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Digital Economy Integration Driving New Quality Productivity: Factor Mobility and Institutional Coordination

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Abstract

Against the backdrop of the Yangtze River Delta integration being elevated to a national strategy, the integration of the digital economy has become a key pathway for the region to foster new-quality productive forces. This paper constructs a dual-drive theoretical framework for how the integration of the digital economy drives new-quality productive forces, based on the two dimensions of factor mobility and institutional synergy. The study proposes that the integration of the digital economy directly empowers new-quality productive forces through three pathways—technological breakthroughs, factor allocation and industrial transformation—whilst generating indirect transmission effects by facilitating the cross-regional flow of three types of factors: data, technology and talent. At the same time, institutional synergy plays a positive moderating role in the transformation from macro-level integration to micro-level productive forces. More importantly, factor mobility and institutional synergy are not independent, parallel mechanisms, but rather constitute a spiralling, synergistic system in which 'mobility drives institutional innovation, and institutions ensure the unimpeded flow of factors'. On this basis, this paper distils four core theoretical propositions and offers policy implications in light of the latest collaborative legislative practices in the Yangtze River Delta. This paper provides an integrated theoretical analytical framework for understanding the pathways to fostering new-quality productive forces within the process of regional integration.

Keywords

Digital Economy Integration, New-Quality Productive Forces, Factor Mobility, Institutional Coordination, Yangtze River Delta.

1. Introduction

The 15th Five-Year Plan places the development of new-quality productive forces at its core, explicitly identifying the digital economy as the key driver for fostering such productive forces. The 2026 Government Work Report proposed for the first time the creation of a new form of smart economy, placing it alongside the low-altitude economy, the deep-sea economy and the deep-earth economy as the four core forms of new-quality productive forces, with 'AI+' serving as the key driver to advance the commercialisation and large-scale application of artificial intelligence [1]. As the core driving force behind high-quality development, new-quality productive forces represent a new form of productive capacity typified by the digital and intelligent technology revolution and driven by clustered breakthroughs in cutting-edge technologies. Advancing the integration of the regional digital economy, promoting the efficient flow of production factors and fostering institutional synergy have become key pathways to accelerating the formation of new-quality productive forces.

Looking at the national regional landscape, the agglomeration effect in the Yangtze River Delta region is particularly pronounced. In 2026, the scale of the Yangtze River Delta's digital

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economy reached 18.5 trillion yuan, representing a year-on-year increase of 11.2 per cent and accounting for 40.6 per cent of the national total [2]. The region has attracted more than 100,000 data-related enterprises; the scale of its data industry accounts for 22.6 per cent of the national total, its integrated circuit output accounts for nearly half of the national total, and the scale of its artificial intelligence industry accounts for one-third of the national total [3][4]. The Yangtze River Delta is not only the 'ballast' of the national economy but also a frontier in the construction of a Digital China. In terms of digital infrastructure, the Yangtze River Delta is likewise at the forefront nationwide. By the end of 2025, the number of 5G base stations in China had reached 4.838 million [5], of which over 790,000 had been built in the Yangtze River Delta. Thirty-two 'gigabit cities' had been established, and the '1+4' computing power platform of the Yangtze River Delta hub under the 'East Data, West Computing' initiative had commenced interconnectivity. These breakthroughs in 'hard connectivity' have laid a solid foundation for the cross-regional flow of high-level factors.

However, infrastructure interconnectivity is merely the 'first half' of regional integration. The more critical task at present lies in opening up channels for the cross-regional circulation of factors such as data, technology and talent, and in resolving deep-seated bottlenecks such as high institutional transaction costs, policy inconsistencies and lack of standardisation. Administrative barriers, data silos and regulatory disparities continue to constrain the free flow of factors, and the strategic potential of digital economic integration has yet to be fully realised.

It is against this backdrop that breakthrough progress has been made in institutional coordination within the Yangtze River Delta. In September 2025, the 'Decision on Promoting the Coordinated Development of Science, Technology and Innovation in the Yangtze River Delta' came into force simultaneously in Shanghai, Jiangsu, Zhejiang and Anhui; this was the region's first piece of legislation in the field of science, technology and innovation formulated through coordinated legislative efforts [6][7]. In May 2026, the 'Regulations on Promoting "One-Stop Online Processing" for Government Services in the Yangtze River Delta' officially came into force. The 2026 Government Work Report explicitly proposed the establishment of the 'Shanghai (Yangtze River Delta) International Science and Technology Innovation Centre'. These twin breakthroughs—regional collaborative legislation and the construction of the innovation centre—mark a profound transformation in Yangtze River Delta integration, shifting from the 'physical construction' of infrastructure to the 'functional integration' of institutional rules and factor allocation.

