Data-Empowered High-Quality Economic Development: Mechanisms and Pathways

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Abstract: *To achieve high-quality economic development, it is imperative to prioritize the real economy and foster new factors for economic growth. Data, as a new factor of production, plays a pivotal role in facilitating the seamless integration between digital technology and the real economy. It possesses inherent attributes and techno-economic characteristics that enable the extraction of value across various processes, including production, transaction, consumption, and regulatory supervision. The integration with digital technology enhances the productivity and efficiency of the real economy by facilitating service sector digitalization, accelerating the growth of the new real economy, and supporting the virtual economy in its role of serving the real economy. At present, unleashing the value of data is hindered by inadequate fundamental systems for the data, a lack of activity in the transaction market, and the underutilization of the data as a factor of production by enterprises in the real economy. Therefore, it is advised that data be fully utilized to develop the real economy through the four-pronged approach of "enhancing support for the high-quality provision of the data, expediting the integration of the data into the real economy, promoting the high-quality development of the real economy, and enhancing public service and governance systems".*

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1. Introduction

The real economy is the backbone of national economy and the foundation for national strength and prosperity. According to the Report to the 20th CPC National Congress, "we should focus economic development on the real economy, promote new-type industrialization, and build a strong country of manufacturing, quality, aerospace, transportation, internet, and the digital economy... We should accelerate the development of the digital economy, integrate the digital economy with the real economy, and establish internationally competitive digital industry clusters" (Xi Jinping, 2022). In addition, the *Recommendations of the CPC Central Committee for Formulating the 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives through the Year 2035* explicitly call for developing a digital economy, promoting digital industrialization and industrial digitalization, and integrating digital and real economies. Such integration will smooth the real economy's circulation, enhance domestic and international circulations, and facilitate further Chinese modernization. Hence, it is necessary to identify

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new factors and opportunities in this new development stage to identify and unleash the value of new factors for high-quality real economy development.

Data, often referred to as the "oil of the new era", are a vital resource for the high-quality development of the digital economy and the broader national economy. Data have a crucial role in integrating digital technology with the real economy. The *Opinions of the State Council on the Improvement of Market-Based Factor Allocation Systems* released in 2020 highlights the inclusion of data as the fifth factor of production, alongside land, labor, capital, and technology. The document emphasizes the urgency to foster the data factor market. In March 2023, the *Institutional Reform Program of the Party and State Institutions* was issued by the CPC Central Committee and the State Council. This program led to the creation of the National Data Administration, which is entrusted with the responsibility of spearheading strategic initiatives such as the "Digital China" and the digital economy. The establishment of the National Data Administration is meant to enhance the progress of Digital China, the data resource system, and the integration between digital technology and the real economy in China. Data are the building blocks of the digital economy and play a crucial role in facilitating its circulation (Hu and Xia, 2023). The significance of data is realized through their distribution and circulation, transformation of individual lifestyles, corporate decision-making processes, productivity, and trade. The real economy has been energized by data-driven innovations in production, transaction, and consumption modes. In the new era, data are expected to play a pivotal role in facilitating the real economy's high-quality advancement. By facilitating the digital transformation of conventional industries, expediting the growth of the emerging real economy, and aiding the virtual economy in its support of the real economy, the digital factor effectively eliminates obstacles and limitations to the real economy's development.

2. Attributes and Value Creation Mechanism of the Data

Data have become a factor of production with novel natural and techno-economic attributes, in contrast to conventional factors of production. The mechanisms and theories for traditional factors of production are subject to limitations of applicability, making it difficult to explain the new changes to economic activities stemming from the data. To reveal how the data empowers the real economy, the first step is to define the characteristics and mechanisms of data as a modern factor of production. This will shed light on the role of the data in economic activity, barriers to its value creation, and the mechanisms by which it can foster real economy's high-quality development.

