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Assessment of Financial Inclusion of Russia's Northern Regions

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ABSTRACT

Multidimensional assessment of financial inclusion is crucial for understanding both the financial aspect of people's lives and the state's overall financial situation. The northern territories play a significant role in modern Russia, and it is important to study their financial inclusion. The aim of this study is to compare financial inclusion in the northern regions of Russia between 2000 and 2022 and identify the main trends and factors influencing financial accessibility in these areas. To achieve this goal, we need to identify and analyze the main factors that affect financial accessibility in the northern regions and create a rating based on these factors. This will help us better understand the current situation and make informed decisions about future policies. The approach proposed in this paper, which is based on a two-stage principal component analysis (PCA), allows us to get rid of subjective processes in the weighing of indicators and form a comprehensive assessment of financial well-being. This method involves endogenous assignment of weights and the creation of a composite index. The Kaiser criterion is used to identify the main components. As a result of our study, we have determined that the most significant factors influencing financial well-being are the number of operating credit institutions, their branches, and funds (deposits) held by legal entities and individuals, both in rubles and foreign currency. We have also developed financial accessibility indices that allow us to conduct rating assessments of regions and identify significant changes over time. The results of the study will help us to evaluate the effectiveness of the current policy and provide a basis for developing targeted measures to achieve convergence in financial accessibility in northern Russia.

Keywords: Arctic and Northern regions; financial inclusion; Russia; credit organizations; deposits; loans

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INTRODUCTION

Recently, policy makers have started to pay more attention to financial inclusion as a way to ensure sustainable economic growth, particularly in developing countries. However, there is still controversy over whether financial accessibility actually contributes to economic growth due to conflicting information in the literature [1].

Financial inclusion can promote human development by fostering inclusive growth and economic development, as well as financial deepening. Research has shown that expanding access to financial services, such as banking services, can significantly contribute to the stability of the banking sector and increase the stability of individual banks [2].

Since 2016, there has been an increase in research on financial inclusion in different regions around the world.

For example, W. D. Bekele conducted a comparative analysis of the factors influencing financial accessibility in Kenya and Ethiopia at the macro and micro levels [3]. A number of studies have examined the issue of financial inclusion in African countries. In a study by J. C. Kouladoun et al., the relationship between digital technologies and financial accessibility was studied in 43 African countries. It was found that the level of financial accessibility increases with the development of digital technologies [4]. Later articles (A. Girón et al., 2021) examine the relationship between the financial inclusion index and development variables in the least developed countries of Asia and Africa. They argue that economic growth leads to financial inclusion [5].

M. Sarma and J. Pais were among the pioneers in developing financial accessibility indices [6]. In many countries, ensuring financial access is a priority in development policy.

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Financial accessibility in China has seen significant progress recently, thanks to policies, regulations, and the rapid development of digital technology [7, 8]. This has led to a unique path of development for China.

A study of financial inclusion in Asia and Africa's least developed countries has shown that increased access to financial services leads to higher levels of official savings, which in turn contributes to the development of these countries [4, 5].

To compare financial accessibility between countries or regions, a comprehensive indicator is needed that takes into account all aspects of accessibility [9, 10].

The Indonesian government has created a national strategy to improve financial inclusion, and a study by S. M. Damayanti et al. [11] identified the key factors influencing this index: unemployment, internet access, and problematic loans. Numerous other studies have also constructed financial accessibility indices for Indonesia using multidimensional approaches [12, 13].

According to the study's findings, financial inclusion has long-term implications for the development of human capital in South Asian countries. In the short term, it has a positive impact on economic growth [14].

The analysis of key components also revealed that management quality negatively affects financial accessibility but positively impacts financial stability. Additionally, financial accessibility positively influences financial stability in Asia [15].

Mobile technology can contribute to economic growth and financial inclusion in Sub-Saharan Africa [16].

