# New growth in cross-border E-business: evidence from gray forecasting to cross-border E-business in China

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## Abstract

**Purpose** – This paper delves into cross-border E-business, unraveling its intricate dynamics and forecasting its future trajectory.

**Design/methodology/approach** – This paper projects the prospective market size of cross-border E-business in China for the year 2023 using the GM (1,1) gray forecasting model. Furthermore, to enhance the analysis, the paper attempts to simulate and forecast the size of China's cross-border E-business sector using the GM (1,3) gray model. This extended model considers not only the historical trends of cross-border E-business but also the growth patterns of GDP and the digital economy.

**Findings** – The forecast indicates a market size of 18,760 to 18,934 billion RMB in 2023, aligning with the consistent growth observed in previous years. This suggests a sustained positive trajectory for cross-border E-business.

**Originality/value** – Cross-border e-commerce critically shapes China's global integration and traditional industry development. The research in this paper provides insights beyond statistical trends, contributing to a nuanced understanding of the pivotal role played by cross-border e-commerce in shaping China's economic future.

**Keywords** Cross-border E-business, Gray forecasting model, Digital economy

**Paper type** Research paper

## 1. Introduction

China has consistently been at the forefront of growth and innovation in the global digital retail landscape, seamlessly transitioning from digital trade to cross-border e-commerce. According to an April 2023 report on the development of digital China, as of 2022, the scale of

China's digital economy has surged to 50.2 trillion yuan (approximately 7.25 trillion US$), constituting a substantial 41.5% of the GDP. Remarkably, China holds the title of the world's largest e-commerce market, with transactions totaling US$ 1.5 trillion (RMB 42.3 trillion) in 2021 – a remarkable 20% surge from the previous year. This figure surpasses the combined e-transactions of France, Germany, Japan, the United Kingdom and the United States. Despite the preference of US citizens for online shopping, the UNCTAD Annual Report 2020 reveals that an astonishing 56.67% of global online retail sales are directed toward e-commerce platforms based in China, highlighting the exponential surge in e-commerce retail metrics. Moreover, China's demographic landscape, boasting the world's highest population base, emphasizes the significant demand it generates, facilitating the processing of nearly 50% of global transactions. As of December 2021, the Chinese e-commerce user base had burgeoned to 842 million individuals, constituting a remarkable 81.6% of the total netizen population – an increase of 59.68 million users compared to December 2020. Furthermore, China claims the position of the globe's largest mobile payment market, amassing a revenue of RMB 2,976 trillion in 2021.

In consideration of the aforementioned background, this study employs the GM (1,1) gray forecasting model to project the prospective market size of cross-border E-business in China for the year 2023. The research endeavors to delve deeper into the landscape of cross-border E-business by initiating an in-depth examination of its future trajectory. This involves scrutinizing the various dynamics, including technological advancements, regulatory changes and consumer behaviors, that could influence the trajectory of cross-border E-business. Furthermore, to enhance the analysis and provide a more comprehensive forecast, the study incorporates the GM (1,3) gray forecasting model. This extended model takes into account not only the historical trends of cross-border E-business but also factors in the growth patterns of GDP and the digital economy. By integrating these additional dimensions, the study aims to offer a nuanced understanding of the complex interplay between economic indicators and the cross-border E-business sector. The forecasting outcomes reveal a projected market size ranging between 18,760 and 18,934 billion RMB for the year 2023. This consistent growth projection aligns with the observed performance trends in the preceding years, indicating a sustained positive trajectory for cross-border E-business in China. The study, therefore, not only provides valuable insights into the anticipated market size but also offers a robust foundation for strategic planning and decision-making in the dynamic landscape of cross-border E-business. The nuanced approach of considering multiple variables ensures a more accurate and holistic forecast, contributing to the reliability and applicability of the study's findings for stakeholders in the cross-border E-business ecosystem.

The distinctive merits of cross-border e-commerce, in comparison to traditional business frameworks, are noteworthy. Unlike conventional retailing, the cross-border e-commerce model boasts economic advantages, characterized by cost-effectiveness and substantial discounts. Simultaneously, it offers lifestyle advantages, including convenience, time efficiency, a diverse array of choices and a streamlined ordering process. By separating the shopping and payment processes, consumers can make better use of their fragmented time, reducing impulsive purchases and aligning with today's fast-paced lifestyles (Lai *et al.*, 2014; Duarte *et al.*, 2018). Moreover, cross-border e-commerce exhibits distinctive social advantages relative to its domestic counterpart, particularly in the democratization of knowledge. The abundance of diverse goods, services and global information allows consumers to engage with a myriad of cultural perspectives, thereby enhancing their insights into and fostering the cultivation of an international outlook. The evolution of cross-border e-commerce in China is driven by the co-innovation of profit, marketing and regulatory paradigms (He and Xu, 2018). The integration of "online–offline" marketing channels within cross-border e-commerce plays a pivotal role in advancing digital