2.1 Data Inherent Characteristics

The inherent characteristics of the data encompass virtuality, instability, liquidity, and non-consumption. First, virtuality is the most fundamental characteristic of the data, from which many other characteristics have been derived (Mueller and Grindal, 2019). In contrast to traditional production factors, data require integration with other factors (Jones and Tonetti, 2020). Second, data liquidity and instability mean that it is difficult to control its size, form, storage method, and that data content is susceptible to change across the value chain. The data is also fluid and reproducible across all electronic devices and users (Cai and Ma, 2021). Third, non-consumption means that, unlike conventional factors of production that are subject to loss during economic activity, data generate new data during economic activity. Therefore, non-consumption implies that the data is available for continuous use without value loss. The value of the data is influenced by multiple variables, including time and users, and depreciates significantly over time.

2.2 Data Techno-Economic Attributes

In addition to low cost and broad scope, the data possesses unique techno-economic characteristics

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(Cai and Ma, 2021). First, partial exclusivity and non-competitiveness. Exclusivity means that the proprietor may prohibit others from using or consuming his property. Data are partially exclusive due to the participation of multiple entities in the process of their production and use under an implicit property ownership system. Non-competition implies that the data can be utilized concurrently by numerous entities without any loss in value; in fact, the value of the data may even increase because of more users being involved (Jones and Tonetti, 2020). Non-competition is evident in both the use and production stages. Second, externalities are the positive or negative effects of an entity's decisions or actions on other entities. Data contain a wealth of information, including information regarding privacy and security, and the use and purpose of data determine the direction of externalities. The negative externalities of privacy constitute a significant barrier to data transmission. Third, heterogeneity of value: The value and volume of data are nonlinear and involve a variety of entities and use cases, which arises difficulties of data pricing and standardized transactions. Fourth, synergy and substitutability: As a factor of production, data cannot function and generate products in isolation from other technologies and factors of production but may substitute certain factors of production (Jorgensen and Vu, 2016). Fifth, sensitivity: The data holds copious amounts of information and is susceptible to privacy leaks, necessitating delabeling and desensitization prior to distribution (Acquisti et al., 2016).

2.3 Data's Value across Economic Activities

Digital technology applications have become increasingly diverse and profound. As a vital pillar of industrial core competitiveness, data have generated a multiplier effect in concert with conventional production factors. Data have both original value and shared value, with shared value not only vastly exceeding original value but also being nearly infinite and non-consumable (Xia and Zhang, 2022). Data have permeated every aspect of our lives and professions. As a vehicle for the creation of information and knowledge, data contribute to value creation and innovation by facilitating the discovery of patterns and knowledge for optimizing economic decision-making and behavior. Production, market transactions, consumption and government regulation are important components of economic activity, in which data plays a significant role.

(i) Production. As a carrier of information, data are a resource for development and utilization with the potential to generate wealth. However, data can only generate wealth when they are utilized in productive activities. The data contributes to an increase in output and productivity through the following channels: First, data as a new factor of production become a key variable to the production function, which is transformed due to the limitations of the traditional hypothesis of return to scale (Jin and Sun, 2019). Second, due to its synergistic effects, the data may optimize the volume and proportion of the existing factor inputs and distribute the means of production across various sectors in a manner that increases productivity. Third, data may optimize decision-making in manufacturing and operational processes and facilitate the upgrade of enterprises to data-driven decision-making, as well as smart manufacturing and production mode upgrades. The data has effectively increased the innovation output and manufacturing efficiency of enterprises in the real economy, but the effects are heterogeneous: Data empowerment is more significant for large and capital-intensive enterprises, tech firms, and enterprises in regions where innovation and knowledge protection are highly valued (Li et al., 2022).