Currently, there is a great interest in creating a more inclusive financial system, particularly through the use of digital money as a means to promote financial inclusion [17]. Fintech, directly or indirectly, affects inequality by its involvement in the financial system [18]. In addition, participation in financial services through savings accounts has a significant impact on stock market participation [19]. According to L. Igonina, assessments of financial inclusion relate to determining the accessibility of financial services for economic agents [20]. As S. Miroshnichenko rightly notes, the development

of consumer digital literacy will contribute to increased digital financial accessibility [21].

As for the analysis of financial accessibility in Arctic regions, the research findings show a positive and significant impact of financial development on sustainable competitiveness, contributing to resource efficiency and social cohesion. Nevertheless, overexploitation of natural resources can bring short-term benefits for local and regional communities but may compromise long-term sustainability in the Arctic. Therefore, the financial sector should prioritize supporting financing and investment in alternative, environmentally friendly technologies and businesses in order to mitigate the overexploitation of natural resources [22].

The overall state of financial accessibility in Russia can be considered satisfactory.

However, as noted in the Strategy for Increasing Financial Accessibility in the Russian Federation for 2018–2020, there are several unresolved issues related to financial inclusion in Russia due to the unique characteristics of the country. These include its geographical and demographic features, economic conditions, and the relatively young age of the Russian financial market.

One of these issues is the challenge of overcoming the “last mile” — the difficulty in reaching certain segments of the population, particularly those living in rural and remote areas, as well as in the northern parts of Russia. These regions often face difficulties in accessing financial services, including remote access.

The main challenges of working in remote, sparsely populated, or hard-to-reach areas, such as the northern regions of Russia, include the lack of financial services, including POS terminal networks and agency networks, concentrated in large settlements. This is due to the limited functionality of public automatic devices and the limited interest or opportunities for financial service providers. Additionally, there is a lack of access to financial services in these areas.

The aim of the study is to compare the level of financial inclusion in the northern regions of Russia over the period from 2000 to 2022 and to identify the main trends and factors that significantly influence the spread of financial accessibility in these regions.

To achieve this goal, we set the following research objectives:

1. To identify and evaluate the key factors affecting financial accessibility in the north of Russia.
2. To conduct a rating assessment of the regions based on a composite indicator of financial inclusion, calculated using a two-step principal component analysis (PCA).

We will use endogenous weighting to ensure that the results are more accurate and relevant to the specific context of the northern territories.

The northern territories play a significant role in the modern Russian economy. They are a source of valuable mineral resources, including hydrocarbons. More than 20% of Russia's oil reserves and over 70% of its natural gas reserves are located in these regions. These figures make Russia the country with the largest hydrocarbon reserves among those with northern territories.

The lack of a clear structure and heterogeneity in the list of regions presented challenges for law enforcement agencies. In this study, the northern regions of Russia include: the Republic of Karelia, the Komi Republic, the Krasnoyarsk Territory, the Arkhangelsk Region, the Tyumen Region, the Khanty-Mansi Autonomous Okrug — Yugra, the Republic of Sakha (Yakutia), the Murmansk Region, the Chukotka, the Yamalo-Nenets Autonomous Area, the Kamchatka Territory, the Magadan Region.

Multidimensional assessment of financial accessibility is essential for understanding both the financial situation of individuals and the overall financial health of the country.

MATERIALS AND METHODS

The data set covers eight regions of northern Russia for the period between 2000 and 2022.

One of the main challenges in financial accessibility research is the lack of use of subjective indicators. However, this study relies on both objective and subjective data collected by the Central Bank of Russia and Rosstat.

The study aims to evaluate the availability of financial services in northern Russia. Financial inclusion is defined as a composite index based on three dimensions: the penetration, engagement,

and usage of financial services. To address the main challenge of the study, a financial accessibility indicator was constructed using a two-step principal component analysis (PCA) with endogenous weighting.

