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Sharing Economy: For or against Sustainable Development

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Abstract: The development of sharing economy business models is one of the features of the digital economy. The issue of sustainable development has been of particular importance in the intensively developed theory of the sharing economy. However, methodological approaches for examining the relationship between the sharing economy and sustainable development need further investigation. Economic and mathematical models that allow for a quantitative estimate of the impact of the development of the sharing economy on the sustainable development goals achievement have to be enhanced. This contribution attempts to fill the indicated gap. We have examined the relationship between the sharing economy and the sustainable development goals achievement in three directions, namely by analyzing the prerequisites for the sharing economy emergence, by tracing the sharing economy theory evolution, and by investigating the quantitative impact of the sharing economy development on the sustainable development goals achievement. To determine the sharing economy's impact on sustainable development, a three-dimensional indicator based on the triple-p concept was developed. The correlation between the sharing economy and the unemployment rate has been used as an indicator of the influence the sharing economy has on the social domain. The correlation between the sharing economy and waste generation has been used as an indicator of the influence the sharing economy has on the environmental domain. The correlation between the sharing economy and GDP has been used as an indicator of the influence the sharing economy has on the economic domain. As a result of the study, the insignificant influence of the development of the sharing economy on the achievement of the quantitative goals of sustainable development was established. The main reason for this is the lack of acceptable macroeconomic indicators. The rise of the digital economy has been made into standard macroeconomic indicators that are insufficient to assess the social, environmental, and economic areas of sustainable development. The existing problems of regulating the digital economy threaten its inherent positive features. The developed model can be used to diagnose the influence of the sharing economy on sustainable development goals achievement, and can also be finalized regarding the available statistical base.

Keywords: sustainable development; sharing economy; collaborative consumption; digital economy; sustainable development goals

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1. Introduction

If ten years ago, the sharing economy was a new concept, today it would be renowned as actively developing all over the world business model. The main reason for this is digital globalization, which entailed socio-cultural transformations, changes in the public consciousness, and the emergence of new consumption patterns. The significance of the problems under consideration is also determined by the fact that digitalization processes have become key features of the global economy [1]. The technologies of the Internet and digital devices are the internal engines of the shared economy models. From here, it often boils down to activities carried out using digital platforms, providing peer-to-peer access to goods and services [2]. Sharing and embodying the leading trend in consumer behavior in the digital economy allows building synergies for all participants involved in the process of sharing. Thus, the sharing economy enhances the effectiveness of the

used resources regarding both economic and environmental issues, acting as one of the components of "sustainable and responsible consumption". In addition, a sharing economy that is based on the largest foundation in the form of active citizens of all countries and businesses, creates the foundations for the sustainability of the socioeconomic system as a whole, ensuring social cohesion and the sustainability of society. This was observed during the COVID-19 pandemic.

The most important feature of sharing, or operating on modern digital platforms, is its ability to generate reputation and trust. Nowadays, trust is becoming an intangible capital, allowing for a reduction in transaction costs and attracting the attention of buyers. Sharing also allows users to feel a sense of belonging to the sustainable development goals declared by the United Nations.

Starting in 2014, the issue of sustainable consumption and sustainable development became paramount in the study of the sharing economy [3]. According to researchers, the sharing economy has become a "modern trend with high growth potential"; it has been transformed from an "economic opportunity" into an innovative model for creating products, services, and relationships based on "sustainable consumption". Whereas the sharing economy originally covered only the fields of economics and social sciences, today it has become a multidimensional interdisciplinary concept influencing business, urban planning, tourism, information technology, and digital science. The sharing economy increasingly has been associated with a "decentralized, equitable, and sustainable economy", with the development of incentives aimed to decrease the negative anthropogenic impact on the environment by reducing the use of natural resources [4].

Today, according to the 2019 Global Consumer Behavior Survey [5], sustainable development has become part of the corporate brand strategy. Consumers want to feel involved in the history of the global responsibility to nature [6,7]. The sharing economy, which makes it possible to use the resources already put into circulation and do it efficiently both from an economic and an environmental point of view, is often considered a component of sustainable consumption. The damage to ecosystems and living standards caused by the production, consumption, and disposal of disposable clothing leads to the depletion of natural resources, water pollution, and an increase in the incidence of diseases of the population. At the same time, clothing sharing services are solving this problem. In addition to propulsion self-employment and work via the Internet, SE is helping to reduce the load on the city's transport infrastructure and to improve the environmental situation by reducing CO emissions. Car sharing and carpooling services, the sale or exchange of unnecessary clothing, sports equipment, and other things at C2C sites have high environmental effects. They help reduce overproduction by providing access to benefits not being 100 percent utilized.

The development of the sharing economy is an attractive alternative to the traditional economy, contributing to the achievement of the socially significant, environmental, and economic goals of modern society.

The next direction of the influence of the sharing economy on sustainable development is connected with the social component. Moreover, "By taking on a particularly poignant form of individualism ... and positioning unlimited consumption as the goal of life, traditional economics prevents us from thinking about human relationships, which are the soul of the community, rather than a means of the personal pursuit of happiness" [8]. The sharing economy providing new opportunities for achieving meaningful social goals strengthens communities by increasing the level of trust between people.

Does the sharing economy contribute to sustainable development? Despite numerous publications on this issue, the final answer has not yet been found.

Zhu X. and Liu K., in their systematic development review of SE studies, pointed to the need for the development of new SE models, as well as the need for government regulation in this area, and the need for investigation of different impacts of the sharing economy on the environment [9].

Gupta D.P. and Chauhan P.S., when considering SE's contribution to sustainable development, found that sustainability was one of the most important factors in SE studies; however, these studies did not provide any conclusive evidence for or against SE's claims of economic, social, and environmental sustainability [10]. In this regard, they highlighted the necessity of the generalization of various SE activities, and the necessity of confirming the SE's contribution to the sustainable development goals achievement.

Pouri M.J. advocated for examining evidence of SE in terms of sustainability, which can lead to increased efficiency and optimization effects, but also can bear negative bounce effects [11].

Vicente M.R. and Gil-De-Gómez C. examined the collaborative economy from a supplier perspective, using the concept of triple-p (planet, people, profit). Having analyzed the data from representative samples of national populations in the member states of the European Union, they found economic reasons as the main motives for offering shared transport and accommodation services [12].

Overall, the issue of sustainable development remains topical in sharing economy studies. Of the greatest interest is the study of quantitative relationships between the citizen's wellbeing, the environmental state, and the level of the sharing economy development. Methodological approaches for this have to be improved.

The purpose of this study is to investigate the relationships between the sharing economy and the opportunity for sustainable development. This paper proposes a hypothesis of influencing the sharing economy on achieving sustainable development goals. For this, the work examines the prerequisites for the emergence of the sharing economy in the context of their conditionality by global problems underlying the concept of sustainable development. The genesis and transformation of sharing economy models have been explored in the context of the practices they contain for sustainable production and consumption. The quantitative links between the development of the sharing economy and the achievement of the sustainable development goals have been analyzed in the context of changes in their indicators.

