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Research on the Integration and Development of Digital Economy and Real Economy under the Perspective of New Quality Productive Forces
—Taking Fujian Province as an Example

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Abstract

In the strategic context of developing new quality productive forces, the integration of digital economy and real economy has become the core path to promote high-quality development. As a pioneer area in the construction of "Digital China", the integration practice of Fujian Province is of typical significance. The purpose of this paper is to reveal the non-equilibrium evolution mechanism of digital integration between leading enterprises and small and medium-sized enterprises (SMEs), and to solve the problem of industrial digital divide. Comprehensively applying case study method, comparative analysis method and policy text analysis, this paper selects leading enterprises such as Contemporary Amperex Technology Co.,Ltd., Anta and traditional manufacturing SMEs as research objects, and systematically analyzes the micro-paths and macro-barriers of digital integration by combining the policy documents of Fujian Province and field data. The study proposes a three-in-one integration support framework of "chain leader - small, fast, light and accurate - transformation coupon", emphasizing that the role of the government should be shifted from a resource provider to an ecological enabler; introduces the perspective of "new type of production relationship", highlighting the systemic and institutional barriers to the integration. It also introduces the perspective of "new type of production relationship", highlighting the key role of institutional innovation and cross-strait collaboration in fostering new productive forces. Fujian Province is characterized by a "dual structure": leading enterprises have achieved productivity leap through extreme manufacturing and green transformation, while SMEs generally face the dilemma of "not daring to switch, not wanting to switch, and not knowing how to switch". The solution lies in the construction of a dynamic ecosystem with chain master as the traction, service platform as the carrier, and institutional innovation as the guarantee, so as to promote the development of integration in the direction of wider, deeper and greener.

Keywords

new quality productive forces, integration of digital economy and real economy, dual structure, case study of Fujian Province, institutional innovation and talent cultivation

1. Introduction

In the wave of global scientific and technological revolution and industrial change, digital economy has become a key force in reshaping the global economic structure. China has elevated the deep integration of the

digital economy and the real economy ("digital-real integration") to a national strategy, aiming to lead the development of new quality productive forces through scientific and technological innovation. The new productivity is driven by revolutionary breakthroughs in technology, innovative allocation of production factors, and in-depth transformation and upgrading of industries, with a significant increase in total factor productivity as the core symbol. As the ideological source and practical starting point of the construction of "Digital China", the development results of the digital economy in Fujian Province provide a typical sample for the study of this strategy.

However, the development of Fujian Province shows a remarkable "dual structure" contradiction: on the one hand, leading enterprises such as Contemporary Amperex Technology Co., Ltd. and Anta have realized "extreme manufacturing" and "green manufacturing". On the one hand, leading enterprises such as Contemporary Amperex Technology Co., Ltd. and Anta have realized "Extreme Manufacturing" and "Green Manufacturing", and have become important "chain masters" of the global industrial chain; on the other hand, a large number of SMEs are still facing the predicament of "not daring to turn, not wanting to turn, and not knowing how to turn", and it is difficult for them to transform. This structural fault leads to the core question of this study: what are the micro-mechanisms of digital integration that drive productivity leap and green transformation in leading enterprises? What are the key barriers to the diffusion of digital capabilities to SMEs? How can more effective policies be designed to bridge the digital divide?

This study aims to systematically answer the above questions through multi-level empirical analysis. Specific objectives include: at the theoretical level, sinking the macro-framework of new quality productive forces into the micro-practice of enterprises and examining the concrete embodiment of its core elements; at the empirical level, analyzing the path of digital-real integration of leading enterprises and quantifying SMEs' transformation predicaments; at the policy level, criticizing the "one-size-fits-all" subsidy model, and proposing to "lead by chain masters" and "lead by chain masters" to "lead by chains". At the policy level, the "one-size-fits-all" subsidy model is criticized, and a dynamic support framework centered on the "chain leader", "small, fast, light, and accurate" program, and "digital transformation vouchers" is proposed.

The structure of this paper is as follows: Part 1 depicts the quantitative panorama of Fujian Province's "double-engine" economy through macro-data analysis; Part 2 analyzes the realization path of digital integration in advanced manufacturing, process industry and traditional industry by going into the depths of enterprise cases and focusing on its catalytic effect on green manufacturing; Part 4 systematically diagnoses the core barriers to SME transformation and proposes a new model for the transformation of SMEs. Finally, the fifth part summarizes the whole paper, highlights the research findings and looks forward to future research directions.

