Evaluating Industrial Belt Growth and E-Commerce Expansion Through a Malmquist TFP Framework

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Abstract – Cross-border e-commerce (CBEC) encompasses internet-mediated transactions to acquire and deliver goods and services across the border. In the following research, the objective is to evaluate the economic development and contribution of CBEC on industrial zones by employing a new Malmquist Total Factor Productivity (TFP) technique. To this end, the study will use nonparametric linear programming techniques to create an efficient Malmquist TFP index that provides efficiency evaluation, ranking of different regions, and time series analysis. We employed Data Envelopment Analysis (DEA) to effectively compare industrial transfer effects in several regions. Our findings show that industrial belts supported by infrastructure and other fixed assets and centralized urban areas are the major beneficiaries of industrial productivity and international trade. Launched in Jiangsu Province, the results reveal that cities within major economic axes, including the Yangtze River Economic Belt and the Shanghai-Nanjing Economic Circle, experience the most rapid CBEC transactions. Besides, the study also reveals that there are regions where government support facilitates logistics and e-commerce infrastructure, which indicates that those regions seem to be more coherent in developing e-commerce and modern logistics. These findings further underpin the centrality of industrial belts in the growth of the economy and highlight the need to align CBEC strategy to the development of these belts.

Keywords – Cross-Border E-Commerce, Total Factor Productivity, Data Envelopment Analysis, Cross Border Logistics.

I. INTRODUCTION

Recent advancements in information technology (IT) have allowed exporters to enhance their efficiency, effectiveness, and overall performance in international marketplaces. Numerous studies have explicitly investigated how exporters might use the internet to augment their international operations. Comprehensive insights exist on the internet's role in enhancing foreign market research, diminishing mental distance, expediting market access, augmenting internationalization skills, and bolstering customer relationship management. Nonetheless, much of this study perceives the internet as an auxiliary instrument to enhance and refine exporters' marketing efforts rather than as a primary sales conduit.

E-commerce is the most rapidly expanding sector in the global economy, reducing the distance between customers and sellers. Cross-Border E-Commerce (CBEC) refers to online transactions and dealings made across several regions or nations using information and communication technology (ICT). Globalization denotes the increasing quantity and diversity of international exchanges in commodities and services facilitated by the rapid and extensive dissemination of technology. Advanced e-commerce technologies diminish marketing expenses and administrative costs, while facilitating access to remote markets for enterprises. The rapid evolution of the internet has significantly increased the number of online purchasing consumers and broadened the worldwide commercial market.

Wang et al. [1] reveal that CBEC the online selling of products and services to international customers is seeing tremendous growth. Estimations from the recent UN (United Nations) conferences on Trade and Development show that revenues from cross-border B2C (business-to-consumer) e-commerce attained USD 400 billion in 2018, with COVID-19 outbreak further accelerating its expansion. In some nations, CBEC is markedly elevated. In 2019, CBEC constituted 7% of total Italian B2C goods exports. This situation has emerged due to the fact that 99.9% of Italian companies are small and medium-sized enterprises (1 to 249 workers), with 94.9% classified as microenterprises (1 to 9 employees), and their access to international markets is being expedited by CBEC. In that case, CBEC is the most efficient avenue for entering certain export markets, including China. The economy of China is now at a pivotal point when emphasizing high-level development is essential, and a novel stage of Chinese modernization is under progress.

Developing a novel model of superior quality and exceedingly effective service sector is essential for enhancing the computerized industrial framework and building a resilient socialistic current state. The government and CPC (Communist Party of China) prioritize the advancement of the service sector. This is specially made clear in the CPC's reporting to the 20th National Congress, which calls for the creation of a brand-new, highly effective service sector model and a deep integration of the contemporary service sector, modern agriculture, and advanced manufacturing. Over the past few decades, the service sector in China has seen significant expansion. Value addition, in 2023, amounted to 68 trillion yuan, accounting a GDP of 54% and contributing approximately 60.19% to economic growth [2]. Nonetheless, in contrast to developed nations, China's service sector faces ongoing challenges, such as a relative growth delay, insufficient support for advanced and productive service sectors, a necessity for enhanced service efficiency and quality, and a lack of technology application and innovation.