Overall, the connections between the sharing economy and sustainable development have been analyzed in three directions. Firstly, there has been an analysis of the prerequisites for the emergence of the sharing economy; secondly, there has been an analysis of the transformation of the sharing economy theory; and thirdly, there has been an empirical study of the impact of the development of SE on achieving sustainable development goals through the use of a developed three-dimensional indicator.

2. Methodology

To get a complete understanding of the problem, a mixed approach has been chosen for this paper. Qualitative methods were chosen to study the genesis and background for the emergence of the sharing economy in the context of its conditionality by the sustainable development issues. The emergence of both the sustainable development concept and the sharing economy business models had been driven by global environmental and socioeconomic issues. Quantitative methods have been used to examine how new business models of the sharing economy had influenced the achievement of sustainable development goals in practice.

The methodology chosen for this paper includes a historical approach, and economic and mathematical modeling. The historical approach is the method used to study the occurrence, formation, and development of processes and events in chronological sequence to identify internal and external relationships, patterns, and contradictions.

The historical approach is based on considering the sharing economy theory. The historical approach has been based on considering the sharing economy since the time of inception, considering its properties and characteristics in the past, present, and future in the context of relationships with the concept of sustainable development. The historical approach has been used in this paper for investigating the prerequisites for the sharing economy emergence, as well as for investigating the transformation of the sharing economy

theory in the context of the relationship with the sustainable development goals. Economic and mathematical modeling is the method for a description of economic processes and phenomena in the form of economic and mathematical models. Statistical and correlation analyses have been used in the empirical study.

Examining the impact of the sharing economy on achieving sustainable development goals has been done through the development of a special three-dimensional indicator. This indicator has been grounded on multivariate comparisons reflecting social environmental and economic aspects of sustainable development. Correlation analysis is a statistical data processing technique examining the correlation coefficients between variables. The correlation coefficients between the development of the sharing economy and the achievement of social, economic, and environmental goals of sustainable development have been used to develop a three-dimensional indicator. For the development of a complex indicator, a transition was made from the values of the correlation coefficients to their rank, 0 or 1. As a result, the three-dimensional indicator has six states, wherein each of which characterizes a certain influence of the sharing economy on achieving the goal of sustainable development. For the development of a complex indicator, a transition was made from the values of the correlation coefficients to their ranks, 0 or 1. As a result, the three-dimensional indicator has eight states, characterizing the level of the sharing economy's influence on achieving sustainable development goals. These eight states have been divided into three groups corresponding to the positive, partial, and minor effects of the sharing economy on the achievement of the sustainable development goals.

3. Theoretical Framework and Literature Review

For understanding the relationship between SE and sustainable development, it is necessary to consider the prerequisites for the emergence of SE and how they coincide with the principles of the sustainable development concept.

Based on the analysis of studies on the development of the sharing economy, one can conclude that it is the result of a complex of technological, economic, social, and environmental changes that have taken place in the world.

The prerequisites for the emergence of the sharing economy systematized in the form of a STEP analysis are given in Table 1 [1,9,13–19].

Table 1. Preconditions for the emergence of the sharing economy. Developed by the authors based on works [1,9,13–19].

Technological Prerequisites	Social Prerequisites
Industry 4.0 and digitalization of the economy The transition of producers and consumers to digital information technologies Development of online services and digital platforms The emergence of two-way reputation assessment systems Development of payment systems New capabilities of digital devices (smartphones) and the use of the application Development of social networks	Changing the culture of consumption Changing attitudes towards ownership Consumer crisis Growing inequality Rational consumption basis Expanding social connections Population growth and urbanization Migration growth Life expectancy growth Increasing population density Striving for sustainable development of society Developing a sense of community involvement and altruism
Environmental Prerequisites	**Economic Prerequisites**
Environmental crisis Growth of anthropogenic load Responsible attitude to the environment Responsible production and consumption	Economic crisis Pandemic situation New business models The downward trend in transaction costs Monetizing passive assets Development of financial literacy Development of flexible forms of lending Venture fund investments

According to most researcher's points of view, the modern concept of the sharing economy reflecting qualitative changes in the technical and technological characteristics of production and consumption was caused by the digitalization of all areas of life.

It is known that the most significant features of the transition to the digital economy are the relationships of digital transformation with the new stage of the industrial revolution, "Industry 4.0", including robotization, big data, augmented production, 3D printing, cloud computing, data storage, augmented reality, etc. The biggest impact digital technologies have had is not on the way goods and services are produced, but on personal consumption technologies, influencing millions of households around the world.

These changes have led to the emergence and proliferation of new business models of the sharing economy, reflecting a new type of environmentally and socially responsible attitude inherent in sustainable consumption. The introduction of sustainable consumption is one of the greatest challenges and opportunities that humanity faces today. On the one hand, consumption is a popular and necessary phenomenon important for society and the economy; on the other hand, modern means of consumption contradict many long-term oriented goals of green and inclusive growth and the environmental state.

Analyses of the prerequisites for the emergence of SE allow for the conclusion that contained SE new business models of sustainable and responsible consumption overlap with the socially oriented, environmental, and economic goals of the concept of sustainable consumption. The next step of the examination is a retrospective analysis of the sharing economy theory.

Although there is considerable attention to the study of various aspects of SE in the scientific literature currently, a unified, generally accepted approach to the definition of this concept and its constituent elements has not been formed [20].

The modern understanding of the term "collaborative consumption" was presented in 1978 by M. Felson and J. Spaeth. In 1979, P. Rigby documented the term "sharing" as a term for the group use and exchange of resources by herding tribes in Tanzania. More complete disclosure of this term is associated with the introduction of the Internet and digital technologies into economic relations [9,21,22].

In many cases, it is more profitable and convenient for a consumer to pay for temporary access to a product than to own it [13]. At the same time, owners with underutilized capacities [23] bear the full costs of their maintenance; thus, the cost of object ownership is increasing. These owners can improve the efficiency of ownership—including through a mutually beneficial exchange—by conventionally selling decreasing transaction costs [24]. This creates a supply in the sharing economy system. The modern importance of the sharing economy is based not only on its economic benefits, but also on the acceptance of the sharing economy phenomenon by society, with its non-economic essence. The development of a sharing economy contributes to enhancing the economic importance of interpersonal aspects and direct transactions between households. There are two types of factors that induce a person to accept the principles of sharing: social and external. Based on interactions between people, social acceptance means making new acquaintances and helping members of your group; external ones imply economic benefits in meeting needs.

Thus, the sharing economy is a tool for realizing a surplus resource by selling, renting, or exchanging for material or social benefit [25]. A distinctive feature of modern sharing economy business models is their peer-to-peer nature based on digital platforms. Experts from the World Economic Forum define the sharing economy as an economic activity based on online platforms, based on the sharing of underutilized assets for free or for a fee on a peer-to-peer basis [14,26].