In particular, this approach allows us to eliminate criticism of arbitrary weight choices and comprehensively reflect the level of financial accessibility. This is a useful tool for developing policies and assessing financial accessibility in the north of Russia. At the same time, the calculated index of financial accessibility highlights those factors that are truly significant in a given period and affect the distribution of financial accessibility throughout the north.

Principal component analysis allows us to reduce the number of variables in the data set and find new, hidden factors that explain the relationships between the original data. To determine the most important components, we used the Kaiser criterion, which retains only those components with an Eigenvalue greater than one.

By analyzing these components, we can gain a better understanding of the effectiveness of our current policies and use this information to develop targeted measures to improve financial accessibility in northern regions of Russia.

RESULTS

The financial accessibility indicators from the website of the Federal State Statistics Service have been analyzed. At the initial stage, 10 indicators have been studied, which are available for all regions in the north of Russia between 2000 and 2022, including infrastructure and engagement indicators. These indicators include:

1. The number of active credit institutions.
2. The number of operating branches of credit institutions within the region.
3. Funds (deposits) in rubles of legal entities and individuals attracted by credit institutions (by place of raising funds; beginning of the year, million rubles).
4. Funds (deposits) of legal entities and individuals in foreign currency, attracted by credit institutions based on the place where funds were raised; at the beginning of the year (million rubles).

5. Funds (deposits) of individuals in foreign currency raised by credit institutions.

6. Debt on loans in foreign currency provided by credit organizations to individuals (at the location of borrowers; at the beginning of the year; in million rubles).

7. Debt on loans in Russian rubles provided by credit organizations to legal entities (at the location of borrowers; at the beginning of the year; in millions of rubles).

8. Debt on loans in foreign currencies provided by credit organizations to legal entities (located at the borrower's location; at the start of the year, in millions of rubles).

9. Debt on loans in rubles provided by credit institutions to individuals (located at borrower's place; at start of year; millions of rubles)

10. Funds (deposits) in rubles raised by credit institutions from individuals (located where funds are raised; at beginning of year; in millions of rubles).

Analyzing the number of credit institutions in the northern regions, it should be noted that they have decreased over time. Thus, the Komi Republic is characterized by a decrease in the number of credit institutions from 7 to 1, in the Arkhangelsk Region from 5 to 0 by 2022, in the Krasnoyarsk Territory from 12 to 1, in the Republic of Sakha (Yakutia) and in the Kamchatka Territory there was a decrease from 8 organizations to 1.

In the Khanty-Mansi Autonomous Okrug — Yugra, in the first decade up to 2010, there was a significant increase in credit institutions: 3 to 12. But they subsequently closed, and by 2022 there are only three of them left.

A similar situation was observed with the number of branches of credit institutions. In almost all regions of the North, their number has sharply decreased by 2022.

A marked decrease in the number of branches of credit institutions in 2022 was observed in the Murmansk Region (from 26 to 1), the Krasnoyarsk Territory (from 76 to 11), the Republic of Sakha (Yakutia) (from 51 to 3), the Kamchatka Territory (from 21 to 2), and the Magadan Region (from 20 to 1), and in the Chukotka Autonomous Okrug, out of 7 branches of credit institutions in 2022, not a single one remained. In the Khanty-Mansi and Yamalo-

Nenets Autonomous Okrugs, there was a tendency to increase the number of branches of credit institutions until 2015, and then their partial closure.

Analyzing the factor of funds (deposits) of legal entities and individuals in foreign currency, it is necessary to note its decrease in volumes in the regions of the north of Russia over time.

As for deposits of legal entities and individuals in rubles, there is a significant growth trend by 2022, which can be observed in such regions as the Khanty-Mansi Autonomous Okrug, the Yamalo-Nenets Autonomous Okrug and the Krasnoyarsk Territory.

Let's consider the results of the analysis of the main components in 2000, 2010 and 2022 for the regions of the North of Russia.

