Towards Economic Growth in Managing Financial Digitalization Environment: Cluster Perspective

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Abstract:

The objective of the research is to arrange European Union nations according to their level of development in financial management digital transformation. By cluster evaluation, the following indicators are utilized to measure the financial digitization performance of the EU financial sector: Saved money at a financial institution or with a mobile money account, and made a digital in-store merchant payment with a mobile phone. According to the research results, Denmark and Sweden were the leading cluster in 2021 year. The study confirmed the research hypothesis that EU countries differ statistically significantly based on changes in financial digitization effectiveness, grouping them into five relatively homogeneous groups (clusters) depending on their similarity, with a clear geographical disparity for the period under consideration. Identifying discrepancies in the digital financial environments of EU member states, in terms of enhanced support to specific members, EU countries might be beneficial in future benchmarking their own digital financial policy measures. The paper's novelty originates from the use of a new set of digitally oriented indicators in comparative form to identify the EU clusters.

Keywords: Financial Management, Digitization, Cluster Analysis, Economic Growth.

1. Introduction

With COVID-19 our lives moved online. The pandemic fostered the digital era as national policies were focused on continued innovation in technologies. One of the effects was the fast development of digital finance. This digital era measures the effects of the impact of digitalization in financial management on economic growth. The literature and research show that in many locations where traditional finance was underdeveloped, digital finance had a crucial role in economic development. Also, we are witnesses that developed countries gave full room space for the improvement of digital finance to improve the standard of living, as giving the example of countries that support healthy economic development. The quality of economic development depends on efficiency, sustainability, stability, and finance. Seeing the digital era like synonym of emerging development technologies and digital finance, can help in service efficiency and stimulating the innovation and SMEs, exports growth. So the driving force in the new era of managing is the development of emerging technologies such as big data, distributed technology, IoT, AI, and 5G communication, digital finance as core element for quality growth. Digitalization of financial management will enhance boosting the innovation and entrepreneurship through financial sector.

2. Literature Review

The literature that analyze the implications of digitization in the financial sector on economic development, underline the opinions that one of the key elements is social dialogue. Social dialogue is considered a tool that will reveal the introduction of new digital techniques in the financial sector. The pandemic has left governments pondering how remote work will increase productivity, how to keep their jobs and what the meaning of inclusion can be. The intensified state of digitization in the financial sector made us think about the importance of the regulatory environment, to respect the privacy of use and data protection. The digitization of financial services enables the aceleration of the automation of business processes, their transformation, but also the

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reorganization of businesses. Today's population with a new way of life demonstrates a strong potential in the use of digitalization in financial management while gaining decent work, sustainable growth, and development of small and medium enterprises and financial inclusion.

One research finds that the development of digital finance in China promotes economic growth, and further analysis finds that the development of digital finance promotes technological innovation and regional entrepreneurship, that is, the development of digital finance has a positive effect on economic growth and increase of entrepreneurial channels [6]. Some of the research dealing with DFS suggests that digital assets will boost GDP in developing countries [8]. According some authors, digital finance can move funds to effectively engage in industrial sectors, and this will enable better capital utilization efficiency and optimization[7]. With digitalization in financial management and the provision of digital financial services, citizens' consumption increases.

3. IT revolution and innovations related to finance

The digital age has changed the way we live. FinTech has proven to be a necessary factor for financial institutions, especially in terms of providing banks and financial services. Online trade, the use of new technologies, has caused the risk of demand for new electronic wages. With Information Technology, instruments such as electronic cash, e-bag, e-currency, digital currency, digital money or digital cash are made, to choose the efficiency when compared with the standard payment method. There are no clear standards in the Blockchain mechanism and we do not know the boundaries, so participants can easily communicate without a regulator [1]. Artificial intelligence has overtaken human resources in various sectors. This is a standard expectation for further transformation in all sectors, the goal is that the solutions are in the direction of rapid and sustainable economic growth and development. In this direction, the economic application of XBRL aims to improve transparency and business operations, which will return with better positioning of all when it comes to investors. This paragraph is a conclusion of the function that XBRL has – comparing and total business solution for financial data can generate the necessary information from their financial data. In the continuation of the financial digital environment, we meet the blockchain and cryptocurrencies.

