

Payment Services Availability in the Context of Digital Transformation of Financial Markets

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Abstract—The article discusses the issues of increasing financial inclusion based on the development of payment services, taking into account modern processes of digitalization of the economy. Various approaches to the content of the concept of "financial inclusion» and their evolution are presented on the basis of Russian and foreign authors' researching of scientific publications, as well as its definition in materials of central banks and international organizations. The necessity of developing a toolkit for a comprehensive assessment of the development of the level of accessibility of payment services as a component of monitoring financial accessibility in various countries has been substantiated. Based on the data on the statistics of payment, clearing and settlement systems BIS, an integrated index of the sustainability of the development of financial accessibility of payment services of the G20 countries was determined, reflecting the level of development of each country, the level of development of the infrastructure of its payment system and payment services and their adequacy to the problems of digital transformation of financial markets, as well as the level of demand for payment services. According to the proposed method, a rating was compiled for a comprehensive assessment of the level of financial availability of payment services in the G20 countries, which made it possible to distribute the latter according to the stability groups of the process of increasing the availability of payment products and services.

Keywords—*financial inclusion, digital transformation, G20 countries, payment system, payment services availability, payment products and services, bank card, ATM, fast payments, electronic money.*

I. INTRODUCTION

In the last decade, in many countries of the world, more and more attention is paid to the problem of increasing the availability of financial services. This is largely due to the processes of transition to a new technological order, the main trend of which is the digitalization of the economy.

For the first time at the international level, the problem of increasing financial inclusion was raised by Kofi Annan when he was the UN Secretary General, calling the inaccessibility

of financial services for a significant part of the world's population "a serious barrier to the development of the world economy" [1].

The Alliance for Financial Inclusion (AFI) was established in 2008 to help developing countries engage the poor and small businesses "in making wise use of financial market services" [1]. At the moment, the Alliance includes central banks, supervisory and controlling institutions, associations from nearly 100 countries. Its activities are supported and coordinated by the World Bank, the Big Twenty (G20), and the UN. The unifying structure for international organizations in the field of financial inclusion was the Global Partnership for Financial Inclusion (GPFII), which was formed at the end of 2010. In 2011, the Mayan Declaration was adopted at the World Political Summit in Mexico City, which outlined "the priority tasks of the world community as a whole and individual countries to improve financial inclusion" [1]. The Bank of Russia joined the Declaration in 2014.

Financial inclusion is one of the significant factors in improving the quality of life of the population, and therefore increasing the level of availability of financial products and services while ensuring the protection of consumer rights and financial stability undoubtedly seems to be the most important task of the state, which the issues of providing financial services are in the area of close attention of the World bank. To monitor the population's availability to financial services, together with Gallup, Inc. a large-scale complex of Global Findex data was created, which allows obtaining this information for 144 countries. Moreover, every three years the World Bank publishes changes in financial inclusion indicators in these countries.

The issues of increasing the availability of financial services in Russia were raised at the state level and fixed as a priority since 2016. Development of the financial market was included in the number of priority areas, the Strategy for increasing financial inclusion in the Russian Federation for the period 2018-2020 was adopted, which in fact, it became the

first strategic program document to address the problem under consideration at the macro level.

Financial inclusion can be determined by the level of development of the financial market, at which the population and small and medium-sized businesses are provided with a full-fledged opportunity to receive a basic set of financial services, characterized by the presence of a set of conditions: provision of infrastructure for the provision of financial services, quality of financial services, demand for financial services and their usefulness. The basic set of financial services is adopted by the G20 global partnership: credit, insurance, payment and savings services [2].

The need for financial accessibility for the development of states and the standard of living was quite accurately substantiated by K. Sukumaran (2015), noting that “financial inclusion paves the way for mobilization of untapped savings in the society and channelizing these savings towards investment and results in growth of different sectors of the economy” [3].

Scientist K. Sukumaran defines full financial inclusion is a state in which all people who can use them, have access to a suite of quality financial services, provided at affordable prices, in a convenient manner, and with dignity for the clients [3].

The idea of a significant link between financial literacy and financial inclusion has been articulated relatively recently in international scientific research and working papers of international organizations. Financial literacy as a characteristic of the usefulness of financial services is studied in the works of scientists Almenberg J., Widmark O., Clapper L., Lusardi A. et al. [4].