(ii) Market transactions. The data has transformed market operations and transactional practices. Through its migration across economic entities at the downstream and upstream sectors as well as the supply and demand sides, the data transmits and connects the requirements of various entities, thereby fostering a cost-effective and efficient business environment. The collection, consolidation, and analysis of supply and demand data will improve the distribution of production resources and factors. As a typical mode of the digital economy, digital platforms have increased the efficiency of resource allocation and market transactions by matching supply with demand, thereby playing a crucial role in fostering growth, creating jobs, and promoting international competition. Users, data, and algorithms have a significant

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impact on the operational effectiveness of platforms. With the abundance of data generated by two-way users, digital platforms may employ algorithms to create user portraits to analyze user requirements and behaviors to efficiently implement matching and recommendation functions. The convergence of digital technology and the real economy is driven by digital platforms that employ the data as core productivity.

(iii) Consumption. In their daily lives and spending behaviors, consumers generate an enormous amount of data that reflects their consumption preferences and habits. Data mining and analysis enable dynamic product and service optimization on the demand side. The data has the potential to enhance consumer convenience and experience and facilitate consumption. Internet-based digital technologies have transformed consumer behavior, and data analytics of these changes are crucial for revealing consumer needs and barriers to consumption. Moreover, the data is tradable as a factor of production, and digital products have also become a commodity. The digital industry has flourished on an increasing demand for data-based goods.

(iv) Government regulation. Government administration and regulatory work must be guided with extensive market information, and data from market entities are crucial to the transition from empirical to data-driven decision-making, enabling broad public participation. Regarding public administration, the data serves as a tool for the government to address market failure, build smart cities, provide digital government services, improve policy decision-making and implementation, broaden market boundary and corporate development space, and ameliorate the market environment. With its access to a wealth of public data, the government is well-positioned to capitalize on the value of data in the public sector through sharing and open access.

3. Mechanism of Data-Empowered High-Quality Economic Development

Based on the attributes and effects of the data, it is necessary to clarify the composition and structure of the real economy and examine the effects of the data on its various components. To ascertain the data's empowerment mechanism, this section will further consider the "new real economy" resulting from the innovation and development of the real economy, as well as the virtual economy at the service of the real economy.

3.1 Real Economy and New Real Economy

According to the "broad approach for the real economy and narrow approach for the virtual economy" classification, the real economy consists of all sectors of the primary, secondary, and tertiary industries, excluding financial services and real estate (Huang et al., 2017); this is the most prevalent classification standard. In recent years, the digital economy has significantly augmented, expanded, and restructured the real economy. In this way, the real economy has been completely transformed. As a new development catalyst, the digital economy has increased the real economy's efficiency and transformed its paradigms (Hong and Ren, 2023). It is far from enough, therefore, to discuss high-quality development from the sole dimension of the real economy's composition. New modes of production exemplified by digital platforms have become an integral part of people's life and work, necessitating a reexamination of the factors that constitute the real economy. Xia and Xiao's three-tiered framework for the new real economy consists of the digital technology industry, the "new industry, new business mode, and new paradigm" economies, and the digitalization of traditional industries; the incorporation of data into production and consumption processes is the key for new economic entities to promote economic modernization (Xia and Xiao, 2023).

3.2 Data's Empowerment of the Real Economy: Transforming the Primary, Secondary, and Tertiary Industries

(i) Agriculture. With manual labor and mechanized operations as the primary modes of production,

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conventional agriculture is highly reliant on natural conditions, such as location, soil, and weather. According to the dual factor theory, land and labor are the primary production factors. Nevertheless, the data may increase the efficiency of land and other natural resources, make appropriate use of suitable natural conditions, reduce empirical decision-making practices, and enhance crop yield and sales performance. In 2021, the overall mechanization rate of crop cultivation in China exceeded 72%, involving over 600,000 sets of agricultural machinery equipped with the BeiDou satellite terminals (He, 2022). The data has increased agricultural efficiency and marketing by facilitating origin traceability, intelligent irrigation, greenhouse temperature and humidity control, and electronic commerce of agricultural products. In particular, the digitalization of information such as soil and climatic conditions enables intelligent planning and dynamic adjustment, as well as the selection of crop species, fertilizer types and frequencies, and pest control methods (Hu and Xia, 2023). The data is/are spawning new forms of virtual land and space, such as metaverse, which will be more dynamic and offer more opportunities than traditional geographical space and resource endowment (Hu and Xia, 2023).