2. New Paradigm: The Theoretical Basis of New Quality Productive Forces and the Inner Mechanism of Digital-realistic Integration

New quality productive forces is the ability to utilize and transform nature with high efficiency and high quality spawned by strategic emerging industries and future industries under the agitation of scientific and technological innovation, representing a new type of high-quality productivity leap (Zhang & Pu, 2023). The deep integration of the real economy and the digital economy can help the development of Chinese-style modernization by releasing the effect of technological innovation and the crowding-out effect on low-skilled jobs, which is the key focus point for comprehensively promoting Chinese-style modernization (Sun, 2025). This section aims to establish a theoretical framework for subsequent case studies. Through an in-depth interpretation of the two core concepts of "new quality productive forces" and "integration of the digital economy and the real economy," it provides a clear and unified analytical benchmark for evaluating Fujian Province's development practices.

2.1 Deconstructing New Quality Productive Forces

The concept of "new quality productive forces" is the core concept of China's current economic policy, and understanding its connotation is the prerequisite for all analyses. It is not a simple upgrade of traditional productivity, but a qualitative leap.

2.1.1 Official Definition and Core Characteristics

According to the official discourse, new quality productive forces is the “advanced productivity quality” (Zhejiang Provincial Department of Commerce, 2025), which is generated by revolutionary technological breakthroughs, innovative allocation of production factors, and in-depth transformation and upgrading of industries. Its core features can be summarized as “three high and one new”: high technology, high efficiency, high quality, and a new model to get rid of the traditional economic growth path (Zhou, 2024). The essence of new quality productive forces is “advanced productivity”, and its core symbol is “a significant increase in total factor productivity” (Zhou, 2024). In addition, it inherently contains the requirements of sustainable development, which is itself a kind of “green productivity”, emphasizing the synergy between economic development and the construction of ecological civilization (The Central People’s Government of the People’s Republic of China, 2024).

2.1.2 The “Trinity” of Driving Forces

The formation of new quality productive forces comes from the synergistic effect of three major driving forces, which together constitute the systematic logic of its generation:

Revolutionary technological breakthrough: this is the premise and foundation of the formation of new quality productive forces. It refers to original and disruptive technological advances, such as artificial intelligence, new materials, next-generation information technology, quantum computing, etc., which are capable of creating new products, giving rise to new business forms, and building new models (National Development and Reform Commission of the People’s Republic of China, 2024).

Innovative allocation of production factors: this is the power source of the development of new quality productive forces. It requires that all factors of production, such as labor, capital, land, knowledge, technology, management, data, etc., can realize convenient flow, network sharing, systematic integration and efficient utilization, so as to effectively reduce the transaction costs and enhance the efficiency of resource allocation (National Development and Reform Commission of the People’s Republic of China, 2024). Deep transformation and upgrading of industries: this is the ultimate practice carrier of new quality productive forces. It is manifested in the transformation and upgrading of traditional industries, the cultivation and expansion of emerging industries and the forward-looking layout of future industries, with the ultimate goal of building a modernized industrial system (The Central People’s Government of the People’s Republic of China, 2024).

2.1.3 Three Major “Leaps” in Basic Connotation

The internal logic of new quality productive forces is rooted in the Marxist theory of productivity, which is specifically reflected in the qualitative change and leap of the three elements of productivity:

New type of workers: people are the most active factor in the productive forces. New quality productive forces requires higher quality laborers, including not only strategic scientists and top talents who can lead the world's scientific and technological frontiers, but also applied talents who can skillfully master the new tools of production and have a multi-dimensional knowledge structure (National Development and Reform Commission of the People’s Republic of China, 2024).

New-quality labor means: the scientific and technological attributes of the production tools are the distinguishing mark between new quality productive forces and traditional productive forces. The new tools of production represented by the industrial Internet, artificial intelligence-driven automation equipment, industrial software, etc., have greatly expanded the production space and are the material conditions for the formation of new productivity (National Development and Reform Commission of the People’s Republic of China, 2024).

New-quality labor object: scientific and technological progress has greatly expanded the breadth and depth of labor objects. On the one hand, the scope of human transformation of nature extends to deep space, deep sea, deep earth; on the other hand, data as a new type of production factors, itself has become an important object of labor, which can create value directly, but also through the integration of other factors, play a multiplier effect (National Development and Reform Commission of the People’s Republic of China, 2024).