The issues of public demand and satisfaction with financial services are discussed in the publications: Garcia M.J.R., Demirguk-Kunt A., Clapper L., Singer D. Ossandon Busch M., Heng D. [5, 6].

Scientist Gortos S.V. (2016) in his study notes and reveals the relationship between financial inclusion and ensuring the integrity and reliability of the financial system [7].

The influence of financial inclusion on financial stability and development of countries is also studied by M.J.R. Garcia in "Can Financial Inclusion and Financial Stability Go Hand in Hand?" (2016). At the same time, he draws conclusions about the ambiguity of the impact of financial inclusion. On the one hand, it has a positive effect on the development of the economy, leading to a decrease in interest rates, an increase in the share of users of financial services. On the other hand, increasing financial inclusion increases the debt burden of businesses and the population, leads to the growth of new financial institutions and instruments from among the unregulated areas of the financial system [8].

Increasing financial inclusion is directly related to the development of the payment systems market, payment services and payment infrastructure. It is the payment industry that is a necessary component of the provision of any services to the financial industry. So in the journal "Payment Systems" (2017) it is noted that "payment systems are extremely important for the financial system as any failure in these systems may result in the non-availability of funds, in terms of amount or time, preventing economic agents from meeting the commitments that they acquire in the ordinary course of their business" [9].

Studies of trends and problems of increasing financial accessibility, to study the impact of the development of payment systems on the monetary policy of the state in Russia, became widespread in the 2000s: E.V. Sinelnikova-Muryleva [10], A.A. Gulko [11, 12], L.A. Bondarenko [13], E.N. Pashkova [14] and others.

At the same time, establishing the nature of the relationships and interdependencies between the components of financial inclusion will improve the objectivity of assessing financial inclusion and its impact on the development of national economies.

II. METHODS

To study the financial availability of payment services, as well as the state of their development, we use the resources of the BIS statistical database, the Google Books Ngram Viewer service, mathematical models for analyzing and assessing the level of development of financial systems.

Using the Ngram Viewer service makes it possible to assess the frequency of mention in the literature of the above-mentioned components of ensuring the financial availability of payment services, to establish the time period for the growth of their demand. This service is used to analyze publications of the time of occurrence and frequency of application of concepts [15]. For research, we use the most massive database of publications - publications posted in English. (fig. 1).



Fig. 1. Analysis the concepts' occurrence characterizing financial inclusion using the Ngram Viewer service

The resulting graph (Fig. 1) clearly shows that the mention of the availability of payment services, an analysis of their development and application refer to earlier periods, and there is a greater amount of literature studying this problem. Here we can talk about the needs for receiving payment services of both organizations and other structures, and just individuals, as well as the readiness of the financial sector to satisfy them.

The results of the analysis show that the “surge” in the mention in publications of the concept of financial inclusion and, as its component, the availability of payment services, falls on the beginning of the 2000s. We associate this process with the creation of the G20 group - in December 1999, a founding conference was held in Berlin, and since November 2008, meetings of the G20 have been held annually.

Actually, due to the introduction of a number of restrictions to the epidemic situation in COVID-19, the demand for the using of financial instruments, payment transactions in remote mode is increasing. That should ensure the availability and ease of using of the resources of the payment system not only for organizations, but also for the population.

The calculation of the level of sustainability of the development of financial availability of payment services in the G20 countries is based on data from the database on

statistics of payment, clearing and settlement systems in individual countries provided by the Bank for International Settlements.

For determine the level of development of the country, the infrastructure of the payment system, as well as the demand for payment services of the G20 countries, the authors used the indicators presented in Table 1.

TABLE I. INDICATORS FOR ASSESSING THE INTEGRATED SUSTAINABILITY INDEX OF FINANCIAL INCLUSION OF PAYMENT SERVICES

Key assessment indicators of countries' development	Payment system infrastructure assessments indicators	Indicators for assessing the demand for payment services
<ul style="list-style-type: none"> - GDP, USD billion - Population, thousand people - GDP per capita, USD per inhabitant - Rate of inflation growth, % - Average exchange rate against the dollar, per US dollar 	<ul style="list-style-type: none"> - Institutions offering payment services / instruments, units. - Number of institutions offering payment services / instruments per 1 million inhabitants - Number of payment accounts, units - Number of banks offering payment services / instruments - Non-banking institutions offering payment services / instruments - ATMs terminals, thousand units - POS terminals, thousand units - Number of ATMs terminals per inhabitant, pcs. - Number of POS terminals per inhabitant, pcs. - Participation in SWIFT domestic institutions, units 	<ul style="list-style-type: none"> - Volume of non-cash payments, mln USD - Average number of non-cash payments per one inhabitant, pcs. - Cash withdrawal, mln - Number of cards, thousand pieces - Number of cards per inhabitant, pcs.