(ii) Manufacturing. Mechanization is displacing manual labor and reducing reliance on natural conditions in the industrial economy era. The pursuit of technological advancement has resulted in cost reductions and efficiency improvements, making capital and technology crucial production factors. The data may effectively coordinate capital and technology factors to multiply their efficiency. In the product design and manufacturing phases, the wealth of information contained in big data is crucial for optimizing product design, shifting value creation from product design to consumer co-creation, digitalizing product design through data sharing, and transforming the mode of production in industrial sectors (Prahalad and Ramaswamy, 2000). Data and digital technologies are essential for industrial enterprises to improve intelligent and effective management in raw materials procurement and inventory management of goods. In the 110 intelligent manufacturing demonstration factories, intelligent manufacturing renovations have increased productivity by 32% and resource utilization by 22% as a result of data and digital technology applications ; their product R&D cycle has been shortened by 28%, operational costs have been reduced by 19%, and product non-conformance rate has decreased by 24% (He, 2022). The data has significantly facilitated the integration of sophisticated manufacturing with modern services. Data regarding changes in consumer requirements and preferences are recorded and transmitted instantly to the production side to extend manufacturing service chains and develop user-connected smart factories with mass custom-made production.

(iii) Services. Most service sectors, except for financial services and real estate, constitute vital components to the real economy. First, services are typically labor-intensive industries, and data-labor integration has the potential to increase productivity. Data and digital technologies have transformed the modalities of service delivery, allowing services to be delivered anytime and anywhere over the internet. This eliminates the non-portability and non-storability constraints of services. In highly standardized use cases, AI-based robots can substitute simple, repetitive, and low-skilled labor, boost productivity, and improve customer experience. Second, owing to the intangibility of services, the service industry has the highest level of digital technology adoption and digital upgrade. The data's value is incorporated in all product design, production, consumption, and feedback processes. Digital platforms facilitate service delivery by matching service supply with demand. As a result of the rapid growth of digital trade, data have become a final product and a crucial vehicle, transforming the transaction modes of commerce and distribution.

3.3 Data-Empowered New Real Economy: New Industries, Business Modes, and Paradigms

(i) Economies of emerging industries, new business models, and innovative paradigms. The platform economy, as a prevalent manifestation of the digital economy, is driving the use of digital technologies in the real economy, serving as a catalyst of economic progress. The platform economy has

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unique functions and values that set it apart from other forms of the real economy. As with other two-sided markets, the platform economy is driven mostly by the network externalities resulting from the volume of two-way users. Without data, it is impossible to realize platform functionalities and increase the number of active users. Digital platforms have implemented a data-driven operational mode to anticipate users' preferences and fulfill users' requirements through data gathering, mining, analysis, and computation. Data and platform applications have revitalized and reenergized traditional enterprises and business models. The advent of digitalization has brought about significant changes in the traditional retail sector, leading to the emergence of intelligent retail characteristics that contribute to the techno-economic advancement of the retail industry (Wang et al., 2022).

(ii) Convergence of digital technology with real economy. Most components of the digital economy can be considered part of the real economy. In other words, there exists a significant level of connectivity between digital and real economies. Hence, our study should focus on exploring strategies to enhance such integration and promote data as a new input of production. In the digital economy, data have emerged as a pivotal resource and factor of production. Every operation in the digital economy involves the creation, exchange, application, and value of data, which links digital and real economies. Employment opportunities are created and the factor market expands as a result of data search, cleansing, labeling, and transactions. New business models such as data labeling have emerged with expanding application scenarios in conventional industries like transportation, healthcare, and catering, fostering creativity and competitiveness. Progress in digital technologies leads to a rise in the volume, quality, and value of the data, bolstering the productivity of conventional factors such as labor and the growth of the real economy. As a positive feedback loop, the abundance of data generated from the real economy reinforces the optimization of data models and algorithms and facilitates digital technology progress. The integration of data and digital technology is pervasive across key aspects of the real economy, deepening the integration of digital and real economies.

