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Résumé de l'article

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ABSTRACT

The purpose of this paper is to study the impact of Digital Business Strategy (DBS) on income inequality. This study investigates how DBS complements financial development in order to influence income inequality in a large panel of 149 countries relying on the GMM estimations for the period 2012 to 2016. Results show that digitalisation helps reduce inequality across countries that belong to the high and the medium DBS maturity levels. This paper highlights the importance of building a mature DBS both for enhancing the positive effects of technology innovation and for promoting financial development as a solution to income inequality.

Keywords: Digital Business Strategy maturity, Cluster, Inequality, Financial Development, Generalised Method of Moments (GMM)

Résumé

Le but de cet article est d'étudier comment la stratégie numérique des entreprises, associée au développement financier des pays, influence les inégalités de revenus dans un panel de 149 pays en s'appuyant sur les estimations de la méthode des moments généralisée pour la période 2012 à 2016. Les résultats montrent que le numérique contribue à réduire les inégalités entre les pays ayant une maturité numérique moyenne ou élevée. Cette recherche met en évidence le fait qu'une stratégie numérique mature renforce les effets positifs de l'innovation technologique et pour promouvoir le développement financier et ainsi réduire l'inégalité des revenus.

Mots-Clés : Maturité de la stratégie numérique des entreprises, Cluster, Inégalités, Développement Financier, Méthode des Moments Généralisée (GMM)

Resumen

El objetivo de este trabajo es investigar cómo la estrategia digital de las empresas, asociada con el desarrollo financiero de los países, influye en la desigualdad de los ingresos en un panel de 149 países utilizando estimaciones del método generalizado de momentos para el período 2012-2016. Los resultados muestran que lo digital contribuye a reducir la desigualdad entre los países que muestran una madurez digital media y alta. Esta investigación pone de relieve que una estrategia digital madura refuerza los efectos positivos de la innovación tecnológica y para promover el desarrollo financiero y así reducir la desigualdad de ingresos.

Palabras Clave: Madurez de la Estrategia de Negocio Digital, Clúster, Desigualdad, Desarrollo Financiero, Método Generalizado de Momentos (GMM)

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Information and Communication Technologies (ICT) have over the past decades been expected to improve inclusive development (UNESCO, 2016). Thus, ICTs are gaining more attention among scholars and policymakers (Ben Youssef, Boubaker, & Omri, 2018) since inclusivity is essential to most Sustainable Development Goals (SDGs) such as inequality reduction (Asongu & Odhiambo, 2020). This helps the "unbanked" who cannot access the formal financial system. Financial inclusion therefore contributes to economic growth by accumulating more savings and investment (Pearce, 2011; Cumming, Johan, & Zhang, 2014).

Most research on the impact of ICTs on income inequality has been done in middle- or low-income countries. Many of them are based on African countries' data (Kpodar & Andrianaivo, 2011; Tchamyou, Erreygers, & Cassimon, 2019) like Nigeria (Amagoh, 2016) or the general Sub-Saharan region (Asongu & Odhiambo, 2020). Similar research is now done on other developing countries (Srivastava & Panigrahi, 2016), but it generally uses a small panel, for instance Mongolia (Kwak, *& al.*, 2020), Poland (Olszewska, 2020), or Australia (Shahiduzzaman et alam, 2014).

However, in some Middle East and North Africa (MENA) countries, bank branch extension and the spread of Micro Finance Institutions (MFI) have not reduced financial exclusion and poverty. MFIs do have an impact on the standard of living, commercial banking, and economy through different mechanisms (Mushtaq & Bruneau, 2019, p. 3). However, developed financial markets and access to finance contribute to poverty reduction (Ibid., p. 3).

On the other hand, greater financial depth facilitates faster technology diffusion, particularly for higher capital-intensive technologies leading to more financial development (Comin & Nanda, 2014).

For 10 years, we have noticed more and more connections between products, services, and processes. The countries' business infrastructures integrate many more digital technologies as combinations of information, IT, communications, and technological connections.

The recent studies have employed general indicators of ICT adoption such as the ICT use or access provided to all the economic sectors (measured by subscriptions of people) (Ochara & Mawela, 2015; Asongu, 2020). Tchamyou, Erreygers, & Cassimon (2019, p. 172) propose three proxies for ICT: mobile phone penetration rate, internet penetration rate, and fixed broadband subscription.[1]

1. All three proxies are per 100 people

We could therefore define a Digital Business Strategy (DBS) as a result of the evolution of the role of ICT strategy and as a reflection of the merger between "ICT strategy" and "business strategy" (Bharadwaj *& al.*, 2013, p. 471). At a microeconomic level, the DBS is an organisational strategy formulated and executed by leveraging digital resources to create differential values.

Although the existing literature convincingly examines the association between ICT adoption and income inequality, there is a lack of empirical studies of this association using a comprehensive set of measures of DBS, specifically indicators related to digitalisation such as the scope, the scale, the speed, and the sources of business value creation at a cross-country setting. Previous studies have concentrated exclusively on the association between IT adoption and income inequality.

Responding to the research gaps identified above, this paper determines the impact of proxies related to DBS on reducing income inequality indicators. It thus adopts a novel perspective on this problem by considering how a country's DBS and associated mechanisms address (or neglect) multiple dimensions of income inequality, namely the Gini coefficient and the Palma ratio. In addition, this study examines this relationship across a sample of 149 countries classified into three clusters according to their respective DBS maturity: a high level of DBS maturity, a medium level, and a low level. Finally, this study also considers whether the interaction between DBS and financial development indicators across countries positively affects income inequality.

This leads to the following research question: does digital business strategy (DBS) constitute a robust determinant of income inequality at different levels of DBS maturity?

To answer this question, we conducted estimations using a system Generalised Method of Moments (GMM) estimator over the period from 2012 to 2016.

This study develops and empirically tests a conceptual model of income inequality that: *(i)* identifies the determinants of income inequality; *(ii)* explains the impact of DBS on enhancing the income equality; *(iii)* demonstrate the impact of financial development indicators on reducing the income inequality; *(iv)* highlights the role played by additional variables; and *(v)* provides guidance on factors that possible intervention strategies for poverty reduction could target by adopting a mature DBS.

The article is structured as follows: in section 2, the literature review is presented by explaining the importance of DBS maturity for inequality reduction in the context of this study. Therefore, the hypotheses of this research are discussed in the same segment, followed by an explanation of the methodology in section 3. Section 4 presents and discusses the empirical results.

Theoretical Insights and Hypotheses Development

Some authors suggest analysing computerisation using the digital divide with seven ICT variables to measure digital development in 45 countries (Cruz-Jesus, Oliveira, & Bacao, 2018). Micro (level of individuals) and macro (level of social structures and social and economic conditions found in the regions) reasons can explain the digital divide (Garcia-Garcia & Gil-Garcia, 2018, p. 3). At the micro-economic level, enterprises must develop mobile applications and provide internet access to consumers (Olszewska, 2020, p. 278). There are two facets of the divide—access (ethnicity, income, education, and age) and skills and capabilities (experience in the use of computers, general internet use, online purchases, and information searches on the internet) (Bélanger & Carter, 2009)—that can be considered at a macroeconomic condition (Olszewska, 2020, p. 282).

How Does Digital Business Strategy Reduce Inequality?

Many authors have strongly argued that digitalisation is radically transforming the financial sector through organisations (Fichman, Dos Santos, & Zheng, 2014; Nambisan, *& al.*, 2017; Maomao, *& al.*, 2018; Park & Mithas, 2020). All sectors of activity are thus impacted, but at different levels and ranges (Westermann, *& al.*, 2011).

In low-income countries, economic growth can only be impacted by mobile growth, but not by the rise of the Internet or the securing of Internet servers (Cheng, Chien, & Lee, 2020). In developing countries, the role of ICT in promoting financial inclusion and growth is not very promising and more investment in educating people about the usage of ICT in formal banking sector is required (Chatterjee, 2020). In the example of a developed country (Poland), Olszewska (2020, p. 288) explains how digital skill gaps may present a barrier to the digital transformation process and thus to economic growth. Some authors propose to explore issues on e-government using factors like governing, technical or organisational (Keramati, Behmanesh, & Noori, 2018), or theoretical models of innovation diffusion (Technology Acceptance Model, Diffusion of Innovation theory, and the Unified Theory of Acceptance and Use of Technology) (Amagoh, 2016).

The digital reform of the company's borders (O'Mahony & Bechky, 2008), destabilizes the established order, the relationship with stakeholders, and the speed at which companies must respond to market orders while keeping an eye on all business sectors. At the macro-economic level, digital transformation represents a channel to be financially included for people who suffer from financial constraints. Other research has found that ICT reduces transaction costs and information asymmetry, enhances economic growth, and contribute to the reduction of poverty and income inequality (Tchamyou, Erreygers, & Cassimon, 2019, p. 171). Wang & Guan (2017) show what are the factors explaining the level of financial inclusion: important factors are an individual's income, education and use of communications equipment, while financial depth and banking health status are the main determinants.

Regarding the recent studies, people who are financially included tend to be more productive while consuming and investing more (Beck, *& al.*, 2004). ICT allows easy access to financial products (Asongu & Nwachukwu, 2017; Tchamyou, Erreygers, & Cassimon, 2019, p. 171; Mushtaq & Bruneau, 2019). If Broadband and ICT, especially mobile phones and internet connections, can help fighting poverty (UNDESA, 2012), then policy variables may produce the opposite effect (Tchamyou, Erreygers, & Cassimon, 2019, p. 172). Digital banks can reduce the long time spent in queues (Ekwonwune, *& al.*, 2017). It is easy to affirm that ICT reduces inequality with the development on formal financial sector but not with informal one (Ibid., p. 182).

Economic growth and ICT development exclude some social groups from accessing financial markets (Mushtaq & Bruneau, 2019, p. 2), but increasing such access for the lower end of society would help reduce the financial infrastructure gap in low- and middle-income countries (Kpodar & Andrianaivo, 2011). Finance also propels technology development because many financial market operations are managed from computer and internet-related technologies, trading of securities in capital markets, and future-forward contracts, among others (Comin & Nanda, 2014).