The particular indicators shown in Table 1 are used to calculate the integrated index of the sustainability of the development of financial inclusion of the payment system of the G20 countries. The method is based on a multidimensional comparative analysis, which allows taking into account both the absolute values of the indicators of each country and the degree of their location in relation to the benchmark indicator.

In accordance with the chosen methodology, the coordinates of the compared countries are expressed in fractions of the corresponding coordinates of the standard taken as a unit [16]:

$$K_i = \frac{x_i}{\max x_i} \quad \text{or} \quad K_i = \frac{\min x_i}{x_i} \quad (1)$$

where K_i – is the assessment of the level country's development i for each indicator; x_i – value of the indicator for country i ; $\max x_i$ - the maximum benchmark indicator, which can be selected as the optimal (or threshold) values of the country's development indicators; $\min x_i$ - the minimum benchmark indicator, which can be chosen as the optimal (or threshold) values of the country's development indicators.

We find the value of the index of each indicator under study by the formula:

$$I_j = \sqrt{\frac{\sum_{i=1}^n K_j^2}{n}} \quad (2)$$

where n - is the number of indicators; I_j - is the index of stability of each indicator.

It is expedient to calculate the Integrated Sustainability Index for the financial inclusion of payment services in the G20 countries (I_s) using the following formula:

$$I_s = \sqrt[3]{I_c * I_i * I_d} \quad (3)$$

where- I_c - is the index of the country's development level; I_i - index of the level of development of the country's payment system infrastructure; I_d is an index of the level of development of the demand for payment services in the country.

The authors believe that a definition of the integrated sustainability index for the development of financial inclusion of payment services for countries makes it possible to take into account the importance of each indicator characterizing the level a country's development and its payment system, as well as the level of demand for payment services in the country.

III. RESULTS

The multivariate comparative analysis, based on the Euclidean distance method, made it possible to compile a rating of the G20 countries and reveal the level of development for each country in the G20, the level of development of the payment system infrastructure in these countries, as well as the level of demand for payment services in them.

To determine the values under study, we use the data of the Bank for International Settlements system on the indicators of the G20 countries for 2017, which is associated with the peculiarities of data placement in the system. Note that the databases contain limited information on the USA and the Eurozone, which does not allow applying the method in full. The results obtained by the authors on the basis of this technique are presented in Figure 2.

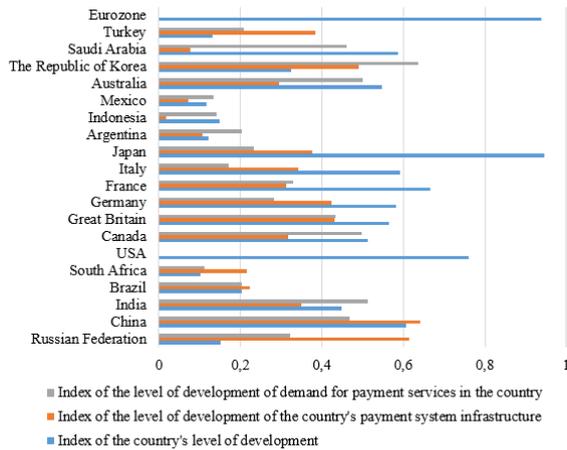


Fig. 2. Values of indices of levels indicators' development of financial inclusion of payment services

Thus, this method made it possible to reveal the highest level of the main indicators of the development payment system infrastructure of the G20 countries is in Japan. The five leaders are the Eurozone, USA, France, China. The lowest level of the country is in Argentina, Mexico and South Africa. Russia took 15th position in this rating.

At the same time, the infrastructure of the payment system is best developed in China, Russia, the Republic of Korea, Great Britain, and Germany, as evidenced by the calculated index of the level development payment system infrastructure of the G20 countries.