Each component is a combination of the initial variable characteristics of the northern region and describes some part of the data variance. The contribution of each component shows how important it is to explain the changes in the data.

Figure 1 shows the weights of the components and their impact, taken into account when forming the financial accessibility index in 2000 in the northern regions of Russia.

As can be seen in *Figure 1*, the factor with the highest share is "Number of credit institutions". This factor had a positive impact on financial engagement in 2000, as can be seen. Factor 5 also had an impact, although it was negative. All other factors did not have a significant weight or influence in the overall combination of factors.

The visualization diagram of Eigenvalues for 2000 is shown in *Fig. 2*.

The first main component in the analysis of the financial accessibility of the northern Russian regions is related to the number of credit institutions. This component explains 54.45% of the variation in these output indicators. Considering the relatively high salaries and average per capita income of the population in the northern regions, as well as the remoteness and underdeveloped infrastructure in sparsely populated areas, the lack of access to digital technology in 2000 was a significant factor.

The second main component in the analysis of the financial accessibility of the northern regions of Russia in 2000 was related to factor No. 3 — "Deposits of individuals and legal entities". This component

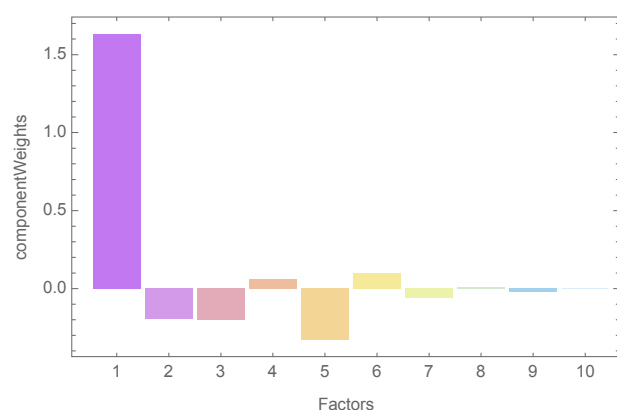


Fig. 1. Component Weights and Their Effects, 2000

Source: Author's calculations based on statistical data obtained from the Rosstat website.

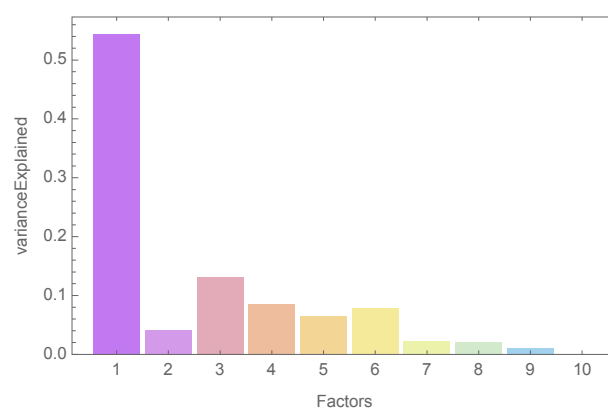


Fig. 2. The Visualization Diagram of Eigenvalues for the Year 2000

Source: Author's calculations based on statistical data obtained from the Rosstat website.

explained 13.16% of the variation in the baseline data, which means that the variation in this indicator also has a strong influence on the variation in data when assessing financial accessibility. This could be due to the impact of the number of financial and credit institutions in the region on the population.

The third main component (8.5% of the explained variance) is related to the indicator “Total volume of deposits in foreign currency”. The high value of this indicator is associated with high per capita incomes and wages in the northern regions of Russia, as well as with the main direction of financial investments — deposits in foreign currency.

These three factors are the main components that explain the formation of the financial accessibility index.

In the context of principal component analysis, a negative value for a component means that the data associated with that component is changing in a direction opposite to the average data value. This means that if a component has a negative “weight”, it describes an inverse deviation from the average of the data. Conversely, if a component has a positive “weight”, then it describes a positive deviation from the mean value. To understand the results, it is essential to identify which components have the most significant impact on the data.