2.1.4 The Key Role of "New Production Relations"

The development of new quality productive forces is not only a technical task, but also a profound institutional change. Official discourse has repeatedly emphasized that relations of production must be adapted to the requirements of productivity development (The Central People's Government of the People's Republic of China, 2024). This means that in order to successfully develop the new quality productive forces, it is necessary to build a "new type of production relations" in line with them. This requires deepening the reform of the economic system, science and technology system, and other reforms, efforts to open up the constraints on the development of new quality productive forces of the blockage points, innovation in the allocation of factors of production, so that all kinds of advanced and high-quality factors of production can be smoothly to the development of the new quality productive forces of the direction of the flow and agglomeration (The Central People's Government of the People's Republic of China, 2024). For example, without institutional innovation in data property rights, circulation and trading, and revenue distribution, the huge potential of data as a new type of production factors cannot be fully released. Therefore, institutional innovation is not an auxiliary condition for development, but a constitutive element for cultivating new quality productive forces. An examination of Fujian Province should not only assess its technological and industrial progress, but also scrutinize its determination and effectiveness in institutional innovation, and the two must evolve synergistically.

2.2 The Engine of Transformation: The Internal Mechanism of Digital-real Integration

The in-depth integration of the digital economy and the real economy (referred to as "digital-real integration") is the core path to new quality productive forces. The relationship between the two is not a simple superposition, but a symbiotic and co-prosperous engine mechanism.

2.2.1 Theoretical Framework: A Symbiotic Engine

The real economy is the "foundation" and "carrier" of the development of the digital economy, which provides a wide range of application scenarios, massive data sources and ultimate value realization channels for digital technology (Zhao & Yang, 2024). Without the demand traction of the real economy, the digital economy will become water without a source and wood without a foundation. On the contrary, the digital economy is the "engine" and "multiplier" that drives the high-quality development of the real economy, and through the application of digital technology to carry out an all-round, full-chain transformation of the traditional industry, it can significantly improve production efficiency, give rise to new models and new business formats, and expand the scope for value creation (China Reform Forum, 2022). The deep integration of the two can give full play to the amplification, superposition and multiplication of digital technology on economic development, which is the key to enhancing total factor productivity and forming new quality productive forces (China Reform Forum, 2022).

2.2.2 Four-stage Evolutionary Path of Integration

The process of digital-real integration does not happen overnight, but follows a gradual evolutionary logic from basic empowerment to value creation. According to the analysis of the Report on the Integration and Development of the Digital and Real Economies, this process can be summarized in four stages (Xinhua, 2023):

Stage 1: Foundation Reengineering (from "dumb devices" to ubiquitous connectivity): The core task of this stage is to digitize "dumb devices" and traditional IT systems in factories using technologies such as 5G, IoT, and the Industrial Internet, and to realize the networking of devices, data collection and system interoperability, laying a solid "digital base" for deeper integration (Xinhua, 2023).

Stage 2: Factor integration (from "manual configuration" to "data-driven"): Based on the realization of interconnection, this stage focuses on cloud aggregation and management of the massive data collected and other factors of production. By building data lakes, algorithm libraries and model libraries, enterprises can shift from the experience-dependent "manual allocation" mode to the "data-driven" decision-making mode based on data analysis to realize the optimal allocation of resources (Xinhua, 2023).

Stage 3: Process optimization (from "passive execution" to "active response"): The integration of data elements creates the conditions for the revolutionary optimization of business processes. In the core links of

R&D, production, supply chain, and marketing, enterprises can utilize technologies such as digital twin, artificial intelligence, and big data analysis to build agile, intelligent, and collaborative business processes that can actively respond to changes in the market. For example, virtual R&D through digital twins or zero inventory management through intelligent supply chain systems (Xinhua, 2023).

Stage 4: Value Enhancement (from "Efficiency Gain" to "Benefit Creation"): This is the ultimate goal of digital-real integration. Based on the first three phases, companies can not only reduce costs and increase efficiency, but also create new value. This includes the development of new services based on data, the creation of new business models such as personalized customization, and the enhancement of the overall innovation capacity of enterprises, and ultimately the realization of economic benefits, innovation benefits and social benefits of a comprehensive leap, which is the core embodiment of new quality productive forces, "a significant increase in total factor productivity" (Xinhua, 2023).