Industrial issues have surfaced in China recently, coinciding with the growth of the nation's regional economy, and the field of Industrial Transfer (IndT) research has quickly heated up there, eventually becoming a hotspot for study. Generally, domestic scholars are currently focused on reevaluating the theory in this field, whereas foreign research tends to be less empirical and more theoretical. Although foreign nations initiated their studies initially, the findings are dispersed across different disciplines, and a cohesive theoretical framework has yet to be established. Lim, Jin, and Srai [3] present an omnichannel commercialized logistics framework to examine e-logistics, addressing the complexities of logistics and enhancing the efficiency of operations. Integrating domestic research with foreign experience to achieve an optimal synthesis of model and impactful indication in the investigation of manufacturing belts is a critical challenge we face.

This research study therefore seeks to assess the economic growth and performance of Industrial belts by analyzing the impact of CBEC using the Malmquist TFP. More precisely, the research seeks to quantify productivity fluctuations with time, analyze IndT effectiveness across regions, and determine the impact of CBEC on these processes. Thus, by building a new TFP model that incorporates both regional comparisons and time series analysis the research aims at providing a perspective on the relationships between industrial productivity, infrastructure growth, and CBEC's expansion with a view towards suggesting ways to improve cross-border trade activities and, thereby, stimulate regional economic development. The remaining section of this study have been organized as follows: Section II reviews previous literature works on CBEC and its relevance to the Chinese economy. Section III provides a methodology that is based on Malmquist Total Factor Productivity (TFP). Section IV critically discusses the results concerning the improvement of government resource support, optimization of enterprise service platforms, and enhancement of multi-party collaboration. Section V provides a concise summary of the findings and recommends future research directions on CBEC.

II. RELATED WORKS

According to Wang, Wang, and Lee [4], Cross-Border E-Commerce (CBEC) refers to online transactions that occur across different countries. Retailers provide their goods and services globally, attracting clients from many nations. This industry has evolved swiftly in recent years, propelled by technology advancements and the growing adoption of online shopping globally. Statista estimates that worldwide CBEC sales would attain 5.4 trillion US dollars by 2030. This result indicates that firms who invest in global e-commerce early may ensure long-term market share. It is essential to thoroughly understand the specific market and tailor your services to local requirements.

In international trade theories, as depicted by Witt and Jackson [5], comparative advantage is a crucial idea for elucidating trade patterns. They introduced the notion of comparative advantage under stringent assumptions. This is hence acknowledged as the Ricardian model. Contemporary international trade theories substitute rigid assumptions with more realistic ones. The scholars analyze the impact of varying factor endowments on international commerce. The Heckscher-Ohlin (HO) model posits that a nation will export goods that use its plentiful component of production and import goods that utilize its limited factor of production. Several new models that relax various assumptions have emerged, including imitation lag, Linder model, reciprocal dumping mode, Krugman model, product cycle theory, gravity model, and flying geese model.

The concept of comparative advantage has recently gained dynamism, and its allure remains intact despite the emergence of new models. Some economists assert that a nation's comparative advantage may evolve over time, contrary to common perception. Until date, the dynamic theory of comparative advantage has mostly concentrated on the evolution of the production aspect, or supply. This is linked to the effect of certain circumstances on the growth of economic output, which subsequently affects comparative advantage. According to Rauf, Ma, and Jalil [6], the outcomes of previous technological innovation and change are the endogenous drivers of comparative advantage. Factors including input trade, international trade, and investment flows are impeded by elements such as geography, institutions, transportation, and information costs, as well as the transference of knowledge across borders, technological disparities, and monopolistic competition in differentiated products with increasing returns to scale.

Leveraging its comparative advantages, China can integrate value chains for capital-intensive items that are now unproducible and potentially stimulate the industry by bypassing certain nodes in the chain. The concept of comparative advantage has propelled Guangzhou's economic expansion in recent decades, as the city has vigorously cultivated labor-intensive industries. According to Scott [7], labor-intensive sectors can no longer independently sustain economic expansion due to the escalating costs of land and labor. Furthermore, Guangzhou succumbed to the comparative advantage trap by failing to undergo industrial transformation and upgrading, resulting in the loss of its comparative advantage to Vietnam and other Southeast Asian nations with lower labor costs. When a city becomes ensnared in the comparative advantage trap, it will be unable of modernizing its industrial framework, resulting in talent exodus and economic stagnation. Shenzhen and Guangzhou, then only municipalities in the Guangdong province to be ranked in the top ten globally, have surpassed the rest of the province in economic development and serve as crucial contributors to China's total economic growth. The economic success of Guangdong has traditionally centered on Guangzhou. Shenzhen, an expanding city, has been advancing to surpass Guangzhou in recent years. In terms of technological innovation, Guangzhou lags behind Shenzhen in three critical aspects.