In the field of research on the digital economy and new-quality productive forces, existing literature primarily follows two lines of inquiry. The first concerns the regional effects of the digital economy. Lu Jiang et al., drawing on the 'Broadband China' pilot policy, demonstrated that the development of digital infrastructure significantly promotes the growth of new-quality productive forces in cities [8]. Yang Wanping et al. revealed that the enabling effect of the digital economy on high-quality development in the Yangtze River Delta is subject to a spatial threshold effect [9]. He Shou-kui et al. found that the spatial spillover characteristics of the digital economy intensify as geographical distance increases [10]. The second approach involves research into the measurement and driving factors of new-quality productive forces. Han Wen-long et al. constructed an evaluation system based on the three elements of new types of workers, means of production and objects of labour [11]. ZanZhi-peng demonstrated that science, technology and financial policies enhance new-quality productive forces by promoting the cross-regional flow of talent and capital [12]; Ma Hongge et al. found that the mobility of labour is a key pathway through which new-quality productive forces drive urban-rural integration [13]. Regarding the interplay between factor mobility and institutional mechanisms, Ni Kejin et al. demonstrated that regional integration can significantly improve the efficiency of factor allocation in the manufacturing sector [14]; Lan Faqin et al. and Peng Yuanhuai et al.

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indicated that the opening up of government data can effectively expand the cross-regional flow of capital [15][16].

In summary, existing research still suffers from the following shortcomings. Firstly, most studies treat the integration of the digital economy as a holistic concept, lacking a systematic theoretical explanation of the specific pathways through which it drives new-quality productive forces. Secondly, although some studies have recognised the importance of factor mobility or institutional innovation, research that incorporates both into a unified analytical framework to examine their synergistic effects remains scarce. Thirdly, the understanding of the distinctive characteristics of the Yangtze River Delta region largely remains at the level of phenomenological description, with a lack of in-depth theoretical analysis of the intrinsic mechanisms linking factor mobility and institutional synergy; furthermore, the theoretical significance of major institutional breakthroughs since 2025, such as coordinated legislation, has not yet been fully explored.

Addressing these research gaps, this paper constructs a 'dual-engine' theoretical framework in which digital economic integration drives new-quality productive forces, based on the two dimensions of 'factor mobility' and 'institutional synergy'. Specifically, this paper analyses the mechanisms through which the integration of the digital economy directly empowers new-quality productive forces via three pathways—technological breakthroughs, factor allocation and industrial transformation—and demonstrates its spatial spillover characteristics; reveals the intermediary and transmission roles of cross-regional factor flows; elucidates the positive regulatory effects of institutional linkage; and demonstrates the synergistic gain mechanism whereby 'flows drive institutional innovation, and institutions ensure the smooth flow of factors'. On this basis, four core theoretical propositions are distilled, and policy implications are proposed in light of the latest institutional practices in the Yangtze River Delta.

The remainder of this paper is structured as follows: Part Two constructs the theoretical analytical framework and formulates the research propositions; Part Three designs the evaluation indicator system and measurement methods; Part Four analyses the practical foundations and institutional practices of digital economic development in the Yangtze River Delta; Part Five proposes policy recommendations and implementation pathways; and Part Six presents the conclusions.

2. Theoretical Mechanisms and Conceptual Model

2.1. The Direct Empowerment Effects and Spatial Transmission Logic of Digital Economic Integration

Through the deep interconnection of regional digital systems, digital economic integration generates a systemic synergy that transcends individual cities, directly empowering new-quality productive forces via three pathways [17].

