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Effect of Digitalization on the Competitiveness of Money Transfer Operators in the National Payment System

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ABSTRACT: The development of digital technologies has significant impact on the operational activities of the national payment system participants, which requires for comprehensive study of the impact of the digitalization factor on the competitiveness of payment service providers. The effect of digital technology on the competitiveness of money transfer operators in the national payment system has been analyzed in the article. The authors have studied the effect of digitalization on increasing the transaction activity and the number of accounts that are remotely accessed to transfer funds, using the correlation and regression analysis methods. It has been established that the greatest impact on the competitiveness of money transfer operators in the national payment system is exerted by the level of competitiveness in the corporate segment, due to the influence of digital technologies. Practical recommendations have been given to improve the competitiveness of the corporate and retail segments of the national payment system, taking into account the capabilities of digital financial technologies. The use of advanced financial technologies and the introduction of the international financial electronic data interchange standard ISO 20022 in automated banking systems, as well as non-banking services, in digital channels for interacting with customers will increase the competitiveness of money transfer operators in the corporate segment of the national payment system. The introduction of digital technologies in the retail segment, in particular, the fast payment system, increases customer loyalty and transaction activity, which ultimately will allow the retail segment of the national payment system to reach the level of world identifiers.

Keywords: Competitiveness, corporate and retail segments of the national payment system, digitalization, financial technology, money transfer operators, national payment system.

I. INTRODUCTION

The national payment system is a complex object in structure, consisting of many subsystems that are directly related to the provision of payment services. Payment service providers – money transfer operators, whose main function is to arrange settlements between economic agents – form the most important subsystem of the national payment system. The money transfer operators are hereinafter referred to as credit organizations entitled to carry out money transfers. Studies in the field of competitiveness of elements of the national payment system are mainly devoted to the analysis of the dynamics of the number of operations and turnover of service providers and payment infrastructure operators, while the impact of digitalization on the competitiveness of money transfer operators has not been comprehensively studied. In the framework of the proposed approach, the influence of digital technologies on the level of competitiveness of service providers in the wholesale and retail segments of the national payment system using the tools of mathematical statistics was studied.

Digitalization contributes to the emergence of more convenient, affordable, and efficient payment services, reduces the transaction costs of parties to the settlements, and is a driver for the development of the financial market. The use of digital technology changes the principles of interaction between credit organizations and customers (legal entities and individuals), increases the volume and speed of payment transactions [1]. The use of digital technology for the provision of payment services allows money transfer operators to create additional value, which is a source of competitive advantage and improves the competitiveness of the national payment system.

Let us consider the effect of digital technology on the competitiveness of money transfer operators in the national payment system. A model of stochastic connection between the competitiveness of money transfer operators and digitalization of the corporate and retail segments of the national payment system can be established using the methods of correlation and regression analysis.

Digital technology allows to send orders to make payment transactions from bank accounts remotely. An indicator that takes the advantages of digitalization in the provision of payment services into account is defined as the ratio of the number of active accounts that can be managed remotely (electronically) (N_i^{el}) to the total number of accounts within the i-th segment N_i^{all}:

$$\varphi_i = \frac{N_i^{el}}{N_i^{all}}, \quad (1)$$

where i = 1 corresponds to corporate (accounts of legal entities), and i = 2 corresponds to retail (accounts of individuals) segments of the national payment system.

The degree of the effect of the corporate and retail segments is taken into account by applying their weighting coefficients, found using the following formula:

$$\gamma_i = \frac{P_i}{P}, \quad (2)$$

where P_i is the number of payment orders transferred to credit organizations in the i-th segment, and P is the total number of payment orders transferred by all money transfer operators.

The competitiveness of money transfer operators can be found using the following formula:

$$y = \sum_{i=1}^{n} \gamma_i \varphi_i \quad (3)$$

The value $x_i = \gamma_i \varphi_i$ is the dynamic parameter that defines the competitiveness of money transfer operators in the i-th segment of the national payment system at any point in time. The statistics of the national payment system for the period from 2013 to 2018, published by the Bank of Russia, are used for estimations in this study [2].

II. METHODS

Let us find the empirical coefficient of determination to analyze the effect of digitalization on the competitiveness of money transfer operators, which reflects the proportion of variation of the effective attribute (y) under the influence of factor attributes (x_1, x_2). The empirical coefficient of determination is found using the following formula:

$$\eta^2 = \frac{\delta^2}{\delta^2 + \overline{\sigma^2}} \quad (4)$$

where $\sigma_i^2 = \frac{\sum_i (x_i - \overline{x_i})^2}{\sum n}$ are the intragroup variances, $\overline{\sigma^2} = \frac{\sum_i \sigma_i^2 n}{\sum n}$ is the average of intragroup variances, and $\delta^2 = \frac{\sum_i (\overline{x_i} - \overline{x})^2 n}{\sum n}$ is the intergroup variance [3]. The empirical coefficient of determination was estimated based on the statistical data from the Bank of Russia [2], η^2 = 0.988. As a result, the competitiveness of money transfer operators is determined by differences in the competitiveness of the corporate and retail segments resulting from the advantages of digitalization by 98.8 %, and by the effect of other factors by 1.2 %.