industrialization, industrial digitization and governance digitization in China's developmental framework. This integration has the potential to catalyze regional economic transformation, leveraging ecological advantages to radiate influence on the surrounding economic landscape (Ni, 2022). Furthermore, the catalytic impact of cross-border e-commerce extends beyond its operational dimensions, ushering in prospects for the economic development model in the digital age. This is achieved through adept integration with traditional industries, international trade, cross-border financial services and the emerging field of domestic new urbanization (Liu, 2017). The interplay between cross-border e-commerce and these sectors delineates an emergent economic landscape, highlighting the dynamic synergy between digital innovation and traditional economic paradigms.

Overall, the benefits of studying cross-border e-commerce can be summarized in the following three points. Firstly, augmenting investment in cross-border e-commerce holds the potential to markedly enhance the overall developmental caliber of China's digital economy. Despite the rapid volumetric expansion, challenges demand immediate attention, including information asymmetry (Mavlanova et al., 2012; Li et al., 2023), infringement issues (Huang and Li, 2019) and deficiencies in ancillary facilities concerning production safety and labor protection. Cross-border e-commerce can bolster the overseas market performance of low-cost, low-value-added small commodities, introducing distinctive "selling points" and engendering unique appeal for these small goods. Simultaneously, it can uncover new growth avenues for high-value-added goods and services within more expansive and diversified international markets. Secondly, digital trade stands poised as a pivotal driver for the nation's deepened integration into the international arena. The digital realm can propel the ongoing standardization of trade patterns (Polyanin et al., 2019). The robust evolution of e-commerce models plays a pivotal role in curtailing transaction costs (Garicano and Kaplan, 2001), streamlining processes (Eastin, 2002), mitigating barriers and reducing the threshold impact of the Internet on exports. Digital technologies also play a role in fostering international trust mechanisms (Aljifri et al., 2003). Cross-border e-commerce leverages the loosely coupled organizational attributes of platforms and their inclusive, open ecological advantages, striving to encompass participants from diverse nations (Li et al., 2019). This approach not only furnishes an environment and technical support framework for profound international collaborations (Niehoff et al., 2022; Veile et al., 2022) but also, through internal cooperation mechanisms, implicitly cultivates and fortifies the international trust system (e.g. Niu et al., 2019; Yan et al., 2021; Fan et al., 2023). China's established digital leadership strategically positions it to proactively engage in global digital cooperation, bearing paramount significance in reshaping the international order and forming a crucial foundation for the forthcoming intensive permeation of the global cooperation network during the smart economy era. Thirdly, further scholarly exploration into cross-border e-commerce holds considerable promise. Scholars have delved into unraveling its multifaceted role in fostering international trade expansion, examining dimensions such as trade distance, consumer welfare and policy shocks (Wang et al., 2017). As a nascent trade paradigm, cross-border e-commerce is poised to transcend its current role, catalyzing its ascendancy in diverse realms, including the invigoration of consumption dynamics and catalyzing consumption upgrading (e.g. Huo, 2023). It acts as a transformative force, steering traditional industries toward intelligent and hybrid development, with the capacity to enhance ecological sustainability and elevate global welfare levels (e.g. Chang and Uden, 2008; Almeida et al., 2020; Gamidullaeva et al., 2021; Zhang, 2021). These potentials can be achieved through judiciously designed mechanisms, such as the sharing of digital resources, cultivation of mutual trust channels and robust international economic collaboration, necessitating strategic interventions exemplified by the establishment of various "e-commerce plus" models.

The subsequent sections of this paper are structured as follows. The second segment presents a thorough literature review, constructing a macroscopic theoretical analytical framework rooted in the ecological advantage perspective. This effort aims to elucidate the role of cross-border e-commerce development in cultivating competitive advantages at the industry level, positioning Chinese enterprises not only to endure but also to triumph in the progressively intensifying global ecological competition. The third section delves into the intricacies of research design, encompassing the delineation of the model, the articulation of analytical concepts and details related to data sources, variable selection and the chosen research methodology. The fourth section provides an exhaustive account of our research findings, concurrently engaging in a comparative discourse with existing studies. The fifth part delineates the primary conclusions derived from our study, encapsulating a synthesis of theoretical contributions and pragmatic implications. The final section articulates targeted policy recommendations, spanning the realms of scenario and culture, mixed industry development and the fortification of platform ecological responsibility.