Figure 3 shows the weights of the components and their impact, which were taken into account when forming the financial accessibility index in 2010.

As can be seen in Figure 3, factor No. 1, “The

number of credit institutions”, has the largest share. However, its impact in 2010 was negative. Factor No. 2, “The number of branches of credit institutions”, had the second largest share and had a positive impact on financial accessibility indicators. This suggests that there has been a shift in the relative importance of these factors over the ten-year period from 2000 to 2010.

The value of factor No. 5, “Deposits of individuals in foreign currency”, increased by 18.25%. A visualization of Eigenvalues for 2010 can be found in Fig. 4.

In 2010, due to the impact of the 2008–2009 crisis, the situation had changed somewhat, with the number of credit institutions becoming the main explanatory variable in 2010. Now, the number of branches of a credit institution has a positive impact on the formation of the financial accessibility index and is the second most significant explanatory factor.

However, in 2022, things have changed again, with factor No. 2 becoming the main one, which is beneficial for the regions of Karelia, Komi, the Murmansk region, and Magadan.

For the Arkhangelsk, Murmansk and Magadan regions, factor number 1 has the greatest impact, although this impact is negative for the financial involvement of the northern region. The financial accessibility of the Yamalo-Nenets Autonomous Okrug is mainly influenced by factor No. 3, although this influence is also negative. Factor number 4 has a predominant influence on financial accessibility in the Republic of Sakha (Yakutia).

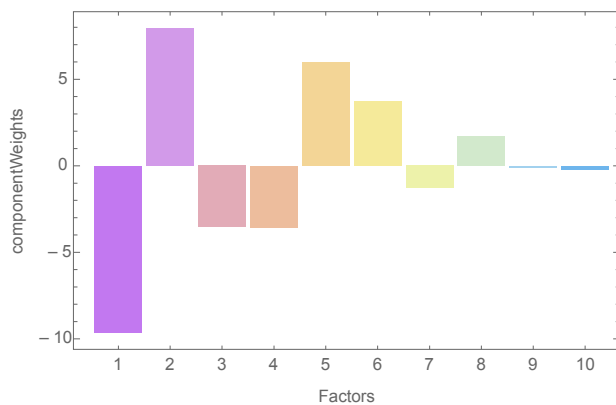


Fig. 3. Component Weights and Their Effects, 2010

Source: Author's calculations based on statistical data obtained from the Rosstat website.

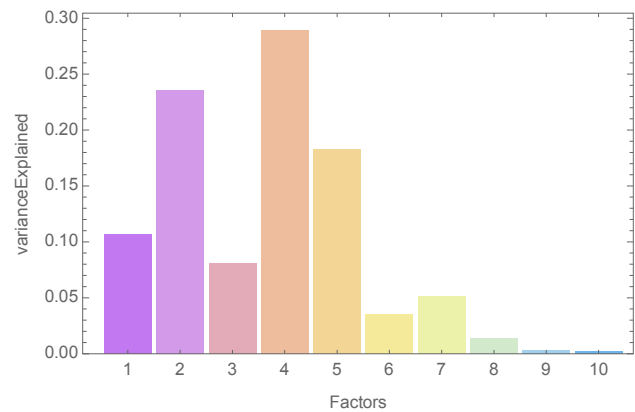


Fig. 4. The Visualization Diagram of Eigenvalues for the Year 2010

Source: Author's calculations based on statistical data obtained from the Rosstat website.

Figure 5 shows the weights of the components and their impact, which were taken into account when forming the financial inclusion index in 2022.

Thus, in 2022, the main indicator remains indicator No. 2 — “The number of branches of credit institutions” — and factor No. 3 — “Deposits of individuals and legal entities in rubles”.

Figure 6 shows that the main components are factor No. 2 — “The number of branches of credit institutions” — and factor No. 3, which has a negative value — “Deposits of individuals and legal entities”.