The effect of factor attributes on the resulting attribute is determined by an empirical correlation relation, which is found using the following formula:

$$\eta = \sqrt{\frac{\delta^2}{\delta^2 + \overline{\sigma^2}}} = 0.994 \quad (5)$$

If η falls into the interval $0.91<\eta<1$ in accordance with the Chaddock's scale, this indicates a close relationship between the competitiveness of the corporate and retail segments, in which credit and settlement organizations operate, and their general level of competitiveness [3].

The authors defined the resulting factor (y) within the framework of stochastic connection with factor attributes based on the statistical data of the national payment system prepared by the Bank of Russia [2], using the following formula:

$$y = \frac{P^{el}}{P^{all}}, \quad (6)$$

where P^{el} was the number of payment orders submitted by legal entities and individuals to the money transfer operators electronically, while P^{all} was the total number of payment orders.

A two-factor linear regression model was used to analytically assess the effect of digitalization on the competitiveness of payment service providers in the national payment system:

$$\hat{y} = a_0 + a_1 x_1 + a_2 x_2, \quad (7)$$

where a_0, a_1, and a_2 were the parameters of the regression equation, which resulted from the solution of the system of linear equations expressed as a matrix:

$$\begin{pmatrix} n & \sum x_1 & \sum x_2 \\ \sum x_1 & \sum {x_1}^2 & \sum x_1 x_2 \\ \sum x_2 & \sum x_1 x_2 & \sum {x_2}^2 \end{pmatrix} \begin{pmatrix} a_0 \\ a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} \sum y \\ \sum y x_1 \\ \sum y x_2 \end{pmatrix} \quad (8)$$

Solution of the system of linear equations using the Cramer's rule allows to establish the dependence of the competitiveness of payment service providers in the national payment system on the competitiveness of the corporate and retail segments resulting from the advantages of digitalization:

$$\hat{y} = 3.916 + 0.9379 x_1 + 0.677 x_2 \quad (9)$$

The adequacy of the regression model was tested on the basis of the F-test: $F = \frac{\sigma_y^2}{\sigma_{res}^2} \times \frac{n-m}{m-1}$, where $\sigma_y = \sqrt{\overline{y^2} - \overline{y}^2}$ was the mean square deviation of the resulting factor, and $\sigma_{res}^2 = \frac{\sum_{j=1}^{n} (y_j - \hat{y}_j)^2}{n}$ was the residual variance. The obtained value of the F-test was 4.4 times the tabular value at a 1 % significance level and the number of degrees of freedom $F_{tab}(\upsilon_1 = 1, \upsilon_2 = 4)$, which confirmed the adequacy of the two-factor regression model.

III. RESULTS

The developed regression model describing the dependence of the competitiveness of money transfer operators on the competitiveness of the corporate and retail segments resulting from the introduction of digital technology allows to draw conclusions within the economic interpretation. Partial correlation coefficients were found using the following formulas:

$$e_1 = a_1 \frac{\overline{x_1}}{\overline{y}} = 0.65, \; e_2 = a_2 \frac{\overline{x_2}}{\overline{y}} = 0.11 \quad (10)$$

where $\overline{x_1}$ and $\overline{x_2}$ were the average values of the factors, and $\overline{y}$ was the average value of the resulting indicator for the period from 2013 to 2018. A 1 % increase in the competitiveness of the corporate segment resulting from digitalization increases the competitiveness of money transfer operators by 0.65 %. At the same time, a 1 % increase in the competitiveness of the retail segment resulting from digitalization leads to an increase in the competitiveness of money transfer operators by only 0.11 %. This means that the introduction of digital technologies in the corporate segment has the greatest effect on the factor attribute.

The coefficient Δ_i indicates the share of the contribution of the analyzed factor to the total effect of all the selected factors, and is found using the following formula:

$$\Delta_i = a_i \frac{r_i}{R^2} \frac{\sigma_{x_i}}{\sigma_y}, \quad (11)$$

where $r_i = \frac{\overline{x_i y} - \overline{x_i}\,\overline{y}}{\sigma_{x_i} \sigma_y}$ and $r_{12} = \frac{\overline{x_1 x_2} - \overline{x_i}\,\overline{x_2}}{\sigma_{x_1} \sigma_{x_2}}$ are the paired correlation coefficients, $\sigma_{x_i} = \sqrt{\overline{x_i^2} - \overline{x_i}^2}$ is the standard deviation, and $R = \sqrt{\frac{r_1^2 + r_2^2 - 2 r_1 r_2 r_{12}}{1 - r_{12}^2}}$ is the multiple correlation coefficient. In this case, Δ_1 = 0.57, Δ_2 = 0.43

– therefore, of the two factors under study, factor x_2 – the level of competitiveness of the corporate segment resulting from digitalization – can have the greatest effect, with due consideration of the level of their variation.