Meanwhile, banking transactions have become more efficient and secure; e-banking has changed the entire banking system. With the increasing spread

of mobile phone and internet-related technologies, digital banking is progressing at a rapid pace. When it comes to the adoption and implementation of new technologies, the MFI also do not fall short. These institutions typically deal with less educated, (rural) poor, and unbanked individuals, so their ICT based solutions are largely customer oriented. On that score, Berger and Nakata (2013) revealed that MFI are switching from labour-intensive and costly social networks to ICT-based solutions. A study on OECD countries show that FinTechs can improve SME efficiency. SME can accede quickly to funds at lower interest rates avoiding intermediaries. Cultural aspects play also a role: individualistic or long-term oriented cultures should be more tailored for FinTech entrepreneurs (Abbasi, *& al*., 2021). FinTech can improve financial inclusion and reduce income inequality, but less so in low-income countries because access to financial services is complicated by the absence of good infrastructure and appropriate consumer protection regulations (Demir, *& al*., 2020).

The finance and inequality literature mentions for corruption control, government consumption expenditure, remittances, and primary education (Beck, *& al*., 2007; Ssozi & Asongu, 2016; Tchamyou, 2019). The control of corruption is an institutional governance factor that is anticipated to increase equality. According to the recent literature, remittances are generally used for consumption purposes and can be anticipated to diminish the inequality indicators; the actual impact on income distribution depends on whether the bulk of the remittances are destined to the poorer people in the population. Although compared to other levels of education, primary education has been recognised to positively affect development externalities in countries at the initial stages of industrialisation (Asiedu, 2014), the overall outcome may be reliant on several factors, such as the education quality in a country and importance of primary education in the job market relative to other educational levels.

There are also negative effects of ICT penetration on poor households because they might spend a greater portion of their earnings on mobiles, Subscriber Identity Module (SIM) cards and recharging pre-paid connections. This increases the share of household or personal budget on mobile and Internet-based technologies instead of utilising for other basic needs (food, health, and education) (Mushtaq & Bruneau, 2019, p. 2). However, ICT facilitates communications and transactions between banks with tools like the SIM as a virtual bankcard or the Automated Teller Machine (ATM) for transaction purposes (Asongu & Nwachukwu, 2017). It is therefore necessary to understand the interactions between technology and other factors to expand financial inclusion and thus reduce poverty and inequality.

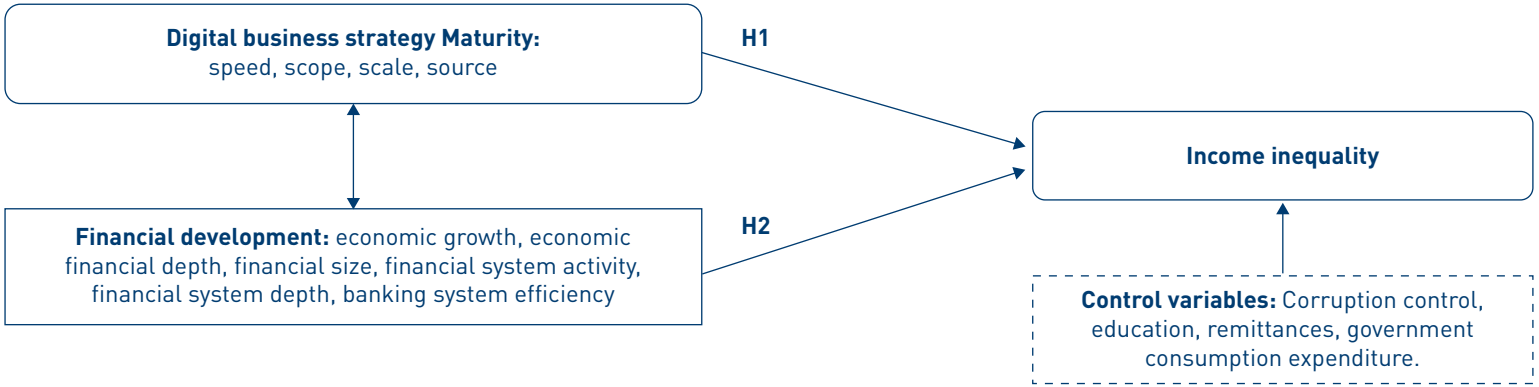
The concept of digitising encompasses and catalyses many concepts (digitisation, computerisation, automation, etc.). However, at a macro-economic level, four key dimensions characterise a DBS (Bharadwaj, *& al*., 2013). Firstly, the scope of the changes brought about is unprecedented: all or many parts of the organisation are concerned. Secondly, the scale of information in transactions with stakeholders is increased tenfold because of the multiplication of interfaces between the company and its environment. Thirdly, the speed of these changes is brutal: the transformations can be very rapid and cause a restructuring of rapid resources. Finally, the sources of change are multiple: competition is exacerbated and polymorphic. As far as the scope is concerned, the changes brought by the digital transformation can call into question historic players who were believed to be well established and unbeatable. Hence, digitalisation can blur the boundaries of competition. The emergence of the multichannel commerce and the associated consumption behaviours require actors of the distribution to revise their business models.

In terms of the scale of information transactions, it is the flow of information that is increased tenfold due to the variety of interfaces between companies and their environment. They must now re-examine their internal processes and respond to new requests via Facebook or Twitter.

These four themes (4S model) are used to guide the discussion and analysis of the nature, role, and emergence of a DBS in an organisation (Ibid., p. 472). The term "Digital Business Strategy" has different meanings depending on the visions of the authors. In this context, Singh, Gaur, and Agarwal (2017) postulate that the scope and scale of the concept are nuanced in the literature.

Recent studies highlight the urgent need for the reconceptualization of the role of digital connections within a firm's portfolio to better prescribe its DBS under increased digital conditions (Bharadwaj, & al., 2013). Moreover, a positive correlation appears between the instability of financial development and its level, and on average financial development is more profitable to the poorer people in countries with stable financial systems. Kwak, *& al*. (2020) support the idea that there is a digital divide between a developed and a developing country that is still expanding. There have been increasing international tests

FIGURE 1
Digital business strategy, financial development, and income inequality



to explore this gap; one such attempt evaluates the IT maturity level of each developing country and improves the weaknesses recognised.

Hence, the corresponding testable hypothesis is:

H1. Income inequality is dependent on the level of Digital Business Strategy maturity

Financial Development Affects Income Inequality

Some authors argue that financial development does not significantly influence poverty due to the business cycle of some countries during the 1980s and to unstable growth rates and/or the weakness of the financial environment and systems (Ben Naceur & Ghazouani, 2006; Fowowe & Abidoye, 2013, p. 13). In poor countries, many gains from growth are transferred to the non-poor people (Fowowe & Abidoye, 2013, p. 2). Poor households do not benefit from microfinance (Uddin, *& al.*, 2014). Financial development and economic growth do not therefore seem to contribute to inequality reduction, but inequality reduction leads to financial development.

Financial liberalisation does not have a positive impact on inequality and poverty (Zhang & Ben Naceur, 2019, p. 12). Financial development can, however, positively benefit economies in the MENA region once a level of ICT development is reached. At first, only the rich can take advantage of sophisticated financial institutions, and then an extension of the financial structure is reachable by poor people (D'Onofrio, Minetti, & Murro, 2019, p. 14; Destek, Sinha, & Asumadu Sarkodie, 2020). Strong economic growth and appropriate policies for income distribution are the two conditions to reduce poverty and inequalities (Khemili & Belloumi, 2018, p. 16).

Some suggest that accelerating financial reforms (launched since the mid-1980s) stimulate saving/investment and, consequently, long-term economic growth (Abu-Bader & Abu-Qarn, 2008). Specifically, five dimensions of financial development can reduce income inequality and poverty: growth, access, depth, efficiency, and stability (Zhang & Ben Naceur, 2019). Financial development has an impact on the socioeconomic structure, such as urbanisation and geographical mobility, and material and immaterial infrastructures impact income inequality by giving more investment opportunities to the poor (D'Onofrio, Minetti, & Murro, 2019, p. 7).

The relationship between financial development and poverty could either be direct (the poor can accede to credit and can consume and invest) or indirect (financial intermediaries can better channel funds from savers to investors and more efficient uses) (Fowowe & Abidoye, 2013, p. 3). There should be no relationship between the "supply-leading" and the "demand-leading" and no strong support for a bidirectional view. Situations are country-specific with variations due to different policies and institutions and measurement of financial development. Abu-Bader & Abu-Qarn (2008) demonstrate that in one study Israel is the only one of six countries where there is no causality from financial development to economic growth. Meanwhile, Tita and Meshach (2016) show no or non-linear relationships between financial development and income inequality, except for the Ivoirian context.

Given these insights, the following testable hypothesis can be formulated:

H2. Income inequality is linked to financial development

See the conceptual model in Figure 1.

Additional Variables Affecting Inequality Reduction

Some situations or phenomena could mitigate the effects of financial development on inequality reduction like political instability, corruption, or incomplete and erratic regulation of financial institutions (Akhter, Liu, & Daly, 2010, p. 11; Cepparulo, Cuestas, & Intartaglia, 2016). These additional variables (corruption control, education, remittances) can interact with financial development to promote economic growth and to reduce income inequality. In addition, the selection of variables is supported by the previous papers (Ahlin & Pang, 2008; Akhter, Liu, & Daly, 2010; Asongu & Odhiambo, 2020; Tchamyou, Erreygers, & Cassimon, 2019; Amari, Baklouti, & Mouakhar, 2020). Lannon (2016) works on ICT project evaluation using capacity building and information management solutions.

Data, Construct Validity, and Methods

The purpose of this research was to evaluate the influence of the DBS adoption across clusters of countries included in our study according to their digital maturity category. A principal component analysis was used to reduce the dimensions of DBS components before dynamic panel GMM estimation techniques are employed to examine the nexus. Then, this study adopted the two-step system GMM in order to resolve the inherent problems of endogeneity and persistence in economic data. The robustness of the results was assessed using several measures of financial development and dividing the sample into clusters. The motivation for the temporal scopes is determined by constraints in data available when the study was conducted.