## 2. Theoretical background and literature review

In the realm of e-commerce, where the value primarily comes from new transactions, the complexity poses a challenge for any single classical theory to fully understand and predict its performance. To address this, Amit and Zott (2001) integrated previous perspectives, identifying four key dimensions: efficiency, complementarity, lock-in effect, and innovation. They introduced a business circle concept, encompassing supplier (complementors), partner, and customer segments—a seminal yet nebulous prototype of the e-commerce platform ecosystem. Subsequent literature has deepened our understanding of the intricacies surrounding the e-commerce platform ecology, recognizing its ecological and systemic facets (e.g. Liu *et al.*, 2013). Tian *et al.* (2014) further advanced the structural model of e-commerce market analysis, grounding their innovations in ecological theory and network science. Despite these advancements shaping a foundational systematic framework, there remains a noticeable gap in research perspectives' innovation. The current discourse has inadequately addressed the catalytic effect of the e-commerce ecosystem on industry development and the comprehensive dynamic analysis concerning the linkage and interaction among platform elements. In response to these observations, a growing group of scholars has embraced the concept of digital ecology, integrating innovation, information, strategy, and organizational management into a unified framework. Their research on the platform-specific advantages of the ecosystem provides a more nuanced explanation of the e-commerce model, aligning better with its logic of co-creating value. In this context, this paper maintains its focus on the ecological advantage perspective, aiming to construct a coherent theoretical framework. The overall goal is to explore the inherent characteristics and developmental logic of e-commerce, seeking to complement and expand the existing literature in terms of both breadth and depth.

In the upcoming literature review section, we will expand our framework to explore how e-commerce growth impacts cross-industry interactions from broader perspectives. Initially, we'll highlight the unique advantages of e-commerce in catering to small markets and micro-groups, focusing on its success in the paradigm of small-scale technology. Our analysis will delve into the catalytic role of digital ecological advantages, customization, and scenario matching. Subsequently, we'll then project potential trajectories for e-commerce evolution. The paper will also examine how digitalization contributes to the intelligent transformation of traditional industries and the development of mixed industries, particularly focusing on how digital technology influences smart growth and fosters environmental benefits across diverse fields. Additionally, acknowledging the extensive impact of ecosystem social responsibility, we expand the traditional Environmental, Social, and Governance (ESG) paradigm. Informed by existing research and e-commerce model characteristics, we

scrutinize the environmental performance of digital trade in e-commerce. Systematically outlining key areas in the academic community related to digital ecosystem social responsibility, we present current and future trends in the literature. We argue that the e-commerce industry's future trajectory will witness further innovation and diversification within the service scenario, fostering synergistic and inclusive growth through digital-intelligent transformations and shaping its long-term development path.

## 2.1 A new application of small-scale technology theory

The small-scale technology theory, initially proposed by Wells (1977, 1983), represents an early milestone in exploring the role of transnational corporations (TNCs) in developing countries. The prevailing argument suggests that a strategic competitive edge is achieved by developing small-scale production technologies tailored to the specific needs of small markets, especially in labor-intensive industries (e.g. Anderson, 1982; Liedholm and Mead, 1987; Schmitz, 1995; Frijns and Van Vliet, 1999). This approach can purportedly facilitate the convergence of social, economic, and environmental benefits more easily (Burton and Hubacek, 2007). These small-scale markets typically have low demand, making it unfeasible for companies from developed countries to enter due to the difficulty of achieving economies of scale. However, existing research on this theory has two main shortcomings: an overly absolute and delimited definition of technology, and a lack of recognition of the positive impacts of small-scale markets on industrial development (Romijn, 2001). Despite the growing interdisciplinary research (e.g. Dinham, 2003) based on this theory, research tends to focus more on the theory's application rather than on its innovation and systematic refinement.

We pioneeringly assume that research rooted in the domain of e-commerce holds promise for ameliorating the aforementioned theoretical gaps to a certain extent. On one facet, the e-commerce ecosystem emerges as an apt conduit for the proliferation of intangible or "soft" products, including ethnic elements and culture, thereby expanding the ambit of traditional technological advantages from a service and innovation perspective. Concurrently, the small-scale markets cultivated through the alignment of nuanced demand and bespoke services constitute the primary revenue source within the e-commerce paradigm. Intensive exploration of this mode's evolution may contribute to a more holistic comprehension of scenario-based markets and intensive services.