The most demanded payment services are consumers of the Republic of Korea, India, Australia, Canada, China. Russia ranks 9th in terms of demand for payment services.

Based on the calculated integrated index, we will compile a rating of the level of sustainability of the development of financial availability of payment services in the G20 countries (Table 2). At the same time, the highest value indicates the highest level of its development, and vice versa, a small value indicates a low level.

TABLE II. RATING OF COUNTRIES BY THE LEVEL OF SUSTAINABILITY OF DEVELOPMENT THE FINANCIAL INCLUSION OF PAYMENT SERVICES

№	A country	The value of the integrated development sustainability index	№	A country	The value of the integrated development sustainability index
1	China (excluding Congo and Macau)	0.566827	11	Russia	0.310678
2	Great Britain	0.471690	12	Saudi Arabia	0.275148
3	The Republic of Korea	0.465734	13	Turkey	0.219461
4	Japan	0.436032	14	Brazil	0.209725
5	Canada	0.432458	15	Argentina	0.138139
6	India	0.431396	16	South Africa	0.134484
7	Australia	0.431195	17	Mexico	0.104037
8	Germany	0.410775	18	Indonesia	0.070538

№	A country	The value of the integrated development sustainability index	№	A country	The value of the integrated development sustainability index
9	France	0.409134	19	USA	there is no data
10	Italy	0.325653	20	Eurozone	there is no data

Let's group the G20 countries to determine the sustainability of the development the financial inclusion of payment services- (Table 3).

TABLE III. GROUPING OF THE G20 COUNTRIES BY THE DEGREE OF SUSTAINABILITY OF DEVELOPMENT OF FINANCIAL INCLUSION OF PAYMENT SERVICES

Resilience level	Index Thresholds	Country	System development stability degree
1	0,81 < I sustainability < 1,0	-	High level of stability
2	0,61 < I sustainability < 0,8	-	Sustainable development
3	0,41 < I sustainability < 0,6	China, United Kingdom, Republic of Korea, Japan, Canada, India, Australia, Germany, France	Development with minor imbalances
4	0,26 < I sustainability < 0,4	Italy, Russia, Saudi Arabia, Turkey	Development with signs of instability
5	0 < I sustainability < 0,2	Brazil, Argentina, South Africa, Mexico, Indonesia	Unsustainable development

As a result of the grouping of countries by the value of the integrated development index, it is possible to draw conclusions about the stability of the development of financial availability of payment services, the orderliness and efficiency of the implementation of measures taken by the state and the banking sector [17]. Leaders in the stable development of payment services availability: China, Great Britain, Republic of Korea, Japan, Canada, India, Australia, Germany, France. At the same time, we note that there is an uneven development of payment services, as evidenced by individual indicators.

A number of countries, including Russia, are included in the fourth group. With regard to the current policy in Russia, we note that the strategy of the Bank of Russia defines the directions for increasing financial literacy and developing payment systems. The set tasks are being actively implemented and should soon lead to sustainable development of the financial availability of payment services, including through the digitalization of their provision, remote provision, and expansion of the sector providing payment services.

IV. CONCLUSION

Increasing the level of financial inclusion, which is one of the most important factors in improving the quality of life of the population, seems to be a strategic task of the modern state.

This is the reason for the close attention to the issues of financial services provision by national regulators, international organizations, the World Bank, etc., as well as the scientific community.

Effective monitoring of increasing financial inclusion is one of the most important components, because it helps to determine the optimal and promising directions for improving the relevant methods and tools for expanding financial services, taking into account modern trends in the transformation of financial markets in the format of the digital economy development.

The modern payment landscape is being formed under the influence of the development of fintech, but at the same time, the formation of a new payment landscape is a factor in accelerating the digital transformation of the economy and an essential condition for increasing the availability of financial services. The methodology for determining the integrated sustainability index of the development of financial inclusion of payment services for different countries allows taking into account the importance of each indicator characterizing the level of development of payment systems, as well as the level of demand for payment services in the country. Establishing the nature of the relationship and interdependence between the components of financial inclusion makes it possible to increase the objectivity of assessing its impact on the development of national economies.

The proposed method for assessing the development of payment services includes the use of a wide range of indicators available to the scientific community, which makes it possible to use it in various studies.

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