According to Xu and Yeh [8], the notion of urban growth in Guangzhou is antiquated, and the industrial framework is entrenched. Approximately 95% of industrial sectors in Guangzhou are traditional, while just five percent are classified as sophisticated manufacturing. Approximately 75% of industrial sectors in Shenzhen are classified as sophisticated manufacturing, while just 29.09 percent are categorized as conventional industries. Secondly, the capital investment for innovation in Guangzhou is inadequate. The ratio of R&D spending to GDP is a significant metric. Guangzhou’s R&D investment, in 2016, amounted to 45.1 billion Yuan, constituting just 2.31% of its GDP. Shenzhen's R&D investment was 80.1 billion Yuan, or a GDP of 4.11%. Simultaneously, Guangzhou's research and development investment reached 45.1 billion Yuan, representing just 2.3% of its GDP. The conversion rate of scientific and technological advantages is low in Guangzhou. Guangzhou has several research institutes and universities, with scientific study universities and entities constituting 70.2% of this province; yet, these technical merits had not been converted into technological and scientific accomplishments.

According to Yang [9], CBEC has undergone a phase of development and expansion and is now at a mature phase, advancing towards the international digital trade. Within the context of trade advancement, digital technology is advancing swiftly, with innovations such as blockchain, artificial intelligence, cloud computing, and big data thoroughly infiltrating every facet of the CBEC sector. These technologies serve as crucial catalysts for model efficiency and innovation transformations, facilitating the digital evolution of CBEC enterprises. Complexity [10] elucidates the origins and relevance of big data, examines the implications and benefits of e-commerce in the big data era, delineates the challenges and opportunities confronting e-commerce firms within this context, and evaluates the existing e-commerce service framework to facilitate the swift advancement of e-commerce.

Chen, Chen, and Ahmed [11] developed an intelligent shopping guide system for a CBEC platform utilizing big data and artificial intelligence technologies, addressing significant functionalities unattainable by traditional CBEC and facilitating its intelligent transformation. They examined the generation and evolution of CBEC big data, conducted data mining and analysis of CBEC information, and refined the clustering study technique for quantitative characteristics to assist CBEC enterprises in optimizing their industrial chain, enhancing operational and managerial efficiency, and establishing brand impact. They examine the smart perception model for CBEC decision-making based on big data, emphasizing the application of data fusion in innovation procedure of e-commerce organizational models. This enables e-commerce firms to more effectively address buyer needs, significantly bridging the existing gap between the seller and buyer demand and supply pattern. Feng [12] utilize the theoretical framework of regional variation measurements to develop a model for assessing the transfer effects of the CBEC industry, evaluates the development level of CBEC in China, enhances the coordinated advancement of CBEC and electronic logistics, and fosters the interaction and comprehensive involvement of enterprises, government, and other stakeholders.

Konopik et al. [13] posits that digital transformation may facilitate digital innovation inside organizations via several mechanisms. Digital transformation enables enterprises to connect with end users via digitalized technologies, including feedback mechanisms, data collection, and data mining; precisely recognizing customer preferences and needs; executing target innovations; and enhancing the effectiveness of innovation investments. Secondly, digital transformation enhances the effectiveness of both external and internal data transfer within organizations, mitigating issues of information asymmetry. Furthermore, digitalized technologies can be used to effectively track risks in R&D endeavors, thereby increasing the effective rate of digitalized innovative projects and fostering digitalized innovation within enterprises.