4. Digitalization and the finance sector

FinTech is unequivocally making its way to our wallets, smartphones and financial systems. Virtual currencies as part of them are volatile and risky, but provide "peer-to-peer" transactions without central clearing houses, without central banks. For now, they are energy intensive, but the technology is in constant progress, so noshould be disregarded financial restructurings are different from those future ones thoughts. If the economy knows consumption/euroization, where it grows with weak institutions and unstable national currencies decided to accept the state currency (dollar/euro) as means of payment, today, in the 21st century, it is not at all strange expectations to opt for virtual currencies [2]. And when they are analyzed the conclusion of the IMF, the severity for them should be set at a high level. Digitalization in small and open economy is an interesting example of how the health-economic crisis from the pandemic affected the development of FinTech. The negative effects on the global and domestic economy from the health crisis with Covid-19 will be large and long-lasting, but the crisis has the potential to reinforce some trends that were present in the period before it. Digitalization can help in the recovery of the economy, and also strengthen the capacity to deal with such shocks in the future. Within these frameworks, there is also a large space for the FinTech industry. So, for example, the tendencies at the beginning of the crisis showed the more intensive use of electronic payment methods by the population in emerging economies. This is just an indication that changes in habits may follow in the coming period, which would mean easier acceptance of potential FinTech products and services. During the crisis, in addition to the increased demand for cash and the use of payment cards, the use of the banks' digital channels by the population also increased. According to the National Bank of the Republic of North Macedonia, in March 2021 the number of electronic credit transfers initiated by the population increased by a significant 30.3% on an annual basis, i.e. by 21.4% on a monthly basis [3]. Citizens especially used computers and mobile phones to make payments. This indicates that the new situation has broadened the perceptions that there are other channels, beyond cash and cards, as an alternative for payments. The impact of the new Law on Payment Services and Systems, which implements several European directives, will be pointed out, considering the importance of the existence of regulation. The last seven years have witnessed that the governments of several developed countries through their financial regulatory system with set "ultimatums" forced citizens and several attractive businesses to use digital financial services. By setting limits on daily cash withdrawals, charging high fees for cash withdrawals above a certain amount, etc. they enjoy the benefits of financial inclusion and digital finance. The fact is that the financial regulatory system can use its powers through laws to force the population to be financially included. The masses will register on the digital finance platform, but they may refuse to use it to (to a greater or lesser extent) carry out

basic transactions. This creates a new problem for digital financial service providers who previously started with the idea of profiting from the large number of financial transactions through digital FinTech platforms.

In addition, the "targeted" individuals and attractive businesses are "allowed" to suspect that there are other motives behind the "forced inclusion" because they know that the inclusion should be voluntary. Exactly because of this, one of the problems that is yet to be addressed is the problem of intermediation, even in the world of digital finance. Agency theory explains the conflict between the principal and the agent. This conflict arises from the relationship between the principal and the agent in a business or economic activity for unrelated purposes of said participants. In digital finance, the intermediation problem exists because of the profit maximization goals of DFS (digital finance service) providers and the goals of maximizing the welfare of DFS users. On the supply side, private and public partnerships in providing digital finance can play an important role in digitizing a country's economy. Namely, private partnership in the provision of digital financial services is driven by profit maximization initiatives, while public partnership in the provision of digital financial services is driven by the idea of welfare maximization, which also causes an increase in intermediation problems. DFS providers may exercise their discretion to pursue strategies that enrich themselves at the expense of digital finance users through their choice of profit-maximizing digital financial services, rather than welfare-maximizing DFS. DFS providers can generate huge profits by increasing their revenue for the services they provide. For example, banks, non-banking financial institutions and Fintech firms are leading the push for digital financial inclusion to reach billions of new customers, by offering digital financial services on the mobile (or digital device) itself to the excluded and underserved population, of course in exchange for a certain financial compensation. De facto this will raise questions about banks and Fintech providers profiting from the poor, and it also begs the question – how digital finance can enable greater financial inclusion for individuals outside the formal sector and those who have deliberately refused to use digital devices for financial transactions.