Sample and Data collection

To investigate the impact of DBS on the reduction of income inequality; we are consistent with the previous papers in merging data collected from various sources (Omri, *& al.*, 2015; Asongu & Nwachukwu, 2017; Neaime & Gaysset, 2017; Tchamyou, Erreygers, & Cassimon, 2019; Omri & Bel Hadj, 2020; Omri, *& al.*, 2019; Mushtaq & Bruneau, 2019; Amari, Baklouti, & Mouakhar, 2020; Asongu, 2020). Data was collected from the World Economic Forum (WEF); the second set contains macroeconomic indicators (World Development Indicators: WDI and worldwide governance indicators: WGI)[2] from the World Bank Data Centre[3]. Required data about Information and Communication Technologies (ICT) was uploaded from the International Telecommunications Union (ITU) and Global Information Technology Report (GITR) databases[4].

The study applies the dynamic system GMM on a panel of 149 countries for the period of 2012 to 2016. In Table A1 (see appendix), we explain the different sources of data and present short definitions of all variables used in this research. In Table A2 (see appendix) we make available the list of countries along with regions and income levels.

Construct Validity

In order to evaluate the influence of the DBS adoption between clusters of countries included in our study according to their digital maturity category, two statistical methods were used: Exploratory Factor Analysis (EFA) and cluster analysis. Firstly, Cronbach's alpha and explorative factor analysis (EFA) were employed to evaluate the reliability of variables. Secondly, cluster analysis was conducted using the standardised factor scores from the exploratory factor analysis as variables. Hierarchical cluster analysis was used to identify the number of clusters, discover outliers, and profile the cluster centres. STATA and SPSS statistical software packages were employed for the two steps of the estimation.

Establishing the Dimensions of DBS: Confirmatory Factor Analysis

Principal Components Analysis (PCA) was used to bundle the four DBS variables into composite indices (see table A3 in appendix). The PCA is a statistical technique generally adopted to diminish highly interrelated indicators into a smaller set of indexes. To handle the variables, the 16-item questionnaire was factor analysed. The questions about the impact of digital adoption in the government and business environment were compiled based on previous studies (confirmatory analysis was carried out).

The objective of the exploratory factor analysis was to extract only the factors whose Eigen value was superior to 1. Hence, the maximum likelihood technique was employed to extract the factors. To support the interpretation of the factors, the Varimax rotation technique was carried out, and the whole explained variation is 81.78%. The explained variations of each factor are the following: 64.72%, 9.23%,

2. We collected data from: https://info.worldbank.org/governance/wgi/.

3. and: https://databank.worldbank.org/source/world-development-indicators

4. We collected data from: https://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf.

and 7.82%. Table 1 presents the three factors identified by the factor analysis of the digital business level of the countries included in our sample. Following the construct validity test as presented above, the three factors produced by the principal components analysis were further tested for reliability using Cronbach's alpha (α).

TABLE 1
ANOVA statistics

	Cluster		Error		F	Sig.
	Mean	ddl	Mean	ddl		
Speed	115,377	3	.375	549	307,679	.000
Scope and scale	10,321	3	.949	549	10,875	.000
Source	125,124	3	.322	549	388,915	.000

We then analysed the four factors of a DBS from Bharadwaj, *& al*. (2013). The composite nature of factor F1 (Cronbach's alpha = 0.778), can be termed "speed". The second factor F2 (Cronbach's alpha = 0.910) contained altogether seven items, and F2 was termed "scope and scale". The third factor (Cronbach's alpha = 0.844) contained six items that referred to E-Participation Index ICT use and government efficiency, etc. Based on the adjectives in this group, F3 was called "source".

The results of the confirmatory factor analysis reveal only three factors of related to the DBS theme, namely: speed, scope and scale, and source (see Table A4 in appendix).

After estimating the reliability of scales by Cronbach's alpha, all 16 items were employed in the exploratory factor analysis (EFA). The results of testing the validity of measures (variables) by the exploratory factor analysis show that KMO = 0.847 and that Sig. (Bartlett's Test) = 0.000 <0.005. Thus, all scales are appropriate.

Empirical Taxonomy: Hierarchical Cluster Analysis

After establishing the factors, hierarchical cluster analysis was used to reveal the relations among the DBS levels of the countries. For the measure of distance, the usual standard deviation was used for uniting the clusters the Ward model was used as a hierarchical method (see Table 2).

According to Table A5 (see appendix), the technological environment of the countries included in our study indeed forms a homogenous group. The DBS levels of the examined countries can be divided into three clear clusters: high, medium, and low digital maturity (Kulichkina, 2020). Firstly, we applied the hierarchical classification (Ward's method) to allow us to maintain three clusters of countries[5] (Mouakhar & Tellier, 2017). We then proceeded with a K-means (non-hierarchical) categorisation to discover relatively homogenous countries concerning their DBS maturity intensity. Ward's method results proposed the following distribution of observations: 274 observations for the first cluster,

TABLE 2
Descriptive statistics for the final clusters

The number of the cluster	The name of the cluster	The item number of the cluster	The proportion of the clusters	Cluster 1	Cluster 2	Cluster 3
Cluster 1	A country with a high level of Digital maturity intensity	274	36.69%		1,836	1,780
Cluster 2	A country with a medium level of Digital maturity intensity	166	22.22%	1,836		2,123
Cluster 3	A country with a low level of Digital maturity intensity	115	15.39%	1,780	2,123	
Not. Class	Not classified	193	25.70%			

5. The relative sizes of the classes must be relevant (a minimum of 10% of the sample and balanced groups).

166 for the second cluster, and 115 for the third cluster. In the next step, we analysed variance (ANOVA) to assess classification quality. In Table A5, we reiterate the results attained a level of significance set at 95%. A Scheffe test (F) was also employed to get the required information in detail about the contribution of each variable to the separation of the groups. This technique show that the three variables are discriminating. The variables' average values all presented considerable differences between the three classes identified in the previous step.

Methodology

Due to the high number of periods (five from 2012 to 2016) for each of the 149 countries, we adopted the GMM estimation technique conducted by STATA 16 in the next step of the estimation methodology (Srivastava & Panigrahi, 2016; Asongu, 2020; Tchamyou, Erreygers, & Cassimon, 2019). Hence, the cross-sections are exceeding the period. Consequently, it is apparent that five years less than 149 countries in terms of numerical value.

Table A6 (see appendix) summarises the descriptive statistics. Information obtained reports that the average Gini of the sample is 0.4528, while its standard deviation narrowed by 0.1035. It shows that the mean value of the Palma ratio of the sample of countries included in the sample is 3,339. The mean of financial development indicators employed in the empirical analysis equals 24.87 for economic growth, 3.74 for financial activity, 4.44 for banking efficiency, 4.49 for financial size, 3.96 for economic financial depth, 2.48 for speed, 2.36 for scope and scale, and 2,051 for source. Data present that the highest score of the Gini index is Kazakhstan and Lebanon with their low levels of business digitalisation strategy. Contrarily, Norway, Belgium, and Denmark are the countries with a low Gini index and high DBS.

Based on the correlation matrix presented in Table 3, we can confirm that the independent and the control variables are both positively associated with income inequality. The descriptive statistics reveal that the United Arab Emirates has achieved the highest score of technology speed and that the Russian Federation is the highest in scope and scale scores. Furthermore, there are some outlier observations due to the unbalanced panel (which justify the 0 and 1 as values in some data). In the next step of the estimation techniques, all the independent variables were integrated since there were no high correlations between them. According to the goodness of fit information, the explanatory capacity of the models was verified. The model often has a dynamic effect, being connected to its earlier value. Thus, it has been reported in recent empirical studies that researchers should consider the dynamic effect when conducting times series estimation. This is usually established by adding a lagged dependent variable as an explanatory in the model.

Hence, the correlation matrix (Table 3) shows that the correlation value between their levels and first difference is higher than the established value of thumb for confirming persistence (Tchamyou, Erreygers, & Cassimon, 2019; Omri, *& al*., 2019; Amari, Baklouti, & Mouakhar, 2020; Asongu, 2020).

This matrix displays the correlations between the index of income inequality and the independent variables. The proxies for financial development and the DBS are all significantly correlated with the dependent variables, though the sizes of the correlations are not high. Although they are informative, these simple correlations provide little insight in terms of a causality. To examine that, we turn to the dynamic GMM estimations, where $INQ_{i,t}$ is an income inequality indicator of country i at period t; σ_0 is a constant, FD represents financial development in the country i at period t; DBS represents digital business strategy in the country i at period t; is a constant; τ represents the coefficient of autoregression, which is one in our case; W is the vector of control variables; γ_i is the country-specific effects; and υ_i is the time-specific constant. Finally, our panel data structure is consistent with the GMM method.

