPay	0.343	0.210	0.041	0.910	90
MStore	0.223	0.025	0.220	0.285	90
MAcct	0.257	0.175	0.120	0.791	90
GDP Per Capita	4845.787	5084.611	274.132	33422.5	90
FDI	4.171	6.928	-37.173	86.989	90
FD	0.264	0.165	0.028	0.797	90
Tariff	5.718	0.337	5.183	6.252	90
Distance	285.920	248.443	9.793	1554.24	90
HC	0.506	0.113	0.293	0.777	90
Polity	3.533	0.070	3.453	3.651	90

Table 3
Pairwise correlations.

Variables	GVC	DVX	FVA	Macct	Mstore	Mpay	Distance	Tariff	FD	GDPPC	Polity	FDI	HC
GVC	1.000												
DVX	0.988*	1.000											
FVA	0.921*	0.896*	1.000										
Macct	0.151*	0.169*	0.137*	1.000									
Mstore	0.140*	0.165*	0.154*	0.899*	1.000								
Mpay	0.183*	0.201*	0.185*	0.969*	0.956*	1.000							
Distance	-0.010	-0.008	-0.002	-0.143*	-0.101*	-0.130*	1.000						
Tariff	-0.089*	-0.106*	-0.147*	-0.187*	-0.249*	-0.258*	0.009	1.000					
FD	0.499*	0.514*	0.568*	0.356*	0.355*	0.407*	-0.028	-0.396*	1.000				
GDPPC	0.161*	0.184*	0.195*	0.499*	0.440*	0.522*	-0.022	-0.346*	0.578*	1.000			
Polity	-0.146*	-0.147*	-0.083*	0.047	0.097*	0.081*	0.003	-0.173*	0.039	-0.105*	1.000		
FDI	-0.075*	-0.083*	-0.075*	-0.028	-0.018	-0.026	0.060	0.076	-0.164*	-0.104*	0.082*	1.000	
HC	0.162*	0.172*	0.112	0.292*	0.358*	0.373*	-0.012	-0.425*	0.299*	0.316*	-0.051	0.025	1.000

*** p<0.01, ** p<0.05, * p<0.1

Table 4
 QR of Mobile Money Innovation (Mpay) and Global Value Chain
 Mpay means the proportion of adults using mobile money to pay bills.

	Foreign Value Added (FVA)				Indirect Value Added (DVX)				Global value chain (GVC)				VIF
	Q.25	Q.50	Q.75	Q.90	Q.25	Q.50	Q.75	Q.90	Q.25	Q.50	Q.75	Q.90	
Mpay	0.390*	0.268**	0.531**	-0.053	-0.006	0.178*	0.071*	0.072*	-0.157	0.058*	0.258*	0.299**	1.68
	(0.050)	(0.045)	(0.023)	(0.851)	(0.994)	(0.065)	(0.089)	(0.079)	(0.815)	(0.087)	(0.059)	(0.025)	
Distance	6.790	-6.724	12.442	-35.698	-48.821	79.926	-32.987	7.655	-56.529	1.943	-80.780	-16.646	1.01
	(0.981)	(0.969)	(0.954)	(0.793)	(0.894)	(0.671)	(0.900)	(0.955)	(0.860)	(0.992)	(0.730)	(0.895)	
Tariff	-0.007	-0.013	-0.071**	-0.075***	0.027	-0.0007	-0.052*	-0.091***	-0.001	0.011	-0.048*	-0.077***	1.54
	(0.805)	(0.479)	(0.004)	(0.000)	(0.513)	(0.974)	(0.078)	(0.000)	(0.968)	(0.569)	(0.070)	(0.000)	
GDPPC	-0.00002	2.31e-06	0.00001	.000017	0.799	-0.445	0.236	-0.906	-0.00001	-0.00001	0.881	0.814	2.12
	(0.356)	(0.886)	(0.597)	(0.168)	(0.816)	(0.801)	(0.923)	(0.459)	(0.708)	(0.514)	(0.968)	(0.995)	
FDI	-0.0511	-0.0505	-.0429	-0.00696	-.0102	-0.076***	-0.0630**	-0.090***	-0.053	-0.058**	-0.084***	-0.044***	1.09
	(0.125)	(0.015)	(0.094)	(0.666)	(0.814)	(0.001)	(0.045)	(0.000)	(0.167)	(0.009)	(0.003)	(0.004)	
HC	1.684	.7424	.302	.3813	.75245	.5730	.3090	-.2092	.937	.858	.410	.5192	1.40
	(0.097)	(0.234)	(0.697)	(0.438)	(0.571)	(0.401)	(0.744)	(0.673)	(0.421)	(0.197)	(0.629)	(0.258)	
Polity	.0090	-.00027	.02673	.02991	-.0198	-.007	.0103	.0071	-.0232	-.0046	.0088	.0180	1.17
	(0.611)	(0.980)	(0.052)	(0.001)	(0.393)	(0.505)	(0.533)	(0.414)	(0.257)	(0.690)	(0.552)	(0.027)	
FD	4.514***	3.7877***	3.891***	3.277***	4.689***	3.905***	3.462***	2.901***	4.317***	3.824***	3.347***	3.174***	1.92
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Constant	-12.545	21.369	-24.52	93.732	124.196	-190.99	87.371	-11.407	144.152	.853	205.231	48.052	Mean VIF= 1.49
	(0.985)	(0.960)	(0.963)	(0.779)	(0.890)	(0.680)	(0.892)	(0.973)	(0.855)	(0.998)	(0.721)	(0.877)	
Pseudo R2	0.320	0.424	0.483	0.494	0.264	0.416	0.429	0.488	0.264	0.407	0.428	0.492	
No. of Ob	90	90	90	90	90	90	90	90	90	90	90	90	