Furthermore, as a development hub for CBEC, the formation of CBECPZs (Cross-Border E-commerce Pilot Zones) has resulted in the concentration of several downstream and upstream digitalized sectors. The beneficial agglomeration externalities indicate that digitalized change facilitates the establishment of interconnections among enterprises within the data network, diminishing the rigidity of tacit knowledge and enabling the gathering of data components in networking to produce novel knowledge, which could be perpetually reprocessed. Subsequently, via data components and the “knowledge spillovers” impact of the web, data is disseminated among cluster firms, therefore augmenting their digitalized technological innovation capacities [14]. For an extended period, shaped by the global financial landscape and the phenomenon of global IndT, the characterization of initial IndT typically reflected the advantages held by industrialized nations.

Subsequently, the process of IndT evolved from being limited to a single fading sector to including an expanding industry, therefore providing a more thorough characterization of the industry about its nature, methodologies, and impacts. As regional economic theory advances, an increasing number of statistical tools for evaluating regional disparities are emerging. The predominant models for measuring regional differences are the variation coefficient (or variation’s weighted coefficients), the Tyre index, and the Gini coefficient. Variation coefficient quantifies the mean dispersion of all the distances. It mostly reflects the disparity in the pace of growth and distribution features. It may be employed to analyze the metrics for assessing local disparities. Gini coefficients differ from variation coefficients since it considers the differences for all pairs of comparisons rather than the departure from the mean. Subsequently, it aggregates absolute disparities and subdivides by the entire number of regions, as well as the mean of the regional indices. The Thali index serves as a tool used by both local and international experts to assess disparities in regional economic growth. This analysis employs three parameters: the weighted (CV_w) coefficients of variation, Tyra index (T), and Gini coefficient (G). Their computational formulae are as shown in Eq. (1), (2), and (3).

$$CV_w = \frac{1}{\mu} * \sqrt{\frac{\sum_{i=1}^{n}(y_i-\mu)^2 * P_i}{\sum_{i=1}^{n} P_i}} \tag{1}$$

$$G = \frac{1}{2n^2\mu}\sum_{i=1}^{n}\sum_{j=1}^{n} n_i n_j \left|y_i - y_j\right| \quad (2)$$

$$T = \sum_{i=1}^{n}\frac{P_i}{P}\log\left(\frac{\mu}{y_i}\right) \quad (3)$$

In this context, μ represents the GDP per capita, P_i denotes the population segment for every municipality i and nation relative to the total provincial population P_i, n signifies the total number of nations and municipalities, n_i and n_j indicate the population proportions of counties i and j, correspondingly, in relation to the provincial total, while y_i and y_j refer to the GDP per capita of city and territory, correspondingly.

III. METHODOLOGY

The conventional Malmquist TFP (Total Factor Productivity) indicator has existed for an extended period, used by the Swedish statistician and economist Malmquist to examine temporal variations in consumption. Mattsson et al. [15] suggested the Malmquist TFP index; nevertheless, it has been disregarded with complexities. Non-parametric lineal programming method reintroduces the index. This strategy has been extensively used across several industries, sectors, and worldwide assessments in agriculture, public administration, and finance. Malmquist TFP index is often expressed using Eq. (4) and (5).

$$M(x^t, y^t, x^{t+1}, y^{t+1}) = \left[\left(\frac{D^t(x^t,y^t)}{D^t(x^{t+1},y^{t+1})}\right)\left(\frac{D^{t+1}(x^t,y^t)}{D^{t+1}(x^{t+1},y^{t+1})}\right)\right]^{1/2} \quad (4)$$

$$= \frac{D^t(x^t,y^t)}{D^{t+1}(x^{t+1},y^{t+1})}\left(\frac{D^{t+1}(x^{t+1},y^{t+1})}{D^t(x^{t+1},y^{t+1})}\frac{D^{t+1}(x^t,y^t)}{D^t(x^t,y^t)}\right) \quad (5)$$

D denotes the distance element, a mechanism for analyzing multi-output and multi-input technological models without presupposing producer behaviors. Charnes et al. [16] established a distance element derived from manufacturing functionalities that subsequently had extensive use. The scholars indicated that the index relies on the element of distance and may be quantified straight using output-based or input-based classical Data Envelopment Analysis (DEA) methods, which underpins the present computation of the Malmquist TFP index. Nevertheless, as previously stated, the conventional DEA model has inherent deficiencies that hinder the Malmquist TFP index from realizing its full potential.