Having done a retrospective analysis of studies devoted to the sharing economy, three stages in the development of SE can be distinguished (Table 2). The first stage is characterized by the emergence of the term "collaborative consumption" (CC)/ "sharing economy" (SE), referring to the end of the 1970s and the 20th century. The second stage—the genesis stage—covers the period from 2002 to 2015, when new facts of economic life in the field of joint consumption were studied, accumulated, and summarized, and

terminological, theoretical, and methodological foundations had been formed, where, finally, a special object of the SE appeared. Since 2016, the third stage has begun—the stage of intensive development of the theory of the sharing economy as a new business model of the digital economy, associated with sustainable consumption conducive to achieving the United Nations (UN) Sustainable Development Goals (SDG).

Table 2. Development of sharing economy and collaborative consumption research. Developed by the authors [27–37].

1979	2002–2015			2016–2021	
The emergence of the term SE	Generalization of new facts in the field of SE and CC, the formation of the term SE, object and its theoretical foundations			Intensive development of SE theory, development of SE methods and models	
1978–1979	2002–2003	2011–2013	2014–2015	2016–2020	2016–2021
Technological and social aspects of SE in high-tech industries		Qualitative shifts in consumer behavior: cashiering, online shopping and exchange, tourism		SE as a tool for achieving the SDG SE as a new business model and a new no-ownership consumption model	

The first studies in the field of SE were devoted to the influence of the new technological order on changing relations in the field of mass consumption of high-tech products, and the role of high-tech companies in the economy of exchange. Then, researchers revealed that joint activities in knowledge-intensive organizations and the subsequent use of its results are based on mutual exchange, but not on exploitation [38].

Since 2004, along with the development of technological platforms and the usage of consumers new ICTs, the number covering various aspects of the SE publications has been growing. The explosion in the sale of financial, transport, and hotel services online caused by the development of technologies for online orders and purchases via Internet mobile services was accompanied by the formation of SE models [39,40].

In 2011–2013, there was an accumulation and generalization of new facts in the field of shared consumption. The technological and social aspects of the sharing economy and incentives for the sharing of technological advances in the field of information transmission via wireless networks were investigated. Car sharing and its social, environmental, and economic aspects were actively explored. The features of joint consumption were highlighted, including temporality, anonymity, market intermediation, consumer interest, the type of object, and the legal protection of consumer rights [4,16,20,41]. The role of SE in ensuring environmental sustainability and social equity was beginning to be explored.

In 2014–2015, the sharing economy was seen as an element of the digital exchange economy conducive to the implementation of social goals. The SE model in tourism was also examined, being seen as a non-institutionalized business model opposing conventional tourism [16,42].

The sharing economy can be considered from two points of view: firstly, from the standpoint of enhancing the role of environmental factors and ensuring sustainable growth; and secondly, as the implementation of the well-known principle of flea markets and micro-entrepreneurship, transferred to the Internet and based on mobile applications [43]. At the same time, the SE was beginning to be viewed as an element of the digital exchange economy in achieving social goals, including employment opportunities and additional income, improving social interactions, and gaining access to information resources [44]. Since 2015, scientists have been exploring not only the socioeconomic aspects of SE, but also the SE business model as a socioeconomic phenomenon [45].

A new vision of sharing economics dates back to 2015, and is explained by an expanding implementation of digital platforms. Digital technologies expand the possibilities of using those resources that were not previously involved in the economy, or were used inef-

fectively. The sharing economy unites around activities carried out using digital platforms, providing equal access to goods and services [3].

Since 2016, the intensive development of the SE theory has begun.

Acquier A. et al., considered the contribution of SE from the perspective of the three cores that make it up (access economy, community economy, and platform economy). Having shown possible contradictions, the authors concluded that only balanced initiatives can fix the situation [46].

In their work, Govindan K., Shankar K. M., and Devika K. showed the need to analyze the prospects for an SE in the industrial sectors more prone to "negative stability". The authors found that the most prominent barrier to implementing a sharing economy in industries, especially among small and medium-sized enterprises, is "mistrust". Implementing sharing economy strategies in an industrial domain needs to be examined more deeply [47].

Huang L., Li Y., Huang X., and Zhou L. examined the social aspects of collaborative consumption, and how social distance affects it in the case of car services organized by online calls. They concluded that social distance has both direct and indirect effects on the intention to consume together: the greater the social distance, the lower the intention to consume together [48].

Strulak-Wójcikiewicz R. and Wagner N. examined the collaborative economy's role in ensuring sustainable urban freight transport by reducing the number of serviced trucks and by using green vehicles. The authors showed that the development of LCV sharing is determined both by the availability of the service and its cost, as well as by the general awareness of the benefits and credibility of the collaborative business model [49].

Luri Minami A., Ramos C., and Bruscato Bortoluzzo A. compared the sharing economy (SE) and collaborative consumption (CC), and concluded that SE is mainly determined by internal reasons, while CC is determined by external ones. Economic motives are stronger in collaborative consumption (CC), while ecological orientation is stronger in the sharing economy (SE) [50].

Pouri M.J. and Hilty L.M. considered SE as an embodiment of the digital technologies development, and proposed the term "digital sharing economy: (DSE) as a socioeconomic phenomenon and a new class of resource allocation systems. The authors identified three main aspects of DSE: (1) a technical aspect related to the peculiarities of a shared resource; (2) the social aspect, concerning the models and rules of social interaction; and (3) an aspect of coordination that addresses the enabling role of digital online platforms to provide coordination mechanisms and reduce transaction costs [51].

Considering the role of platforms in SE, Ye F., Ni D., and Li K.W. found that the manufacturer and the platform should collaborate to increase the utility of sharing. A win-win situation can be achieved due to increasing the sense of community belonging, increasing the benefits of collaborative activities, and addressing sustainability issues.

Davlembayeva D., Papagiannidis S., and Alamanos E. concluded that reciprocity perceptions are associated with a sense of social identity, intergroup comparison, procedural fairness, and an inclination to maximize outcomes. In addition, the authors offered practical guidelines for achieving higher levels of platform satisfaction by increasing reciprocity [52].

As a result of a retrospective analysis of the sharing economy theory, some controversial questions connecting with the practical significance of the SE business model in the implementation of the sustainable development concept have been rising.

Agreeing with Richardson, it can be noted the main paradox of SE is that sharing opportunities are considered both as part of the traditional economy and as its alternative. This duality stipulates focusing on the sharing economy peculiarities, and understanding how it simultaneously creates different types of economic activity and also contributes to the deconstruction of the continuing practice of market dominance. At the same time, there is a significant role played by SE in rethinking both classical economic business models and concepts; in particular, the categories of individual labor, supply, and demand.