The standard GMM equations in levels (1) and first difference (2) can be summarized as follows:

$$\boldsymbol{INQ_{i,t} = \sigma_0 + \sigma_{01}\, INQ_{i,t-\tau} + \sigma_2 DBS_{i.t} + \sum_{h=1}^{K} \delta_h W_{h,i,t-\pi} + \sigma_3 FD_{i.t} + + \gamma_i + \vartheta_t + \mathcal{E}_{i,t}} \quad (1)$$

$$\boldsymbol{INQ_{i,t} - INQ_{i,t-\tau} = \sigma_1 \left(INQ_{i,t-\tau} - INQ_{i,t-2\tau}\right) + \sigma_2 \left(FD_{i,t} - FD_{i,t-\tau}\right) + \sigma_3 \left(DBS_{i,t} - DBS_{i,t-\tau}\right) + \sum_{h=1}^{K} \delta_h \left(W_{h,i,t-\tau} - W_{h,i,t-2\tau}\right) + \left(\vartheta_t - \vartheta_{t-\tau}\right) + \left(\varepsilon_t - \varepsilon_{t-\tau}\right)} \quad (2)$$

TABLE 3
Correlation matrix

Variables	GINI	PALM	SPEED	SCOPE	SOURCE	LNGDP	LNFSAC~Y	LNBSEFFI	LNFSIZE	LNFSDE~H	LNEFDE~H	CC	GOVCONS	EDUC	REM
GINI	1														
PALMARATIO	0.927	1													
SPEED	-0.452	-0.341	1												
SCOPE	0.176	0.123	-0.097	1											
SOURCE	0.046	0.015	0.032	-0.008	1										
LNGDP	-0.157	-0.164	0.439	-0.516	0.369	1									
LNFSACTIVITY	0.403	0.158	0.273	-0.215	0.083	0.157	1								
LNBSEFFI	-0.311	-0.397	0.009	0.164	-0.061	0.018	-0.115	1							
LNFSIZE	0.105	0.148	0.0556	0.101	-0.142	-0.080	0.466	0.132	1						
LNFSDEPTH	0.253	0.396	0.122	-0.174	0.019	0.008	0.683	-0.173	0.321	1					
LNEFDEPTH	0.124	0.290	0.002	-0.168	0.002	0.052	0.342	0.029	0.299	0.212	1				
CC	-0.233	-0.014	0.397	-0.111	-0.061	0.050	0.626	-0.003	0.332	0.399	0.312	1			
GOVCONS	-0.361	-0.164	0.480	-0.356	-0.079	0.140	0.250	-0.092	-0.099	0.286	0.088	0.382	1		
EDUC	-0.087	-0.011	0.267	-0.390	0.083	0.305	0.600	-0.012	0.3014	0.494	0.231	0.589	0.24	1	
REM	0.115	0.041	-0.157	0.054	-0.135	-0.266	-0.035	-0.221	-0.026	0.030	0.005	-0.253	-0.17	-0.063	1

The GMM empirical strategy adopted within the framework of this analysis is based on Roodman (2009a, 2009b), an extension of Arellano and Bover (1995) which has been reported to control for cross-sectional dependence and to restrict instrument proliferation (Baltagi, 2008; Asongu, Anyanwu, & Tchamyou, 2019). To control for heteroscedasticity, a two-step procedure is chosen in the modelling exercises in place of the one-step approach.

Empirical Results and Discussions

The panel dynamic regression results confirm that DBS measures are associated with the financial development levels across the identified clusters of the sample. The following tables report the results obtained with the dynamic GMM estimation technique, with a confidence level of 95%. The following panels are reserved to explores the relationship between the financial development indicators, DBS, and income inequality (respectively, economic growth financial system activity, banking system efficiency, financial size, financial system depth, and economic-financial depth). Consistent with previous studies (Tchamyou, Erreygers, & Cassimon, 2019) we use two dependent variables for individual income inequality, namely the Gini coefficient for the baseline regressions and the Palma ratio was used to further assess the robustness of our findings.

When comparing estimations of the different clusters, we conclude that the DBS factors effect was significant, and there were significant differences between countries. These results confirm the first hypothesis H1. Results show significant differences in the impact of the DBS indicators (speed, scope, scale, and source) by grouping countries included in the sample according to their DBS.

Recently, there is a growing concern over the importance of the evolution of e-business values captured through DBS (Park & Mithas, 2020), so we focus here on the specific impact of digital maturity on income inequality, which can affect e-government success beyond the lack of Internet access, the necessary technical skills, or the level of educational attainment (Garcia-Garcia & Gil-Garcia, 2018). The impact of the technological environment on the reduction of income inequality is related to DBS, as technology adoption is a powerful way to reduce income inequality (Zhang & Ben Naceur, 2019; Asongu, 2020).

Results presented in Table 4 concern our H2 hypothesis and confirm that controlling for DBS has a negative and significant impact on income inequality at a rate of 1% in the first and the second clusters of countries and is insignificant in the third cluster containing countries with a low level of DBS maturity. In general, financial development is expected to enhance growth by enabling the efficient allocation of capital and reducing borrowing and financing constraints.

TABLE 4

Interactions between DBS maturity and economic growth on income inequality

	Model 1 (Baseline regression) *Income inequality (Gini) = Gini(-1) + DBS maturity* + Econgrowth + *DBS maturity* × Econgrowth + *control variables*						Model 2 (Robustness checks) *Income inequality (Palmaratio) = Palmaratio (-1) + DBS maturity* + Econgrowth + *DBS maturity* × Econgrowth + *control variables*					
Cluster of country	Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity		Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity	
Variable	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	Coeff	Pr(>t)
Gini (-1)	0.964631	(0.000) ***	0.94431	(0.000) ***	0.98147	(0.000)***	-	-	-	-	-	-
Palmaratio (-1)	-	-	-	-	-	-	0.989875	(0.000)***	0.990521	(0.000)***	0.991458	(0.000)***
Speed	0.0006	(0.000)***	0.00012	(0.652)	-0.0005	(0.4328)	0.005211	(0.243)	0.00102	(0.721)	0.048319	(0.433)
Scope and scale	-0.00152	(0.000)***	-0.00147	(0.000) ***	-0.00098	(0.071) **	0.003221	(0.120)	0.000039	(0.421)	(0.003831)	(0.534)
Source	-0.00325	(0.000)***	-0.00175	(0.000) ***	-0.0000	(0.839)	0.00425	(0.320)	0.01108	(0.142)	-0.01429	(0.135)
Econgrowth	-0.000813	(0.000)***	-0.00018	(0.399)	-0.00021	(0.861)	-0.00132	(0.442)	0.000015	(0.845)	-0.01154	(0.554)
Econgrowth × speed	0.0158	(0.0042)***	0.00257	(0.0058)**	-0.00065	(0.2112)	0.00475	(0.142)	0.00301	(0.719)	0.00148	(0.9875)
Econgrowth × scope and scale	0.0281	(0.006)***	0.00089	(0.0037)***	-0.00486	(0.889)	0.01482	(0.0293)**	0.001079	(0.7961)	0.005785	(0.4287)
Econgrowth × source	0.0133	(0.0025)***	0.00286	(0.008)***	-0.0028	(0.587)	0.00963	(0.421)	0.045871	(0.179)	-0.01463	(0.2436)
Corruption control	0.000401	(0.537)	-0.00094	(0.008) ***	-0.0035	(0.037) **	0.02026	(0.213)	0.00523	(0.324)	-0.10021	(0.005) ***
Government expenditure	-0.000040	(0.567)	0.00005	(0.269)	-0.00028	(0.256)	0.00132	(0.089) *	0.00040	(0.098) *	0.078*	(0.751)
Education	0.000016	(0.482)	-7.87E-0	(0.328)	0.00011	(0.031**)	0.001451	(0.095)*	0.000021	(0.369)	0.0010134	(0.152)
Remittances	0.000121	(0.016) **	0.00020	(0.000***)	0.00019	(0.298)	0.000021	(0.831)	0.001173	(0.049)**	0.000013	(0.987)
Constant	-0.01795	(0.000) ***	0.01222	(0.001) ***	0.00665	(0.81)	0.010994	(0.872)	-0.000134	(0.967)	0.45780	(0.491)
AR(1)	0.085		0.067		0.042		0.076		0.095		0.063	
AR(2)	0.666		0.113		0.574		0.852		0.319		0.752	
Sargan OIR	0.002		0.008		0.005		0.005		0.007		0.003	
Hansen OIR	0.852		0.544		0.554		0.724		0.642		0.651	
Fisher	130,898.3		36,758.25		22,250.55		1.72e+05		25973.06.05		32,331.02	
Observations	274		274		274		166		166		166	

Note: ***,**,*: Significance levels at 1%, 5% and 10% respectively.

The robustness of the baseline analysis was checked with a GMM regression analysis by controlling this association relying on other income inequality proxy such as the Palma ratios. For example, a percentage change in the source values creation and capture of the DBS maturity is associated with a 0.00325 decrease in income inequality in high digital maturity countries against 0.00175 in the medium digital maturity countries, while an insignificant coefficient was reported in the third cluster of the lower DBS maturity countries. These findings are verified in the robustness checks using the Palma ratio. Similarly, Table 5 shows that a percentage change in the source values creation and capture of the DBS maturity is associated with a 0.00278 decrease in income inequality in high digital maturity intensity countries against 0.00141 in the medium digital intensity countries.

Our results confirm that financial development is helpful to the reduction of income inequality through promoting economic growth, economic depth, and banking efficiency.

Previous studies suggest that larger stock markets benefit mainly large and mature firms. Through enhanced investment opportunities, they can expand and eventually offer better employment opportunities, resulting in lower inequality. This suggests that sophisticated financial systems that may primarily serve entrepreneurs in contributing to poverty alleviation.

The implementation of the technological tools in the banking sector has received much attention because ICT extensively influence how managers decide and plan, and what products and services the banking industry offers.

Consistent with the recent studies, information technology has continued to transform the traditional relationship between banks and their partners into a digital one. In sum, there is a need to digitalise all services sectors since a digital economy could enhance countries' proficiency, productivity, efficiency, and profitability (Tchamyou, Erreygers, & Cassimon, 2019).

Consequently, it summarises findings of the impact of DBS on income inequality with an interaction term for the DBS and financial development indicators. Results quantify the effects of DBS with consideration to the maturity cluster of countries. It displays the results on the DBS interaction term (speed, scope, scale, and source) and financial development to show whether they are complements or substitutes. The main conclusion of our work is that financial development drives poverty reduction within the framework of high DBS maturity countries confirming the GMM estimations results. These results provide clear policy implications for countries of the third cluster on the verge of embarking on a high DBS adoption.

Firstly, estimations present, in Table 4 and Table 5, a positive and significant coefficient, which implies that DBS factors are complements for financial development indicators especially more in the first cluster of the sample. A positive value of the interaction term also suggests that the marginal impact of financial development on income inequality is higher for countries with higher DBS maturity. Hence, the results of these interactions reveal that the impact of financial development varies according to the level of the DBS factors of the country.

Secondly, results in Table 6 provide empirical and global evidence that if the financial sector is developed by a mature DBS it is closely linked with more inequality reduction and long-run economic growth. Moreover, we can confirm that digital strategy has surely affected the bank, the employees, and the customers. Findings provide evidence that adopting DBS can improve banking services to maintain a high level of proficiency and efficiency.