NB: VIF means variance inflation factor

*** p<0.01,

** p<0.05,

* p<0.1

Table 5
QR of Mobile Money Innovation (Macct) and Global Value Chain
 Macct means the proportion of adults having mobile money accounts.

	Foreign Value Added (FVA)				Indirect Value Added (DVX)				Global value chain (GVC)				VIF
	Q.25	Q.50	Q.75	Q.90	Q.25	Q.50	Q.75	Q.90	Q.25	Q.50	Q.75	Q.90	
Macct	1.151** (0.040)	0.234* (0.060)	-0.478 (0.259)	0.0380* (0.089)	0.455** (0.027)	0.114* (0.078)	0.112* (0.083)	0.022* (0.092)	0.462** (0.049)	0.121* (0.075)	0.082* (0.086)	0.282** (0.028)	1.49
Distance	47.004 (0.858)	80.124 (0.708)	6.263 (0.975)	-37.054 (0.782)	-69.071 (0.843)	92.670 (0.635)	-61.432 (0.810)	-18.419 (0.867)	-36.775 (0.911)	25.838 (0.890)	-86.714 (0.720)	-9.767 (0.939)	1.01
Tariff	0.003 (0.900)	-0.017 (0.463)	-0.074*** (0.002)	-0.075*** (0.000)	0.025 (0.523)	-0.002 (0.942)	-0.070** (0.017)	-0.096*** (0.000)	0.006 (0.869)	0.014 (0.487)	-0.050* (0.066)	-0.076*** (0.000)	1.55
GDPPC	-0.036 (0.873)	0.328 (0.869)	0.624 (0.739)	0.00001 (0.214)	0.000013 (0.666)	-0.045 (0.803)	-0.053 (0.822)	-0.0001 (0.198)	-0.106 (0.972)	-0.0518 (0.976)	-0.171 (0.939)	-0.0056 (0.996)	2.03
FDI	-0.036 (0.248)	-0.059** (0.022)	-0.045* (0.062)	-0.006 (0.699)	-0.007 (0.866)	-0.079** (0.005)	-0.061** (0.044)	-0.086*** (0.000)	-0.036 (0.358)	-0.052** (0.020)	-0.079** (0.007)	-0.044** (0.004)	1.09
HC	2.953*** (0.000)	0.931 (0.224)	0.498 (0.494)	0.518 (0.280)	0.475 (0.702)	0.577 (0.408)	0.319 (0.726)	-0.008 (0.983)	0.976 (0.406)	0.928 (0.164)	0.254 (0.768)	0.497 (0.274)	1.36
Polity	0.003 (0.825)	-0.001 (0.933)	0.027** (0.032)	0.029*** (0.001)	-0.018 (0.404)	-0.006 (0.605)	0.014 (0.379)	0.008 (0.204)	-0.019 (0.347)	-0.002 (0.825)	0.011 (0.455)	0.017** (0.030)	1.16
FD	3.790*** (0.000)	3.922*** (0.000)	3.881*** (0.000)	3.254*** (0.000)	5.054*** (0.000)	3.926*** (0.000)	3.325*** (0.000)	2.818*** (0.000)	4.300*** (0.000)	3.809*** (0.000)	3.295*** (0.000)	3.159*** (0.000)	1.93
Constant	-112.173 (0.862)	-192.106 (0.714)	-9.487 (0.985)	96.985 (0.768)	174.037 (0.839)	-222.243 (0.643)	157.438 (0.802)	52.610 (0.846)	95.501 (0.906)	-57.893 (0.899)	219.867 (0.712)	31.1409 (0.920)	Mean VIF= 1.45
Pseudo R2	0.357	0.4299	0.483	0.494	0.266	0.415	0.431	0.498	0.266	0.407	0.427	0.491	
No. of Ob	90	90	90	90	90	90	90	90	90	90	90	90	

NB: VIF means variance inflation factor .

