

Research on the Upgrading Path of Resident Consumption Behavior Driven by Big Data under the Dual Circulation Pattern

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Abstract: Building a new development pattern of dual circulation is a strategic choice for China to achieve high-quality development. Consumption, as the core engine of domestic demand, and its behavioral upgrading is the key support for smooth dual circulation. With the deep penetration of big data technology, digital empowerment has become the core driving force for promoting the transformation of residents' consumption behavior. However, the current upgrading of residents' consumption still faces challenges such as supply-demand mismatch, insufficient technological empowerment, and limited consumption potential release, which restricts the deep adaptation of consumption to the dual circulation pattern. This article adopts research methods such as literature review and logical analysis to define the core concepts of the new development pattern of dual circulation, big data technology, and the upgrading of residents' consumption behavior. It sorts out relevant theoretical support, systematically analyzes the current situation, characteristics, and practical difficulties of residents' consumption behavior under the dual circulation pattern, explores the internal mechanism of big data driving the upgrading of residents' consumption behavior, and ultimately constructs a five in one upgrading path of "demand supply technology scene circulation" and a four-dimensional guarantee system of "policy enterprise market society". Research has shown that big data can effectively solve the dilemma of consumption upgrading through a closed-loop logic of precise capture on the demand side, optimization and adaptation on the supply side, innovation and upgrading on the scene side, and internal and external linkage on the circulation side. The dual circulation pattern provides macro guidance and environmental protection for empowering big data. The research results of this article enrich the interdisciplinary study of dual circular economy theory and consumer behavior theory, providing theoretical and practical references for enterprises to optimize supply, governments to make decisions, and promote high-quality upgrading of residents' consumption behavior.

Keywords: dual circulation pattern; big data; resident consumption behavior; consumption upgrade

1. Introduction

Building a new development pattern with domestic circulation as the mainstay and domestic and international dual circulation mutually promoting each other is a strategic choice for China to respond to global economic changes and achieve high-quality development. Consumption, as the core engine of domestic demand, is the key pivot to smooth the domestic circulation and link the international dual circulation. With the deepening of the Digital China strategy, digital technologies such as big data and artificial intelligence are rapidly penetrating the consumption field, reconstructing the consumption ecology, reshaping consumption patterns, and promoting the transformation of residents' consumption from "quantity satisfaction" to "quality improvement" and from "homogenization" to "personalization", becoming the core driving force for activating consumption potential [1]. At present, the upgrading trend of residents' consumption in China is significant, but it still faces practical bottlenecks such as supply-demand mismatch, insufficient release of consumption potential, obvious digital divide, and hidden data security risks, which restrict the deep adaptation of consumption upgrading to the dual circulation pattern. In this context, exploring the path of upgrading residents' consumption behavior driven by big data has important theoretical and practical value. At the theoretical level, it can enrich the cross disciplinary research between dual circular economy theory and consumer behavior theory, improve the theoretical system of big data empowering consumption upgrading, and make up for the shortcomings of existing research in analyzing driving mechanisms and pattern adaptability. At the practical level, it can provide guidance for enterprises to optimize supply and accurately match demand based on big data, provide

decision-making references for the government to formulate consumption stimulus policies and improve the digital consumption environment, help solve the dilemma of consumption upgrading, promote the benign interaction between consumption and the dual circulation pattern, and inject lasting momentum into high-quality economic development. This article reviews relevant research results at home and abroad, clarifies core concepts and theoretical support, analyzes the current situation and difficulties of consumer behavior upgrading, explores the mechanism driven by big data, and ultimately constructs a consumer behavior upgrading path and guarantee system that adapts to the dual circulation pattern.