(1) The Pathway of Revolutionary Technological Breakthroughs. The cross-regional flow of data as a production factor breaks down the geographical boundaries of innovation activities, enabling the convergence and integration of R&D data, user data and production data across cities, thereby providing a resource base for algorithm training and model optimisation. Regional coordination of computing infrastructure enables the flexible allocation of ultra-large-scale computing demands within the region, lowering the threshold for small and medium-sized cities to access advanced computing power. Regional integration promotes cross-regional collaboration among innovation actors; Shanghai's basic research, Hangzhou's application scenarios, Hefei's computing power clusters and Suzhou's manufacturing transformation complement one another, forming a complete innovation chain .

(2) Pathways for the Innovative Allocation of Production Factors. The interconnectivity of digital infrastructure reduces institutional transaction costs, enabling factors such as capital,

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technology and talent to seek optimal allocation across a broader geographical space. The cross-regional flow of data not only constitutes an optimisation of allocation in itself, but also reduces the search and matching costs of other factors by improving the information environment. The digital platform economy breaks down spatial constraints on industrial organisation, facilitating a regional division of labour [17].

(3) Pathways for In-Depth Industrial Transformation and Upgrading. A unified digital market unleashes economies of scale and scope, transcending the boundaries of individual cities [18]. The regional deployment of technologies such as 'digital twins + industrial internet' accelerates the intelligent and green transformation of traditional industries. The digital economy significantly enhances the level of new-quality productive forces by driving technological innovation and optimising the employment structure [18].

(4) Logic of Spatial Transmission. Digital knowledge spreads rapidly via data, forming a pattern where 'innovation in one location benefits the entire region' [19]. Technological innovation in core cities drives the upgrading of surrounding areas through industrial chain linkages, generating significant spatial spillover effects [20]. Cross-regional infrastructure connectivity forms channels for the flow of factors of production, enabling the enabling effects to permeate continuously into surrounding areas [21].

Based on the above analysis, this paper proposes Proposition 1 (P1): the integration of the digital economy in the Yangtze River Delta has a significant positive and direct driving effect on new-quality productive forces, and generates spatial spillover effects through knowledge spillovers, industrial chain synergy and infrastructure transmission.

2.2. Intermediary Transmission Mechanisms for Factor Mobility

The driving force of digital economic integration on new-quality productive forces is, more crucially, generated through indirect transmission effects resulting from the promotion of cross-regional mobility of advanced factors. Factor mobility constitutes the core intermediary channel through which 'integration policies' are transformed into 'productive efficiency' [22].

(1) Data Factor Mobility. Cross-regional data mobility enables data resources scattered across various cities to converge and integrate, forming regional data factor markets. By eliminating information asymmetries and reducing search costs, data flow optimises the allocation efficiency of traditional factors such as capital, technology and talent [23].

(2) Flow of Technological Factors. The cross-regional transfer of technology facilitates the free flow of innovation resources—such as patents, technological achievements and R&D capabilities—within a region. Technological spillovers from core cities spread to peripheral cities through channels such as technology trading markets and industrial collaboration networks. The flow of technology accelerates the technological renewal of traditional industries and shortens the cycle from R&D to application.

(3) Flow of Talent. The cross-regional flow of talent reduces information barriers and institutional obstacles, enabling the freer allocation of high-calibre talent within the region. Through channels such as face-to-face exchanges and collaborative R&D, the flow of talent promotes the cross-regional spillover of tacit knowledge, thereby enhancing the region's overall innovation capacity.

In summary, this paper proposes Proposition 2 (P2): the flow of the three types of factors—data, technology and talent—plays a mediating role between digital economic integration and new-quality productive forces, constituting a transmission chain of 'integration → factor flow → leap in productive forces'.

2.3. The Moderating Effect of Institutional Coordination

Institutional coordination refers to the institutionalised framework of cooperation established across administrative regions in areas such as policy coordination, mutual recognition of

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standards and collaborative regulation. In the process by which the integration of the digital economy drives new-quality productive forces, institutional coordination is not a direct source of productive forces, but rather acts as a contextual condition that exerts a positive moderating effect—it determines the extent to which the enabling effects of digital economic integration can be translated into actual increases in productive forces.

(1) Reducing Institutional Transaction Costs. Through unified policy frameworks and mutual recognition of standards, regional institutional coordination effectively reduces the institutional friction faced by cross-regional economic activities. Policy coordination reduces the compliance costs faced by enterprises operating across regions; mutual recognition of standards eliminates the barriers posed by duplicate certification for the cross-regional transfer of technological achievements; and shared regulatory governance reduces institutional uncertainty for market entities [24]. Research indicates that the higher the level of institutional coordination, the stronger the enabling effect of the digital economy.