3.4 Data Enhances the Virtual Economy's Capacity to Serve the Real Economy

The virtual economy is commonly understood as a system of economic activity that revolves around the circulation of money and the utilization of credit systems to generate financial gains (Huang, 2017). Empirical study unveiled a notable beneficial spillover effect of the virtual economy on the real economy (Liu, 2004). High-quality development in the real economy is contingent upon support from the virtual economy. Data have the potential to indirectly contribute to the growth of the real economy through its optimization of finance and other aspects of the virtual economy. This represents a significant avenue through which data can empower the real economy. The financial sector takes data as an essential input for optimizing financial products and managing credit risks. First, data provide a clue for the analysis and identification of the financial requirements, operational risks, and solvency of real-economy enterprises and other service entities to optimize the development and provision of financial products and services. Second, corporate entity data are necessary for effective corporate value and credit appraisal, which lowers the credit risk and corporate financing costs caused by information asymmetry. Data analytics is vital for capital to be invested in businesses and locations most in need of capital but underserved due to their backgrounds and lack of collaterals. In particular, small and medium-sized businesses (SMEs) are the most in need of capital but the least served. The financial sector is the one with the greatest volume of data generated, distributed, and used. Since the Shanghai Data Exchange opened for business in 2021, 248 data products - or 82.4% of all products - have been listed in the financial segment, where product transactions are the most frequent. The data has provided the financial industry with new opportunities and dynamism. It has helped financial and other sectors of the virtual economy to support real-economy entities, such as SMEs, through financial sophistication and inclusive digital finance (Lu and Wang, 2022).

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4. Pathways for Data's Empowerment of High-Quality Real Economy Development

4.1 Improving Fundamental Systems to Support High-Quality Data Supply

(i) Promoting the research and implementation of fundamental data systems. The transaction and flow of data cannot take place without data ownership, pricing, and income distribution systems. It takes theoretical research and practice to support high-quality data supply and foster the data market. First, an explicit data ownership system is the foundation for data transactions, and steps should be taken to address challenges to data ownership. Referencing the separation of ownership and use rights under the property law, it is suggested to establish the ownership separation and usufructuary rights of data for various entities. The "20 data measures", jointly released by the Central Committee of the Communist Party of China and the State Council, calls for establishing a market-based new model of "shared access and shared income", as well as separate data ownership, processing, and use rights. Second, a key aspect in fostering the data market is to establish a reasonable, fair, and effective data pricing mechanism. Unlike conventional factors of production, data pricing is complex and challenging. As such, it is essential to synchronize theoretical research with transaction practice, explore a dynamic pricing mechanism involving diverse users and use cases, improve professional pricing services at the data exchange, and enhance regulatory supervision over data pricing. Third, incorporating data into the income distribution system; contributions of labor and other factors to the realization of data's value should be respected, ensuring that data owners and processors are rewarded and incentivized to provide high-quality data services.

(ii) Fostering a multitiered data market. Data transactions cannot take place without transaction platforms and markets. A multitiered data market should be established to provide intermediaries services such as supply and demand matching, value appraisal, and transaction control for data transactions both within and outside data transaction venues. First, priority should be given to developing intermediary service institutions such as data exchanges. As an important initiative to address the absence of data transaction systems and develop the data factor market, data exchanges are intended to provide data services such as data pricing, registration of data owners, matching between both sides of data transaction, and data application consulting services. The creation of intermediary service institutions such as data exchanges will facilitate the flow of the data to the demand side, optimize resource allocation, increase the vibrancy of data transactions, and unleash the value of data. Second, fostering data brokers and other data providers. Personal users are currently ineligible for data transactions at mainstream data transaction platforms. As a result, the tremendous data supply and demand potential of individual users have been stifled. To address this problem, data brokers may collect, desensitize, and integrate personal data to allow for data transactions. Third, standardizing private data transactions. Due to the heterogeneity of data, the exchange-based transactions of raw data cannot meet the diverse needs of data transactions. In comparison, private data transactions outside transaction venues have become more vibrant. Given the absence of private data transaction systems, it is important to step up regulatory supervision and standardization of private data transactions at various levels.