*** p<0.01,

** p<0.05,

* p<0.1

Table 6

QR of Mobile Money Innovation (Mstore) and Global Value Chain

Mstore means the proportion of adults using mobile money to store or save money.

	Foreign Value Added (FVA)				Indirect Value Added (DVX)				Global value chain (GVC)				VIF
	Q.25	Q.50	Q.75	Q.90	Q.25	Q.50	Q.75	Q.90	Q.25	Q.50	Q.75	Q.90	
Mstore	-0.494 (0.515)	0.360** (0.035)	0.241* (0.064)	-0.060 (0.872)	0.009* (0.099)	0.277* (0.054)	0.088 (0.892)	0.100* (0.075)	0.189* (0.082)	0.051 (0.905)	0.096* (0.0871)	0.324** (0.0285)	1.52
Distance	2.822 (0.993)	2.339 (0.988)	-141.151 (0.503)	-35.723 (0.815)	-48.785 (0.893)	85.282 (0.647)	-31.230 (0.906)	10.733 (0.934)	-27.163 (0.938)	-2.1594 (0.990)	-52.784 (0.827)	-47.428 (0.699)	1.01
Tariff	-0.006 (0.853)	-0.014 (0.419)	-0.089*** (0.000)	-0.075*** (0.000)	0.027 (0.505)	0.001 (0.951)	-0.054** (0.067)	-0.092*** (0.000)	0.002 (0.964)	0.012 (0.515)	-0.049* (0.070)	-0.077*** (0.000)	1.53
GDPPC	-0.00002 (0.417)	0.429 (0.773)	0.669 (0.736)	0.00001 (0.222)	0.807 (0.815)	-0.302 (0.863)	0.014 (0.953)	-0.945 (0.439)	-0.00002 (0.639)	-0.00001 (0.539)	-0.024 (0.912)	-0.161 (0.989)	2.13
FDI	-0.043 (0.235)	-0.048** (0.012)	0.016 (0.137)	-0.006 (0.704)	-0.010 (0.813)	-0.077** (0.001)	-0.060* (0.059)	-0.090*** (0.000)	-0.057 (0.167)	-0.057** (0.007)	-0.078** (0.07)	-0.042** (0.007)	1.10
HC	1.635 (0.143)	0.784 (0.169)	0.687 (0.365)	0.380 (0.489)	0.754 (0.563)	0.563 (0.402)	0.284 (0.765)	-0.217 (0.642)	0.946 (0.449)	0.867 (0.167)	0.292 (0.736)	0.472 (0.286)	1.38
Polity	0.008 (0.646)	-0.003 (0.759)	0.016 (0.203)	0.030** (0.002)	-0.019 (0.385)	-0.009 (0.443)	0.011 (0.506)	0.007 (0.383)	-0.014 (0.497)	-0.004 (0.701)	0.012 (0.411)	0.020** (0.010)	1.15
FD	4.632*** (0.000)	3.785*** (0.000)	3.504*** (0.000)	3.264*** (0.000)	4.688*** (0.000)	3.896*** (0.000)	3.458*** (0.000)	2.871*** (0.000)	4.440*** (0.000)	3.822*** (0.000)	3.300*** (0.000)	3.1460*** (0.000)	1.85
Constant	-2.859 (0.997)	-0.900 (0.998)	352.596 (0.495)	93.793 (0.802)	124.107 (0.889)	-204.155 (0.656)	83.041 (0.898)	-18.950 (0.953)	71.8752 (0.933)	10.919 (0.980)	136.513 (0.818)	123.640 (0.682)	Mean VIF= 1.46
Pseudo R2	0.319	0.426	0.480	0.4940	0.264	0.417	0.430	0.487	0.264	0.407	0.427	0.493	
No. of Ob	90	90	90	90	90	90	90	90	90	90	90	90	

NB: VIF means variance inflation factor.