Thirdly, according to Table 7 countries that have entered the phase of DBS progress are characterised by changes in the structures of their economies at the macro level, namely greater contributions from the national information sectors to heirs GDP and greater shares of workers engaged in processing and transmitting information to their total labour forces. The shares of digital business in the economies of the mature countries is much greater on account of the secondary information sector, which includes the divisions of firms that produce information for their private requirements, which is called intra-firm consumption.

Fourthly, referring to Table 8, investment in the technology sector increases productivity and economic growth not only directly, but also indirectly because complementary innovations are created. Hence, ICT development affects the economy and leads to the greater efficiency and flexibility of banking operations. Moreover, the use of digital financial services through promoting e-commerce and e-banking transactions has an additional impact on financial development as well as key indicators such as economic growth, financial system activity, banking system efficiency, financial size, financial system depth, and economic-financial depth and consequently poverty reduction (Tchamyou, Erreygers, & Cassimon, 2019).

TABLE 5

Interactions between DBS maturity and financial system activity on income inequality

	Model 1(Baseline regression) *Income inequality (Gini) = Gini(-1) + DBS maturity + + DBS maturity×LNFSACTIVITY + control variables*						**Model 2(Robustness checks)** *Income inequality (Palmaratio) = Palmaratio (-1) + DBS maturity + Lngdp+ DBS maturity×LNFSACTIVITY + control variables*					
Cluster of country	**Countries with high DBS maturity**		**Countries with medium DBS maturity**		**Countries with low DBS maturity**		**Countries with high DBS maturity**		**Countries with medium DBS maturity**		**Countries with low DBS maturity**	
Variable	**coeff**	**Pr(>t)**	**coeff**	**Pr(>t)**	**coeff**	**Pr(>t)**	**coeff**	**Pr(>t)**	**coeff**	**Pr(>t)**	**Coeff**	**Pr(>t)**
Gini(-1)	0.984115	(0.000)***	0.96241	(0.000)***	0.94212	(0.000)***	-	-	-	-	-	-
Palmaratio (-1)	-	-	-	-	-	-	0.998345	(0.000)***	0.99115345	(0.000)***	0.955518	(0.000)***
Speed	-0.00041	(0.013)*	-0.00021	(0.005)**	0.00141	(0.412)	-0.02124	(0.0321)*	-0.001668	(0.615)	0.018051	(0.461)
Scope and scale	-0.00133	(0.018)**	-0.0050	(0.050)**	0.00032	(0.806)	-0.004236	(0.065)*	-0.017761	(0.062)***	-0.003786	(0.865)
Source	-0.00168	(0.002) ***	-0.00141	(0.008) ***	0.00015	(0.892)	-0.015449	(0.091)*	-0.000242	(0.0812)*	-0.00311	(0.954)
LNFSACTIVITY	0.00182	(0.168)	-0.00419	(0.000) ***	-0.00261	(0.536)	0.0102371	(0.871)	-0.008265	(0.0723)*	-0.00122	(0.871)
LNFSACTIVITY × speed	0.02651	(0.023)***	0.002337	(0.003)***	0.002493	(0.858)	0.021274	(0.008)**	-0.009401	(0.6298)	0.03286	(0.1258)
LNFSACTIVITY × scope and scale	0.04573	(0.0129)**	0.002513	(0.018)**	0.000475	(0.723)	0.003236	(0.007)***	0.004781	(0.0838)*	-0.04204	(0.612)
LNFSACTIVITY × source	0.01158	(0.0525)*	0.004691	(0.007)***	0.00285	(0.722)	0.063215	(0.0862)*	0.001234	(0.004)***	-0.02336	(0.985)
Corruption control	-0.00017	(0.615)	-0.00091	(0.127)	-0.00115	(0.668)	0.00183	(0.421)	0.00842	(0.7243)	-0.00616	(0.065) *
Government expenditure	-7.67E-06	(0.908)	0.00067	(0.000) ***	-0.00021	(0.542)	0.00117	(0.045)**	0.00192	(0.063)*	0.00036	(0.874)
Education	0.00005	(0.519)	0.00019	(0.005) ***	0.00012	(0.291)	0.000412	(0.085)*	0.000035	(0.623)	0.000013	(0.851)
Remittances	0.00001	(0.341)	0.00025	(0.058) *	0.00037	(0.431)	0.000021	(0.843)	0.001491	(0.047)**	0.000653	(0.823)
Constant	-0.00584	(0.392)	-0.00038	(0.211)	0.001651	(0.913)	0.003765	(0.673)	-0.000262	(0.763)	0.169360	(0.524)
AR(1)	0.045		0.067		0.052		0.081		0.065		0.054	
AR(2)	0.626		0.123		0.574		0.841		0.652		0.432	
Sargan OIR	0.004		0.002		0.008		0.006		0.003		0.005	
Hansen OIR	0.742		0.854		0.244		0.432		0.216		0.544	
Fisher	140,208.3		37,788.47		26,890.77		1.82e+06		235,906.05		24,337.18	
Observations	274		274		274		166		166		166	

Note: ***,**,*: Significance levels at 1%, 5% and 10% respectively.

TABLE 6

Interactions between DBS maturity and Banking system efficiency on income inequality

	Model 1(Baseline regression) *Income inequality (Gini) = Gini(-1) + DBS maturity + LnBseffi + DBS maturity×LnBseffi + control variables*						**Model 2(Robustness checks)** *Income inequality (Palmaratio) = Palmaratio (-1) + DBS maturity + LnBseffi + DBS maturity×LnBseffi + control variables*					
Cluster of country	Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity		Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity	
Variable	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)
Gini (-1)	0.99618	(0.000)***	0.99653	(0.000)***	0.97202	(0.000)***	-	-	-	-	-	-
Palmaratio (-1)	-	-	-	-	-	-	0.985672	(0.000)***	0.997126	(0.000)***	0.994543	(0.000)***
Speed	0.00020	(0.837)	0.00097	(0.138)	-0.00026	(0.886)	-0.003332	(0.081)*	0.043176	0.017**	-0.02856	(0.687)
Scope and scale	0.00251	(0.09)*	-0.00163	(0.001)***	0.00044	(0.084)*	0.0004291	(0.097)*	0.003318	(0.009)***	0.065321	(0.657)
Source	0.00058	(0.235)	-0.006766	(0.000)***	-0.00028	(0.735)	-0.002822	(0.034)**	0.041976	(0.046)**	-0.001781	(0.813)
LnBseffi	-0.00041	(0.454)	0.00095	(0.382)	-0.00062	(0.919)	-0.04803	(0.01)***	0.001340	(0.008)***	-0.03692	(0.651)
LnBseffi × speed	0.00310	(0.4821)	-0.004937	(0.2681)	-0.00018	(0.446)	0.00496	(0.0045)**	-0.01676	(0.121)	-0.021336	(0.512)
LnBseffi × scope and scale	0.00248	(0.008)**	0.00103	(0.002)***	0.00872	(0.174)	0.002929	(0.002)***	0.01437	(0.005)***	0.011425	(0.561)
LnBseffi × source	0.00049	(0.0625)*	0.00176	(0.001)***	-0.000134	(0.622)	0.006325	(0.0014)**	0.014723	(0.021)**	-0.00581	(0.602)
Corruption control	-0.00117	(0.023)**	-0.00290	(0.003)***	-0.00456	(0.039)**	-0.000231	(0.003)***	-0.0087366	(0.001)***	-0.000425	(0.766)
Government expenditure	-0.00004	(0.511)	0.000148	(0.297)	-0.00011	(0.584)	-0.000495	(0.645)	0.000562	(0.428)	0.0004288	(0.765)
Education	-3.01E-0	(0.853)	-0.00003	(0.123)	-0.00013	(0.074)*	-0.000543	(0.417)	-0.000549	(0.445)	-0.005604	(0.662)
Remittances	0.000055	(0.328)	0.000257	(0.066) *	0.00029	(0.378)	0.001584	(0.681)	0.004432	(0.008)***	-0.007512	(0.765)
Constant	0.00359	(0.379)	0.00037	(0.937)	0.00351	(0.904)	0.064031	(0.009)***	-0.122413	(0.07)*	0.308145	(0.892)
AR(1)	0.045		0.067		0.052		0.066		0.078		0.062	
AR(2)	0.566		0.113		0.474		0.875		0.751		0.631	
Sargan OIR	0.005		0.008		0.018		0.004		0.005		0.002	
Hansen OIR	0.658		0.554		0.554		0.401		0.504		0.491	
Fisher	1.39e+06		18,172.03		11,579.09		1.562e+07		235,606.12		23,227.28	
Observations	274		274		274		166		166		166	

Note: ***,**,*: Significance levels at 1%, 5% and 10% respectively.