This work presents the concept of measuring industrial transfer effects inside Malmquist TFP index and develops a novel TFP measurement system, which incorporates effectiveness assessment, time-series analysis, and regional ranking. The conventional assessment of industrial transfer effects relies on the classic DEA model, which is limited by its inability to provide effective rankings. Avoiding secondary target selection in the cross-efficiency DEA model is more pragmatic. Assume a unit of decision is denoted as $1 \le j \le n$, with every unit possessing an output and input, then every unit is regarded as "respondent" within the game, and the "respondent's" effectiveness value may be determined using the conventional CCR models. In case the effectiveness value of participants and that of the other participants are both maximized simultaneously, the participation effect is optimal. Consider a decision-making unit n, denoted as DMU_j, whereby ($1 \le j \le n$); every decision unit have s outputs and m inputs.

Every unit of decision-making is regarded as a "respondent" DMU_d within the game, and the respondent's effectiveness value α_d may be determined using the conventional CCR framework. Considering that the effectiveness value of each individual and that out of the rest of the respondents are optimized as DMU_j, whereas preserving similar efficacy score DMU_j. The effectiveness value of cross efficiency for DMU_j derived from weights in Eq. (6).

$$\alpha_{dj} = \frac{\sum_{r=1}^{s}\mu_{rj}^{d}y_{rj}}{\sum_{i=1}^{m}\omega_{ij}^{d}x_{rj}}, \quad d, j = 1, \dots, n, \quad (6)$$

where μ_j^d and ω_{ij}^d represent feasible model weights. For computations of a_{dj}, it is essential to consider the mathematical planning queries in Eq. (7), (8), (9), (10), (11) and (12).

$$Max \sum_{r=1}^{s}\mu_{rj}^{d}y_{rj} \quad (7)$$

$$s.t. \sum_{i=1}^{m}\omega_{ij}^{d}x_{ij} = \sum_{r=1}^{s}\mu_{rj}^{d}y_{rj}\hat{A}_s \ge 0, \qquad j = 1, \dots, n, \quad (8)$$

$$\sum_{i=1}^{m}\omega_{ij}^{d}x_{id} = 1 \quad (9)$$

$$\alpha_d \times \sum_{i=1}^{m}\omega_{ij}^{d}x_{id} - \sum_{r=1}^{s}\mu_{rj}^{d}y_{rj} \le 0, \quad (10)$$

$$\omega_{ij}^{d}\hat{A}_s \ge 0, \qquad i = 1, 2, \dots, m, \quad (11)$$

$$\mu_{ij}^{d}\hat{A}_s \geq 0, \qquad i = 1,2,\dots,s, \tag{12}$$

where αd ≤ 1 denotes the computational constraints of the iterative process. The starting DMU_d value is first established as the conventional cross-efficacy score, and upon convergence, it transforms into cross-competition effectiveness value. Eq. (13) and (14) refers to the Malmquist exponential, derived from the evaluation of the effects of industrial transfers, referred to as CC-Malmquist.

$$CC - M_k(x^t, y^t, x^{t+1}, y^{t+1}) = \left[\left(\frac{E_k^{t+1}(x^t,y^t)}{E_k^{t+1}(x^{t+1},y^{t+1})}\right)\left(\frac{E_k^{t}(x^t,y^t)}{E_k^{t}(x^{t+1},y^{t+1})}\right)\right]^{\frac{1}{2}} \tag{13}$$

$$= \frac{E_k^{t}(x^t,y^t)}{E_k^{t+1}(x^{t+1},y^{t+1})}\left(\frac{E_k^{t+1}(x^{t+1},y^{t+1})E_k^{t+1}(x^t,y^t)}{E_k^{t}(x^{t+1},y^{t+1})E_k^{t}(x^t,y^t)}\right)^{1/2} \tag{14}$$

IV. RESULTS AND DISCUSSION

The establishment of the industrial belt is a characteristic aspect of the local economic growth, with infrastructural advancement, tertiary industries, and major cities serving as the primary elements. Consequently, based on the implications of the industrial belts, the primary catalysts for the creation and development of the belt in Jiangsu would be examined and compared through the lenses of infrastructure, resource development, central urban centers, export-oriented economy, and technological advancement. The core city serves as a service center, command center, and regulatory center for local economic growth, functioning as a crucial node in the industrial belt. As the core city's economy expands and its size increases, the dispersion effect intensifies, and the firm propels economic growth in the surrounding area. Central cities with advanced growth increasingly generate industrial belts with superior development levels.