It is worth noting that these four stages are not simply a linear ladder, but more like an iterative spiral process. After initially completing the foundation reengineering, an enterprise may discover through process optimization that higher requirements are placed on the network and arithmetic power, thus forcing it to return to the first stage for a higher level of infrastructure upgrades. This continuous iteration and feedback loop is the intrinsic motivation for digital-real integration to go deeper. Therefore, relevant policy design should focus on long-term support to encourage enterprises to climb up this spiral ladder.

3. Fujian Context: Policy Blueprint and Economic Landscape

This section combines the theoretical framework with the specific practices of Fujian Province to examine in depth its strategic layout, development goals and unique economic foundation for promoting digital-real integration and cultivating new quality productive forces.

3.1 Fujian's Strategic Ambition: Policy Framework and Development Goals

As the ideological source and practical starting point of the construction of "Digital China", Fujian Province has always been in the forefront of promoting the development of digital economy, and has transformed the national strategy into a clear local program of action.

3.1.1 Top-level Policy Design

The strategic intent of Fujian Province is clearly reflected in a series of key policy documents:

The Action Plan for a Larger, Stronger and Better Digital Economy in Fujian Province (2022-2025) (National Development and Reform Commission of the People's Republic of China, 2024): This plan sets out a grand blueprint for the development of Fujian's digital economy, including specific infrastructure construction targets (e.g., the number of 5G base stations), targets for industrial cluster development (e.g., building a trillion-dollar electronics and information industry cluster), and the direction of cultivation of the platform economy.

Overall Program for Accelerating Digitalization in Fujian Province to Comprehensively Enable High-Quality Economic and Social Development (Fujian Provincial & Reform Commission, 2025): This programmatic document sets out clear quantitative targets, i.e., the province's added value of the digital economy will account for about 57% of GDP by 2026; and it will become a benchmark for the construction of Digital China by 2030. The program also details specific initiatives in science and technology innovation (e.g., improving the system of "unveiling the list of commanders"), digital infrastructure (e.g., building the province's integrated arithmetic network) and data security.

3.1.2 Landing New Quality Productive Forces in Government Work Reports

The government work reports of Fujian Province in recent years have explicitly linked the above digitization initiatives closely to the development of new quality productive forces (Fujian Daily, 2024). The report has repeatedly emphasized the need for "scientific and technological innovation to lead the development of new productivity" and "comprehensive digital empowerment" as the core driving force (People's Daily Online, 2025). At the same time, the forward-looking layout of future industries, such as the "low-altitude

economy", demonstrates a strategic foresight that is highly compatible with the connotation of new quality productive forces (Southeast Net, 2025).

This policy layout reflects a strategic model of "basic first, application-driven". On the one hand, Fujian Province has spared no effort in investing heavily in building world-class "hard" infrastructure, such as the plan to build more than 10,000 new 5G base stations per year by 2026, and the scale of public arithmetic power to reach 10,000 PFLOPS (Fujian Provincial & Reform Commission, 2025). This is the "foundation first". On the other hand, the policy vigorously promotes the landing of application scenarios, and plans to cultivate more than 100 typical application scenarios empowered by public data, and deepen the penetration of digital technology in thousands of industries, such as healthcare, education, agriculture, etc. (Fujian Provincial & Reform Commission, 2025). This is "application-driven". However, the key to the success of this strategy lies in the ability to effectively build a bridge connecting "foundation" and "application". The advanced digital highway has already been built, but how to ensure that enterprises in the real economy, especially SMEs, have the ability and willingness to "get on the road" is the reality of Fujian Province, as well as the potential risks and opportunities in its policy system.

3.2 A Portrait of the Twin Engines: Fujian's Digital and Real Economy Foundations

The economic landscape of Fujian Province presents the typical "double engine" feature, i.e., the parallel development of a strong digital economy and a solid real economy, which provides unique conditions for the deep integration of the two.

3.2.1 Strong Digital Engine

Fujian Province's digitalization level has ranked in the first tier of the country.