TABLE 7

Interactions between financial size and digital business strategy maturity on income inequality

	Model 1(Baseline regression) *Income inequality (Gini) = Gini(-1) + DBS maturity + LnFsize + DBS maturity×LnFsize + control variables*						**Model 2(Robustness checks)** *Income inequality (Palmaratio) = Palmaratio (-1) + DBS maturity + LnFsize + DBS maturity×LnFsize + control variables*					
Cluster of country	Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity		Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity	
Variable	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	Coeff	Pr(>t)	coeff	Pr(>t)
Gini (-1)	0.989573	(0.000) ***	0.995784	(0.000)***	1.00226	(0.000) ***	-	-	-	-	-	-
Palmaratio (-1)	-	-	-	-	-	-	0.997234	(0.000)***	0.990652	(0.000)***	0.996723	(0.000)***
Speed	-0.000717	(0.392)	0.000452	(0.274)	0.000379	(0.634)	0.002778	(0.671)	-0.010143	0.042**	-0.010156	(0.272)
Scope and scale	-0.00742	(0.001)***	-0.001184	(0.01) ***	0.000675	(0.334)	0.0050571	(0.431)	-0.0202665	(0.038) **	0.005103	(0.653)
Source	0.000657	(0.332)	-0.003301	(0.000)***	-0.000364	(0.47)	-0.0031532	(0.356)	-0.0222245	(0.062) *	-0.011681	(0.343)
LnFsize	-0.001290	(0.588)	0.004678	(0.182)	-0.023919	(0.145)	-0.0146437	(0.436)	0.0004197	(0.468)	0.033897	(0.651)
LnFsize × speed	-0.000657	(0.412)	0.002595	(0.482)	0.000689	(0.363)	0.0034961	(0.257)	-0.02318	(0.3732)	-0.021458	(0.164)
LnFsize × scope and scale	0.00242	(0.003)***	0.00014	(0.001)***	0.000355	(0.228)	0.0089051	(0.466)	0.00069	(0.0616)**	0.004211	(0.229)
LnFsize × source	0.003215	(0.1632)	0.003301	(0.010)**	-0.000651	(0.279)	-0.004285	(0.223)	0.00088	(0.091)*	-0.00282	(0.342)
Corruption control	-0.001233	(0.007)***	0.000685	(0.107)	-0.001363	(0.253)	-0.014160	(0.062)*	-0.0194137	(0.025)**	-0.01075	(0.389)
Government expenditure	-0.00006	(0.385)	0.000217	(0.002)***	-0.000013	(0.891)	0.0000074	(0.873)	0.0024437	(0.081)*	-0.00010	(0.542)
Education	8.65E-07	(0.957)	-0.00001	(0.458)	0.000038	(0.335)	0.0005053	(0.078)*	-0.000350	(0.268)	0.0006122	(0.267)
Remittances	0.000059	(0.657)	0.000319	(0.000)***	0.0001529	(0.232)	-0.0004521	(0.397)	0.0024634	(0.084)*	0.002834	(0.301)
Constant	0.011855	(0.245)	-0.02184	(0.157)	0.102785	(0.162)	0.0993602	(0.876)	-0.031504	(0.633)	-0.268221	(0.655)
AR(1)	0.075		0.067		0.052		0.049		0.031		0.061	
AR(2)	0.566		0.213		0.552		0.724		0.412		0.871	
Sargan OIR	0.013		0.018		0.018		0.003		0.005		0.007	
Hansen OIR	0.452		0.454		0.654		0.322		0.456		0.214	
Fisher	837,766.43		330,986.37		966,517.43		220,943.32		245,503.65		243,237.23	
Observations	274		274		274		166		166		166	

Note: ***,**,*: Significance levels at 1%, 5% and 10% respectively.

TABLE 8

Interactions between DBS maturity and financial system depth on income inequality

	Model 1(Baseline regression) *Income inequality (Gini) = Gini(-1) + DBS maturity + LnFSdepth + DBS maturity×LnFSdepth + control variables*						**Model 2(Robustness checks)** *Income inequality (Palmaratio) = Palmaratio (-1) + DBS maturity + LnFSdepth + DBS maturity×LnFSdepth + control variables*					
Cluster of country	Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity		Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity	
Variable	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	Coeff	Pr(>t)	coeff	Pr(>t)
Gini (-1)	0.99211	(0.000)***	0.99599	(0.000)***	0.97433	(0.000)***	-	-	-	-	-	-
Palmaratio (-1)	-	-	-	-	-	-	0.9898542	(0.000)***	0.990783	(0.000)***	0.991428	(0.000)***
Speed	-0.008	(0.03)**	-0.00113	(0.068) *	0.000626	(0.794)	-0.02814	(0.006)***	0.017765	(0.248)	0.014268	(0.612)
Scope and scale	-0.0066	(0.086) *	-0.0017	(0.000)***	0.000289	(0.837)	0.001225	(0.349)	-0.020438	(0.034) **	-0.004349	(0.813)
Source	-0.00004	(0.962)	-0.0020	(0.004)***	0.000406	(0.633)	-0.021553	(0.423)	-0.04342	(0.009)***	-0.012527	(0.547)
LnFSdepth	0.001474	(0.257)	-0.0017	(0.003)***	-0.00319	(0.439)	-0.000044	(0.891)	-0.024847	(0.07)*	-0.04582	(0.231)
LnFSdepth×speed	0.003792	(0.067)*	0.000581	(0.2688)	-0.00014	(0.223)	0.00412	(0.031)**	0.000581	(0.1826)	-0.02936	(0.455)
LnFSdepth× scope and scale	0.00349	(0.007)***	-0.00293	(0.2928)	0.00234	(0.1325)	0.000291	(0.429)	0.03457	(0.0119)**	0.01219	(0.237)
LnFSdepth × source	0.00381	(0.0145)**	0.000111	(0.001)***	-0.00013	(0.625)	0.00316	(0.0346)**	0.0006589	(0.048)**	-0.058101	(0.655)
Corruption control	0.00078	(0.349)	-0.00264	(0.001)***	-0.00346	(0.321)	-0.025712	(0.09)*	0.0071510	(0.388)	-0.023025	(0.872)
Government expenditure	0.00003	(0.611)	0.00006	(0.555)	-0.00017	(0.494)	-0.000631	(0.423)	-0.001206	(0.217)	0.003802	(0.564)
Education	-0.00002	(0.45)	0.00000	(0.799)	0.00025	(0.249)	0.000472	(0.067) *	0.000510	(0.193)	0.00132	(0.631)
Remittances	0.00002	(0.746)	0.00027	(0.000)***	0.00029	(0.457)	0.000147	(0.445)	0.004302	(0.023) **	0.004503	(0.702)
Constant	-0.00294	(0.442)	0.0066	(0.073) *	0.00420	(0.751)	0.043778	(0.335)	0.087231	(0.133)	0.13480	(0.531)
AR(1)	0.075		0.077		0.022		0.034		0.039		0.061	
AR(2)	0.444		0.213		0.474		0.425		0.761		0.981	
Sargan OIR	0.013		0.018		0.008		0.008		0.001		0.006	
Hansen OIR	0.452		0.534		0.564		0.339		0.361		0.542	
Fisher	752,884.8		18,729.2		127,425.28		1.75e+09		234,807.06		244,927.28	
Observations	274		274		274		166		166		166	

Note: ***,**,*: Significance levels at 1%, 5% and 10% respectively.

Fifthly, the development of DBS is presently delayed by the insufficient size of production and distorted motivation among low DBS clusters, banks, and other financial institutions concerning DBS's advisability (available in Table 9). Nevertheless, without attaining the needed threshold of digital business strategy, it is impossible to attain an effective financial development across the unmatured countries. The progress of digital business must be accompanied by the corresponding action among concerned government and commercial establishments and harmonise with an effort from the world community. Hence, digital marketing will serve as a stimulus for the structural and technological reform and modernisation of the national economy (Cheng, Chien, & Lee, 2020).

Future studies can be conducted to evaluate whether the established results are relevant within country-specific frameworks. This is principally because the GMM empirical strategy adopted in this paper eliminates country-specific effects to control for the concern of endogeneity arising from the correlation between the lagged outcome variable and country-specific effects. In the proposed future research direction, using the relevant alternative estimation techniques to comprehend how the engaged DBS factors create a value addition across the countries (e.g. the MENA region) is advisable. Moreover, from the findings, future studies can be tailored to determine threshold values required to reverse the negative and the insignificant impact of DBS on financial development in the low DBS maturity countries. DBS can probably add sufficient value to financial development indicators to reduce inequality and poverty. DBS proxies' level should exceed certain thresholds of speed, scope, scale, and source for value-added in the low and unmatured regions. To dampen these negative effects, corresponding DBS thresholds should be computed using a threshold regression approach, for the existence of a DBS threshold driving a regime switching in our sample countries, supporting the idea that high DBS maturity is potent in long-run financial development.

Conclusions and Implications

The main contribution of our work is that DBS drives financial development within the framework of the high-maturity countries more than the low-maturity ones.

The study also examined whether a DBS is associated with financial development that could give rise to either policy conflicts or synergies.

The main output of this study is constructing DBS as a mechanism of technology adoption that reduces income inequality. PCA was conducted on different sets of normalised variables to construct the three DBS proxies. The estimation results from GMM indicate that DBS significantly influences financial development. This study attempted to classify the 149 countries into clusters according to their DBS maturity.

From a theoretical perspective, we can confirm that, in the light of our results, income inequality is influenced by the levels of DBS maturity; the use of information communication technology can reduce inequality intensity through promoting financial development and economic growth. Therefore, entrepreneurship, human capital, and economic growth are far from being the only channels for transmitting financial development and reducing inequality.

Like the findings of Maomao, *& al*. (2018), our results highlight the role of DBS in enhancing firms' performance through the channel of financial development. Therefore, the digitalisation of the economy can help in reducing income inequality by encouraging entrepreneurial intention.

From a methodological perspective, this paper advances research on the construction of a DBS index to classify countries into three clusters according to their DBS maturity. This research therefore validates the Bharadwaj, *& al*. (2013) 4S model as an applicable measure of DBS maturity.

As managerial contribution, this research encourages firms to adopt an appropriate DBS giving them the sense of direction and stability they require to maintain pace with the fast-paced online environment because reaching a DBS maturity will help with specific objectives and analysing results in detail.

At a macroeconomic level, this study gives a mixed picture; the results tend to suggest that overall the reforms have increased income inequalities in the world. It would be risky to prescribe a general policy because of the diversity of the country.

Policymakers should thus emphasise DBS maturity. Public policies, improving digitisation, and accelerating the digital transformation of society can play an important role in reversing excessive inequalities. As such, academics must conduct studies to discover the levers on which these governments can act to promote it.