(2) Providing a Stable and Predictable Institutional Environment. Institutional coordination provides a stable regulatory framework for the formation and operation of a unified digital market. Clear regulatory boundaries and mechanisms for safeguarding rights and interests bolster the confidence of market entities in participating in cross-regional digital economic activities, enabling the effective transmission of innovation incentives arising from digital economic integration [25]. The implementation of the 2025 'Decision on Promoting the Coordinated Development of Science, Technology and Innovation in the Yangtze River Delta' marks a shift in institutional coordination within the Yangtze River Delta from policy advocacy to legal safeguards [26].

(3) Amplifying the Empowering Effects of Integration. By reducing friction and stabilising expectations, institutional coordination enables the technological spillover, factor allocation and industrial upgrading effects of digital economy integration to be realised more fully. The more refined the institutional environment, the stronger the marginal driving effect of digital economic integration on new-quality productive forces.

Based on the above analysis, this paper proposes Proposition 3 (P3): institutional coordination plays a positive moderating role between digital economic integration and new-quality productive forces—the higher the level of institutional coordination, the stronger the empowering effect of digital economic integration on new-quality productive forces.

2.4. The 'Spiral Synergy' Effect of Factor Mobility and Institutional Interaction

Factor mobility and institutional interaction are not independent, parallel mechanisms, but rather constitute a 'spiral-ascending' symbiotic system that generates systemic gains unattainable through any single mechanism.

(1) Factor Mobility Drives Institutional Innovation. In practice, the free cross-regional flow of factors of production continually encounters institutional obstacles such as administrative barriers, differences in standards and regulatory conflicts. The existence of these obstacles keeps institutional transaction costs high, constraining further improvements in the efficiency of factor allocation [27]. The practical demand for the flow of factors of production thus creates sustained pressure for institutional reform—the more extensive the flow, the more specific the institutional shortcomings that are exposed, and the stronger the driving force for policy coordination, mutual recognition of standards and collaborative regulation [28].

(2) Institutional Coordination Ensures Unimpeded Mobility. Institutional coordination provides a stable, transparent and predictable regulatory framework for the mobility of factors of production. Policy coordination across administrative regions reduces institutional friction in the cross-regional allocation of factors, mutual recognition of standards eliminates barriers caused by duplicate certification for the cross-regional mobility of factors such as technology and talent, and collaborative regulation enhances the confidence of market entities in

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participating in cross-regional economic activities[29]. A superior institutional environment further attracts and stimulates the cross-regional aggregation of high-level factors, forming a virtuous cycle of 'superior institutions → factor aggregation → increased productivity'.

(3) Spiralling Systemic Gains. In practice, the two reinforce one another: the flow of factors continually exposes institutional shortcomings, compelling institutional coordination to evolve to a higher level; institutional coordination continuously optimises the environment for mobility, further stimulating the cross-regional allocation of factors. This virtuous cycle, in which 'mobility drives institutional innovation and institutions ensure the smooth flow of factors', generates a systemic empowerment effect where '1+1>2'.

Based on the above analysis, this paper proposes Proposition 4 (P4): there is a significant synergistic interaction between factor mobility and institutional coordination; the two reinforce each other in a spiral of ascension, generating systemic gains that cannot be achieved by a single mechanism.

Drawing on the analysis in Sections 2.1 to 2.4, this paper constructs a dual-drive theoretical framework of 'digital economic integration → factor mobility and institutional synergy → new-quality productive forces'. Within this framework, the direct effect (P1) addresses whether digital economic integration has an empowering effect; the mediating effect (P2) reveals the intrinsic mechanisms of factor mobility as a transmission channel; the moderating effect (P3) elucidates the reinforcing role of institutional synergy as a contextual condition; and the synergistic effect (P4) further demonstrates the systemic gains arising from their spiralling upward interaction. These four propositions progress in a stepwise manner—from 'whether it is effective', 'how it takes effect', 'when it is most effective', to 'how multiple mechanisms combine to amplify the effect'—and together constitute an integrated analytical framework for understanding how the integration of the digital economy in the Yangtze River Delta empowers new-quality productive forces.