In 2022, the scale of the province's digital economy has exceeded 2.3 trillion yuan, accounting for more than 47% of GDP (The Central People's Government of the People's Republic of China, 2022). According to the plan, this proportion will reach about 57% in 2026 (Fujian Provincial & Reform Commission, 2025). Fujian ranks among the top in the country in terms of a number of core evaluation indicators such as the level of comprehensive digital development, the ability of integrated government services, and the level of open utilization of public data (Fujian Provincial People's Government, 2024b). The province has formed a digital economy highland centered on Fuzhou, Xiamen, and Quanzhou. For example, the scale of digital economy of Quanzhou city in 2024 has exceeded 700 billion yuan, and the proportion of its GDP is even higher than 56%, showing a strong regional driving capacity (Fujian Provincial Department of Industry Information Technology, 2024).

3.2.2 Solid Real Economy Engine

Fujian Province has a modernized industrial system with complete categories and strong strength.

The province has 21 industrial clusters with an output value of over 100 billion (National Development Reform Commission of the People's Republic of China, 2023). Among them, the four pillar industries are particularly prominent:

Electronic information: as the core pillar, it is accelerating the strategy of "increasing the core and strengthening the screen", i.e. strengthening the chip industry and expanding the new display industry (National Development Reform Commission of the People's Republic of China, 2023).

Petrochemicals: An industrial cluster has been formed with "two bases and one special zone" as the core, such as Gulei in Zhangzhou and Jiangyin in Fuzhou (National Development Reform Commission of the People's Republic of China, 2023).

Modern textile and apparel: the output value of the cluster has exceeded one trillion dollars, which is a traditional advantageous industry in Fujian (National Development Reform Commission of the People's Republic of China, 2023).

Advanced Equipment Manufacturing: The revenue is up to RMB 1.28 trillion and is moving towards intelligence and high-end (National Development Reform Commission of the People’s Republic of China, 2023).

Cluster development strategy: Fujian Province has formed a distinctive development model of county industrial clusters by promoting “strong alliance” and “regional synergy”, relying on key county economies (e.g., Jinjiang and Changle), and facilitating horizontal agglomeration and vertical collaboration of industrial chains (Fujian Provincial People’s Government, 2024a).

Table 1: *Comparison of key indicators of digital economy development (estimated in 2024)*

Indicator	Fujian Province	Guangdong Province	Zhejiang Province	National Average
Share of digital economy in GDP	Approx. 50% (target: 57% by 2026)	>50% (Target: 60% by 2025)	Approx. 50% (Target: 60% by 2025)	Approx. 42
Share of core digital industries in GDP	Approx. 11% (Target: 15% by 2025)	- - - - - - - - - - - - - - - - - - - -	-Approx.	Approx. 10%
Key Policy Focus	Foundation first, application driven	Chain transformation, industry cluster synergy	Platform economy, digital ecosystem	Macro Guidance

As shown in Table 1, it clearly demonstrates Fujian Province's leading position in the national digital economy map, but also reveals the intense competitive pressure from benchmark provinces such as Guangdong and Zhejiang. More importantly, it highlights the differences in the strategic paths of different provinces, providing a reference for subsequent comparative analysis and strategic recommendations.

However, behind the powerful twin engines, Fujian Province faces a profound “dual structure” challenge. On the one hand, Fujian has leading enterprises like Contemporary Amperex Technology Co.,Ltd., which was born in the digital era and represents the global technological frontier (Fujian Provincial People’s Government, 2022). On the other hand, the cornerstone of its economy is tens of thousands of traditional manufacturing enterprises in textile, footwear, and food processing industries (National Development Reform Commission of the People’s Republic of China, 2023). These two types of firms have very different paths to developing new qualitative productivity. For Contemporary Amperex Technology Co.,Ltd., the path is to explore “extreme manufacturing” in a technological no-man's land. For a traditional textile enterprise, its path is to upgrade its stock and improve quality and efficiency through “intelligent reform and digital transformation” (Shanghai Municipal Taxation Bureau of State Taxation Administration, 2024). There are huge differences between the two in terms of financial strength, talent reserves, technology needs and risk appetite. Therefore, any “one-size-fits-all” policy is unlikely to be effective. The core challenge for Fujian Province is to design and implement a two-track strategy: one track is to support headline companies to venture into the “no man's land” of science and technology, and the other track is to promote the digital modernization of the entire traditional industrial base on a large scale, at low cost, and in a highly efficient manner. The ultimate success or failure of Fujian Province's new quality productive forces strategy depends not only on how high its champion enterprises can reach, but also on whether it can systematically raise the level of the entire industrial base.