The urban areas next to the Shanghai-Nanjing industrial corridor and the Yangtze River are economically advanced and highly populated. There are 4 major towns, 2 megacities, 8 medium-sized towns, 7 minor towns near the Yangtze River, and numerous developed cities. Modern populations have reached 12.1253 million, with a built-up area of 1,467.41 square kilometers; the Shanghai-Nanjing industrial belt comprises 1 minor city, 2 medium cities, and 4 megacities, and many developed cities. The urban population has reached 11.954 million, and the built-up area has expanded to 1,415.16 square kilometers. The industrial belts around the eastern and coastal Bohai Sea are economically advanced and densely inhabited in northern Jiangsu Province. Along the East Longhai Sea, there exists 1 major city, 2 medium cities, and 1 megacity.

The developed area totaled 2,904,699 and 400.079 km^2, correspondingly; the establishment coastal industrial zone began belatedly, resulting in the city's overall growth being behind schedule. There are three big cities, four medium cities, ten minor cities, and an urban populace. The district's size is 4,375,701 and 1,590.93 km^2, correspondingly. Consequently, big and medium-sized towns within the urban axis system of the 4 main industrial belts are established and exhibit diverse functional kinds. The Jiangsu industrial belt's fundamental structure comprises regional-level industrial bases and detailed regional towns. Linear regression framework and entropy approach were employed to statistically and fully assess the effects of the aforementioned 5 dynamics on establishment and growth of Jiangsu Province industrial belt.

From 5 perspectives: infrastructure direction, resource development facilitation, center city influence, technological advancement promotion, and external development. The evaluation focuses on the primary dynamic processes involved in the construction and growth of the industrial belt in Jiangsu Province from 2001 to 2016, after the implementation of the regional common development plan. **Fig 1** displays the comprehensive value, which was calculated using the weights and normalized values of each evaluation index. The dynamic value from 2001 to 2016 for the formation and growth dynamics of the CBEC industry transfer belt in Jiangsu was also calculated. **Fig 2** illustrates the primary processes involved in the establishment and evolution of Jiangsu industrial belt. Examine the evolutionary procedure of the establishment and developmental dynamics of Jiangsu's CBEC sector transfer.

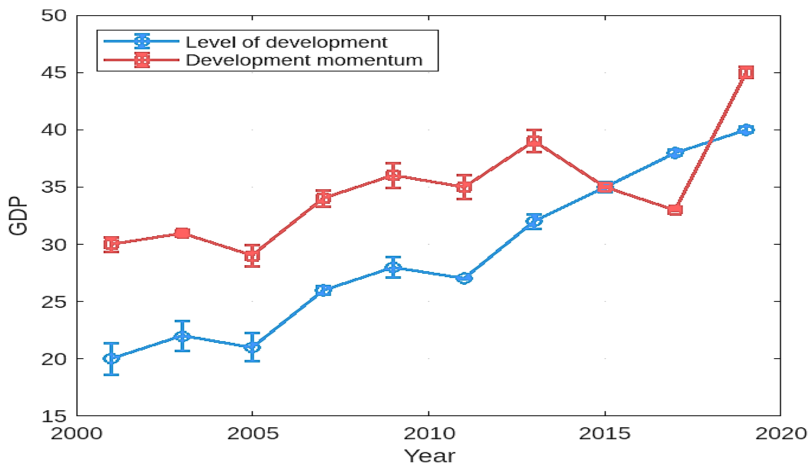

Fig 1. Economic Growth Status and Growth Potential of Key Jiangsu Province Industrial Zone

Fig 1 and **Fig 2** illustrate that, over time, CBEC trade constitutes an increasing share of total trade. As e-commerce continues to evolve, a rising number of contracts are shifting to online from online platforms, establishing e-commerce trades as a predominant force. In the new normal, advancing the synchronized growth of CBEC and contemporary logistics constitutes a complicated system engineering challenge, necessitating collaboration and profound integration among many stakeholders, including government, corporations, and industry groups. Currently, it is essential to establish a contemporary integrated logistics service system to facilitate the systematic alignment of CBEC and modern logistics, thus optimizing the synergy between the two domains. It is essential to establish a synchronized growth trajectory and endeavor to attain an interaction progression of CBEC and contemporary logistics.