*2.1.1 Digital inclusion and market segmentation.* Primarily, from a supply-side perspective, the entry of numerous small-scale and less efficient producers lays the foundation for the formation of the e-commerce ecosystem and its small-scale technological edge. These vendors avoid relying on economies of scale or scope for cost reduction. Instead, they choose to gain premium pricing and competitiveness through differentiation. The capacity of the Internet to furnish SMEs with opportunities and facilitate competitiveness in global markets is widely recognized (e.g. Ramsey *et al.*, 2003; Dholakia and Kshetri, 2004; Levenburg *et al.*, 2005). Digital inclusion positions e-commerce strategically to attract a diverse array of small-scale producers by mitigating entry barriers. This model effectively extends greater financial accessibility for small and medium-sized sellers, reducing the cost of integration into the digital financial system and diversifying the array of financial products and services. This, in turn, fosters inclusive growth within the ecosystem, harnessing the innate advantages of digital platforms (Wirdiyanti *et al.*, 2023). In conclusion, e-commerce, facilitated by the establishment of digital platforms and online communities, nurtures small-scale marketplaces while adeptly catering to niche segments (Turowski, 2002; Koch and Moslein, 2005; Chen, 2021).

Furthermore, when considering the demand aspect, the e-commerce paradigm, characterized by goods diversification and demand intricacy, inherently tends towards

market segmentation, giving rise to numerous heterogeneous small-scale markets. These market segments form organically, unlike traditional divisions based on geography, driven by intricate factors including psychological, social, and demographic aspects (e.g. Liu *et al.*, 2015; Ballestar *et al.*, 2018; Muchardie *et al.*, 2019). The evolution of digital technology, alongside the refinement of business intelligence tools and optimization of decision-making models, robustly supports the nuanced analysis of segmented niches and the formulation of tailored strategies for distinct segments (Beheshtian-Ardakani *et al.*, 2018; Kamthania *et al.*, 2018; Tiwari *et al.*, 2018; Dolnicar, 2022). Hence, we contend that the strategic alignment of scenarios facilitated by digital advantages is pivotal for enhancing the e-commerce model's efficacy in meeting the nuanced needs of small-scale markets.

*2.1.2 Ethnic marketing and price advantage.* A broader interpretation of the small-scale technology theory suggests that firms in emerging markets can establish competitiveness by exporting ethnic products, specifically targeting small-scale markets formed by the same ethnic group abroad. This approach focuses on fostering stable trade relationships rooted in cultural affinities (Wells, 1983). With the export-oriented impacts of digitalization (Von Arnim and Mrozewski, 2020; Elia *et al.*, 2021; Eduardsen *et al.*, 2023) and performance optimization mechanisms (Yao *et al.*, 2023; Yang *et al.*, 2023), e-commerce enables local small-scale producers to more effectively serve international markets in comparison to traditional direct investment models. The evolution of information and communication technology (ICT) facilitates communication between local merchants and overseas ethnic markets, overcoming geographical and time zone constraints through digital platforms, thereby enhancing logistics responsiveness and service quality (Zou and Cheshmehzangi, 2022). Additionally, the eco-cooperation mechanisms that drive the e-commerce model streamline resource allocation (Mason and Mouzas, 2012; Li *et al.*, 2019; Fan *et al.*, 2023). This allows sellers to modularize production, marketing, transportation, and after-sales services, flexibly distributing them between domestic and foreign markets as well as online and offline channels, without the need for establishing overseas factories. Furthermore, the small-scale technology theory underscores that firms in emerging markets gain competitive advantages through low production costs and competitive pricing strategies (Wells, 1983). This synergy between low-cost strategies and digital marketing in e-commerce not only promotes affordability but also boosts the platform's overall competitiveness.

*2.2 The empowerment of digital advancement in cross-sector development*
*2.2.1 Digitally enabled smart industries.* Digitalization empowers industries by optimizing resource allocation through new infrastructures, circular economy models, and ecosystem advantages (Cioffi *et al.*, 2020). Current scholarly discussions primarily focus on smart industries, examining how digitalization catalyzes intelligent production and manufacturing. There is a prevailing consensus asserting that the concentration, connectivity, and interaction of digital factors are foundational for intelligent development (e.g. Cioffi *et al.*, 2020; Eichstädt *et al.*, 2021; Kumar *et al.*, 2021). For example, digital twin technology enhances simulation computing, visualization, and analytics in the industrial Internet, opening new possibilities for intelligent industrial systems across manufacturing, regulation, and service domains (Cheng *et al.*, 2020; Lin *et al.*, 2021). Scholars such as Salvatore and Stefano (2021) and Dornelles *et al.* (2022) suggest that digital technologies oriented toward intelligent operations can enhance worker performance, contributing significantly to industrial sector growth.