Both in modern processes of exchange value creation and systems of sustainable consumption, it is necessary to examine the roles of not only producer and consumer but also a "prosumer".

According to K. Marx, labor creates an exchange value that involves not only abstractly universal labor, but concrete individual labor. The subject of this work is "models of management and production, organization, distribution and consumption", as well as social algorithms.

In this model, for the most part with an open-source algorithm, each member of society contributes, making certain decisions at the micro-level. The tendencies of "prosumerization" entail significant changes in the sphere of social production and the social organization of labor. It is known that prosumers are one of the opportunities for the development of the sharing economy.

The phenomenon of freelancing as a private form of precarious work is widespread currently. It testifies to both the increasing importance of individual labor and the demand for individual labor by society, especially in the SE business models. In some countries, the introduction of a basic income for citizens shows that labor is no longer a necessity for the existence of a person as a biological species, and it is not a condition for the survival of an individual. The preferred type of worker in the modern economy is a sociological person for whom the most significant is the recognition of his work by others. According to K. Marx, when all other things are equal, the more expedient the labor, and the better the yarn. However, being an important condition for reproduction in society, individual labor is often not properly taken into account in economic statistics. Individuals not built into the existing system of the division of labor fall into the category of informal employment. For them, social guarantees and criteria for decent work are an issue [53–56].

The question of the values produced by the SE and the role played by technological infrastructure in its models is also controversial. Initially, SE acted as an alternative to the "capitalist production" of satisfying needs. This meant a royalty-free or peer-to-peer fee. According to Bauwens (2005), egalitarian networks are a new form of relationship, and "an essential ingredient in finding solutions to current global problems." However, due to the processes of digitalization and platformization of SE models, the situation has changed. This has led to the emergence of "platform capitalism" of companies like Uber, with a hierarchical structure. The development of the digital sharing economy is also associated with the formation of a new class of digital rentiers. A digital rentier is a person who receives their main income from investments in digital economy objects or platforms that previously monetized the usefulness of the presented functionality and data. The market power of the platforms has been increased, caused by the possibility of the stable extraction of digital or communication rent. To finance generating income, platform digital rentier models are more attractive than equity ones. The usage of the digital rentier model leads to an increase in distribution inequality in the income between SE participants. Also, the concentration of capital in the platform market segment emerges, which can be explained by its investment attractiveness. However, these findings are controversial and require further detailed research [57,58].

4. Materials and Methods

4.1. Sharing Economy Analysis in Russia: Trends Diagnosing

To analyze the quantitative connections between the achievement of the SDGs and the SE, it is necessary to reveal some trends in its development. The presented analysis examines the development of SE in Russia.

It is interesting to note that SE statistical data has been collected in the Russian Federation since 2016. During these 5 years, the volume of SE in Russia sharply increased by more than 28 times (Figure 1).

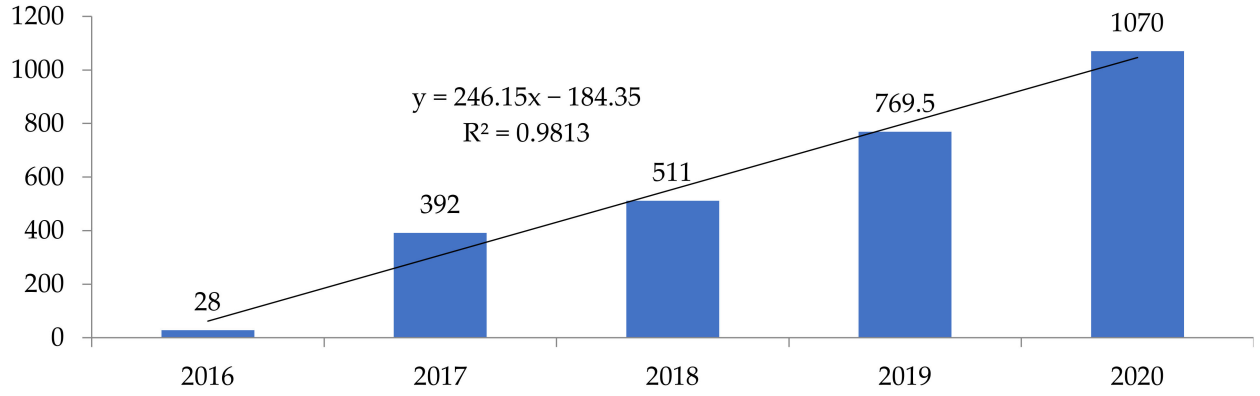


Figure 1. Sharing Economy in Russia, billion rubles. Compiled by the authors based on the Russian Federal State Statistics Service [59,60].

One can see a steady growth trend in the SE development—both in absolute and relative terms—as a percentage of GDP (Figure 2). The sharing model has passed the test of the pandemic and has shown its importance for mankind. Sharing services providing an opportunity to save money are very important in economic turbulence.

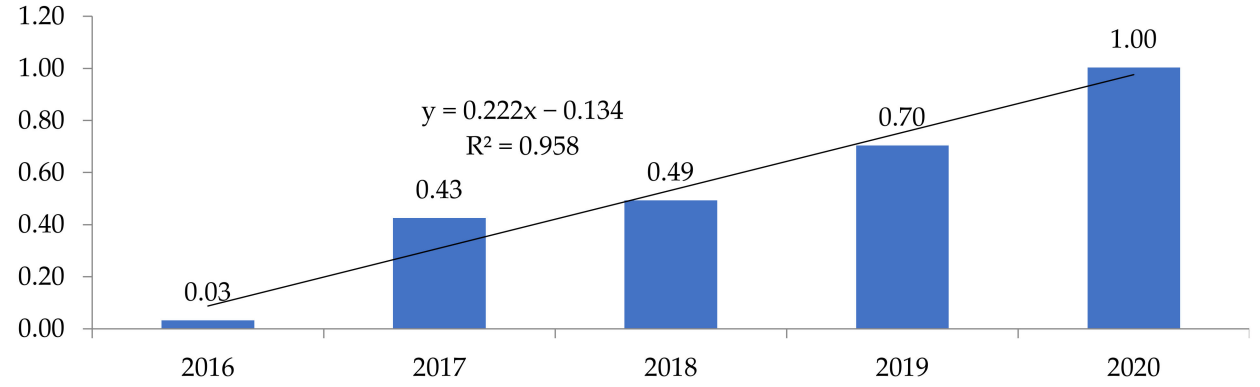


Figure 2. Sharing Economy as a percentage of GDP. Compiled by the authors based on the Russian Federal State Statistics Service [59,60].

What is behind this growth? An analysis of the SE structure has revealed that the main contribution is C2C sales and P2P services. The share of C2C sales increases every year (Figure 3).