The first main component in the analysis of financial accessibility of the northern regions of Russia is related to Factor No. 2 — “The number of branches of credit institutions”. This component explains 33.55% of the variance in these output indicators.

Due to the development of programs and strategies for improving financial accessibility in sparsely populated and remote regions of Russia, as well as the ongoing digitalization of these regions, the number of branches of credit institutions has become more important in 2022.

The second main component in the analysis of financial accessibility in the northern regions of Russia in 2022 is related to factor No. 1 — “The number of credit institutions”. This component explains 25.08% of the variance of the baseline data. This means that the variation of this indicator also strongly influences the variation of data when assessing financial accessibility. This may mean

the impact of the number of financial and credit institutions on the financial accessibility of the population of the regions of the North of Russia.

Below is a visualization of the factors for 2000, 2010, and 2022, by region. The lines on the graph represent the values of various variables for different regions of the North. This helps to visually assess trends and patterns in the data for each region. All data on the factors has been logarithmic and standardized (Fig. 7).

As can be seen in Figure 7, factors four and five coincide for nine out of ten northern regions. However, in Figures 8 and 9, we can see that the situation has changed in 2010 and 2022, and the influence of these factors has become more diverse across different regions, and it does not correspond to any of the studied factors.

Thus, the values of the indicators have changed over the decades, but certain trends can be traced in different regions of northern Russia, for example in the Republic of Karelia and the Komi Republic.

The Table presents the ranking of the regions in the North of Russia based on the financial accessibility index for the given period, based on an analysis of key components.

The index values differ during the period for each region due to the selection of different main components in each period, despite the fact that all selected indicators have been normalized and standardized.

Table 1 presents the changes in the rating of the northern regions over 22 years. So, if in 2000

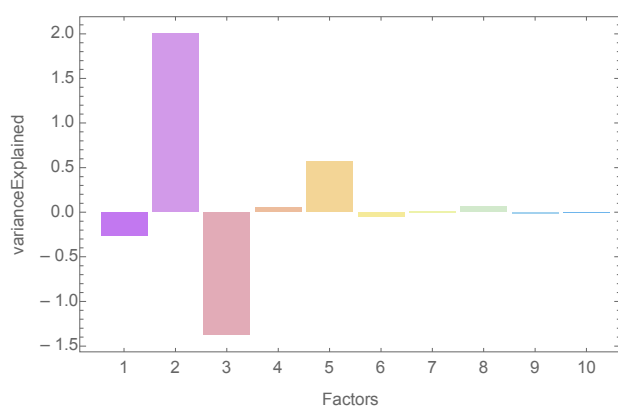


Fig. 5. Component Weights and Their Effects, 2022

Source: Author's calculations based on statistical data obtained from the Rosstat website.

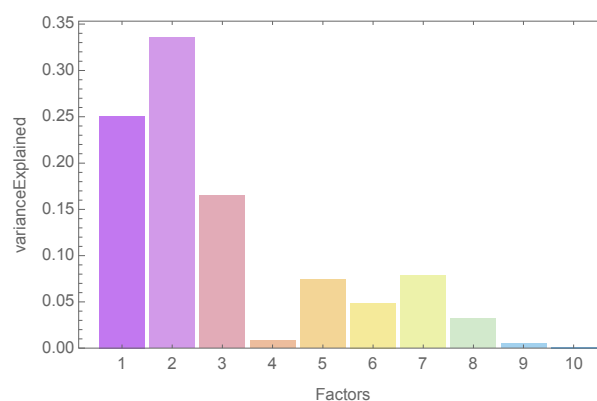


Fig. 6. The Visualization Diagram of Eigenvalues for the Year 2022

Source: Author's calculations based on statistical data obtained from the Rosstat website.