5. Methodology

The methodology adopted for this study mostly relies on cluster analysis. The goal is to classify member states so that, by taking into account the initial achievement of particular financial digitization indicators, homogeneous groupings of counties may be identified. The aforementioned indicators were chosen, according to the authors, following a review of the literature to find similarities across countries in the EU based on indicator levels in the most recent data available for a particular period- 2021. This procedure was carried out to avoid misleading outcomes and to reduce the impact of market shocks, which are obvious in some years. The current EU members were assessed, except Luxembourg and Malta, for which no statistics are available. The values for the following indicators were from the World Bank database for the year 2021:

- Made a digital in-store merchant payment or using a mobile phone (% age 15+) (I-1) : The percentage of respondents who report using a mobile phone to make an in-store purchase (World Bank Gender Data Portal, 2021).
- Saved at a financial institution or using a mobile money account (% age 15+) (I-2) : The percentage of respondents who report saving or setting aside any money at a bank or another type of financial institution or using a mobile money account to save in the past year. The percentage of respondents who report saving or setting aside any money at a bank or another type of financial institution or using a mobile money account to save in the past year (World Bank Gender Data Portal, 2021).
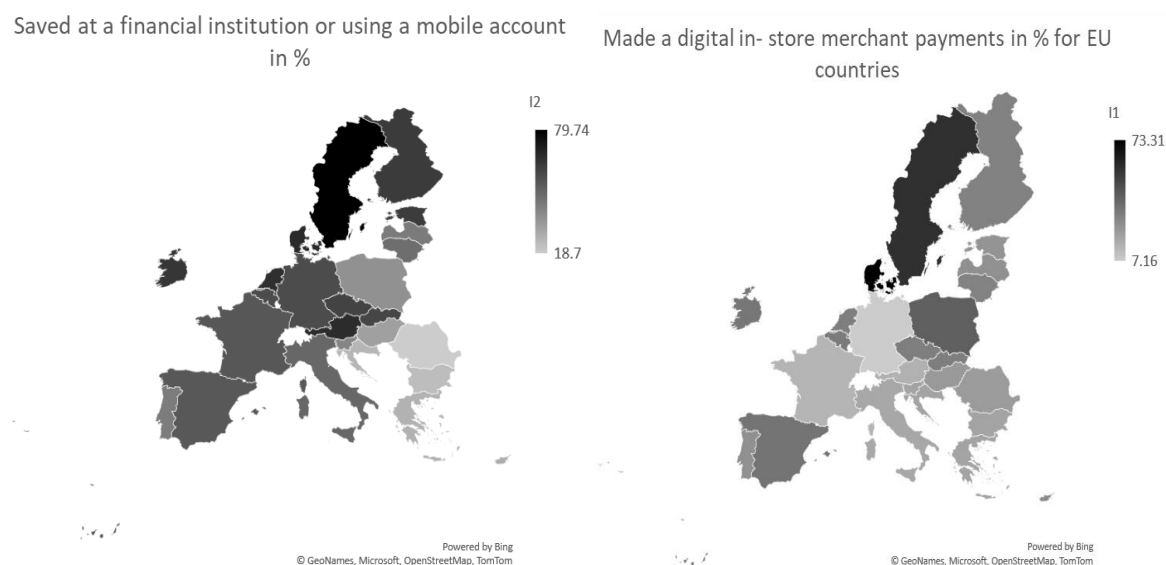
Saved at a financial institution or using a mobile account
in %

Made a digital in- store merchant payments in % for EU
countries

Figure 1: *Digital financial environment indicators European map charts and their three-color divergent interval-valued scale in %*