4. The Path to Integration: In-depth Analysis of Key Industries in Fujian Province

This part will go deep into the core industries in Fujian Province, and through specific enterprise cases, empirically analyze how digital-real integration can give rise to new quality productive forces, and closely combine macro theory with micro practice.

4.1 Electronic Information and Advanced Manufacturing: "Increasing Core and Strengthening Screen" and "Extreme Manufacturing" Mode

As the leader of Fujian's economy and the most natural breeding ground for new productivity, the integration practice of electronic information and advanced manufacturing is very representative.

4.1.1 Case study: "Extreme Manufacturing" of Contemporary Amperex Technology Co., Ltd.

The "Extreme Manufacturing" system implemented by global power battery leader Contemporary Amperex Technology Co., Ltd. (CATL) at its Ningde plant is a model of how new productivity can be realized in practice (Fujian Provincial People's Government, 2022). The core of the system is the use of the nation's largest 5G enterprise network covering more than 5 million square meters, combined with technologies such as artificial intelligence, big data analysis, and edge computing, to intelligently reconfigure the entire production process.

Analyzed from the perspective of the three elements of new quality productive forces:

New quality labor means: high-speed and low-latency 5G private network, AI control system that automatically adjusts process parameters, AR glasses that assist remote expert guidance, and high-speed AI quality inspection equipment based on machine vision, all of which are typical intelligent and networked new production tools.

New type of laborers: those who operate and maintain this complex system are no longer traditional workers, but compound engineers capable of designing, managing, and optimizing networks, algorithms, and data models.

A new quality of labor object: the system processes massive amounts of real-time production data at every moment, which becomes the core input for adjusting processes, predicting failures, optimizing energy consumption, and is a key element of value creation.

The results of this system are staggering: a defect rate of one in a billion is achieved at the extremely high speed of producing one cell every 1.7 seconds, while labor productivity is increased by 75% and energy consumption per unit is reduced by 10% (Fujian Provincial People's Government, 2022). This perfectly illustrates the connotation of high-tech, high-efficiency, high-quality and green development pursued by the new quality productive forces.

4.1.2 Case Study: Ruijie Networks' Smart Factory

The new digitized smart factory of network equipment provider Ruijie Networks, which was put into production in Fuzhou, is a vivid case of the digital industry itself empowering physical manufacturing (Ruijie Networks, 2024). The factory deeply integrates the concepts of "intelligent manufacturing", "5G interconnection" and "green manufacturing", and applies its advanced technologies in the field of network communications to production, logistics and warehousing, realizing the digital management of the entire process from R&D to delivery. This not only improves its own production efficiency, but also provides a credible and visible digital transformation model for its customers, forming a virtuous cycle between technological innovation and industrial application.

Table 2: Mapping of Policies and Practices in Fujian Province's Electronic Information Industry

new quality productive forces Elements	Fujian Province Policy Initiatives	Specific Case Practices (Contemporary Amperex Technology Co., Ltd. / Ruijie Networks)
Revolutionary technological breakthroughs	Implementing the system of "unveiling the list of commanders" to support the key core technology research and development	Contemporary Amperex Technology Co., Ltd.' continuous R&D investment in battery chemistry and extreme manufacturing processes.

Innovative Configuration of Production Factors	Constructing a province-wide integrated arithmetic network to promote the efficient utilization of data elements.	Contemporary Amperex Technology Co., Ltd. utilizes massive production data and AI algorithms for real-time process optimization and control.
Deep transformation and upgrading of industries	Supporting leading and backbone enterprises to carry out the “Intelligent Reform and Digital Conversion” demonstration.	Ruijie Networks builds the entire factory into a digital and intelligent demonstration benchmark.
New quality labor information	Promoting 5G, artificial intelligence and other new technology application scenarios	Contemporary Amperex Technology Co., Ltd.' 5G enterprise private network and AI visual quality inspection system.

As shown in Table 2, it clearly reveals how Fujian Province's top-level policy design is effectively transmitted to the specific practices of leading enterprises, proving the groundedness and effectiveness of its strategy and making the concept of new quality productive forces concrete and palpable.

4.2 Petrochemicals and New Materials: Implantation and Reconstruction of “Digital Gene”

Petrochemicals is a capital-intensive, complex and high-risk industry, and digital transformation provides a revolutionary tool for improving efficiency, ensuring safety and promoting green development.