Digitalization plays a crucial role not only in industrial sectors but also in various fields, such as smart agriculture, which serves as a significant catalyst for the high-quality development of China's foundational industries and the growth of the rural economy (Li and Nanseki, 2023; Bhuyan *et al.*, 2022). Firstly, communication technologies, especially those based on the Internet of Things (IoT), facilitate efficient digital flow within complex ecological

networks. This connectivity enables precision agriculture, commonly referred to as smart agriculture, by enabling real-time communication between diverse devices (Khanna and Kaur, 2019; Tao *et al.*, 2021). Furthermore, smart agriculture employs digital intelligence algorithms to provide personalized recommendations for consumers (Huo, 2021). Moreover, the e-commerce model transforms traditional offline transactions into a digital ecosystem, increasing profits with higher turnover rates (Zhu *et al.*, 2021; Ramirez-Asis *et al.*, 2022). It also benefits from channel extension and innovative marketing models, particularly for agricultural products that emphasize freshness (Ma and Zhang, 2022). Simultaneously, it ensures the safety of digital transactions through real-time tracking and sharing mechanisms, thus ensuring strict control over the quality and safety of agricultural products (Zhu *et al.*, 2021; Ramirez-Asis *et al.*, 2022).

*2.2.2 Cross-industry development: linkage and synergy effect.* Considerable research has delved into the spillover effects linked to intelligent industry development (Min *et al.*, 2019; Kim and Kim, 2023; Wang *et al.*, 2021; Dong *et al.*, 2023). The growth of cross-sector digital ecosystems, exemplified by e-commerce, significantly enhances interaction between businesses from different fields based on network connections. This dynamic fosters the simultaneous advancement of multidisciplinary science and technology, maximizing synergistic effects derived from ecological advantages (Gamidullaeva *et al.*, 2021; Yamaka *et al.*, 2023).

We argue that e-commerce facilitates mixed-industry development as follows. Firstly, e-commerce serves as a foundational force for mixed-industry emergence by drawing stakeholders into the platform economy for cost savings. This involves a refined division of labor and leveraging comparative advantages for optimal resource allocation. Organic collaboration is crucial for value addition within the e-commerce ecosystem (Li *et al.*, 2019; Fang *et al.*, 2023). Secondly, digital models enhance industrial synergies, such as the synergistic development mechanism between digital financial inclusion and technological innovation, aligning with the inclusive nature of e-commerce (Sun *et al.*, 2023). The shift to online transactions driven by e-commerce necessitates improved payment models, including better credit provisions, diverse financing channels, transparent transaction processes, and secure capital flows. Furthermore, enhanced digital business infrastructure, coupled with overall financial market development, supports an efficient digital system tailored to mixed-industry dynamics. Simultaneously, the trajectory toward industry intelligence facilitates the effective accumulation of innovative capital, offering greater prospects for support.

*2.3 Digital ecosystem social responsibilities: re-examination of the ESG framework*
Compared to corporate social activities, social responsibility within the ecosystem, particularly in e-commerce, is more extensive and complex. This wider scope is subject to stricter regulations and higher risks. The traditional research model for Environmental, Social, and Governance (ESG) may fall short of encapsulating the entire ambit of ecological social responsibility. There's an urgent need to reform the research approach to social responsibility. This reform entails a comprehensive review of the social performance in digital ecosystems and ongoing enhancement of their self-regulatory governance.

Contemporary scholarship on digital eco-governance is directed towards both economic and social dimensions. Specifically, economic governance aspires to integrate the profit imperative across stakeholders, enhancing the integration of external resources (Li *et al.*, 2019). In contrast, social governance endeavors to establish and maintain long-term comparative advantages through social responsibility. Scholars have enriched research paradigms from corporate social responsibility (Montiel, 2008) to broader digital ecosystem responsibility (Yi *et al.*, 2023). There's a shift from prioritizing economic value to emphasizing

social value, from traditional economic governance to broader forms of public and digital self-regulatory governance (Linders, 2012; Sihotang *et al.*, 2023). Concurrently, numerous scholars emphasize the crucial role of eco-governance in understanding the societal impacts of the eco-economy's progress (Chang and Uden, 2008; Almeida *et al.*, 2020). This pursuit involves measuring social responsibility and performance within digital ecosystems. While each part of the digital ecosystem bears its social responsibilities, the aggregate social responsibility transcends mere summation. It requires adjustments based on positive or negative externalities within a particular ecological context (Yi *et al.*, 2023). Illustratively, consider the e-commerce ecosystem, where platforms endowed with robust user-generated content (UGC) can harness the powerful word-of-mouth effect to effectively filter out low-quality products, saving costs on quality control. Conversely, platforms lacking evaluation information must implement additional regulations to manage misinformation (e.g. Wang and Yu, 2017). Furthermore, social quandaries often arise from conflicts among multiple stakeholders in platform ecosystems, as discussed by Shankar *et al.* (2008). Therefore, effective ecological governance involves addressing collective action dilemmas and reconciling diverse stakeholder objectives (Chen *et al.*, 2022; Yi *et al.*, 2023).