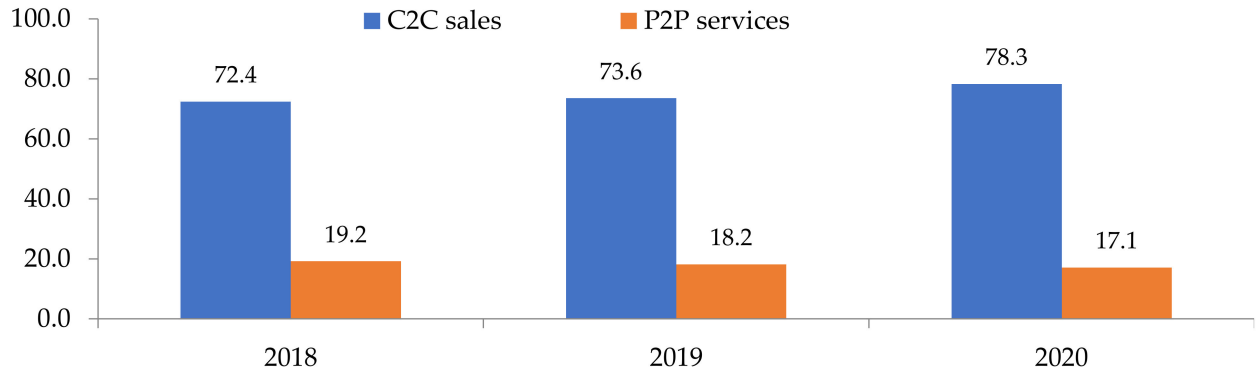


Figure 3. Sharing Economy in Russia: the main components. Compiled by the authors based on the Russian Federal State Statistics Service [59,60].

The rapid growth of the sharing economy was primarily due to C2C sales via the Internet, the use of taxis and car-sharing instead of personal transportation, and the growth in the reuse of things. The vector of the development of SE in Russia has been formed. The trend is aimed at sharing household goods and services, but also reflects the mentality of citizens in making large purchases, primarily housing.

In general, C2C commerce was a driver of SE growth in Russia. In 2020, the volume of the Russian P2P part-time job market grew by 31%. Due to the pandemic, the demand and supply for courier services have increased drastically. The third, fourth, and fifth places were occupied by car-sharing, carpooling, sharing housing, and sharing offices (Figure 4). Distance and project work have become new forms of employment for many Russian residents, giving the labor market the necessary flexibility.

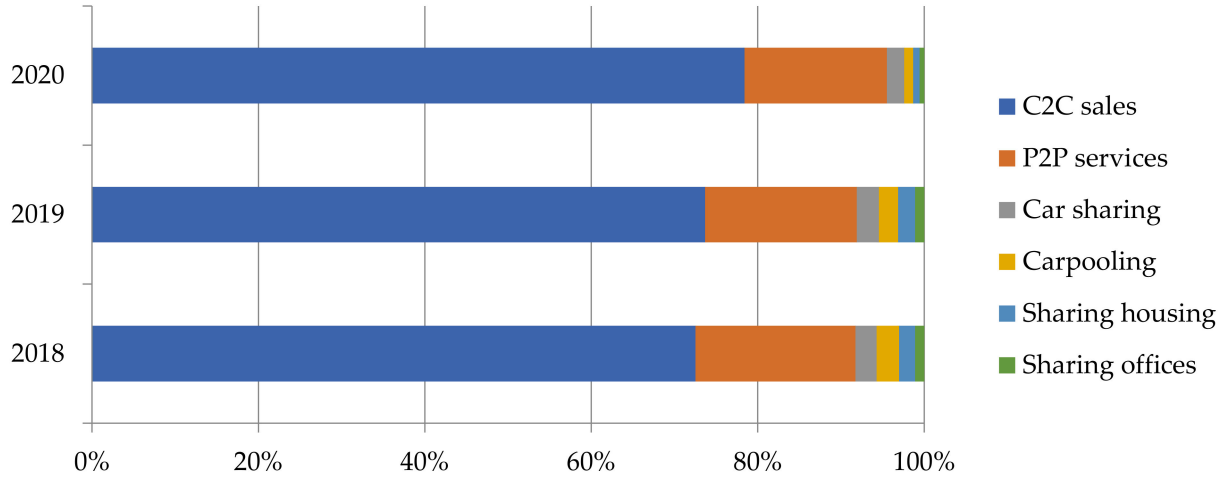


Figure 4. Dynamics sharing economy in Russia as a percentage of GDP. Compiled by the authors based on the Russian Federal State Statistics Service [59,60].

Interestingly, their shares were decreasing every year. The COVID-19 pandemic was the reason for this in 2020 (Figure 5). In addition, in the current economic situation, when the rental rate is similar to payments on long-term (10–15 years) mortgages, a significant part of the population chose to buy real estate [15,60].

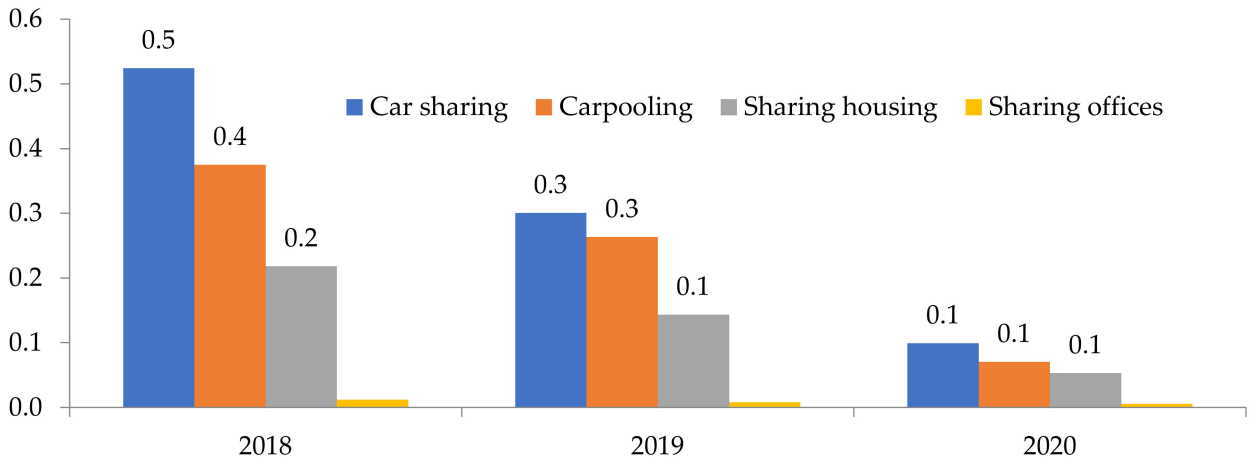


Figure 5. SE in Russia structure. Compiled by the authors based on the Russian Federal State Statistics Service [59,60].

At the same time, the situation with the purchase of a car is the opposite. Thus, in cities with a population of over one million with developed transport infrastructure, taxis, and a shortage of parking spaces, a car becomes an economically unprofitable image acquisition.

