Sustainability of a regional investment strategy: factors of a digital economy

Устойчивость региональной инвестиционной стратегии: факторы цифровой экономики

Sostenibilidad de la estrategia de inversión regional: factores de la economía digital

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Abstract

In modern conditions, investment activity is of particular importance in economic development. The nature and structure of investments in fixed assets affect the implementation of a sustainable investment strategy in a region. Therefore, the aim of this study is to assess the factor impact of the digital economy on the dynamics of attracting investment in fixed assets. The empirical base of this study is compiled from statistical data (a case study of Russian regions for 2015-2017). Based on the correlation analysis, the factors have been differentiated according to the degree of their influence on the processes of investment activity. The results obtained confirm the main hypothesis, according to which: the regions developing the factors of the digital economy have higher dynamics and volumes of attracting investments in fixed assets. It has been established that factors such as the specific number of personal computers in organizations and the level of use of electronic document exchange have a stable relationship with the dynamics of attracting investments. The factor of using local computer networks does not have a significant impact on the processes of investment activity in a region. The practical significance of this study is to clarify the strategic priorities for the development of digital infrastructure, including activation of the investment activity in Russia's regions. Further research prospects are associated with a more detailed analysis of digitalization trends, an assessment of their impact on the efficiency of investments in fixed assets in a region's economy, and an optimization of the management system for these processes.

Аннотация

В современных условиях особую значимость в экономическом развитии приобретает инвестиционная деятельность. Характер и структура инвестиций в основной капитал влияют на ход реализации устойчивой инвестиционной стратегии в регионе. Поэтому цель исследования заключается в оценке факторного воздействия цифровой экономики на динамику привлечения инвестиций в основной капитал. Эмпирическая база исследования составлена по статистическим данным на примере регионов России за 2015-2017 гг. На основе корреляционного анализа дифференцированы факторы по степени их влияния на процессы инвестиционной деятельности. Полученные результаты свидетельствуют о подтверждении основной гипотезы, согласно которой: регионы, развивающие факторы цифровой экономики, имеют более высокую динамику и объемы привлечения инвестиций в основной капитал. Установлено, что такие факторы, как удельное количество персональных компьютеров в организации и уровень использования электронного документооборота имеют устойчивую взаимосвязь с динамикой привлечения инвестиций. Фактор использования локальных вычислительных сетей не оказывает значимого влияния на процессы инвестиционной деятельности в регионе. Практическая значимость исследования заключается в уточнении стратегических приоритетов развития цифровой инфраструктуры, обеспечивающих в том

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числе активизацию инвестиционной деятельности в регионах России. Дальнейшие перспективы исследования связаны с более детальным анализом тенденций цифровизации, оценкой их влияния на эффективность инвестиций в основной капитал в экономике региона и оптимизацией системы управления данными процессами.

Resumen

La actividad inversora adquiere especial importancia en el desarrollo económico actual. La naturaleza y la estructura de las inversiones de capital principal influyen en la aplicación de una estrategia de inversión sostenible en la región. Por lo tanto, el observatorio del estudio es evaluar el impacto de la economía digital en la dinámica de atracción de inversiones en capital principal. La base empírica del estudio se compila estadísticamente a modo del ejemplo de las regiones de Rusia en 2015-2017. Los factores se diferencian en cuanto a sus impactos en los procesos de la actividad inversora sobre la base del análisis de correlación. Los resultados obtenidos indican la confirmación de la hipótesis básica, según la cual: las regiones que desarrollan los factores de la economía digital tienen una mayor dinámica y volúmenes de atracción de inversiones en capital principal. Se ha determinado que factores tales como la cantidad específica de ordenadores personales en la organización y el nivel del uso del flujo de trabajo electrónico tienen una relación constante con la dinámica de la atracción de inversiones en capital principal. El factor del uso de redes locales no tiene un impacto significativo en los procesos de la actividad inversora en la región. La importancia práctica del estudio consiste en aclaración de las prioridades estratégicas para el desarrollo de la infraestructura digital, lo que incluye la intensificación de la actividad inversora en las regiones de Rusia. Las perspectivas futuras del estudio se relacionan con un análisis más detallado de las tendencias de la digitalización, una evaluación de su impacto en la eficiencia de las inversiones de capital en la economía de la región y una optimización del sistema de gestión de estos procesos.