## 3. Research method

It is challenging to forecast data trends using statistical approaches and data mining tools with a small dataset due to the lack of information, and it is this issue that gray system theory seeks to address. Gray systems theory suggests that predicting systems containing both known and unknown or non-deterministic information involves predicting gray processes that vary within a certain orientation and are time-dependent. Although the phenomenon shown in the process is random and haphazard, it is ultimately orderly and bounded. Therefore, this collection of data possesses a potential law, and gray prediction involves using this law to establish a gray model for predicting the gray system (Vallée, 2008; Zhou and He, 2013; Liu *et al.*, 2016). The gray system operates by collating the original data to seek the law of change. This method aims to understand the reality of the data's underlying law by accumulating data to generate a gray sequence, thereby weakening its randomness and revealing its regularity. The process involves diminishing the influence of unknown factors in the gray system, amplifying the impact of known factors, and ultimately constructing a differential equation with time as the variable. Parameters in the equation are determined through mathematical methods to accurately predict the future development trend. The gray model is a popular forecasting technique for use with small datasets.

Based on the time-series data of cross-border e-commerce, this study has established a gray forecasting model GM (1,1) to forecast the expected market size of cross-border E-business in China in 2023. Further discussions on cross-border E-business in the future have also been carried out with the forecasting data of GDP and digital economy growth in the corresponding period. Cross-border e-commerce data from 2014 to 2022 is gathered from both the China E-commerce Research Center and iiMedia Research. Additionally, GDP data is sourced from the National Bureau of Statistics, and information on the digital economy is obtained from the State Council of China's official website.

## 4. Results

The application of the gray forecasting method proves to be instrumental in analyzing the anticipated growth of cross-border E-business in China. Specifically, the GM (1,1) gray forecasting model is employed to predict the expected market size of cross-border E-business in China for the year 2023, leveraging data from 2014 to 2022, a period marked by the

development of cross-border E-business pilot cities. The results, as illustrated in Figure 1, indicate a forecasted market size of 18,934 billion RMB in 2023, affirming a consistent growth trajectory based on the performance observed in the preceding years.

Extending the analysis, the GM (1,3) gray forecasting model is applied to predict the expected market size of cross-border E-business in China for 2023, taking into account the growth of GDP and the digital economy. This forecast utilizes data spanning from 2014 to 2022. Figure 2 displays the outcome of the GM (1,3) gray forecasting, revealing a forecasted market size of 18,760 billion RMB in 2023. Notably, this result aligns closely with the outcome of the GM (1,1) gray forecasting, emphasizing the robustness of the forecasting method. The consistent and parallel projections further reinforce the expectation of a continued upward trend in the growth of cross-border E-business in China throughout 2023.
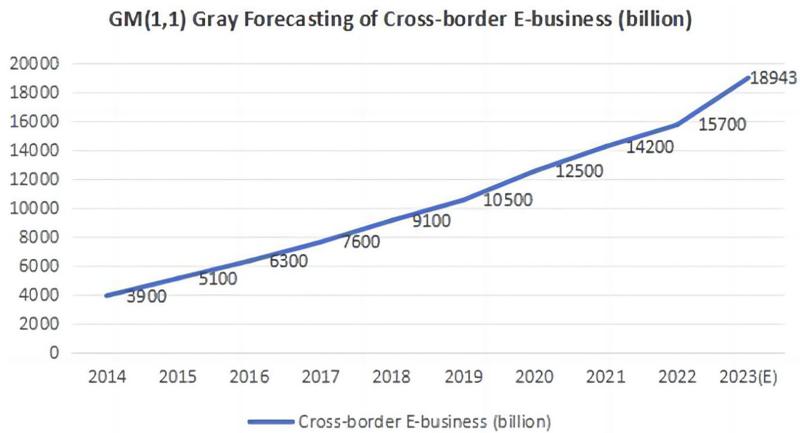