*** p<0.01,

** p<0.05,

* p<0.1

MPay is more effective in the backward GVC (FVA) while *Mstore* is forward GVC (DVX) as demonstrated in Tables 5 and 6 respectively. Another interesting fact about the result is that the higher the coefficients of *MAcct* the higher the GVCs' participation as we move from lower quantile (25th) to higher quantile (90th). We also observe similar fact in the results that contain *MPAY* and *MSTORE* variables. The likely reasons could be that, with the adoption of mobile money innovations, financial transactions are more traceable and facilitate better identification and anti-money laundering regulations become easier. This has encouraged further interconnections among multinational firms and countries in GVCs. This is consistent with the submission of Hassan (2023) who provides that mobile money system has increased entrepreneurial activities across developing nations, removes financial constraints, guarantees lines of credits and boost firms' interconnection with their customers (Aron, 2018). It therefore appears that financial innovation, through mobile money innovation, bridges the gap between producers and end users.

The findings of this study indicate that there is a positive relationship between the three measurements of mobile money innovations and global value chain participation in developing economies. Specifically, the results suggest that increasing mobile money innovations up to certain thresholds can lead to an increase in global value chain participation in these economies. Furthermore, our control variables also conform to a priori expectations and are in tandem with prior research. For instance, findings from study of Efogo (2020) resonate that traditional financial services stimulate GVCs' participation. This is also confirm to the coefficients of *FD* in our QR estimations irrespective of the quantile levels (25th to 90th). Our findings align with the existing body of research on global value chains, as demonstrated by previous studies conducted by *Donova Del Prete et al. (2018)*, *Dovis et al. (2020)*, *Efogo et al. (2021)*, and *Ajide (2023)*. Hence, the formulation of policies aimed at promoting the adoption of mobile money applications would significantly contribute to enhancing engagement in GVCs. Based on our research findings, it is imperative for policymakers to capitalise on the availability of physical and social infrastructures that are crucial for enhancing mobile phone accessibility. Furthermore, governmental measures can be implemented to create a favourable market environment that reduces tariffs, mitigates limitations, and promotes the adoption and utilisation of mobile money applications. The utilisation of these enhancements can be efficiently leveraged for involvement in GVCs.

5. Conclusion

This study examines how mobile money innovations affect global value chain participation using data for 90 developing economies. Our findings reveal that mobile money as a form of mobile money innovation, has significant positive effect on participation in global value chains. We also show that economic and governance factors such as level of education, GDP per capita and distance positively enhances GVC participation. We further demonstrate that the impact of mobile money innovation is more pronounced for developing countries with higher level of participations. We recommend that other regions invest significantly in infrastructure to facilitate the wide-spread adoption of mobile money innovations. Future research may explore the roles of infrastructure and pre-prevailing socio-economic conditions in mitigating the success of mobile money innovations on GVCs. Analysis of the value chain position of individual countries and regional heterogeneity factors such as income levels could be an interesting area for future studies.

CRedit authorship contribution statement

Folorunsho M. Ajide: Conceptualization, Formal analysis, Investigation, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing. **Rilwan Sakariyahu:** Conceptualization, Formal analysis, Investigation, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing. **Rodiat Lawal:** Conceptualization, Formal analysis, Investigation, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing. **Oyebola Fatima Etudaiye-Muhtar:** Conceptualization, Formal analysis, Investigation, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing. **Sofia Johan:** Conceptualization, Formal analysis, Investigation, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

None.

Data availability

Data will be made available on request.

References

- Acemoglu, D., Johnson, S., Robinson, J.A., 2001. The colonial origins of comparative development: an empirical investigation. *Am. Econ. Rev.* 91 (5), 1–20.
- Ajide, F.M., 2023. Global value chain and total factor productivity in Africa. *Organ. Mark. Emerg. Econ.* 14 (1), 26–55. <https://doi.org/10.15388/omee.2023.14.81>.
- Aker, J.C., Boumniel, R., McClelland, A., Tierney, N., 2016. Payment mechanisms and antipoverty programs: evidence from a mobile money cash transfer experiment in Niger. *Econ. Dev. Cult. Change* 65, 1–37.
- Alhassan, A., Zoaka, J.D., Ringim, S.H., 2021. Africa as headwaiter at the dining table of global value chains: Do institutions matter for her participation? *Afr. Dev. Rev.* 33 (3), 560–576. <https://doi.org/10.1111/1467-8268.12592>.
- Antràs, P., 2019. Conceptual aspects of global value chains. *World Bank Econ. Rev.* 34 (3), 551–574.