This situation arises when the sharing community reaches a critical mass, which makes it possible to reduce costs to such an extent that joint consumption becomes cheaper and more convenient than ownership.

It is interesting to note that, according to the sharing economy index, Moscow and St. Petersburg were among the top ten cities for the development of a SE, but in 2021, not a single Russian city was in the ranking [6,7].

Taking into account the current situation, the further development of SE in Russia will be related to the sharing of household services and goods, the recycling of clothes, the development of Internet services, etc. Regarding work and freelancing, the latter will indirectly increase the mobility of citizens and may affect the situation with long and short-term rental housing.

Overall, the growth of SE in Russia as well as in other countries is generally due to the results of scaling using digital platforms. The speedy growth of SE in Russia is due to the entry of generations Y and Z representatives into the economically active population category. The growth rates of the Russian SE market exceed the world ones, and in the future, the sharing economy can become the driver of the state's economic growth [14,61].

4.2. Methodology: Investigating the Impact of the Sharing Economy on Achieving Sustainable Development Goals

Is there a quantitative relationship between indicators of sustainable development and the development of the sharing economy? To answer this question, special models are needed to diagnose the situation.

The sustainable development concept is a paradigm of balanced, self-sustaining development, through the interconnected achievement of environmental, social, and economic goals [62].

The values of a mass consumption society led to the international community facing such challenges as the depletion of natural resources, the growth of environmental pollution, climate change, and the degradation of ecosystems (Figure 6) [63].

Since the term "sustainable development" was coined in 1987 by the International Commission on Environment and Development (ICED)—as a result of the UN-commissioned study conducted by order of the International Commission on Environment and Development (ICED)—the world community realized the responsibility of the living generations before the descendants [62].

According to the Brundtland Commission's report, "sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1,61,64,65].

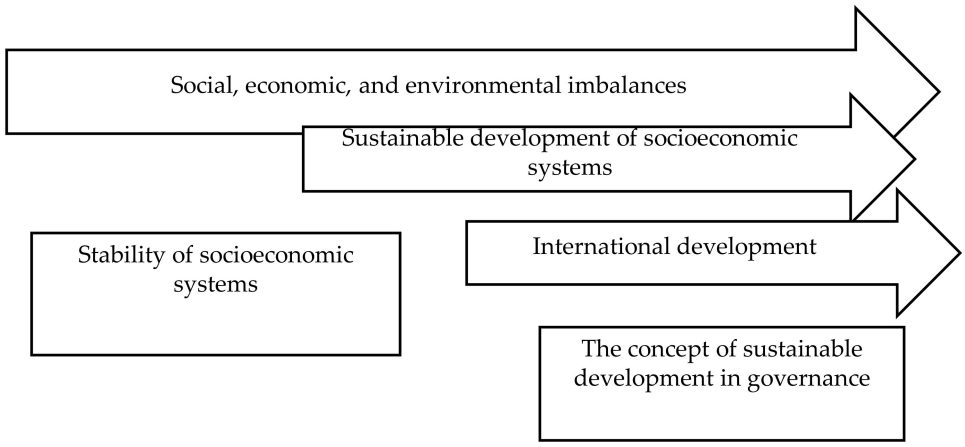


Figure 6. The emergence of the sustainable development concept.

In the course of four decades, from 1987 to 2016, the concept of sustainable development, despite its initial declarative nature, managed to shift the focus of the world

community to a set of environmental and related social problems, and also led to the formation of a new model of civilization development that replaced the old one based on "anthropocentric". First, it was connected with the development of a measurement system, namely with the creation of goals, objectives, and indicators in the field of sustainable development.

Sharing economy models in achieving sustainable development goals.

For studying the impact of business models of SE on the achievement of the SDGs, the state of SE can be represented as an independent factor and the achievement of the SDGs in the form of a resulting indicator $\overline{S}$. This resulting indicator can include several indicators of the achievement of the SDGs. For example, x_1, x_2, x_3, ... $.x_n$.

In this case study, the achievement of the SDGs is presented in the form of a three-dimensional indicator $\overline{S}$ reflecting the achievement of social, environmental, and economic SDG. Thus, the three-dimensional indicator of the influence of SE on the SD is as follows (example 1, Figure 7):

$$\begin{array}{l} \overline{S} = \{x_1; x_2; x_3\}, \\ \text{where } x_1 = f_{SOCIAL}(SHE) \text{ represents the impact of SE on the achievement} \\ \text{of social SDGs,} \\ x_2 = f_{ECONOMIC}(SHE) \text{ represents the impact of SE on the achievement of} \\ \text{economic SDGs, and} \\ x_3 = f_{ECOLOGICAL}(SHE) \text{ represents the impact of SE on the achievement} \\ \text{of social SDGs.} \end{array} \quad (1)$$

Note the model can be expanded to 7(9) directions of SD goals [66].

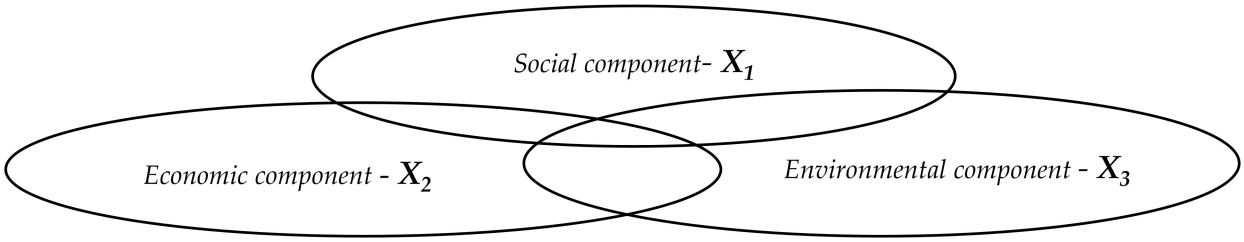


Figure 7. Sharing economy and directions of the sustainable development concept.

The model can be expanded to 7/9 directions reflecting SDGs.

The second question is the definition of the values x_1, x_2, and x_3 in a three-dimensional indicator. A binary system should be used. Moreover, x_i = 1 if the SE does not negatively affect the achievement of the SDGs, and x_i = 0 if SE has a positive impact on the achievement of the SDGs.

Thus, x_1, x_2, and x_3 take on the following values:

x_1 = 1 if SE development facilitates the achievement of SD social goals.

x_1 = 0 if SE development does not affect the achievement of SD social goals.

x_2 = 1 if SE development facilitates the achievement of SD economic goals.

x_2 = 0 if SE development does not affect the achievement of SD economic goals.

x_3 = 1 if development facilitates the achievement of SD environmental goals.

x_3 = 0 if SE development does not affect the achievement of SD environmental goals.