4.2 Facilitating the Data's Infusion into the Real Economy and Establishing a Data Circulation Mechanism

(i) Smoothing the data's distribution channels. The data generates and liberates value through the distribution process. Utilizing data will stimulate the real economy by facilitating production, distribution, transaction, and consumption, which will generate additional data. Therefore, it is essential to facilitate data transactions, open access, and sharing. First, transaction is the most essential data transfer channel. In its present preliminary stage of development, China's data market faces a lack of critical systems and obstacles in terms of market oversight. In the future, it is recommended to foster

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and enhance a unified national data market and to maximize the intrinsic value of data to support the real economy. Second, it is necessary to adopt measures to promote open data access and sharing; a data sharing ecosystem needs to be established with the backbone of enterprises from diverse sectors or data value chains. There should be more secure transmissions of data across international borders, greater international cooperation, and more incentives for companies to compete internationally.

(ii) Mechanisms for integrating data with other production factors need to be devised. For most businesses, data alone cannot generate economic value and must be compounded with other production factors. Moreover, technology is necessary for the realization of the multiplier effect to empower the real economy. Therefore, it is crucial to strategically integrate data with other factors of production. Mechanisms for such integration need to be cultivated throughout all business processes, from manufacturing to transaction, transportation, and feedback to promote the digital upgrade of other factors of production, increase the synergy of the data, and allocate the input volume and proportion of factors of production efficiently. Specifically, the integration of data and technology should be strengthened to empower the real economy. The government needs to stimulate the commercialization of R&D and the transfer of knowledge to the digital economy, promote the digital capabilities of businesses, and drive the development of high-quality data and digital technology as twin engines.

(iii) Expediting corporate digitalization by adopting digital technologies. New infrastructure and digital technologies are required to realize the value of data, as determined by the data's techno-economic characteristics. Barriers to data exchange must be eliminated for digital technologies to support the real economy. New infrastructure and digital technology should receive more funding to nurture a comprehensive data value chain that includes data collection, storage, processing, mining, and transaction. Priority should be given to expediting R&D commercialization and application and establishing a factor system of computing power, algorithms, and data to optimize conventional technology and establish new corporate and industrial ecosystems. Furthermore, businesses must be encouraged to employ digital technology and pursue digital transition. The value of a database varies depending on its use and application scenarios. As such, the acquisition, processing, and utilization of data as a factor require the corresponding digital technologies and skills. Businesses are advised to recruit highly qualified digital professionals to formulate digital transition strategies and facilitate the adoption of digital technologies according to their development goals and conditions. Capabilities for data acquisition and utilization will add significant value to all business processes.

4.3 Leveraging the Value of Data to Drive the Growth of the Real Economy

(i) Accelerating the digital transformation and integration of primary, secondary, and tertiary industries. That requires utilizing data transaction venues and platforms to align demands of entities in the real economy with exact data matching and dynamic optimization. Data companies need to determine the data requirements and application scenarios of businesses and distribute the right data to the right economic entities. First, agriculture is the sector with the lowest digital penetration but has tremendous potential for data applications. To increase agricultural digitalization, priority should be given to bridging the digital divide, improving rural infrastructure, and adopting new technologies in the countryside. Integrated information services should be offered to agriculture, rural areas, and farmers. Smart agriculture should be developed through data-driven innovations. Second, the manufacturing sector is a key component of the real economy for data applications, therefore it is important for manufacturing enterprises to integrate the data into their work processes and develop digitalization strategies and pathways based on their business objectives and conditions. Digitalization should serve as a catalyst for businesses to develop innovative products. That requires promoting cloud and digital applications, instituting classified management and encouraging the secure flow of industrial data and unlock the value of industrial big data applications. Third, the service sector is well-positioned to adopt digital applications to enhance development paradigms and boost productivity. Small, medium-

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sized, and micro enterprises in the service sector need to be prioritized, and data barriers be removed to optimize each service process and develop consumer and producer services in coordination. Fourth, it is recommended to expedite new-generation ICT applications in manufacturing, promote service-based manufacturing, and create a conducive policy environment for new business models (Xia, 2022).