2. Related concepts and theoretical foundations

2.1 Definition of core concepts

The smooth implementation of this study requires a clear understanding of the connotations, characteristics, and boundaries of the three core concepts of the new development pattern of dual circulation, big data technology, and upgrading of residents' consumption behavior, in order to lay a solid conceptual foundation for subsequent research and avoid research bias. The new development pattern of dual circulation is a major strategic deployment proposed by China based on the new development stage and implementing the new development concept [2]. Its core essence is to take the domestic circulation as the main body, focus on the precise docking and smooth circulation of domestic supply and demand, rely on the advantages of China's super large market, and break through the bottlenecks in production, distribution, circulation, and consumption; At the same time, achieving mutual promotion of domestic and international dual circulation, relying on the domestic market to link global factors and markets, promoting the coordinated development of domestic and international consumer markets and supply systems, among which consumption, as the fundamental and driving force of domestic demand, is the key hub connecting internal and external circulation. Big data technology is a full process technology system that covers data collection, storage, cleaning, analysis, mining, and application. Its core features are massive, high-speed, diverse, valuable, and low value density. In the consumer field, it is mainly applied in user profile construction, consumer demand forecasting, precision marketing push, and consumer scenario innovation. As a new production factor, its core value in empowering consumer upgrading lies in cracking information asymmetry and optimizing resource allocation. The upgrading of residents' consumption behavior is a comprehensive transformation process of residents' consumption needs, consumption decisions, consumption patterns, and consumption structures. It is specifically reflected in the transition of consumption levels from basic material needs to high-quality material needs and spiritual and cultural needs, the transformation of consumption modes from passive acceptance to active selection and personalized customization, the transformation of consumption decisions from experience driven to data-driven, and the extension of consumption scenarios from singularity to diversification, immersion, and integration of online and offline. Essentially, it is the synchronous improvement of residents' consumption ability, consumption willingness, and consumption quality.

2.2 Relevant theoretical support

The relevant theoretical support is an important basis for exploring the upgrading path of residents' consumption behavior driven by big data and analyzing the internal mechanism. Combining with the core theme of this study, the focus is on sorting out the theories of consumption behavior, big data empowerment, dual circular economy, and supply side structural reform, clarifying the adaptability and supporting role of each theory to this study, and constructing a "theory practice" analytical framework [3]. Consumer behavior theory is the fundamental theory for studying residents' consumption decisions and behavior evolution, covering utility theory, planned behavior theory, and consumer decision theory. Utility theory provides support for analyzing the core driving force of residents' consumption upgrading, that is, residents' pursuit of maximizing consumption utility promotes the transformation of consumption towards high quality and personalization; The Theory of Planned Behavior and Consumer Decision Theory explain how big data can change the consumption decision-making process and optimize the consumption experience by influencing residents' attitudes, subjective norms, and perceived behavioral control. The core viewpoint of big data empowerment theory is that big data, as a new type of production factor, breaks through the traditional development bottleneck by reconstructing the operational logic of production, circulation, and consumption. Its empowerment logic in the consumption field is reflected in the flow of data elements, breaking down the information barriers between the demand side and the supply side, achieving precise capture of demand, optimization and adaptation of supply, and providing core theoretical support for the upgrading of big data-driven consumption behavior. The theory of dual

circulation economy focuses on the internal synergy mechanism of domestic and international dual circulation, clarifying the core position of consumption upgrading in smoothing the domestic circulation and linking the international dual circulation. It provides macro level guidance for studying the path of big data-driven consumption upgrading and defines the strategic direction of research. The theory of supply side structural reform emphasizes optimizing the supply structure, improving the quality of supply, and solving the problem of supply-demand mismatch. It is highly consistent with the core logic of big data-driven enterprise optimization of supply and adaptation to consumer upgrading needs in this study, providing theoretical basis for designing supply side empowerment paths. In summary, the four theories are mutually supportive and organically integrated, clarifying the internal collaborative logic of "pattern guidance technology driven consumption empowerment" between the dual circulation pattern, big data, and upgrading of residents' consumption behavior. This provides solid theoretical support for subsequent analysis of the current situation, mechanism exploration, and path design.