- Aron, J., 2018. Mobile money and the economy: a review of the evidence. *World Bank Res. Obs.* 33, 135–188.
- Asongu, S., Odhiambo, N., 2022. The role of mobile characteristics on mobile money innovations. *Qual. Quant.* 56 (6), 4693–4710.
- Asongu, S.A., 2017. Conditional determinants of mobile phones penetration and mobile banking in sub-Saharan Africa. *J. Knowl. Econ.* 9 (1), 81–135.
- Asongu, S.A., Biekpe, N., Cassimon, D., 2021. On the diffusion of mobile phone innovations for financial inclusion. *Technol. Soc.* 65, 101542.
- Billger, S.M., Goel, R.K., 2009. Do existing corruption levels matter in controlling corruption? Cross-country quantile regression estimates. *J. Dev. Econ.* 90 (2), 299–305.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., Hess, J., 2018. *The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution*. The World Bank.
- Donova Del Prete, D., Giovannetti, G., Marvasi, E., 2018. Global value chains: new evidence for North Africa. *Int. Econ.* 153, 42–54. <https://doi.org/10.1016/j.inteco.2017.03.002>.
- Donovan, K., 2012. Mobile money for financial inclusion. *Inf. Commun. Dev.* 61 (1), 61–73.
- Dorflleitner, G., Nguyen, Q., 2022. Mobile Money for Women's Economic Empowerment: the Mediating Role of Financial Management Practices. *Review of Managerial Science*. <https://doi.org/10.1007/s11846-022-00564-2>.
- Dorflleitner, G., Nguyen, Q.A., Röhe, M., 2019. Microfinance institutions and the provision of mobile financial services: first empirical evidence. *Financ. Res. Lett.* 31, 357–362.
- Dovis, M., Zaki, C., 2020. Global value chains and local business environments: which factors really matter in developing countries? *Rev. Ind. Organ.* <https://doi.org/10.1007/s11151-020-09768-w>.
- Efogo, O.F., 2020. *Financial development and African participation in global value chains*. *Financing Africa's Development*. Springer, Cham, Denmark, pp. 33–52.
- Efogo, O.F., Kwami, O., Wonyra, E.O., 2021. Foreign direct investment and participation of developing countries in global value chains: lessons from the last decade. *Int. Rev. Appl. Econ.* <https://doi.org/10.1080/02692171.2021.1962255>.
- GSMA. 2017. State of the industry report on mobile money. Retrieved from https://www.gsma.com/mobil-efordevelopment/wp-content/uploads/2017/03/GSMA_Haasan_R_2023_Does_mobile_money_adoption_increase_informal_business_performance_in_Zambia.pdf. *J. Knowl. Econ.* 1–15. <https://doi.org/10.1007/s13132-023-01205-z>.
- Ignatenko, A., Raei, F., Mircheva, B., 2019. *Global Value Chains: What are the Benefits and Why do Countries Participate?* International Monetary Fund, Washington, DC. IMF Working Paper 19/18.
- Koenker, R., Bassett, G., 1978. Regression quantiles. *Econometrica* 46 (1), 33–50.
- Koenker, R., Hallock, F.K., 2001. Quantile regression. *J. Econ. Perspect.* 15 (4), 143–156.
- Konte, M., Tetteh, G.K., 2023. Mobile money, traditional financial services and firm productivity in Africa. *Small Bus. Econ.* 60, 745–769. <https://doi.org/10.1007/s11187-022-00613-w>.
- Lashitew, A.A., Van Tulder, R., Liasse, Y., 2019. Mobile phones for financial inclusion: What explain the diffusion of mobile money innovations? *Res. Policy* 48 (5), 1201–1215.
- Levine, O., Warusawitharana, M., 2021. Finance and productivity growth: Firm-level evidence. *J. Monet. Econ.* 117, 91–107.
- McGowan, A., Andrews, M.D., Millot, V., 2018. The walking dead? Zombie firms and productivity performance in OECD countries. *Econ. Policy* 33 (96), 685–736.
- Naito, H., Ismailoy, A., Kimaro, A.B., 2021. The effect of mobile money on borrowing and saving: Evidence from Tanzania. *World Dev. Perspect.* <https://doi.org/10.1016/j.wdp.2021.100342>.
- OECD, 2013. *Économies Interconnectées: Comment Tirer Parti des Chaînes de Valeur Mondiales (Rapport de Synthèse en Français)*. Publication de l'OCDE, Paris, p. 65.
- Reddy, K., Chundakkadan, R., Sasidharan, S., 2021. Firm innovation and global value chain participation. *Small Bus. Econ.* 57, 1995–2015.
- Suri, T., 2017. Mobile money. *Annual Review of Economics* 9, 497–520. <https://doi.org/10.1146/annurev-econo-mics-063016-103638>.