Introduction

At the present stage of development of the Russian economy, the main task is to stimulate the transition from exports and raw material strategies to reindustrialization and modernization strategies. To solve this problem, a qualitative change in the type of production processes is necessary, which should be based on high-tech methods of creating goods and services, on an updated material and technical facilities. Obviously, this will be possible in the conditions of a sharp increase in the volume of attracting investments in fixed assets.

An analysis of the directions of attracting investments at the regional level is becoming an urgent topic of various scientific studies. Santos (2019) empirically substantiates the crucial role of investments in fixed assets in the achievement of technological progress. The importance of stimulating investment aimed at technological development is also mentioned in Strizhkova (2016). Sibirskaya et al. (2016) emphasize that in order to intensify investment activity at the regional level, special conditions must be created. This idea is being developed by Rakhimov (2007), Egorov (2015), etc., indicating that an analysis of the regional investment climate is an urgent task in planning, organizing and improving regional investment programs. Its improvement is the basis for increasing investments in fixed assets in the region's economy. Ansong and Boateng (2019) show that the development of digital technologies in enterprises leads to increased competitiveness. An analysis of the global experience leads to the conclusion that the main

task of the development of modern investment activity is the formation of a digital economy and the reduction of the digital inequity between regions (Tarchokova, 2019).

These circumstances determined the goal of this study, which is to assess the influence of the factors in the development of a digital economy on the dynamics of attracting investments in fixed assets at the regional level.

Literature Review

The issues of attracting and analyzing investments in fixed assets were reflected in the works of many scholars. The authors present the most well-known research results in this area.

The processes of globalization of the economy assign the investment climate the role of a decisive factor in the spatial development of territories (Antanavičiene, 2014; Kokovikhin, 2016; Kucharcíková *et al*., 2015; Ohotina *et al*., 2018; Šimelyte, & Antanavičiene, 2013; Shuyan, & Fabuš, 2019).

The high importance of investments in fixed assets for economic development at various levels of management is emphasized by Pinkovetskaya (2017). In her opinion, increasing investments in fixed assets allows one to solve a wide range of strategic tasks. Moreover, the level of investments, on the one hand, is determined by the level of the economic development of regions (Rubaeva *et al*., 2018). On the other hand, Kamar *et al*. (2019) established a positive relationship between the investments in fixed assets and regional economic development. This is confirmed by Bilir *et al*. (2019). Using the empirical data over the past few years, they showed that the financial development of regions is directly related to the volume of attracted investments from enterprises. A description of the development of the investment climate at the regional level is disclosed in the methodology of Abdulaeva *et al*. (2019) based on a set of indicators.

Despite a significant number of studies that highlight a set of factors for the growth of investments in fixed assets, the situation with the general deficit of capital in industry is exacerbating. Therefore, special attention should be paid to the studies that discuss the possibilities of enhancement of the regional investment strategy and improving the investment climate (Orekhova, & Kuzmin, 2017).

According to Richter *et al*. (2019), an acute digitalization of the environment is observed in the world, which leads to a change in economic relations and the need to introduce digital solutions in all areas of the socio-economic system. The importance of digitization of the economic processes is also emphasized by Valenduc and Vendramin (2017). This becomes relevant due to the transformation of the management methodology (Zubarev, 2017). Kazancheva and Kilchukova (2017) gave a rationale for the development of a digital economy as a strategic priority for ensuring regional competitiveness. Sustainability is achieved here through territorial interaction (Ponomarev, & Petrov, 2019).

According to Starodubtseva and Markova (2018), the digitalization processes of the modern economy represent the basis for socio-economic development. In the near future, digitalization trends will become the institutional basis for the development of investments and industrial relations. Khoroshavina (2017) puts that the digital economy itself is a factor that changes the socio-economic existence of all spheres of society.