In this study, a multivariate approach called cluster analysis has been applied to examine if member states can be classified into different groups based on the values of indicators during the specific period. As a result, large groupings of nations are reduced to smaller, more homogenous groups [3]. Until every observation unit is located on the dendogram, the hierarchical approach generates clusters incrementally. That is when the number of clusters that are necessary for the investigation is determined. The agglomerative method starts with bottom-up analysis and proceeds to switch around objects and groups until every individual is part of a group or chart [11]. Using Ward's methodology, an agglomeration scheme was created to identify groups of nations that are related to one another but still separate from one another [10]. Ward's protocol indicates "The average value for each variable (center of the cluster) is calculated for each cluster, and then the square of Euclidean distance from the center of the cluster is calculated for each object, after which the distance for the objects is summed". Thus, this method is based on the analysis of variance to estimate the distance between clusters and thus differs from the others [4],[5]. The most important change in the agglomeration pattern occurs in the last few steps, which is the number of clusters. The conducted cluster analysis in this case aims to point out the changes that have occurred in the financial sector of EU member state in order to see the reason for their possible regrouping and transition to another cluster [9].

6. Results and Discussion

A dendogram is created as the outcome of cluster analysis (Figure 2). It depicts a tree and items that are collected together. Vertical lines represent groups of countries. The dendogram can be divided into a particular number of groups in vertical sections at a certain height, with one conceivable option for grouping. The number of horizontal lines crossed by a vertical line closer to the starting dendogram, indicating the number of clusters.
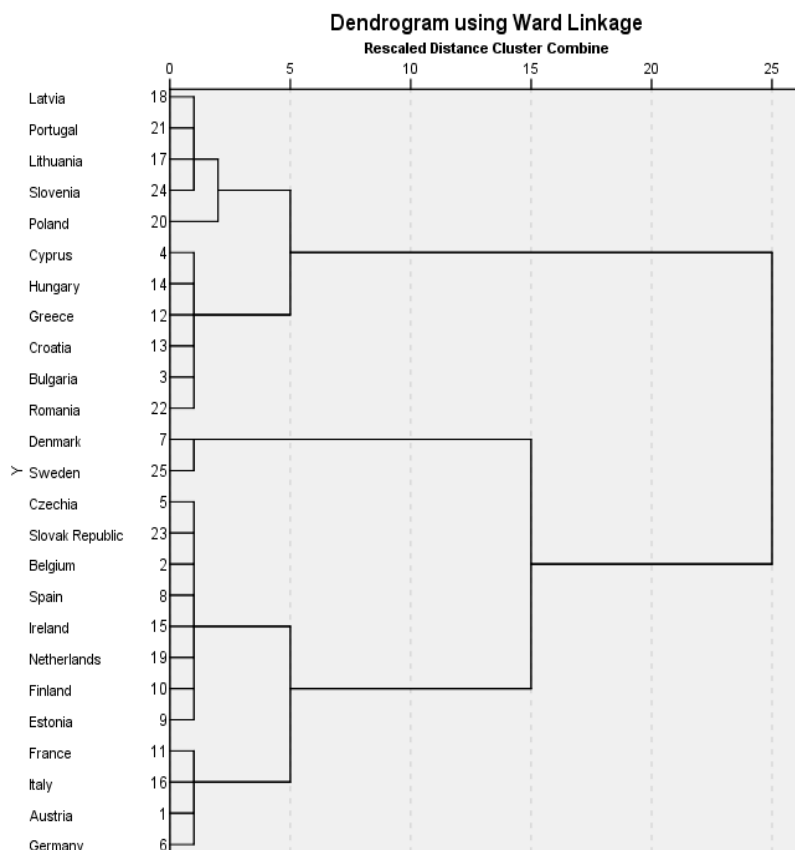
Figure 2: Dendogram and its clusters according to digital financial environment indicator

The descriptive statistics utilized in cluster analysis are calculated on obtaining the digital financial environment indicator mean for each cluster independently across the time period under consideration. As a result, conditions in the clusters could potentially be viewed using the mean of the indicators, and the clusters themselves can be compared. According to Table 1, Cluster 4 is fairly dominant in both situations (indicators). Denmark and Sweden are leaders in financial digitalization among European Union members. Conversely, the I-2 indicator has an extraordinarily low mean value in the first cluster, which includes one of the most developed nations in the EU, when it comes to saving or putting aside any money at a bank or other financial institution or using a mobile money account to save in the previous year. Eight European Union countries belong to the second cluster, which similarly has high scores for the aforementioned variables. Therefore would be predicted, the third cluster with low indicator values is mainly made from countries that have experienced economic transitions and are still adapting to the financial sector's digitalization.