3. Current situation, difficulties and big data-driven mechanism of residents' consumption behavior under the dual circulation pattern

3.1 Current situation and core characteristics of residents' consumption behavior

Against the dual background of the deepening of the new development pattern of dual circulation and the deep penetration of digital technology, China's consumer market presents distinct transformation characteristics. The evolution of consumer behavior not only meets the smooth needs of the domestic circulation, but also echoes the collaborative orientation of domestic and international dual circulation. Its current situation and core characteristics can be comprehensively analyzed from four dimensions: consumption scale, structure, group, and scenario. In terms of consumption scale, China's consumer market continues to expand, and the total retail sales of consumer goods have steadily increased, ranking as the world's second largest consumer market for many years. The annual average growth rate of online retail sales has remained above double digits, and digital consumption has become the core driving force for consumption growth, demonstrating the market advantage of the domestic circulation. From the perspective of consumption structure, residents' consumption shows a clear trend of "improving material consumption quality and expanding service consumption". The proportion of basic daily necessities such as food and clothing continues to decline, while the proportion of high-quality material consumption such as smart homes and green home appliances steadily increases. The proportion of service consumption such as tourism, health, education, and sports has exceeded 50%, becoming the core growth point for consumption upgrading. From the perspective of consumer groups, they exhibit diverse and stratified characteristics. Generation Z pursues personalized and experiential consumption, becoming the leader of new consumption; The digital literacy of the silver haired generation continues to improve and gradually integrates into the digital consumption scene; The consumption potential of rural residents continues to be released, and the growth rate of rural digital consumption market is higher than that of urban areas, forming a pattern of multi group collaborative upgrading. From the perspective of consumption scenarios, the integration of online and offline has become the mainstream trend. Online scenarios such as live streaming sales, social e-commerce, and virtual consumption continue to innovate, while offline scenarios such as smart shopping malls, immersive cultural tourism, and AI shopping guides continue to upgrade, breaking the time and space limitations of traditional consumption and building a diversified and all scenario consumption ecosystem. In summary, the core characteristics of residents' consumption behavior under the dual circulation pattern can be summarized as follows: the demand side is shifting from homogenization to personalization and differentiation, focusing on consumption quality and spiritual experience; The decision-making process is shifting from experience driven to data-driven, with user evaluations and big data push becoming important references for consumer decision-making; The scene has extended from singularity to diversification, immersion, and integration of online and offline, significantly improving consumer convenience and experience; The circular end is shifting from domestic orientation to internal and external collaboration, with residents paying attention to both domestic high-quality supply and global high-quality products and services, becoming an important link between domestic and international dual circulation.

3.2 The realistic dilemma of upgrading residents' consumption behavior

Although the upgrading trend of household consumption in China is significant under the dual circulation pattern, it is still constrained by various factors such as demand, supply, technology, and environment. The upgrading of household consumption behavior still faces many practical difficulties

and has not fully adapted to the development requirements of the dual circulation pattern. Specific analysis can be conducted from four dimensions. On the demand side, the insufficient release of consumption potential and the problem of information asymmetry are prominent. On the one hand, there is a large income gap among residents, and the social security system still needs to be improved. The consumption ability and willingness of low - and middle-income groups are limited, and the consumption upgrading of rural residents lags behind that of urban areas, which restricts the release of overall consumption potential; On the other hand, there is a clear information barrier between consumer demand and supply, making it difficult for residents' personalized and differentiated implicit needs to be effectively transmitted to the supply side, resulting in insufficient demand expression and inadequate demand satisfaction. On the supply side, supply-demand mismatch and insufficient supply quality have become the core bottlenecks. Some enterprises lack the ability to apply big data, making it difficult to accurately capture the dynamic changes in consumer demand. They still use traditional production models, resulting in serious homogenization of products and services, which cannot adapt to the diversified and high-quality demands of residents' consumption upgrades; At the same time, the supply of high-end products and high-quality services is insufficient, the intelligent transformation of traditional industries lags behind, and the supply quality and standardization level of emerging consumer formats need to be improved, making it difficult to meet residents' pursuit of high-quality consumption. On the technical side, the shortcomings of big data empowering consumption upgrading are quite obvious. The development of big data infrastructure shows an uneven trend, and the urban-rural digital divide and regional digital divide still exist. The coverage of big data infrastructure in rural and underdeveloped areas is relatively low, which restricts the inclusive sharing of digital consumption; The issues of data security and privacy protection have become prominent, with violations such as "big data killing" and "algorithm discrimination" occurring from time to time. The unclear definition of data property rights and imperfect regulatory system have reduced the trust of residents in digital consumption; In addition, there is a shortage of composite talents in big data, insufficient capabilities in data collection, analysis, and application in enterprises, and low efficiency in technology transformation, which has led to the underutilization of the empowering effect of big data. On the environmental side, policy guarantees and market environment still need to be optimized. The application of big data in the consumer field lacks a sound legal and regulatory system, and the norms for data circulation and use are not yet clear; The insufficient supervision of the consumer market and the continued existence of illegal activities such as false advertising and counterfeiting have affected the safety and reliability of the consumer environment; At the same time, the policy system supporting big data to empower consumption upgrading is not yet perfect, the mechanism for collaborative innovation between industry, academia, and research is not sound, and the enthusiasm for social capital investment is insufficient, making it difficult to support the continuous promotion of consumption behavior upgrading.