TABLE 9

Interactions between DBS maturity and economic financial depth on income inequality

	Model 1(Baseline regression) *Income inequality (Gini) = Gini(-1) + DBS maturity + LnEfdepth + DBS maturity×LnEfdepth + control variables*						**Model 2(Robustness checks)** *Income inequality (Palmaratio) = Palmaratio (-1) + DBS maturity + LnEfdepth + DBS maturity×LnEfdepth + control variables*					
Cluster of country	Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity		Countries with high DBS maturity		Countries with medium DBS maturity		Countries with low DBS maturity	
Variable	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)	coeff	Pr(>t)
GINI (-1)	0.99856	(0.000)***	1.00183	(0.000)***	1.00751	(0.000)***	-	-	-	-	-	-
Palmaratio (-1)	-	-	-	-	-	-	0.989851	(0.000)***	0.990479	(0.000)***	0.991471	(0.000)***
Speed	0.00174	(0.136)	0.00036	(0.364)	-0.00184	0.495	0.006210	(0.214)	0.007045	(0.662)	-0.05382	(0.331)
Scope and scale	-0.00179	(0.023)**	-0.00110	(0.058)*	-0.00048	(0.033)**	0.002214	(0.218)	-0.02082	(0.034)**	0.002261	(0.814)
Source	-0.00087	(0.231)	-0.00251	(0.001)***	-0.00021	(0.885)	-0.009321	(0.345)	-0.023556	(0.082)*	0.004251	(0.723)
LnEfdepth	0.00067	(0.641)	-0.00169	(0.000)***	-0.00508	(0.251)	-0.01845	(0.044) **	0.00341	(0.767)	-0.11641	(0.099) *
LnEfdepth × speed	0.00728	(0.002)***	0.00226	(0.034)**	0.000313	(0.2364)	0.006448	(0.008)***	0.00273	(0.088) *	0.01584	(0.846)
LnEfdepth × scope and scale	-0.0036	(0.1427)	0.00195	(0.002)***	0.000429	(0.447)	0.00282	(0.186)	0.001027	(0.0431)**	-0.00511	(0.109)
LnEfdepth × source	0.002805	(0.0732)*	0.000178	(0.078)*	0.000123	(0.128)	0.002524	(0.098)*	0.000217	(0.067)*	-0.010147	(0.227)
Corruption control	0.000057	(0.967)	-0.00280	(0.000)***	-0.00507	(0.072)	-0.016463	(0.098)*	-0.001276	(0.463)	-0.03187	(0.312)
Government expenditure	0.00015	(0.104)	0.00006	(0.337)	0.00002	(0.932)	0.000124	(0.461)	0.002891	(0.490)	-0.005445	(0.648)
Education	-0.00003	(0.554)	-0.00002	(0.104)	0.00038	(0.093)	-0.000135	(0.548)	0.000224	(0.513)	0.002482	(0.641)
Remittances	-0.00007	(0.402)	0.00011	(0.028)**	0.00036	(0.08)*	0.001104	(0.141)	0.000017	(0.751)	0.000552	(0.323)
Constant	-0.00179	(0.722)	0.00723	0.084	-0.01961	0.285	0.082107	(0.032) **	-0.01915	(0.453)	0.259226	(0.152)
AR(1)	0.065		0.027		0.012		0.072		0.054		0.065	
AR(2)	0.314		0.113		0.332		0.721		0.342		0.239	
Sargan OIR	0.0214		0.043		0.006		0.004		0.001		0.002	
Hansen OIR	0.212		0.792		0.342		0.313		0.213		0.401	
Fisher	256,577.7		19,707.55		38,069.19		1.73e+34		234,805.12		243,336.24	
Observations	274		274		274		166		166		166	

Note: ***,**,*: Significance levels at 1%, 5% and 10% respectively.

This study remedies some limitations of previous studies that had difficulties in explaining the conditions for the development of digital skills in transforming economies in a context of dynamic change (e.g. Olszewska, 2020, p. 289).

Nevertheless, this study was limited to a five-year period and 149 countries because of data availability, so for future research we intend to extend the study period. The brief study period could bias this study's results or at least limit its inferences for all the countries of the world. The control variables could also have been more numerous.

Finally, it is worthwhile for future studies to examine whether the established findings with stand empirical scrutiny within the firms to verify whether digitalisation can enhance financial and economic performance in crisis periods such as COVID-19.

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APPENDIX / TABLE A1

Definitions and sources of variables

Variables	Label	Definitions	Sources
Gini	GINI	The Gini index is a measurement of the income distribution of a country's residents	GCIP
Palmaratio	PALMARA	The Palma ratio is defined as the ratio of the richest 10% of the population's share of gross national income divided by the poorest 40% share.	GCIP
Economic growth	Econgrowth	GDP per capita (LNGDP)	WDI
Financial system activity	LNFSACTIVITY	Private domestic credit from financial institutions (% of GDP)	FDSD
Banking system efficiency	LNBSEFFI	Bank credit on bank deposits	FDSD
Financial size	LNFSIZE	Deposit bank assets on central bank assets plus deposit bank assets	WDI
Financial system depth	LNFSDEPTH	Liquid liabilities (% of GDP)	FDSD
Economic financial depth	LNEFDEPTH	Money supply (% of GDP)	FDSD
Digital business strategy	Speed	Principal Component of speed proxies	GTIR
	Scope	Principal Component of Scope proxies	GTIR
	Source of value creation and capture	Principal Component of Source proxies	GTIR
Corruption control	CC	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain. Including both petty and grand forms of corruption.	
Government consumption expenditure	GOVCONS	General government final consumption expenditure (% of GDP)	WGI
Education	EDUC	School enrolment, primary (gross), gender parity index (GPI)	WDI
Remittances	REM	Remittance inflows to GDP (%)	WDI

Note: WDI: World Bank Development Indicators. WEF: World Economic Forum. GITR: The Global Information Technology Report 2016. WGI: World Bank Governance Indicators. FDSD: Financial Development and Structure Database.

APPENDIX / TABLE A2

List of countries, income group, and regions

Countries	Income group	Region
Albania	UMI	Emerging and Developing Europe
Algeria	UMI	Middle East, North Africa, and Pakistan
Angola	UMI	Sub-Saharan Africa
Argentina	HI	Latin America and the Caribbean
Armenia	LMI	Eurasia
Australia	HI	Advanced economies
Austria	HI	Advanced economies
Azerbaijan	UMI	Eurasia
Bahrain	HI	Middle East, North Africa, and Pakistan
Bangladesh	LMI	Emerging and Developing Asia
Barbados	HI	Latin America and the Caribbean
Belgium	HI	Advanced economies
Belize	UMI	Latin America and the Caribbean
Benin	LI	Sub-Saharan Africa
Bhutan	LMI	Emerging and Developing Asia
Bolivia	LMI	Latin America and the Caribbean
Bosnia and Herzegovina	UMI	Emerging and Developing Europe
Botswana	UMI	Sub-Saharan Africa
Brazil	UMI	Latin America and the Caribbean
Brunei Darussalam	HI	Emerging and Developing Asia
Bulgaria	UMI	Emerging and Developing Europe
Burkina Faso	LI	Sub-Saharan Africa
Burundi	LI	Sub-Saharan Africa
Cambodia	LI	Emerging and Developing Asia
Cameroon	LMI	Sub-Saharan Africa
Canada	HI	Advanced economies
Cape Verde	LMI	Sub-Saharan Africa
Chad	LI	Sub-Saharan Africa
Chile	HI	Latin America and the Caribbean
China	UMI	Emerging and Developing Asia
Colombia	UMI	Latin America and the Caribbean
Costa Rica	UMI	Latin America and the Caribbean
Côte d'Ivoire	LMI	Sub-Saharan Africa
Croatia	HI	Emerging and Developing Europe
Cyprus	HI	Advanced economies
Czech Republic	HI	Advanced economies
Denmark	HI	Advanced economies
Dominican Republic	UMI	Latin America and the Caribbean
Ecuador	UMI	Latin America and the Caribbean
Egypt	LMI	Middle East, North Africa, and Pakistan
El Salvador	LMI	Latin America and the Caribbean
Estonia	HI	Advanced economies
Ethiopia	LI	Sub-Saharan Africa
Finland	HI	Advanced economies
France	HI	Advanced economies
Gabon	UMI	Sub-Saharan Africa
Gambia, The	LI	Sub-Saharan Africa
Georgia	LMI	Eurasia
Germany	HI	Advanced economies
Ghana	LMI	Sub-Saharan Africa
Greece	HI	Advanced economies
Guatemala	LMI	Latin America and the Caribbean
Guinea	LI	Sub-Saharan Africa
Guyana	LMI	Latin America and the Caribbean
Haiti	LI	Latin America and the Caribbean
Honduras	LMI	Latin America and the Caribbean
Hong Kong SAR	HI	Advanced economies
Hungary	HI	Emerging and Developing Europe
Iceland	HI	Advanced economies
India	LMI	Emerging and Developing Asia
Indonesia	LMI	Emerging and Developing Asia
Iran, Islamic Rep.	UMI	Middle East, North Africa, and Pakistan
Ireland	HI	Advanced economies
Israel	HI	Advanced economies
Italy	HI	Advanced economies
Jamaica	UMI	Latin America and the Caribbean
Japan	HI	Advanced economies
Jordan	UMI	Middle East, North Africa, and Pakistan
Kazakhstan	UMI	Eurasia
Kenya	LMI	Sub-Saharan Africa
Korea, Rep.	HI	Advanced economies
Kuwait	HI	Middle East, North Africa, and Pakistan
Kyrgyz Republic	LMI	Eurasia
Lao PDR	LMI	Emerging and Developing Asia
Latvia	HI	Advanced economies
Lebanon	UMI	Middle East, North Africa, and Pakistan
Lesotho	LMI	Sub-Saharan Africa
Liberia	LI	Sub-Saharan Africa