Table 1: Indicators' mean within clusters

CLU	Number of countries	Mean		Minimum	Maximum
		I-1	I-2		
1	4 (Austria, Germany, France and Italy)	56.59	14.11	7.16	18.96
2	8 (Belgium, Czechia, Estonia, Spain, Finland, Ireland, Netherlands and Slovakia)	60.26	32.01	25.20	35.84
3	6 (Bulgaria, Cyprus, Greece, Croatia, Hungary and Romania)	25.59	22.39	19.94	27.80
4	2 (Denmark and Sweden)	**73.51**	**65.45**	57.60	73.31
5	5 (Latvia, Lithuania, Poland, Portugal, Slovenia)	41.74	29.12	20.17	42.15

Source: Author's calculation in IBM SPSS 26.0

Note: I-1: The percentage of respondents who report using a mobile phone to make an in-store purchase; I-2: The percentage of respondents who report saving or setting aside any money at a bank or another type of financial institution or using a mobile money account to save in the past year.

Clusters' European map chart (Figure 3) based on descriptive statistics showed five clusters and their members.
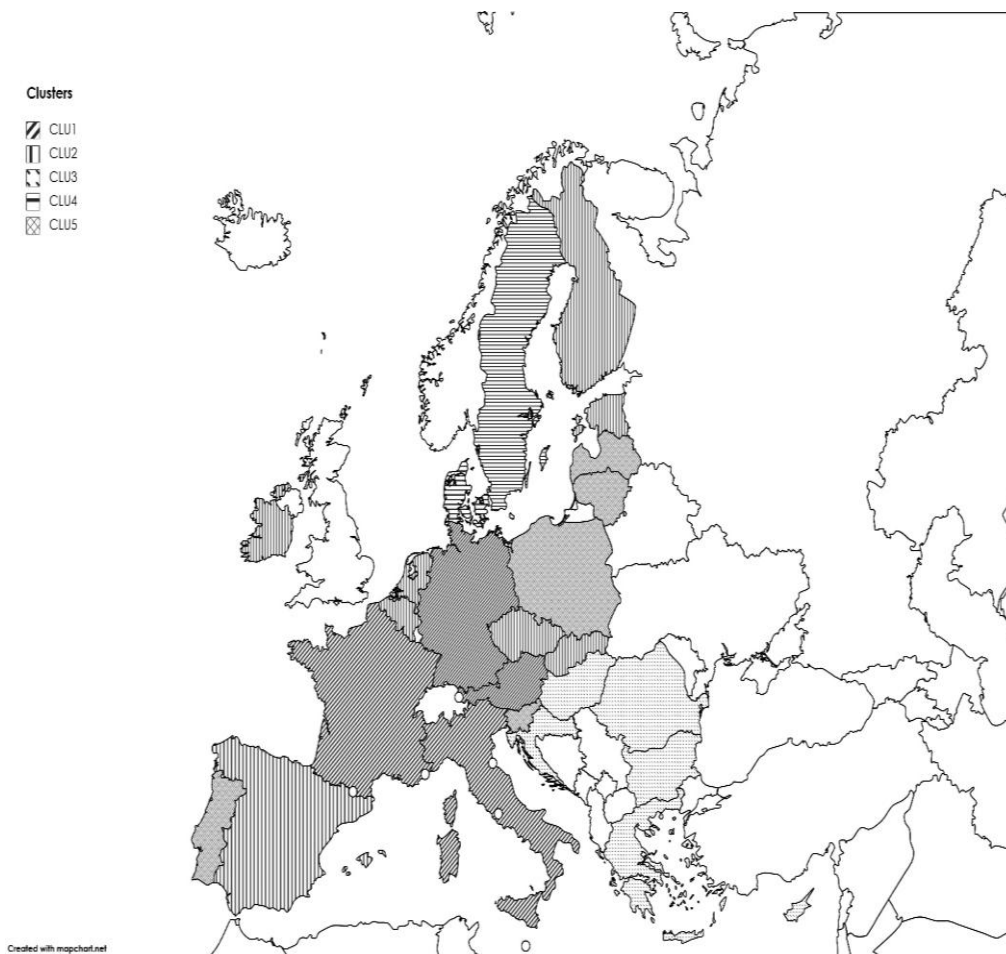