The presented model refers to multivariate comparisons, when, depending on the values of several features, it is necessary to conclude the value of a generalizing indicator. In this case, a qualitative scale of a three-dimensional indicator is used. Depending on the 8 possible values of x_1, x_2, and x_3, there are 4 possible situations. Each of them describes

the impact of the SE on the achievement of the SDGs. Namely, these situations are positive impact, partial contribution, insignificant contribution, and no impact.

The explanations are given in Table 3.

Table 3. SE and SDG achievement.

Situation	Formula	Explanation
The positive impact of SE on achieving SDG	$\overline{S} = \{1; 1; 1\}$	This means a situation where the development of SE contributes to the achievement of the goals of all areas of SDG.
Partial impact of SE on SDG achievement	$\overline{S} = \{0; 1; 1\}$ $\overline{S} = \{1; 0; 1\}$ $\overline{S} = \{1; 1; 0\}$	This means a situation where the development of SE contributes to the achievement of only two of the three areas of SDG.
Minor impact of SE on SDG achievement	$\overline{S} = \{0; 0; 1\}$ $\overline{S} = \{1; 0; 0\}$ $\overline{S} = \{0; 1; 0\}$	This means a situation where the development of SE contributes to the achievement of only one of the three areas of SDG.
Lack of impact (or presence of negative impact) of SE on SDG achievement	$\overline{S} = \{0; 0; 0\}$	This means a situation where the growth of SE is not contributing, but counteracting the achievement of SDG.

Choosing the indicator of the sharing economy's impact on sustainable development is the next stage. The indicators of the level of employment, the level of unemployment, the level of informal employment, the level of poverty, social security benefits, personal income distribution, etc. can be used as indicators of achieving the social goals.

The indicators of GDP, labor productivity index, per capita incomes, material deprivation index, etc. can be used as indicators of achieving the economic goals.

Indicators of production and consumption waste generation, ecological footprint, features of the land, water, and air resources can be used as indicators of achieving environmental goals.

From a practical perspective, the most difficult is the study of quantitative relationships between the level of well-being of the population, the state of the environment, and the level of development of the sharing economy.

The developed model uses the indicators presented in Table 4. Thus, 3 factors related to the 3 pillars of the concept of sustainable development have been identified. The unemployment rate reflects the achievement of social goals. The change in gross domestic product reflects the achievement of economic goals. The generation of production and consumption waste reflects the achievement of environmental goals.

One of the controversial issues is the impact of the sharing economy on the social domain, including dynamics of the unemployment rate and informal employment in the non-agricultural sector.

Considering informal employment, it should be noted that, on the one hand, informal employment is a negative element in the labor market that leads to the precarization of employment, threatens the state budget and social funds, reduces the quality of human capital, and affects many aspects that cause vulnerability and legal insecurity of workers. On the other hand, informal employment can play the role of a social stabilizer that the state needs to level the negative consequences of economic development, and in particular, to compensate for the lack of jobs in the corporate sector [67].

Table 4. Factors used in the SE and SDG communication model.

The Direction of SD Goals	Model Factor	Explanation of the Factor Significance for the SD Concept
Social goals	Unemployment rate, %—x_1	The best weapon to eradicate poverty is employment. Job creation is one of the main SDGs. A decrease in the unemployment rate is the basis for achieving social goals. It is connected with SDG.
Economic goals	GDP, in current prices, bln. rub.—x_2	The Decent Work and Economic Growth SDG is a prerequisite for achieving other SDGs.
Environmental goals	Production and consumption waste generation, million tons—x_3	It is connected with SDGs "Resource Efficiency and Circular Economy" and "Responsible Consumption and Production". Reducing waste leads to decreasing the ecological footprint and is conducive to achieving other SDGs connected with environmental protection and climate change.

Wages are often highly sensitive to the GDP and unemployment rate. Moreover, it is much higher in the informal sector, where workers have no opportunities to protect their rights. The growth in the share of informal employment provokes the deterioration of this situation.

The links between the dynamics of informal employment and SE are two-sided and ambiguous. Informal employment can also increase for various reasons, and this growth, on the contrary, can be constrained by the development of SE models. That is why the presented model includes the unemployment rate as an indicator of influencing SE on SD.

The final step is to choose a way to defining the impact of SE development on the achievement of the SDGs. The correlation coefficients between the development of SE and the indicators of the achievement of social, economic, and environmental goals are used in the model as indicators of the influence sharing economy on sustainable development. The SE size is estimated at current prices in a billion rubles.

Possible values of the correlation coefficients and interpretation are given in Table 5.

Table 5. SE and SDG achievement.

The Direction of SD Goals	Formula	Interpretation	Specification
Social goals SE and unemployment rate	$r_1 < 0$ $/r_1/ > 0.7$	$x_1 = 1$	Strong inverse link when SE growth leads to a reduction of the unemployment rate.
	$r_1 > 0$ $/r_1/ > 0.7$	$x_1 = 0$	Strong direct link when SE growth leads to an increase of unemployment rate (or it means the absence of connection).
Economic goals SE and GDP	$r_2 > 0$ $/r_2/ > 0.7$	$x_2 = 1$	Strong direct link when SE growth leads to GDP growth.
	$r_2 < 0$ $/r_2/ > 0.7$	$x_2 = 0$	Strong inverse link when SE growth leads to GDP reduction (or it means the absence of connection).
Environmental goals SE and waste generation	$r_3 < 0$ $/r_3/ > 0.7$	$x_3 = 1$	Strong inverse link when SE growth leads to reduction of waste generation.
	$r_3 > 0$ $/r_3/ > 0.7$	$x_3 = 0$	Strong direct link when SE growth leads to growth of waste generation (or it means the absence of connection).

Consider the options for the impact of SE on the implementation of the SDG using the example of the selected factors.

If $\overline{S} = \{1; 1; 1\}$, there is a positive impact, implying SE's impact on SDG achievement. This means a decrease in the unemployment rate, a decrease in production and consumption waste, and an increase in GDP with an increase in SE.

If $\overline{S} = \{0; 1; 1\}$ or $\overline{S} = \{1; 0; 1\}$ $\overline{S} = \{1; 1; 0\}$, there is the partial impact of SE on SDG achievement when two components of SD change in a favorable direction, and one changes in an unfavorable direction. For example, the development of the SE can lead to a decrease in GDP or an increase in unemployment rates or waste generation.

If $\overline{S} = \{0; 1; 1\}$ or $\overline{S} = \{1; 0; 1\}$ $\overline{S} = \{1; 1; 0\}\overline{S} = \{1; 1; 0\}$, there is a minor impact of SE on SDG achievement. This characterizes the situation when, with the growth of SE, only one component of SD changes in a favorable direction, and the others are characterized by negative trends.

If $\overline{S} = \{0; 0; 0\}$, there is a lack of impact or negative impact of SE on achieving SDG. This is indicative of a situation where, with the growth of SE, all factors change in an unfavorable direction. There is an increase in SE followed by a simultaneous decrease in GDP, an increase in the unemployment rate, and the generation of waste rate.