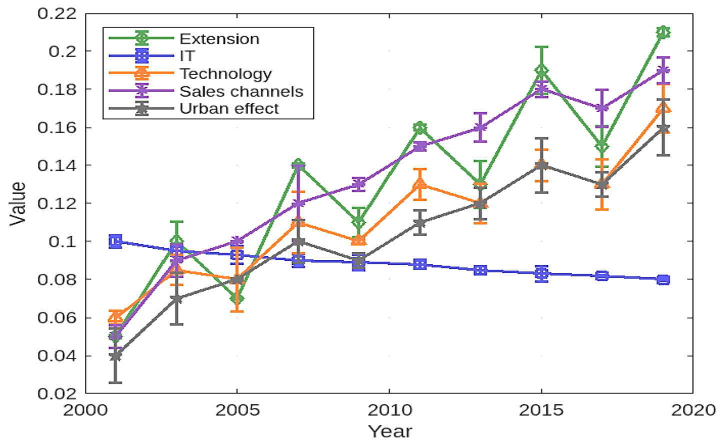

Fig 2. Comparative Findings of Several Models

Improve Government Resource Support

As the Internet economy has evolved, worldwide customers' purchasing behaviors have progressively transitioned to online from offline consumption. The expanding scope of the CBEC business serves as a crucial mechanism to enhance China's export and import trade. Within the context of the escalating COVID-19 pandemic, CBEC B2B export firms will encounter challenges such as interruptions in Cross-Border Logistics (CBL), disruptions in the supply chain, and reduced efficiency in customs clearance. Consequently, the government's planned "dual circulation" strategy aids in addressing this issue. The "dual circulation" strategy facilitates the growth of CBEC in China via government-established international logistics parks, CBEC hubs, and free trade zones. Concurrently, CBEC growth in China is aided by ongoing advancements in data service models, including cross-border compensation laws, cross-border trading public service models, and CBEC infrastructure development.

The government needs to establish "dual flow" strategy to facilitate the advancement of B2B exports in CBEC and to control CBEC operations. It offers financial assistance, decreases corporate tax rates, enhances the efficiency of custom clearance, and upgrades CBEC infrastructure to cut costs for cross-border B2B export firms. The government ought to regulate businesses, penalize tax evaders and counterfeiters, enhance the market environment, and provide a conducive atmosphere for firm growth. The decision of CBEC B2B export firms to engage in export trade amidst the COVID-19 pandemic is influenced by pertinent government actions and policies, while their selected approach concurrently impacts the government's strategic approach. Ning and Xiong [17] elucidate the dynamic evolutionary process between the government and firms using an evolutionary game system, examining the influence of governmental activities on exporters for cross-border B2B utilizing MATLAB.

Optimize the Enterprise Service Platform

CBEC emphasizes the use of marketing, public services, logistics, payment systems, and other economic actions associated with export and import trade to stimulate the expansion of manufacturing and production. The growth of CBEC in China has transitioned from an early phase dominated by transaction corporations and trading platforms to a more developed mid-stage. In the intermediate phase of CBEC evolution, a unified ecosystem has developed in which manufacturing businesses, public service platforms, payment providers, logistics firms, and other stakeholders cooperate to foster development. Like the industrial business, the service industry has emerged as a vital catalyst for the Chinese economy to realize its ambition of becoming an international trading giant.

The 14th Five Year Plan for the People's Republic of China [18] underscore the necessity of promoting the embedded growth of the producers-service sector, concentrating on augmenting the strengths of the whole industrial chain. Thus, it is essential to enhance the growth level of contemporary logistics, distribution, procurement, after-sales service, operational management, and production control. It is essential to promote the incorporation of contemporary service sectors with modern agriculture and advanced manufacturing, as well as the establishment of service firms capable of global competition. The proposed strategy delineates a definitive pathway and aim for using CBEC platforms to enhance digitalized trade. It also outlines a mechanisms design strategy that enables the achievement of China's objective to be considered a global trading powerhouse.