Figure 3: *European clusters map for analyzed digital financial environment indicators*

Using appropriate statistical methods, the authors verify the correctness of the chart analysis. The statistical significance of differences in the average values of variables between clusters may be ascertained using the ANOVA method. The homogeneity of variance test, often known as Levene's test, is used in conjunction with it. One of the most used tests is Levene's, which begins with the null hypothesis that the variation is the same in all samples if P > 0.05"[11]. "If P > 0.05, the null hypothesis is accepted, i.e., the alternative is rejected, which implies such a situation that the variance is equal for at least one pair of samples"[11]. This can be shown through the following relationships:

$$H_0 : \sigma_1^2 = \sigma_2^2 = \ldots = \sigma_k^2, P > 0.05, \tag{1}$$
$$H_1 : \sigma_1^2 \neq \sigma_2^2 \neq \ldots \neq \sigma_k^2, P < 0.05 \tag{2}$$

Testing showed that statistically significant differences do not exist between variations of given samples, which is recorded in Table 2. The results further indicate the null hypothesis acceptance, that there is homogeneity of variance for a given variable by groups.

Table 2: Levene Statistic

Indicators		Levene Statistic	Sig.*
I1	Based on Mean	2.599	.067
I2	Based on Mean	1.084	.391

*Statistical significance at the level of 0.05
Source: Author's calculation in IBM SPSS 26.0

Based on the conducted ANOVA procedure (Table 3), statistically significant differences in average values can be stated for the variables as seen in the Sig. column where P < 0.05 for both indicators.

Table 3: ANOVA

Indicators		F	Sig.*
I1	Between Groups	33.300	.000
I2	Between Groups	58.488	.000

*Statistical significance at the level of 0.05
Source: Author's calculation in IBM SPSS 26.0

7. Conclusion

The paper focused on the development of financial digital transformation. By cluster evaluation, the following indicators are utilized to measure the financial digitization performance of the EU financial sector: Saved money at a financial institution or with a mobile money account, and made a digital in-store merchant payment with a mobile phone. According to the research results, Denmark and Sweden were the leading cluster in 2021 year. The study confirmed the research hypothesis that EU countries differ statistically significantly based on changes in financial digitization effectiveness, grouping them into five relatively homogeneous groups (clusters) depending on their similarity, with a clear geographical disparity for the period under consideration. The approach employed in this research is mostly based on cluster analysis. The intention is to categorize member states so that homogenous groupings of countries may be recognized by considering the baseline performance of specified financial digitization indicators. According to the results, Cluster 4 is fairly dominating in both situations (indicators). Denmark and Sweden are leaders in financial digitalization among Union members. This is notably unambiguous in the Swedish government's new digital financial strategy, which has been recognized as a new booming hotspot for digital finance businesses such as Green Assets Wallet (digital independent platform for investing) and the innovation projects under Stockholm Green Digital Finance. The Danish Financial Supervisory Authority provides a productive, low-cost testing area to facilitate regulatory compliance and security checks for financial activities, including cryptoocurrencies and blockchain-based systems. Fintech organizations may imitate a real-time production environment within this monitored and performance-measured test platform, allowing them to duplicate responses from multiple systems and application interfaces. Identifying discrepancies in the digital financial environments of EU member states, in terms of enhanced support to specific members, EU countries might be beneficial in future benchmarking own digital financial policy measures.

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