**Figure 1.**
GM (1,1) gray forecasting of cross-border E-business in China in 2023

**Source(s):** Created by authors
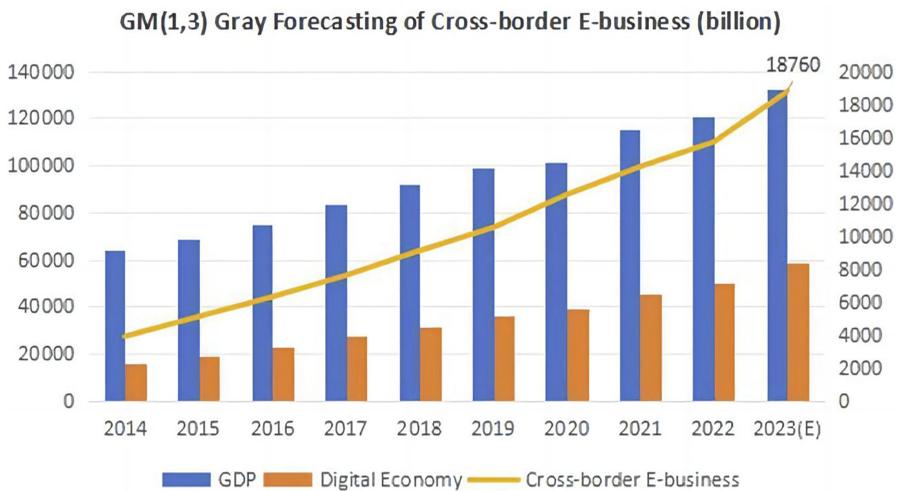


**Figure 2.**
GM (1,3) gray forecasting of cross-border E-business in China in 2023

**Source(s):** Created by authors

This methodological approach not only establishes the reliability of the forecasting models but also provides valuable insights into the multifaceted factors influencing cross-border E-business growth. By integrating the growth patterns of GDP and the digital economy, the extended analysis offers a comprehensive understanding of the interconnected dynamics shaping the future trajectory of the cross-border E-business sector. The close alignment of results from both forecasting models underlines the methodological rigor and consistency in predicting the market size, thereby contributing to a more robust basis for strategic planning and decision-making in the realm of cross-border E-business development in China.

## 5. Conclusion
The strategic significance of cross-border e-commerce in China extends beyond shaping developmental strategies. It serves as a linchpin for integrating traditional industries into the global market. This transformative force not only acts as a catalyst for economic growth but also significantly elevates the overall prosperity of digital trade, contributing to the enhanced developmental quality of China's digital economy. We aim to delve deeper into the multifaceted landscape of cross-border E-business, unraveling its intricate dynamics and forecasting its future trajectory.

In pursuit of a more comprehensive understanding, we leverage the GM (1,1) gray forecasting model to project the anticipated market size of cross-border E-business in China for the year 2023. Furthermore, to enrich our analytical framework, we employ the GM (1,3) gray model, which not only takes into account historical trends in cross-border E-business but also factors in the growth patterns of GDP and the digital economy. The outcomes of our forecasting efforts unveil a projected market size ranging between 18,760 and 18,934 billion RMB for the year 2023. This steadfast growth projection aligns with the observed performance trends of the preceding years, painting a compelling picture of a sustained positive trajectory for cross-border E-business in China. As we unravel the layers of this complex landscape, our findings promise insights that transcend statistical trends, contributing to a nuanced understanding of the pivotal role played by cross-border e-commerce in shaping China's economic future.

## 6. Countermeasures and suggestions
This section outlines targeted policy recommendations designed to leverage the unique advantages of e-commerce in catering to small markets, focusing on its success in the paradigm of small-scale technology. These recommendations include the application of scenario matching and cultural exportation. Additionally, the paper proposes strategies to enhance digital empowerment and industrial synergy, along with initiatives to strengthen eco-governments, enabling them to assume greater social responsibilities.

### 6.1 Apply scenario matching and cultural exportation
For online merchants, small-scale technology within the e-commerce paradigm does not inherently imply inefficient production. Each small market harbors distinct potential that necessitates exploration. Hence, concentrating on catering to a niche market need not be perceived as a drawback; on the contrary, it can be advantageous. The bespoke service model, crafted through meticulous scenario matching, constitutes the key to e-commerce profitability. The strategic pursuit of new opportunities and the scientific reconfiguration of resources, both internal and external to the platform, emerge as pivotal considerations for ecological layout. Therefore, this article contends that the e-commerce ecosystem warrants comprehensive construction and enhancement, with service innovation seamlessly integrated into platform transactions. Simultaneously, profound exploration

and adept utilization of digital technology serve to elevate collective knowledge and capacity reconstruction within the ecosystem. This, in turn, propels the evolution of business models, mitigates innovation constraints and positions platforms to gradually amass technological and service scenario advantages amid the globally diversified ecological competition landscape.

Conversely, from the view of ethical industry diffusion, the boundaries of overseas micro-markets necessitate expansion. Cross-border e-commerce assumes an instrumental role in cultural diffusion, facilitating the exposure of local products to new clientele beyond ethnic group borders. Our assertion posits that digital resources can uniquely enhance the standardization of local products, thereby diminishing institutional and cultural distances between disparate market segments. Meanwhile, they function to assuage the doubtfulness of foreign consumers through the alleviation of information asymmetry, amplifying global awareness and acceptance of local products.

Furthermore, we posit that continued innovations in e-commerce models, exemplified by cross-border marketing, overseas warehousing and the burgeoning live-streaming economy, can surmount the constraints posed by the small-scale technology theory. In other words, the export of reverse innovations from emerging markets need not solely entail the absorption and transformation of "downgraded technology." Rather, it can leverage digital dividends to empower small-scale producers by seizing market gaps and establishing authentic first-mover advantages. Consequently, e-commerce serves as a pivotal lever for propelling the overall prosperity of digital trade. The innovation of business models contributes to enhancing the quality of new retail development and overall value addition, thereby actualizing the sustained high-quality growth of the digital economy.