IV. DISCUSSION

The competitiveness of payment service providers in the national payment system had increased by more than 20.5 % from 2013 to 2018 due to the use of the modern digital technology, and amounted to 93.8 % at the end of 2018. A World Bank report "Competing in the Digital Age: Policy Implications for the Russian Federation" notes a high level of digital transformation in the financial sector, which can be cited as an example for other sectors of the economy. This point of view is backed by McKinsey researchers noting that the level of digitalization in the financial sector corresponds to the world identifiers [4].

The indicator, which takes the advantages of digitalization in the corporate sector into account, φ_1 = 98.4, is high, but it can be brought to the optimal value through the introduction of the advanced financial technology. The use of centralized integrated solutions, which allow organizing the interaction between a legal entity and several settlement banks on the basis of a single-window principle, will increase the φ_1 value by optimizing liquidity, as well as the speed and convenience of payment transactions. The introduction of the possibility to use the international universal financial messaging standard ISO 20022 by credit organizations in their automated systems is their competitive advantage, which improves the quality of service and reduces transaction costs for corporate clients, which ultimately leads to an increase in φ_1 [5]. The lack of the possibility of end-to-end processing of cross-border transactions due to the insufficient digitalization of payment technologies leads to a significant increase in their cost, which in turn forms the final tariff for consumers at a level of 10 to 20% [6].

Digitalization of the interaction between credit and settlement organizations and corporate clients will allow the latter to receive settlement services easier and faster, which will increase the demand for them from consumers of payment services [7]. The introduction of nonbanking services such as accounting, legal services and insurance will increase the number of noncash transactions made through remote banking channels by small and medium-sized enterprises [8, 9]. These factors will lead to an increase in the weight coefficient of the corporate segment of the national payment system (γ_1).

A negative factor that influences $\gamma_1$is a decrease in the index of business activity of small and medium-sized businesses associated with weak demand in the economy [10]. According to the Bank of Russia, only 79.6 % of small and medium-sized businesses used remote access to bank account management in 2017 [11].

The indicator φ_2 = 93.2 in the retail segment, which takes the advantages of digital technology into account, lags behind its counterpart in the corporate segment. This is due to the distrust of a part of the population in cashless payments and a low financial culture. According to the Bank of Russia, only 59.7 % of the adult population had the ability to remotely access bank accounts to transfer funds (Internet or mobile banking) in 2017 [11]. Digitalization secures the positive growth dynamics for the indicator φ_2, which is demonstrated in Table 1. Most often, users of digital services are consumers aged 10 to 34 and people with medium and high incomes. Residents of rural areas, people older than 60, and people with low incomes use digital services the least [12]. One of the main reasons for the lack of confidence in electronic means of payment on the part of consumers is the safety of electronic transactions [13]. Digital technologies, in particular, the possibilities of working with big data technologies, can significantly reduce the level of fraud during payment transactions [14].

Table 1: The share of adults with remote access to bank accounts for money transfers.

Period	2014	2015	Growth 2014/2015	2016	Growth 2015/2016	2017
Share of the population with remote access to account management, %	35	39.5	12	40.8	3.3	59.7

Compiled by the authors using the data from [15].

The value of the weight indicator of the retail segment γ_2 = 16.4 is low, which is associated with insufficient transaction activity of retail clients of money transfer operators. The share of cashless payments in retail turnover will be 65 % by the end of 2019, which indicates a significant growth potential for γ_2 [16]. According to analysts of the Association of Banks of Russia, the share of cashless payments from bank accounts will increase to 80 % due to the introduction of a quick payment system in the C2B sector, which will allow the indicator of the retail segment of the national payment system to reach the level of world identifiers. The introduction of digital technology increases the loyalty of retail customers and the level of protection of financial assets, which motivates mass segment customers to increase transaction activity in relation to money transfer operations from bank accounts.

V. CONCLUSION

As such, the study has resulted in the following:

– the competitiveness of money transfer operators in the national payment system in the context of digitalization has been determined;

– the effect of the competitiveness of the corporate and retail segments (x_1, x_2) on the competitiveness of money transfer operators (y) has been estimated using the methods of correlation analysis;

– the effect of digitalization on the competitiveness of money transfer operators in the national payment system has been analytically estimated using a two-factor regression model;

– the parameters of the regression model have been economically interpreted, which has indicated that the

corporate segment has the greatest effect on the competitiveness of payment service providers; and
–practical recommendations have been given on increasing weight indicators (γ_1, γ_2) and competitiveness levels of the corporate and retail segments, with due consideration for the advantages of digitalization (φ_1, φ_2).
The model proposed in the study can be refined and improved as the statistics of the national payment system published by the national regulator are updated and expanded.

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