3. Construction of the Indicator System and Design of Measurement Methods

This chapter aims to translate the theoretical propositions discussed earlier into an operational analytical framework, thereby laying the methodological foundation for subsequent empirical research.

3.1. Construction of a Comprehensive Evaluation Indicator System

To scientifically measure the levels of digital economic integration, factor mobility, institutional coordination and new-quality productive forces in the Yangtze River Delta, this study constructs four sets of multi-dimensional evaluation indicator systems.

(1) Digital Economic Integration Index (DEI).Indicators are selected from three dimensions: joint construction of digital infrastructure, coordinated development of digital industries, and digital market interconnectivity [30]. The infrastructure dimension covers indicators such as the number of internet broadband subscribers per capita and the density of mobile phone base stations; the industrial synergy dimension covers indicators such as the proportion of employees in the information transmission and software services sectors and the locational entropy of the digital industry; the market interconnectivity dimension covers indicators such as the scale of cross-provincial data transactions and the digital inclusive finance index.

(2) New-Quality Productive Forces Index (NQP). This index is constructed across three dimensions: technological innovation capacity, efficiency of factor allocation, and industrial structure upgrading [31]. The technological innovation dimension covers indicators such as the number of invention patents granted per 10,000 people and R&D expenditure intensity; the factor allocation dimension covers indicators such as labour productivity and capital

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productivity; and the industrial upgrading dimension covers indicators such as the proportion of main business revenue from high-tech industries and the proportion of value added from strategic emerging industries [32].

(3) Factor Mobility Index (FF). This is broken down into the mobility of three types of factors: data, technology and talent. Data mobility is measured using the scale of inter-provincial data transactions and mobile internet traffic as proxy variables; technology mobility is measured using the number of inter-provincial patent transfers and licences as proxy variables; and talent mobility is measured using the proportion of the inter-provincial migrant population and the proportion of highly skilled personnel employed across regions as proxy variables.

(4) Institutional Linkage Index (IL).This is constructed across three dimensions: regional policy coordination, mutual recognition of industry standards, and collaborative market regulation. Policy coordination is measured by the number of policy documents jointly issued by the three provinces and one municipality, as well as the similarity of policy texts; mutual recognition of standards is measured by the number of administrative procedures that can be handled across provincial borders and the number of mutually recognised standards; collaborative market regulation is measured by the frequency of cross-regional joint law enforcement and regulatory cooperation incidents.

3.2. Design of the Measurement Methodology

(1) Entropy Method. To avoid subjective weighting biases, this study employs the entropy method to determine the weights of each indicator. The entropy method is based on the principle of information entropy, determining weights according to the amount of information provided by the observed values of each indicator. The calculation steps are as follows:

Step 1: Construct the matrix of raw indicator data. Let there be m cities and n indicators, which form the matrix $X = (x_{ij})_{m\times n}$.

Step 2: Standardise the data. To eliminate the influence of units, standardise positive and negative indicators separately as follows:

Positive indicators: $X'_{ij} = (X_{ij} - minX_j)/(maxX_j - minX_j)$

Negative indicators: $X'_{ij} = (maxX_j - X_{ij})/(maxX_j - minX_j)$

Step 3: Calculate the characteristic weight of the i-th city for the j-th indicator:

$$P_{ij} = X'_{ij} \Big/ \sum_{i=1}^{m} X'_{ij}$$

Step 4: Calculate the information entropy of the j-th indicator:

$$e_j = -k \sum_{i=1}^{m} p_{ij} \ln (p_{ij})$$

Where, $k=1/\ln(m)$.

Step 5: Calculate the weight of the j-th indicator: $w_j = (1 - e_j)/\sum_{j=1}^{n}(1 - e_j)$

Step 6: Calculate the composite score: $S_i = \sum_{j=1}^{n} w_j X'_{ij}$

(2) Spatial weighting matrix. To identify spatial spillover effects, this study constructs an inverse square distance spatial weighting matrix. Let d_{ij} denote the road distance between cities i and j; the elements of the weight matrix are then $W_{ij} = 1/d^2_{ij}\,(i \neq j)$, whilst the diagonal elements $W_{ii} = 0$. The matrix is row-normalised such that the sum of the elements in each row equals 1.