5. Results

To test the developed model, the statistical data characterizing the development of SE and the dynamics of social, economic, and environmental processes in Russia within the period from 2016 to 2020 was used (Table 6).

Table 6. Data for modeling impact SE on SDG.

	Sharing Economy, RUB bln.	Unemployment Rate, %	GDP, in Current Prices, RUB bln.	Production and Consumption Waste Generation, Million Tons
2016	28	5.2	86,014.2	5441.3
2017	392	5.2	92,101.35	6220.6
2018	511	4.8	103,626.6	7266.1
2019	769.5	4.6	109,361.5	7750.9
2020	1070	5.9	106,606.6	6955.7

The values of the correlation coefficients and their interpretation are given in Table 7.

Table 7. Analysis summary.

Model Factor	Correlation Coefficient	Interpretation
SE and unemployment rate	$r_1 = 0.32$	$x_1 = 0$
SE and GDP in current prices	$r_2 = 0.89$	$x_2 = 1$
SE and production and consumption waste generation	$r_3 = 0.75$	$x_3 = 0$

Thus, in our case, the three-dimensional indicator of the SE impact on the SDG implementation has the form of $\overline{S} = \{0; 1; 0\}$. The SE has an insignificant contribution to the achievement of sustainable development goals, provoking the development of negative trends in the social sphere, explained by the development of the platform economy as one of the components of SE. The growth of the sharing economy does not lead to a decrease in the unemployment rate.

The diagnosed situation of the insignificant influence of SE on the achievement of sustainable development goals is caused by the SE regulation problems. Regulatory issues can be divided into three areas.

First, there are the issues of labor regulation and the regulation of new forms of precarious work. Tech giants SE or digital platforms SE have been accused of exploiting the

people that provide the goods and services. For example, being a special type of worker, Uber participants are not independent contractors or separately functioning businesses. This causes an increase in labor precarization, and leads to the necessity of employment regulation.

Secondly, there are the issues of tax regulation and the need for additional arrangements to limit competition from SE digital platforms. It is topical to define the sphere of activity and areas of responsibility for services and platforms of the SE. Ownership of key resources by independent contractors and not by the company is a characteristic of the SE business model that distinguishes it from the traditional business model. That is why the digital platforms of SE are not responsible for many conventional functions. The need to regulate anti-competitive behavior comes from traditional businesses, which cannot compete with the networks of the SE either in price or the speed of service provision.

Thirdly, these are information security issues. Additional measures are needed to be implemented to ensure the security of both the digital platforms themselves, the data of participants stored and aggregated by them, and to ensure the security of the provided services.

Therefore, SE's impact on SDG achievement is determined not only by the grounds of responsible and sustainable consumption initially constituting the foundation of SE's business models. Today, the observed impact depends on the methods of tax, labor, competition, and information regulation of SE digital platforms that need to be developed.

6. Discussion

Even though the development of the sharing economy is an attractive alternative to the traditional economy, contributing to the achievement of socially significant, environmental, and economic goals of modern society, only a small contribution of the sharing economy leading to the achievement of sustainable development goals has been verified. The situation can also be explained by shortages inherent in existing methods of tax, labor, competition, and information regulation activity of digital platforms SE. The sharing economy is both a threat and an opportunity. The information, environmental assets, and social relationships that form the backbone of the 21st-century economy are embedded in the sharing economy models. Estimating their dynamic special criteria are needed, since accepted ones cannot be used for these purposes.

The questions of the produced SE values and the performed technological infrastructure role in this are also controversial. Due to the processes of digitalization and platformization, SE business models become part of "platform capitalism" and "digital rentier", causing an unequal distribution of income between SE participants.

The emergence of the SE is a paradox. As a part of the capitalist economy, it also acts as its alternative. The sharing economy is a complex phenomenon that continually reconfigures a diverse spectrum of provided economic activities. Shared consumption processes can both weaken and strengthen conventional business practices. Besides that, the SE is also responsible for new forms of inequality and polarization in property relations.

The proposed model can be expanded by including additional factors. At the same time, the rationale for their choice remains the main issue. It is not enough to use old rules and laws to analyze new business models, while new indicators have yet to be developed.

The conducted study has shown the influence of the sharing economy on the growth of the unemployment rate, which is an unfavorable trend. Besides that, the development of the sharing economy contributes to an increase in the formation of the economic significance of interpersonal aspects and the formation of new social links, which provide individuals with new opportunities to achieve personal goals.

7. Conclusions

Forming the sharing economy business models of sustainable and responsible consumption match with the social, environmental, and economic goals of the sustainable development concept. The conducted study of the sharing economy theory has raised

several controversial questions of the practical values of the SE business models for the implementation of the sustainable development concept. The main paradox of SE remains that it is both a part of the traditional economy and its alternative. There is a significant role of SE in changing classical economic business models and concepts, particularly the categories of individual labor, supply, and demand.

The development of the digital sharing economy is also associated with the formation of a new class of digital rentiers. On the one hand, this leads to increased inequality in the distribution of income between SE participants. On the other hand, this leads to the concentration of capital in the digital platform market segment due to its investment attractiveness. For estimating activities and outcomes of SE, special criteria should be developed. Accepted criteria do not match for these purposes.

A three-dimensional indicator has been developed to determine the influence of the sharing economy on sustainable development. According to its values, the type of SE influence on the SDGs can be defined. The initial hypothesis of conditioning the achievement of sustainable development goals by the development of the sharing economy has been partially confirmed. SE insignificantly contributes to achieving the goals of sustainable development. In the case of creating a modern arrangement regulating the activities of technological platforms in SE, the situation of a more significant contribution of SE to the achievement of sustainable development goals can be diagnosed.

The proposed model can be used for diagnosing the impact of the sharing economy on sustainable development goals achievement. The three-dimensional indicator can be expanded depending on the study objectives, and finalized considering the available statistical base.

The practical value of the work consists in the fact that the proposed indicator for assessing the impact of the sharing economy on the achievement of sustainable development goals can be used in different ways. However, the composition of the three-dimensional indicator could be revised. The rise of the digital economy has been made into standard macroeconomic indicators that are insufficient to assess the social, environmental, and economic areas of sustainable development. Moreover, the existing problems of regulating the digital economy threaten its inherent positive influences.

The conducted study results are consistent with the opinion of sharing economy researchers. On the one hand, the global civilization crisis causes a transition to a collaborative consumption model, leading to a decrease in volumes and a consumption structure transformation. At the same time, the development of the sharing economy model deprives the economy of the traditional direction for overcoming the crisis—an increase in consumption, a decrease in unemployment, and amplification in financial flows. The issue of the quality and reliability of goods and services, their compliance with the quality standards, and environmental safety remain to have great importance. Thus, the sharing economy will undoubtedly create an expanded demand for the product producers following the triple-p concept. At the same time, the environmental and social aspects of influence are more difficult to examine.

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