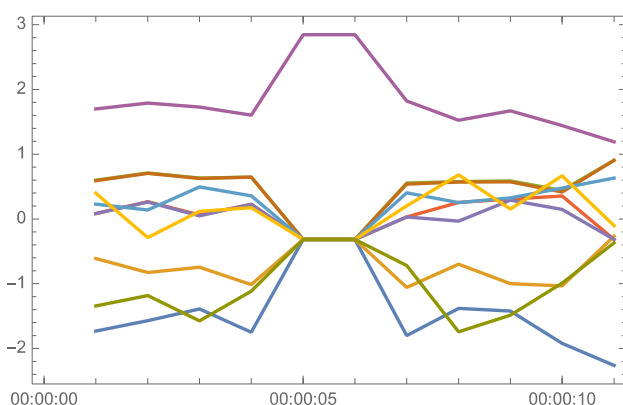


Fig. 7. Visualization of Factor Values for the Year 2000

Source: Author's calculations based on statistical data obtained from the Rosstat website.

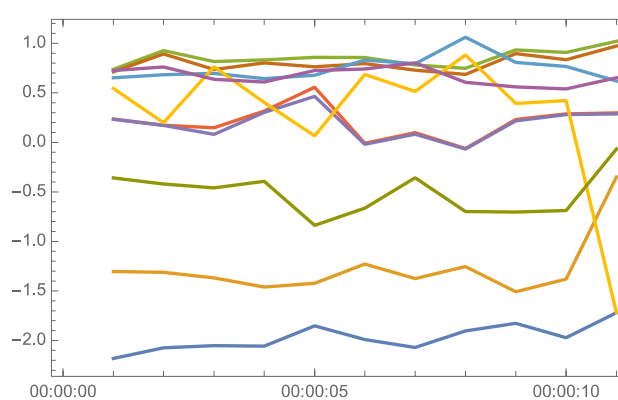


Fig. 8. Visualization of Factor Values for the Year 2010

Source: Author's calculations based on statistical data obtained from the Rosstat website.

the Chukotka Autonomous Okrug was the leading country in terms of financial accessibility. However, in 2010, it fell to the last place, and by 2022, it had risen to seventh place.

As for the Magadan region, it dropped to eighth place by 2000, but rose to fourth in 2022.

The Khanty-Mansi Autonomous Okrug of Yugra has retained the last place for the past 10 years, but in 2022, it took the sixth place after improving its performance. In 2010, the Krasnoyarsk Territory ranked first, improving its position compared to 2000. However, by 2022, it had dropped to fifth place. The Yamalo-Nenets Autonomous Okrug ranked only 10th both in 2000 and in 2022. On

the other hand, the Murmansk region maintained an honorable fourth place for the past 10 years. However, in 2022, it became the leader and took the first place among the northern regions of Russia in terms of financial accessibility. In 2010, the Republic of Karelia came in second place, but in 2022, it saw a decline in performance, falling to eighth place. Despite improving its performance to third place in 2010, the Arkhangelsk Region returned to ninth place in 2022.

The Kamchatka Territory has seen an improvement in its performance, moving up from second place in 2022. This is also true for the Sakha Republic. However, the Komi Republic's performance