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3.3. Data Sources and Processing Notes

This study utilises panel data from 41 prefecture-level and higher cities in the Yangtze River Delta for the period 2016–2025. The data are primarily sourced from the China Urban Statistical Yearbook, the statistical yearbooks of various provinces and municipalities, the EPS database, the National Intellectual Property Administration's patent transfer database, the Peking University Digital Inclusive Finance Index, as well as manually collated policy documents and government work reports. Due to limitations in data availability, the full empirical application of the indicator system is left to future research; this paper focuses on the explanation of theoretical mechanisms and policy analysis.

4. Analysis of the Real-world Basis and Institutional Practice

4.1. The Current Landscape of Digital Economy Integration in the Yangtze River Delta

The digital economy has become the core driver of economic growth in the Yangtze River Delta. By 2026, the scale of the digital economy in the Yangtze River Delta is projected to reach 18.5 trillion yuan, representing a year-on-year increase of 11.2 per cent and accounting for 40.6 per cent of the national digital economy. The Yangtze River Delta's share of national GDP rose from 23.9 per cent in 2018 to 24.7 per cent in 2025, with its total economic output surpassing that of economies such as Japan and Germany.

In terms of digital infrastructure, the Yangtze River Delta leads the nation. By the end of 2024, the region had cumulatively built over 820,000 5G base stations—accounting for one-fifth of the national total—and established 32 gigabit cities, with its total intelligent computing capacity ranking first in the country. The 'East Data, West Computing' Yangtze River Delta hub's '1+4' computing power platform has commenced interconnectivity. In July 2025, the China Mobile Yangtze River Delta (Shanghai) 5G Eco-Valley—the region's first green, energy-efficient demonstration data centre with autonomous computing power dispatch capabilities—passed its comprehensive acceptance inspection and will serve cutting-edge artificial intelligence applications such as the Jiutian large language model and Huawei's Pangu large language model [33]. Shanghai's Qingpu, Jiangsu's Wujiang and Zhejiang's Jiashan are jointly developing a data centre cluster within the Yangtze River Delta Integration Demonstration Zone, which, together with the Wuhu cluster, forms the Yangtze River Delta computing power hub.

At the industrial cluster level, the Yangtze River Delta has formed a distinctive pattern of differentiated collaboration. The Digital Yangtze River Delta Development Report (2025) indicates that the region's artificial intelligence industry accounts for one-third of the national total, its integrated circuit output accounts for nearly half of the national total, its data industry accounts for 23 per cent of the national total, and it is home to over 100,000 data-related enterprises. The three provinces and one municipality have established a differentiated division of labour, with Shanghai strengthening infrastructure, Jiangsu prioritising manufacturing, Zhejiang optimising application scenarios, and Anhui concentrating on computing power [34]. The Yangtze River Delta's integrated circuit industry accounts for approximately three-fifths of the national total, whilst the industrial scales of both the biopharmaceutical and artificial intelligence sectors each account for over one-third of the national total.

4.2. Actual Bottlenecks in the Flow of Factors of Production

Although the integration of the digital economy in the Yangtze River Delta has achieved significant results at the infrastructure level, the cross-regional flow of factors of production still faces multiple institutional and structural bottlenecks [28][29].

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(1) Obstacles to Data Circulation. Unclear mechanisms for establishing data ownership rights, an incomplete valuation system and poor interoperability between trading platforms have resulted in the data factor market exhibiting 'island-like' characteristics. Data trading platforms across the three provinces and one municipality operate independently, and a unified regional market has yet to be established. Surveys indicate that 78 per cent of investment promotion departments impose confidentiality review procedures on cross-regional data enquiries, whilst 53 per cent of key industrial data is restricted to internal use within the local government. Due to the excessive costs of data governance and product development, enterprises generally 'dare not and do not know how to proceed'.

(2) Barriers to the Flow of Technology. The number of patent transfers has declined, and obstacles exist to cross-provincial commercialisation. As of June 2025, there were only just over 2,600 patents resulting from cross-provincial cooperation in the artificial intelligence sector within the Yangtze River Delta, accounting for less than 0.2 per cent of the region's total [35]. The commercialisation of innovation outcomes across cities is inefficient, with a pronounced 'siphon effect' in core cities [36]. The regional standards system has yet to be unified, the development of open-source communities is lagging, and collaborative applications in manufacturing scenarios are insufficient [37].