### 6.2 Enhance digital empowerment and industrial synergy

In light of the positive impact of digitization on various industries and its role in fostering mixed-industrial growth, this paper proposes the following recommendations. First and foremost, there is a need to extend the scope of intelligent industry transformation beyond manufacturing and technology sectors, encompassing additional domains. This necessitates increased support for primary industries and local enterprises, exemplified by promoting intelligent upgrades in foundational sectors and enhancing national industry digitization. Simultaneously, a strategic priority lies in deploying digital technologies to refine marketing strategies and enhance public experiences, expediting initiatives like smart living, intelligent services and enlightened governance. Moreover, innovation should progressively extend beyond manufacturing to include a diverse array of dimensions, covering coordination, organizational frameworks, spatial arrangements and decision-making paradigms. Establishing a scientific and efficacious monitoring and evaluation framework, coupled with robust feedback channels, is paramount within this trajectory. All industries should continuously assimilate lessons from tangible business gains and market responses, fine-tuning their digital strategies. Prioritizing data security and privacy protection is crucial to cultivating a bidirectional propulsion mechanism, where industry support fuels intelligent industrial transformation.

The strategic development of a digital innovation ecosystem, including the impact of e-commerce and new digital retail paradigms, is also crucial in tandem with the prevailing zeitgeist. This ecosystem should adeptly facilitate autonomous value creation, collaborative value co-creation, cumulative income amplification, self-regulatory governance and sustainable evolution. Consequently, this should stimulate original invention and the eventual realization of a more sophisticated cross-industry development model. The cooperative mechanism, based on resource complementarity

and information distribution, should gradually reduce the platform's hegemonic interference. Envisioned evolution aims to transcend the dual paradigm of "complementors-users", extending its purview to encompass the macro-industry system and industrial ecology. This trajectory in mixed-industry development aspires to transform the foundational rationale of interoperability, progressing from loosely coupled superficial affiliations to deeply embedded, high-dimensional network clusters within the system's architecture.

*6.3 Strengthen eco-governments to assume greater social responsibilities*
In digital e-commerce, social responsibility is contingent upon the business domain, necessitating tailored governance objectives for diverse ecologies. To progress, it is crucial to emphasize precision in social responsibility and establish comprehensive goals for digital governance. Goods retailers, as primary business players, must intensify their focus on effective eco-governance. Simultaneously, recognizing potential externalities arising from social tensions among various stakeholders in the platform's operational processes is essential, both within and beyond the ecosystem. Seeking ways to benefit from institutional arbitrage by studying political, environmental, and social landscapes is vital. The goal is to find the optimal combination of public governance and economic benefit. Societies with weak institutions typically prioritize the economic and social benefits of new eco-entrants, fostering digital progress and creating jobs for underprivileged groups. Conversely, regions with advanced institutions are more concerned with balancing ecological welfare and social costs. Therefore, enhancing the net welfare of the local community becomes a pivotal strategy for such e-commerce modes to garner heightened local recognition and seize market prospects. This objective can be achieved through the self-management of each ecological player, efficient communication, and linkage mechanisms facilitated by the platform company's coordination, and other collaborative mechanisms. As local embeddedness and adaptability increase, the scope of social responsibility should encompass an expanded provision of public goods and services within the ecological context.

With the rapid advancement of the digitalization process, digital e-commerce is progressively expanding its operational scope into the service sector. The prevailing trend centers around the online and digitally intelligent transformation of primary service scenarios. The domain of service-oriented e-commerce necessitates the resolution of social frictions among members within the ecosystem, which may derive from institutional and cultural disparities. Varying perspectives on the specific format and caliber of services rendered or received may emerge among participants, while geographical and time-zone differences can further hinder prompt and effective communication within the ecosystem. Hence, the establishment and enactment of norms within the ecosphere can significantly contribute to alleviating discrepancies and conflicts among its stakeholders. Concrete strategies to achieve this include bolstering technological inputs to standardize service quality provided by the supply side and enhancing platform governance to flexibly facilitate transactions between the supply and demand sectors. Simultaneously, ongoing efforts should be made to continuously refine existing eco-regulations, striving to align them more closely with the highest standards among participants. This approach ensures that elevated social benchmarks become internalized as unified norms across the entire ecosystem, enabling the fulfillment of social expectations through adherence to the highest standard. Consequently, the integration of commercial value propositions and social interests is realized, thereby expanding both the boundaries of the ecosphere and the scope of internationalization.

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