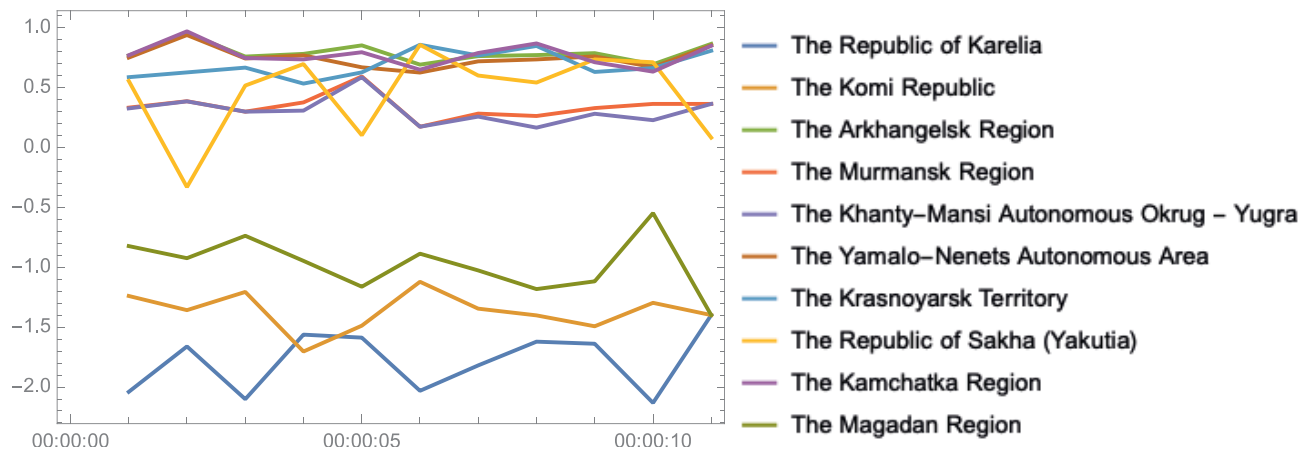


Fig. 9. Visualization of Factor Values for the Year 2022

Source: Author's calculations based on statistical data obtained from the Rosstat website.

Table

Ranking of the Regions of Northern Russia by Financial Inclusion Index over the Period Under Review

Region	2000	2010	2022
The Krasnoyarsk Territory	3	1	5
The Chukotka Autonomous Region	1	11	7
The Yamalo-Nenets Autonomous Area	10	7	10
The Khanty- Mansi Autonomous Okrug – Yugra	11	10	6
The Magadan Region	2	8	4
The Murmansk Region	4	4	1
The Republic of Karelia	5	2	8
The Arkhangelsk Region	9	3	9
The Kamchatka Region	7	9	2
The Republic of Sakha (Yakutia)	8	6	3
The Komi Republic	6	5	11

Source: Author's calculations based on statistical data obtained from the Rosstat website.

has declined, dropping to last place among the regions in the North of Russia when compared to previous decades.

Thus, we can observe the results of the policy implemented in the field of financial accessibility in sparsely populated and hard-to-reach regions of Russia, taking into account the change in factors affecting financial accessibility in these regions from 2000 to 2022, as well as the spread of digital payment instruments and the process of divergence in the northern regions of Russia.

This process of divergence requires further research into its causes, but it is a significant indicator of the success of government policy in

promoting financial inclusion in Russia and achieving SDG 8.

CONCLUSIONS

In the north of Russia, indicators of financial accessibility vary in terms of the factors that affect them.

The factors that are typical for all three time periods include the number of credit institutions operating, the number of branches of these institutions in the region, the funds (deposits) of legal entities and individuals attracted by these institutions, and the funds (deposits) of individuals denominated in foreign currencies, which change

in value over time due to economic and political events. Since 2022, the number of branches of credit institutions in the regions of northern Russia has become a significant factor. However, analysis has revealed a decrease in the number of these branches over the past 22 years. The size of deposits from both individuals and legal entities plays a crucial role, but this factor needs to be examined in more detail due to its potential negative impact on financial accessibility in 2010.

It is worth noting the effectiveness of measures taken to improve the financial accessibility of the northern regions and the process of convergence in terms of loans granted to both legal entities and individuals, both in foreign currency and in rubles.

As well as individual deposits in foreign currency and rubles, we can say that the goals of state policy to ensure financial accessibility in these sparsely populated and difficult-to-access regions of the north of Russia have been achieved.

The proposed approach in the article, which is based on the analysis of key components and the creation of a composite index, has allowed us to eliminate the subjective process of weighting indicators and provides a multi-dimensional assessment of financial well-being and development.

Therefore, economic and political leaders, as well as those who shape public policy and make decisions at all levels, should take into account these significant factors of financial accessibility when making decisions.

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