(3) Barriers to Talent Mobility. Issues such as poor coordination of social security schemes, lack of mutual recognition of professional titles and household registration restrictions are hampering talent mobility. Social security transfer procedures are cumbersome; there are disputes regarding the conversion of social security contribution periods accumulated in other regions; and the transfer of children's school enrolment and medical reimbursement across regions are not running smoothly [38]. Although a pilot scheme for the "cumulative mutual recognition of household registration eligibility periods within the same city" has been launched, full implementation will still take some time [39].

4.3. Landmark Breakthroughs in Institutional Coordination

In recent years, institutional coordination in the Yangtze River Delta has achieved a substantial shift from 'policy advocacy' to 'coordination under the rule of law', with landmark breakthroughs concentrated in two key areas: collaborative legislation and the development of science and technology innovation centres.

(1) The First Collaborative Legislative Act Officially Comes into Force. In July 2025, the Standing Committees of the People's Congresses of Shanghai, Jiangsu, Zhejiang and Anhui respectively voted to adopt the 'Decision on Promoting the Coordinated Development of Science and Technology Innovation in the Yangtze River Delta', which came into force simultaneously across the three provinces and one municipality on 1 September 2025 [40][41]. This is the first regulatory decision in the field of science and technology innovation in the Yangtze River Delta to be formulated through collaborative legislation. Comprising 19 articles, the Decision covers matters such as the implementation of national strategies, the cultivation of original innovation capabilities and the development of new drivers of growth. It explicitly states that the aim is "to promote the Yangtze River Delta's role as a strategic pillar in building China into a science and technology powerhouse, and to establish it as a key hub in the international innovation network and a global centre of science and technology innovation". It sets out clear provisions regarding the joint cultivation of strategic scientific and technological capabilities, the joint construction of innovation platforms, the joint research of core technologies, and the sharing of innovation resources [42]. This move marks a transition in institutional innovation within the Yangtze River Delta from 'physical connectivity' to 'chemical integration'.

(2) Strategic Upgrade of the International Science and Technology Innovation Centre. At the end of 2025, the Central Economic Work Conference first proposed "building the Shanghai (Yangtze River Delta) International Science and Technology Innovation Centre", and the 2026

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Government Work Report further clarified this deployment. From "Shanghai" to "Shanghai (Yangtze River Delta)", the addition of parentheses has transformed the extension of geographical space into a leap in innovation capacity [43]. The three provinces and one municipality have prioritised the joint construction of the Shanghai (Yangtze River Delta) International Science and Technology Innovation Centre as their top priority for concerted efforts [44]. The dual breakthroughs in collaborative legislation and the development of the innovation centre signify that Yangtze River Delta integration is undergoing a profound transformation from the 'physical construction' of infrastructure to the 'functional integration' of institutional rules and factor allocation.

5. Policy Recommendations

Based on the theoretical analysis of mechanisms and the assessment of the practical context presented above, this paper puts forward the following policy recommendations across three dimensions: the flow of factors of production, institutional coordination, and collaborative mechanisms.

(1) Removing Bottlenecks in Factor Mobility and Facilitating Cross-regional Allocation Channels. In response to the practical obstacles to the mobility of the three types of factors—data, technology and talent—the following measures are recommended. With regard to data mobility, efforts should be accelerated to promote the interconnectivity of data trading platforms across the three provinces and one municipality, and the establishment of a unified regional data factor market should be explored. A management system comprising a cross-regional data sharing catalogue and a negative list should be established to clarify the boundaries and rules governing cross-regional data circulation, thereby reducing enterprises' costs of data governance and product development. With regard to the flow of technology, a mechanism for the rapid examination and mutual recognition of patents across provinces in the Yangtze River Delta should be established, and the integrated development of technology trading markets should be promoted. With regard to the flow of talent, the pilot reform of 'cumulative mutual recognition of household registration eligibility periods within the same city' should be deepened; seamless cross-provincial transfer and continuation of social security benefits and mutual recognition of professional titles should be promoted; and institutional bottlenecks hindering the free cross-regional flow of talent should be removed.