3.3 The intrinsic mechanism of big data-driven upgrading of consumer behavior

As a new type of production factor, big data, with its core characteristics of massive, high-speed, diverse, and valuable, can effectively solve the real dilemma of consumer behavior upgrading, promote the transformation of residents' consumption behavior towards high quality, diversification, and intelligence. The internal mechanism of driving residents' consumption behavior upgrading presents a closed-loop logic of "demand capture supply adaptation scenario innovation circulation smoothness", and is also subject to the macro regulation and guidance of the dual circulation pattern. Specifically, it can be analyzed from two aspects: driving dimension and regulatory role. In terms of driving dimension, big data mainly empowers consumer behavior upgrading through four paths: first, demand side driving. Big data collects residents' consumption data, behavior data, and preference data, uses algorithm models to construct accurate user profiles, accurately identifies residents' personalized and differentiated consumption needs, promotes the transformation of implicit demand into explicit demand, and provides accurate demand guidance for residents through consumption trend prediction, stimulates potential consumption willingness, and unleashes consumption potential. The second is supply side driven, where big data breaks down the information barriers between demand and supply sides, promotes precise transmission of consumer demand data to the supply side, guides enterprises to carry out customized production and personalized services based on data, optimizes product structure and service models, and solves the problem of supply-demand mismatch; At the same time, big data can optimize enterprise production processes and supply chain management, improve supply efficiency and quality, promote the intelligent transformation of traditional industries, cultivate emerging consumer formats, and achieve a virtuous cycle of "demand driven supply, supply adapted to demand". The third is scenario driven, where big data drives digital and intelligent innovation in consumer scenarios, upgrading the convenience and experience of online consumption scenarios, creating offline smart consumption scenarios, achieving

linkage between online and offline scenarios, expanding cross-border integration of consumption scenarios, enriching consumption content and forms, meeting residents' diversified and immersive consumption needs, and promoting comprehensive upgrading of consumption scenarios. The fourth is driven by the circular side. Big data relies on the advantages of the domestic super large scale market to break down regional barriers in the domestic consumer market, promote efficient circulation of consumer resources and factors, and smooth the domestic consumption cycle; Meanwhile, by integrating global consumption data with high-quality supply, optimizing cross-border consumption services, boosting exports of domestic products and high-quality imports, coordinated development of domestic and international consumer markets can be achieved, thus facilitating the smooth operation of the dual-circulation pattern.

In addition, the dual circulation pattern plays an important regulatory role in upgrading consumption behavior driven by big data. Firstly, it provides macro guidance. The strategic deployment of the dual circulation pattern guides big data resources to tilt towards the consumption field, promotes the improvement of big data infrastructure and technological innovation, and provides policy support and resource guarantee for empowering consumption upgrading with big data; Secondly, the role of direction regulation is to guide the consumption upgrade driven by big data to focus on the smooth domestic circulation, taking into account the coordination of internal and external circulation, and avoiding technology empowerment deviating from the dual circulation development goal; Thirdly, the role of environmental protection, the construction of the market system under the dual circulation pattern, and the optimization of the business environment provide a favorable macro environment for the compliant application and data security protection of big data in the consumer field, helping to fully realize the empowering effect of big data.