The importance of using the effects of a digital economy as a tool to improve the investment climate was also emphasized by Pryadko *et al*. (2018), Zavarzin (2018), Yakutin (2017). According to Fedorkov and Yanovsky (2017), a digital economy offers new methods and tools to develop investment activities.

Nambisan *et al*. (2019) describe in detail how the advent of new digital technologies, digital platforms, and digital infrastructures has significantly transformed innovation and entrepreneurship. In addition to simply opening up new opportunities for innovators and entrepreneurs, digital technologies have wider implications for value creating. Consequently, digital technologists could serve as a common conceptual platform that allows solving the problems of investment activity at different levels of management.

Rokunova and Angelova (2013) showed that investments in fixed assets ensure the development of an innovative economy, characterized by the introduction of the latest scientific achievements. Thus, it is investments in fixed assets that become the main driver of socio-economic development (Rokunova, & Angelova, 2013). The mechanisms of the influence of digital technologies on investments

at the micro and macro levels of the economy are considered in Cascio (2017).

The literature review showed that despite numerous studies, estimates of the impact of digital technologies on investment processes in the regional economy have not been considered. Given the above, in this study the authors attempted to quantify this relationship.

Materials and Methods

This study used the statistics from Rosstat on the development of digital technologies and the volume of investments in fixed assets in Russia. An aggregate data analysis was carried out in all federal districts of Russia (administrative macro-regions). It is assumed that the values of indicators and the identified dependencies in federal districts can be extrapolated to Russia's constituent entities.

The main hypothesis of this study is that the volume of investments in fixed assets depends on the development of a digital economy. This study also tested other related hypotheses: various factors in a digital economy have different relationships with fixed capital investments; a 1% increment in various types of digital resources leads to different values in the increment of investments in fixed assets.

In order to identify correlation dependencies, the authors have identified the following factors of a digital economy:

- The specific number of personal computers in organizations (per 100 employees);
- The number of enterprises and organizations using servers;
- The level of using electronic document exchange;
- The level of using local area networks;
- The level of using wide area networks.

The value of the correlation coefficient reflects the strength of the relationship between the data series. The interpretation of the correlation analysis data was carried out using the Chaddock scale (Ishkhanyan, & Karpenko, 2016) (Table 1).

Table 1. Gradation of the correlation coefficient (Chaddock scale)

Correlation coefficient	Interpretation
(0.1; 0.3]	weak
(0.3; 0.5]	moderate
(0.5; 0.7]	noticeable
(0.7; 0.9]	high
(0.9; 1.00]	very high

Using the Chaddock scale allows one to "convert" a numerical (quantitative) value into a qualitative characteristic. The study makes an assumption that the strength of the correlation relationship is 0.7 or higher. This means that the analyzed factors have a direct strong relationship. In other words, a factor has a significant impact on the volume of investments in fixed assets.

Results

An analysis of the statistical data allowed concluding that in Russia the leading regions in terms of the specific volume of investments in fixed assets are the Central and Ural Federal Districts, the North Caucasus Federal District is an obvious outsider. Moreover, if one considers this indicator by absolute values, in 2017 in the North Caucasus Federal District the volume of investments in fixed assets amounted to 503,852 million rubles, which is 8.3 times less than in the Central Federal District (4,172,962 million rubles) and 5.7 times less than in the Ural Federal District (2,870,072 million rubles). It should be noted that in the leading regions the volume of investments significantly exceeds the average value of this indicator for Russia as a whole (for example, in the Central Federal District by 2.45 times, in the Ural Federal District by 1.68 times); in the North Caucasus Federal District being 3.38 times less than the average value for Russia. This fact indicates a large level of regional differentiation in terms of investment attraction. To explain this feature, the authors put forward the main hypothesis of this study.

To verify the hypotheses put forward, the authors constructed the matrices of pair correlation coefficients between the dynamics of investments in fixed assets and the value of the indicated factors of a digital economy (Table 2).