The digitalization of trade connections allows corporations and governments to have a better understanding of the limitations and strengths of the industry. The essential factor for facilitating the worldwide expansion of Chinese enterprises is the establishment of a novel international trade environment, which encompasses the digitalization of trading connections and the advancement of e-commerce ecosystems. To expedite the establishment of a reliable cross-border circulation of data and enhance the legal framework regulating these circulations, the State council and the Communist Party of China have formally issued “Data-20”: “Opinions on developing data basis framework and optimizing the objective of data components.” “Data-20” places a high priority on investigating safe and uniform cross-border data transfer techniques, with a focus on typical application situations including supply chain management, CBEC, cross-border payment, and outsourcing of services.

Enhance Multiparty Collaboration

The synchronized development of CBEC and contemporary logistics necessitates collaborative efforts from governments, corporations, and industry groups to improve integration. CBEC organizations need CBL to facilitate transnational shipping and trade, and they may collaborate with CBL firms to improve global liquidity and competitiveness. CBL firms in the logistics sector may enhance the supply chain regarding time and cost efficiency, provide superior logistics service models, and achieve sustainable growth in market competitiveness. Furthermore, CBL companies with adequate capital can invest in the development and enhancement of logistics infrastructure for diverse logistics modalities, thereby achieving green logistics that seamlessly integrates environmental sustainability with logistics facilities, grounded in ecological preservation. The optimization of CBL modes and efficiencies will provide more revenues and facilitate long-term growth for CBEC firms that use them. This creates a virtuous cycle that will eventually enhance the sustainable growth of CBEC and logistics firms, as well as the city’s housing these enterprises.

A number of experts have opted to examine the synergistic interaction between CBEC and CBL. For instance, Guo, Li, and Li [19] examined the synergistic link between the two by developing a big data model from a theoretical perspective. They empirically validated the reciprocal relationship between international logistics and the sustained growth of CBEC trade, utilizing data from OECD member countries spanning from 2000 to 2018. The substantial association between international trade components and CBL performance may be shown by the current state of international commerce in Korea. CBL underpins CBEC, while CBEC propels the advancement of CBL. CBEC firms must choose an appropriate CBL provider to improve both import and export competitiveness for sustained growth. CBL companies must collaborate with CBEC firms to attain sustainable logistics by minimizing costs, transit times, and other variables.

The current collaboration among several parties must concentrate on the following two facets: First, enhance talent development [20]. Universities, governments, corporations, industry groups, and other shareholders collaborate to enhance the varied talent development framework. They emphasize government policy-related responsibilities, university staff training roles, business and industry association practices, and the development of diverse networks. The second facet is to enhance the orientation of the market. The primary objective of CBEC and contemporary logistics cooperation is to attain enhanced growth and generate more economic and social value. This necessitates a market-oriented approach and the optimal use of the fundamental functionalities of the resource allocation marketplace. These are all predicated on the demand of the market, enhancing data exchange and integration of resources, augmenting complementarity of produce services and improving the integration of the supply chain. Furthermore, it is essential to address the prospective demands of customers by expanding international shopping avenues and reducing logistical time for abroad purchases.

V. CONCLUSION AND FUTURE SCOPE

The use of the Malmquist Total Factor Productivity (TFP) index, complimented by industrial transfer analysis, provides a holistic approach to evaluating economic growth of industrial belts especially in Cross Border Electronic Commerce (CBEC) affected areas. In this paper, our analysis shows that CBEC has a positive impact on the enhancement of productivity, the promotion of regional development and the efficiency of industrial transfers in China especially in the crowded and developed regions. However, the analysis also reveals unequal development where the coastal areas, which are the eastern zones experience faster development than the central or the northern areas. As such, these outcomes indicate the necessity for targeted policies that would stimulate the development of infrastructure and technologies for the balanced regional development. In future studies, a rise in the number of variables in a model including the environmental dimension, social effects, and the influence of digital change as a process of industrial transfer could supplement the model to offer a comprehensive understanding of regional performance. Besides, extending this framework to other belts may shed light on how CBEC-led industrial transformation affects international trade and domestic economic plans.

CRediT Author Statement

The author reviewed the results and approved the final version of the manuscript.

Data Availability

No data was used to support this study.

Conflicts of Interests

The author declares that they have no conflicts of interest.

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There are no competing interests.

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