APPENDIX / TABLE A2

List of countries, income group, and regions

Countries	Income group	Region
Libya	UMI	Middle East, North Africa, and Pakistan
Lithuania	HI	Advanced economies
Luxembourg	HI	Advanced economies
Macedonia, FYR	UMI	Emerging and Developing Europe
Madagascar	LI	Sub-Saharan Africa
Malawi	LI	Sub-Saharan Africa
Malaysia	UMI	Emerging and Developing Asia
Mali	LI	Sub-Saharan Africa
Malta	HI	Advanced economies
Mauritania	LMI	Middle East, North Africa, and Pakistan
Mauritius	UMI	Sub-Saharan Africa
Mexico	UMI	Latin America and the Caribbean
Moldova	LMI	Eurasia
Mongolia	UMI	Emerging and Developing Asia
Montenegro	UMI	Emerging and Developing Europe
Morocco	LMI	Middle East, North Africa, and Pakistan
Mozambique	LI	Sub-Saharan Africa
Myanmar	LMI	Emerging and Developing Asia
Namibia	UMI	Sub-Saharan Africa
Nepal	LI	Emerging and Developing Asia
Netherlands	HI	Advanced economies
New Zealand	HI	Advanced economies
Nicaragua	LMI	Latin America and the Caribbean
Nigeria	LMI	Sub-Saharan Africa
Norway	HI	Advanced economies
Oman	HI	Middle East, North Africa, and Pakistan
Pakistan	LMI	Middle East, North Africa, and Pakistan
Panama	UMI	Latin America and the Caribbean
Paraguay	UMI	Latin America and the Caribbean
Peru	UMI	Latin America and the Caribbean
Philippines	LMI	Emerging and Developing Asia
Poland	HI	Emerging and Developing Europe
Portugal	HI	Advanced economies
Puerto Rico	HI	
Qatar	HI	Middle East, North Africa, and Pakistan
Romania	UMI	Emerging and Developing Europe
Russian Federation	HI	Eurasia
Rwanda	LI	Sub-Saharan Africa
Saudi Arabia	HI	Middle East, North Africa, and Pakistan
Senegal	LMI	Sub-Saharan Africa
Serbia	UMI	Emerging and Developing Europe
Seychelles	HI	Sub-Saharan Africa
Sierra Leone	LI	Sub-Saharan Africa
Singapore	HI	Advanced economies
Slovak Republic	HI	Advanced economies
Slovenia	HI	Advanced economies
South Africa	UMI	Sub-Saharan Africa
Spain	HI	Advanced economies
Sri Lanka	LMI	Emerging and Developing Asia
Suriname	UMI	Latin America and the Caribbean
Swaziland	LMI	Sub-Saharan Africa
Sweden	HI	Advanced economies
Switzerland	HI	Advanced economies
Syria	LMI	Middle East, North Africa, and Pakistan
Taiwan, China	HI	Advanced economies
Tajikistan	LMI	Eurasia
Tanzania	LI	Sub-Saharan Africa
Thailand	UMI	Emerging and Developing Asia
Timor-leste	LMI	Emerging and Developing Asia
Trinidad and Tobago	HI	Latin America and the Caribbean
Tunisia	UMI	Middle East, North Africa, and Pakistan
Turkey	UMI	Emerging and Developing Europe
Uganda	LI	Sub-Saharan Africa
Ukraine	LMI	Eurasia
United Arab Emirates	HI	Middle East, North Africa, and Pakistan
United Kingdom	HI	Advanced economies
United States	HI	Advanced economies
Uruguay	HI	Latin America and the Caribbean
Venezuela	HI	Latin America and the Caribbean
Vietnam	LMI	Emerging and Developing Asia
Yemen	LMI	Middle East, North Africa, and Pakistan
Zambia	LMI	Sub-Saharan Africa
Zimbabwe	LI	Sub-Saharan Africa

Notes: Regions and Income groups are classified as per the World Bank classifications. Where, ECA: Europe and Central Asia, SA: South Asia, SSA: Sub-Saharan Africa, LAC: Latin America & the Caribbean EAP: East Asia and Pacific, and MENA: Middle East and North Africa. The income groups are UMI: Upper-middle-income, LMI: Lower-middle-income, LI: Low-income and HI: High-income economies.

APPENDIX / TABLE A3

Confirmatory Factorial Analysis

Principal Component Analysis (PCA)						
	Proper initial values			Extracted sum from the square of loadings		
Component	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
1	10,355	64,720	64,720	**10,355**	**64,720**	**64,720**
2	1,478	9,237	73,957	**1,478**	**9,237**	**73,957**
3	1,252	7,826	81,783	**1,252**	**7,826**	**81,783**
4	.693	4,331	86,114			
5	.648	4,048	90,162			
6	.501	3,131	93,293			
7	.240	1,502	94,795			
8	.192	1,200	95,995			
9	.164	1,028	97,022			
10	.130	.813	97,836			
11	.108	.677	98,512			
12	.069	.430	98,943			
13	.058	.360	99,303			
14	.045	.283	99,586			
15	.034	.212	99,798			
16	.032	.202	100,000			

APPENDIX / TABLE A4

The digital business strategy factors determined during the multi-variant research. Items for Loadings from Confirmatory Factor Analysis

Item	Item description	Component		
		1	2	3
Speed 1	The time required to start a business	**.630**	-.032	.078
Speed 2	Number of procedures required to start a business	**.586**	-.036	.126
Speed 3	Government procurement of advanced tech products	**.351**	.073	0.02
Scope 1	ICT patents applications	.056	**-.217**	.078
Scope 2	ICT use for business-to-business transactions	.087	**-.099**	.081
Scope 3	Business-to-consumer Internet use	.084	**-.206**	.105
Scope 4	Importance of ICTs to government vision	.087	**-.097**	.043
Scale1	Government Online Service Index	.080	**.327**	-.053
Scale 2	Government success in ICT promotion	.078	**-.258**	.060
Scale3	Impact of ICTs on business models	.080	**.328**	-.034
Source 1	Impact of ICTs on new organizational models	.056	.047	**.092**
Source 2	Firm-level technology absorption	.085	.064	**-.091**
Source 3	Impact of ICTs on access to basic services	.030	.037	**.093**
Source 4	Internet access in schools	.019	.084	**-.134**
Source 5	ICT use and government efficiency	-.062	.089	**.200**
Source 6	E-Participation Index	.051	.065	**-.303**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) Sig. of Bartlett's Test of Sphericity		0.847 0.000		

APPENDIX / TABLE A5

The results of the analysis of variance (ANOVA) and Scheffe test (F)

Digital business strategy factors	Cluster		Error		F	Sig.
	Mean square	d.f	Mean square	d.f		
Speed	115,377	3	0.375	549	307,679	0.000
Scope and scale	10,321	3	0.949	549	10,875	0.000
Source	125,124	3	0.322	549	388,915	0.000

APPENDIX / TABLE A6

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Full sample					
Gini	546	0.4528964	0.1035943	0.254913	0.662355
Palmaratio	546	3.339452	2.067279	0.884318	9.59411
Lngdp	730	24.87531	2.008081	20.8186	30.4642
lnfsactivity	680	3.744218	0.9005716	-0.183917	6.87957
Lnbseffi	609	4.443338	0.4682755	2.096517	5.744019
Lnfsize	660	4.491541	0.1566404	3.32824	4.60517
Lnefdepth	592	3.960415	0.7337654	-2.298035	5.927022
Lnfsdepth	670	3.986191	0.6951061	1.19526	6.53948
Speed	553	1.46E-07	1	-2.48799	2.2565
Scope and scale	553	5.52E-08	1	-2.36641	3.12123
Source	553	1.26E-07	1	-2.05162	11.78535
Corruption	710	0.0180517	0.9980205	-1.66373	2.4049
Govcons	745	15.54228	6.301137	0	37.3131
Education	532	87.18405	27.68432	22.3211	163,935
Remittances	745	4.145635	6.407846	0	43.7681
Cluster 1					
Gini	190	0.4753977	0.0918322	0.262101	0.635562
Palmaratio	190	3.705709	1.989892	0.912544	8.51622
Lngdp	273	24.27688	1.67013	21.1933	28,373
lnfsactivity	249	3.636189	0.9306091	0.110405	6.87957
lnbseffi	215	4.413117	0.4406716	2.689193	5.303772
lnfsize	247	4.480454	0.1709071	3.32824	4.60515
lnefdepth	209	3.932825	0.5988804	2.182861	5.527912
lnfsdepth	246	3.874313	0.6763526	1.19526	5.77983
Speed	195	0.4956027	0.6081454	-2.48799	0.95906
Scope and scale	195	0.1809296	0.9145251	-2.36641	2.81722
Source	195	0.5556128	0.4883708	-2.05162	0.45976
Corruption	255	0.1597793	0.9099893	-1.62669	2.27532
Govcons	273	15.19359	5.898761	0	36.4734
Education	197	81.31954	29.9572	22.4151	152,163
Remittances	273	6.095362	7.727736	0	43.7681

APPENDIX / TABLE A6

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cluster 2					
Gini	111	0.3859001	0.1112463	0.254913	0.662355
Palmaratio	111	2.302032	1.986322	0.884672	8.96198
Lngdp	165	26.33818	1.686733	22.2049	30.4642
lnfsactivity	152	4.113921	0.7309864	2.30487	5.20525
lnbseffi	139	4.510526	0.573231	2.096517	5.744019
lnfsize	149	4,526	0.1067336	4.16901	4.60517
lnefdepth	125	4.07884	0.6240233	3.053704	5.556168
lnfsdepth	154	4.251881	0.6913281	2.98967	6.48147
Speed	122	1.210091	0.5442155	0.08019	2.21523
Scope and scale	122	0.2668366	1.079322	-1.75943	2.53353
Source	122	0.0196663	0.5092531	-1.26342	1.20429
corruption	157	0.5963848	1.080864	-1.03127	2.4049
govcons	165	18.23326	4.888425	8.45897	33.3957
education	119	102.3463	26.93224	34.9395	163,935
remittances	165	1.784648	3.223672	0	17.5333
Cluster 3					
Gini	81	0.4940604	0.0788392	0.288833	0.632413
Palmaratio	81	3.999559	2.007446	1.05197	9.59411
Lngdp	110	24.75369	2.162255	20.8186	29.8823
Lnfsactivity	104	3.60023	0.8476904	1.09504	5.38882
Lnbseffi	96	4.417305	0.3381712	3.410362	5.275008
Lnfsize	101	4.486485	0.1543594	3.8251	4.60514
Lnefdepth	105	3.915491	1.133181	-2.298035	5.927022
Lnfsdepth	100	3.995886	0.6785862	2.09361	5.89225
Speed	85	0.5342131	0.728195	-1.94463	1.20363
Scope and scale	85	0.3261456	0.8896725	-1.98375	2.02352
Source	85	0.9746328	0.8566373	-1.39604	3.63269
Corruption	113	-0.278124	0.7562314	-1.40489	1.65131
Govcons	114	14.36963	6.214738	0	26.2423
Education	80	86.62235	16.99129	38.9374	113,707
Remittances	114	3.191259	4.335948	0	17.7908