(2) Deepening Institutional Coordination and Innovation, and Strengthening Coordinated Legal Safeguards. Institutional coordination is a key enabling factor for unleashing the empowering effects of digital economy integration. It is recommended that institutional coordination be deepened in the following areas. Firstly, promote the sharing of experiences in coordinated legislation. Building on the successful practice of coordinated legislation in scientific and technological innovation, promote coordinated legislation in the digital economy sector—covering areas such as the circulation of data as a production factor, algorithm governance, and the standardisation of artificial intelligence application scenarios—to construct a regional coordinated regulatory framework covering the entire digital economy value chain. Secondly, establish a joint regulatory committee spanning administrative regions. To address regulatory challenges such as the cross-regional operations of digital platform economies and the cross-border flow of data, a regularised cross-regional joint regulatory coordination mechanism should be established. Thirdly, unify statistical definitions and standards for the digital economy. Accelerate the formulation of statistical classification standards for core industries of the digital economy in the Yangtze River Delta, thereby providing a data foundation for the precise evaluation of regional integration policies.

(3) Establish a policy feedback loop based on 'promoting synergy through flow' to unleash synergistic gains. The spiral synergy between factor mobility and institutional linkage

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demonstrates that the two mutually reinforce and evolve together. It is recommended to establish a closed-loop policy mechanism comprising "problem identification—institutional response—effectiveness evaluation—dynamic adjustment". Specifically, a dynamic monitoring platform for bottlenecks in factor mobility within the Yangtze River Delta should be established to regularly identify key institutional barriers constraining the flow of data, technology and talent; in response to institutional shortcomings identified through monitoring, cross-regional policy coordination and legislative linkage procedures should be initiated; an integrated policy effectiveness evaluation mechanism should be established to track and monitor the actual impact of coordinated legislation and institutional innovation on the flow of factors and the enhancement of productivity; policy instruments should be dynamically adjusted based on the evaluation results, thereby forming a virtuous cycle of 'problems exposed by mobility — institutional follow-up and innovation — smoother mobility — continuous institutional improvement', providing replicable and scalable experience for fostering new-quality productive forces in the national regional integration process.

6. Conclusion

Based on the two core dimensions of 'factor mobility' and 'institutional synergy', this paper constructs a dual-engine theoretical framework in which the integration of the digital economy drives the development of new-quality productive forces. It systematically elucidates the intrinsic logical relationship between the two and draws the following main conclusions.

Firstly, digital economic integration directly empowers new-quality productive forces through three pathways: revolutionary technological breakthroughs, innovative allocation of production factors, and in-depth industrial transformation and upgrading. Furthermore, this empowering effect exhibits spatial spillover characteristics, enabling it to spread continuously from core cities to peripheral cities via knowledge spillovers, industrial chain synergies and infrastructure transmission.

Second, the free cross-regional flow of three types of high-level factors—data, technology and talent—constitutes the core intermediary channel through which 'integration policies' are transformed into 'productivity gains'; together, these three elements form a complete transmission chain of 'integration → factor flow → productivity leap'.

Thirdly, institutional coordination measures—such as regional policy coordination, mutual recognition of standards and collaborative regulatory governance—play a positive regulatory role in the process by which digital economic integration drives new-quality productivity; the higher the level of institutional coordination, the stronger the empowering effect of integration on new-quality productivity.

Fourthly, factor mobility and institutional coordination are not independent, parallel mechanisms, but rather constitute a spiralling, synergistic system in which 'mobility drives institutional innovation, and institutions ensure the unimpeded flow of factors'; through mutual reinforcement, they generate systemic gains that a single mechanism cannot achieve.

The theoretical contribution of this paper lies in incorporating the mediating mechanism of factor mobility, the moderating role of institutional synergy, and their synergistic effects into a unified analytical framework, thereby addressing the gap in existing research regarding the explanation of the intrinsic mechanisms by which digital economic integration drives new-quality productive forces. It should be noted that this study is a theoretical analysis and does not conduct empirical testing of the four propositions put forward in the text; this constitutes the main limitation of this paper.

Future research could build upon the theoretical framework and indicator system designed in this paper to conduct empirical tests of the four propositions using spatial econometric models. It could also track the dynamic evolution of collaborative legislation and the development of

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science and technology innovation centres in the Yangtze River Delta, thereby conducting a more in-depth quantitative assessment of the moderating effects of institutional linkages.

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