4. The paths and guarantee measures for upgrading residents' consumption behavior driven by big data

4.1 Specific path of big data-driven consumer behavior upgrade

Based on the analysis of the dilemma of upgrading residents' consumption behavior under the dual circulation pattern in the previous text, combined with the inherent mechanism of big data-driven consumption upgrading, and based on the five dimensions of demand side, supply side, technology side, scenario side, and circulation side, a targeted and implementable big data-driven specific path for upgrading residents' consumption behavior is constructed, achieving a logical loop of "dilemma solving mechanism adaptation path implementation", and helping to deeply integrate consumption upgrading with the dual circulation pattern.

On the demand side, with the focus on unlocking consumption potential and achieving precise demand matching, a precise demand capture system should be established. E-commerce platforms and consumer service enterprises are encouraged to integrate residents' consumption data, behavior data and preference data, use big data algorithms to construct refined user profiles, accurately identify differences in consumption demand among different groups and regions, and promote the transformation of implicit demand into explicit demand; The second is to optimize the demand guidance and incentive mechanism, based on the consumption trend analyzed by big data, cultivate the concepts of green consumption, quality consumption, and intelligent consumption through personalized push and scenario based guidance. At the same time, a consumption incentive platform should be established based on big data, through which targeted consumption vouchers can be distributed and consumption subsidies optimized, so as to stimulate residents' willingness to consume; The third is to narrow the consumption gap, promote big data technology to adapt to aging and agricultural transformation, carry out digital skills training, improve the rural digital consumption service system, bridge the urban-rural digital divide, enable the silver haired and rural residents to share the benefits of digital consumption, and expand the coverage of consumption upgrading.

On the supply side, with a focus on addressing supply-demand mismatches and improving supply quality, enterprises should be supported to accelerate digital transformation empowered by big data. They should be guided to increase investment in big data, establish data collection and analysis platforms, strengthen data application capabilities, advance the intelligent and high-end transformation of traditional industries, and foster emerging consumption formats such as virtual consumption and smart services; The second is to establish a precise supply-demand docking mechanism, relying on big data to achieve real-time transmission of consumer demand data to the supply side, guiding enterprises to carry out customized production and personalized services, and optimizing product structure and service models;

The third is to improve the smart supply chain system, use big data to optimize the entire process of procurement, warehousing, and distribution, improve supply efficiency, promote the extension of smart supply chain to rural areas, and solve the shortcomings of rural consumption supply.

On the technical side, we will focus on empowering and filling the gaps, promote balanced layout of big data infrastructure, increase investment in rural and underdeveloped areas, and achieve full coverage of infrastructure such as 5G and the Internet of Things; Strengthen data security and privacy protection, standardize data collection, storage, and usage processes, crack down on violations, and enhance consumer trust among residents; Cultivate big data composite talents, build a collaborative education platform between industry, academia and research, and improve the efficiency of enterprise technology transformation.

On the scene side, we focus on experience optimization and scene expansion, upgrade the convenience and experience of online consumption scenes, innovate virtual fitting, AI guidance and other models, create offline smart shopping malls, immersive cultural tourism and other scenes, promote the deep integration of online and offline, and expand the cross-border integration of consumption and multiple industries. On the circulation side, with a focus on ensuring smooth dual circulation, big data should be employed to break down regional barriers in the domestic consumer market and promote the efficient circulation of consumer resources. Furthermore, big data should be used to integrate with high-quality global supply, optimize cross-border consumption services, facilitate the global expansion of domestic products, and achieve coordination between domestic and international circulation.

4.2 Measures to ensure the implementation of these pathways

To ensure the efficient implementation of the big data-driven upgrade path for residents' consumption behavior, overcome various obstacles in the implementation process, and combine the requirements of the dual circulation pattern strategy, a comprehensive and multi-level guarantee measures system will be constructed from the four dimensions of policy, enterprise, market, and society, forming a collaborative guarantee pattern of "policy guidance, enterprise leadership, market support, and social participation".

At the level of policy protection, we will improve top-level design, introduce special policies to support big data in empowering consumption upgrading, increase fiscal investment and tax incentives, and guide resources to tilt towards the consumption and digital fields; Establish a sound legal and regulatory system, clarify the definition of data property rights, circulation rules, and regulatory standards, and regulate the application behavior of big data in the consumer field; Strengthen market supervision, rely on big data to build an intelligent regulatory system, severely crack down on illegal activities such as false advertising, counterfeiting, and data violations, create a safe, fair, and orderly consumption environment, and help promote the smooth operation of the dual circulation pattern.