(ii) Promoting the solid development of the new real economy. Data are an indispensable resource for the digital economy and digital innovations. The quality of the development of the new real economy is dependent on regulatory systems for the data as a factor and its cross-entity movement. First, priorities need to be set aside to remove barriers to the new real economy and to fortify institutional design. Therefore early-mover advantage through institutional innovation should be encouraged to establishes a new institutional framework for the rights and income distribution of data as a key factor of production in the new real economy. To unleash the benefits of digital innovations, market-based allocation of data needs to be implemented through reforms and pilot programs. To bring about the potential of the new real economy, its qualitative improvement must be driven by both data and digital technology. To enable the value multiplier effect, regulatory supervision on data collection and privacy are needed to facilitate the flow of data across entities and industries. Third, it is essential to strengthen regulatory oversight and standardization of the data in the new real economy, establishing defined behavioral boundaries. The continuous expansion of data capabilities is likely to result in data abuse and monopolization at the expense of social welfare. Therefore, it is essential to improve laws and regulations on the record filing and control of data and algorithms and prevent the platform economy's potential negative externalities.

(iii) Standardizing the virtual economy's development. The virtual economy must serve the real economy and incorporate data as a factor to better assist the real economy. The virtual economy cannot exist in isolation from the real economy. Granted, the virtual economy can operate autonomously and effectively beyond the constraints of time and space. It is natural for the real economy to follow behind the virtual economy and become detached from it. However, with their virtuality and mobility in time and space, digital applications have decreased the latency in real-economy operations and transaction costs. Economic data provide guidance for adjusting the development pace and priorities of the virtual economy. The government needs to also enhance the functions of the virtual economy to support the real economy. The "20 data measures" have established explicit requirements for data ownership rights and revenue distribution in the financial sector. The government is advised to enhance the data market, encourage the use of data in financial services, promote venture capital investment in data firms, create a data credibility system primarily for corporate operational data, improve the supply of credit services, and extend greater financial support to the digitalization of businesses, especially small, medium-sized and micro businesses.

4.4 Enhancing Public Services of Data to Support the Real Economy

(i) Improving the quality of public services related to the data. Open and shared data access is essential for economic growth. First, the government is advised to enhance top-down design and open data access regulations. The United Kingdom, for instance, prioritized access to data in high demand. Referencing this strategy, actions can be taken to expand access to diverse types of data. Second, it is essential to optimize data request and utilization processes and the problem of emphasis on formal procedures over actual results should be addressed in the implementation process. On the premise of ensuring data security, it is recommended that data flow be maximized by improving the quality and applications of open data, formulating public data service standards and request systems, and developing procedures and utilization for tracing essential and restricted data.

(ii) Modernizing the governance of the real economy. Digitalization has transformed economic and social operations. Data empowerment of economic regulation is a key driver of integration between digital and real economies. Data governance need to be made more effective. Data and digital technologies should underpin the modern economic governance system. First, it is recommended that

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the government promote data applications in public services and regulatory oversight. Priority should be given to the design and application of policy experiment platforms, regulatory sandbox, innovative policy instruments and approaches and strengthen the development of a digital government. Second, data should be integrated into the socialist market economic system to link market entities, improve cross-sectoral regulation, enhance the dynamism and efficacy of data, and eliminate the negative effects of data sensitivity so that the data can contribute to the secure and efficient development and management of the real economy.

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