Table 2. Coefficients of pair correlation of the factors of a digital economy and volumes of investments in fixed assets among Russian regions for 2015-2017

Russia's region (federal district)	Factors of a digital economy				
	F1	F2	F3	F4	F5
Central FD	0.920	0.760	0.810	0.300	0.710
North-Western FD	0.920	0.850	0.750	0.650	0.720
Southern FD	-0.470	0.550	-0.180	0.360	0.260
North Caucasian FD	0.040	-0.290	-0.210	-0.190	-0.160
Volga FD	0.750	0.800	0.760	0.120	0.770
Urals FD	0.750	0.800	0.750	0.130	0.550
Siberian FD	-0.090	0.795	0.170	0.300	0.430
Far Eastern FD	-0.440	-0.240	0.310	0.120	0.110

Note: F1 – The number of personal computers per 100 employees, pcs; F2 – Organizations using servers, %; F3 – Relative level of using electronic document exchange in organizations; F4 – Relative level of using local area networks; F5 – Relative level of using wide area networks.

The results of the correlation analysis showed that: firstly, the main hypothesis was fully confirmed (the development of digital technologies in a region's economy determines the dynamics of attracting investments in fixed assets); secondly, there is a relationship between the dynamics of the use of digital resources and the dynamics of investments in fixed assets; thirdly, the impact of factors is heterogeneous and not unidirectional.

It should be noted that in the leading regions in terms of the volume of attracted investments, stronger correlation dependencies are observed. In turn, in outsider regions, correlation is either absent or insignificant. The factors of a digital economy that have the maximum impact on the volume of attracted investments in fixed assets in a region are the specific number of personal computers in the organization and the use of electronic document exchange (indirect evidence is available in the paper (Borsuk *et al*., 2018). Of minimal significance is the factor of using local area networks.

Based on this, it can be concluded that in the current economic conditions it is the development of factors of a digital economy that determines the increase in investment efficiency and the growth of attracted investments in fixed assets in a region.

Table 3 provides estimates of the level of change in investments in fixed assets with an increase in using the analyzed factors of a digital economy in a region by 1%.

Table 3. The sensitivity of investments in fixed assets to changes in the factors of a digital economy, %

Russia's region (federal district)	Factors of a digital economy				
	F1	F2	F3	F4	F5
Central FD	0.170	0.160	1.300	0.010	6.200
North-Western FD	0.120	0.330	1.770	0.980	6.400
Southern FD	0.000	0.210	0.000	0.120	0.010
North Caucasian FD	0.000	0.000	0.000	0.000	0.000
Volga FD	0.125	0.160	0.120	0.120	0.730
Urals FD	0.240	0.310	1.360	0.020	0.420
Siberian FD	0.000	0.230	0.050	0.040	0.060
Far Eastern FD	0.000	0.000	0.030	0.027	0.031

The obtained estimates of sensitivity indicate that the largest increase in investments in fixed assets is caused by such a factor as "wide-area computer networks". It is under the influence of this factor that there is a noticeable increase in investments in fixed assets with rates several times higher than the change in this factor. This is due to the fact that the use of wide-area computer networks, in the first place, allows one to initiate and develop projects that are most effective for investors (Balashova, & Alekseev, 2018). In addition, the introduction of wide-area networks means the openness of the information space.

The next factor in a digital economy in terms of growth in investments in fixed assets is the use of electronic document exchange. In this case, the leading dynamics of changes are also observed. The use of electronic document exchange in organizations indicates an innovative way of their development and confirms the digitalization of the relationship between economic agents. Electronic document exchange makes investment processes in the region as transparent as possible, which reduces transaction costs.

The impact of other factors of a digital economy in terms of sensitivity does not show a noticeable increase in investments in fixed assets.

Conclusions

The study allowed confirming the fact that in modern conditions it is the development of digital technologies in the region that determines the dynamics of attracting investments. Based on the correlation analysis, it was found that such types of digital resources as the specific number of personal computers in the organization and the level of using electronic document exchange have a stable relationship with the dynamics of attracting investments in fixed assets in the region. Moreover, the factor of using local area networks is not interconnected and does not affect the processes of investment activity in the region. The largest increment in investments in fixed assets is provided by such factors as the use of wide-area networks and electronic document exchange. Strengthening positions on these factors is the most promising direction for improving the regional investment strategy. The expected result of that should be an increase in the investment attractiveness of the region as a whole.

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