At the level of enterprise security, strengthen the main responsibility of enterprises, guide them to establish a big data-driven concept, increase investment in technology research and development and talent, enhance data collection, analysis and application capabilities, and actively adapt to the needs of consumer upgrading and dual circulation development; Establish a sound enterprise data security management system, strengthen internal supervision, standardize data usage processes, safeguard consumer privacy, and enhance consumer trust; Promote collaborative development among enterprises, encourage leading enterprises to play a leading role, drive small and medium-sized enterprises to share data resources, jointly build technology platforms, form an industrial collaborative empowerment ecosystem, and enhance overall empowerment efficiency.

At the level of market security, accelerate the construction of a high standard market system, break down barriers such as local protection and market segmentation, achieve integrated development of the domestic consumer market, and smooth the consumption cycle; Cultivate and strengthen new forms and models of consumption, rely on big data to explore new growth points in consumption, enrich consumption supply, and promote the large-scale development of digital consumption, green consumption, and quality consumption; Improve the consumer rights protection mechanism, build an intelligent rights protection platform, smooth the channels for rights protection, establish a rapid resolution mechanism for consumer disputes, safeguard the legitimate rights and interests of consumers, and enhance residents' confidence in consumption.

At the level of social security, strengthen publicity and guidance, popularize big data knowledge and digital consumption concepts through various channels, and enhance residents' digital literacy and consumption awareness; Carry out targeted digital skills training, with a focus on enhancing the digital operation abilities of elderly people, rural residents, and other groups, and promoting inclusive sharing

of digital consumption; Give full play to the role of industry associations as bridges and links, promote industry self-discipline, regulate enterprise business behavior, build a platform for collaborative innovation between industry, academia, and research, promote the transformation of technological achievements and talent cultivation, create a good atmosphere for the whole society to jointly promote consumption upgrading, and provide solid social support for the implementation of the path.

5. Conclusion

This article takes the new development pattern of dual circulation as the macro background, focusing on the core proposition of big data-driven upgrading of residents' consumption behavior. Through literature research, logical analysis and other methods, it systematically analyzes the current situation, characteristics and practical difficulties of residents' consumption behavior under the dual circulation pattern, explores the internal mechanism of big data-driven upgrading of consumption behavior, and finally constructs a targeted upgrading path and guarantee system. The following core conclusions are drawn. Research has shown that under the dual circulation pattern, the consumption of Chinese residents presents a development trend of scale expansion, structural optimization, diverse groups, and scene integration. Consumer behavior shows distinct transformation characteristics in the four dimensions of demand, decision-making, scene, and circulation. However, at the same time, it faces multiple challenges such as insufficient release of demand potential, supply-demand mismatch, technological empowerment shortcomings, and incomplete environmental protection, which restrict the deep adaptation of consumption upgrading to the dual circulation pattern. As a new type of production factor, big data can effectively solve the above difficulties through a closed-loop logic of precise capture on the demand side, optimization and adaptation on the supply side, innovation and upgrading on the scene side, and internal and external linkage on the circulation side. It has become the core driving force for upgrading residents' consumption behavior. The dual circulation pattern provides strategic support and development direction for empowering consumption upgrading with big data through macro guidance, directional standardization, and environmental protection. Based on this, the five in one upgrade path of "demand supply technology scenario cycle" constructed in this article, as well as the four-dimensional guarantee system of "policy enterprise market society", can achieve the organic unity of solving difficulties, adapting mechanisms, and implementing practices, providing feasible guidance for smoothing the domestic circulation, linking the international dual circulation, promoting high-quality upgrading of residents' consumption behavior, and helping to play the fundamental role of consumption in high-quality economic development. This study further enriches the cross disciplinary research between the dual circular economy theory and consumer behavior theory, improves the theoretical system of big data empowering consumption upgrading, and provides theoretical and practical references for subsequent related research.

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