4.2.1 Case Study: “Digital Gene” Transformation of Fujian Energy and Petrochemical Group Co., Ltd

Fujian Energy and Petrochemical Group Co., Ltd is consciously implanting “digital genes” into its industrial ecosystem to modernize its governance capability. The core initiative is to build an “energy brain” - a group-level production command center that integrates 3D visualization, digital twins, artificial intelligence and big data analysis. Through this “brain”, managers can monitor the construction progress of major projects in real time, and use AI situational awareness technology to automatically identify unsafe behaviors at construction sites and issue early warnings. In the subordinate wind farms, the equipment health management system based on Cloud Edge Collaboration can remotely monitor, diagnose and predictive maintenance of wind turbines all over the world, realizing unattended and intensive management. This practice of applying digital technology to group-level strategic control and safety and environmental protection (HSE) systems is the application of new quality labor information at a higher management level, which perfectly fits the requirements of new quality productive forces for high-quality and green development.

4.2.2 Digitalized Blueprint for Industrial Clusters

The policy plan of Fujian Province has a clear regional layout for the digital transformation of the petrochemical industry. The document clearly proposes to focus on core petrochemical bases such as Fuzhou Jiangyin, Zhangzhou Gulei, and Meizhou Bay, focusing on the application of technologies such as digital twins to digitize and deploy the whole elements of materials, processes, tanks, and production capacity, and to realize real-time monitoring of the production process and the digitization and intelligence of safety management. This suggests that Fujian Province's strategy is to move from point breakthroughs of individual enterprises to face enhancement of the entire industrial cluster, with a view to obtaining systematic synergies.

4.3 Renewal of Traditional Industries: The Practice of “Intelligent Reform and Digital Conversion” in the Textile and Footwear Industry

As a trillion-dollar traditional pillar industry in Fujian Province, the textile, footwear and apparel industry faces enormous pressure from cost, efficiency and rapid market changes. “Intelligent Reform and Digital Conversion” is not only a path for its transformation and upgrading, but also a way to maintain its competitiveness.

4.3.1 Case Study: Anta's Smart Factory

Anta Group's smart factory in Tong'an, Xiamen, is an outstanding representative of traditional manufacturing industries embracing digitalization (Fujian Provincial People's Government, 2022). Unlike traditional garment factories with "high volume, low style" production lines, Anta's intelligent production system can handle dozens of different styles, colors, and sizes at the same time. Each piece of clothing in production has an exclusive electronic ID, and according to the ID and the preset process, the system will precisely deliver it to the corresponding workstation through the intelligent hanging system. This model completely subverts the traditional mode of relying on manual scheduling and scheduling inefficiency, and realizes highly efficient human-machine synergy, with a daily output of up to 60,000 pieces. This is from the rigid scale production, vector production, personalized flexible production paradigm shift embodiment, is the three elements of productivity "optimization of the combination of the leap" vivid portrayal, is new quality productive forces in the traditional industries in the specific performance (National Development and Reform Commission of the People's Republic of China, 2024).

4.3.2 The General Trend of "Old Trees Sprouting New Shoots"

Anta's practice is not an isolated case. The Fujian Provincial Government is targeting traditional industries such as textile and footwear, building materials, and foodstuffs to formulate a clear implementation path for digital transformation, with the aim of promoting the sprouting of new growth in these "old trees" (Shanghai Municipal Taxation Bureau of State Taxation Administration, 2024). This trend is also evidenced by the digital textile intelligent manufacturing projects of enterprises such as Fujian Tianshou Textile New Material Co., Ltd.

In these diversified industrial practices, a common pattern emerges clearly: the leading effect of "chain master" enterprises. Whether it is Contemporary Amperex Technology Co.,Ltd., Anta, or Fujian Nengchem Group, they are all leaders in their respective industrial chains (Fujian Provincial Data Management Bureau & Fujian Provincial Department of Finance, 2024). These large enterprises have the capital, talent and strategic determination needed to carry out deep digital transformation. Their transformation practices, like a boulder thrown into a calm lake, are bound to create a huge ripple effect. The digital collaboration requirements put forward by Contemporary Amperex Technology Co.,Ltd. to its suppliers will force the entire supply chain to upgrade; Anta's smart factory has set a new efficiency benchmark for the province's apparel industry. Fujian Province's industrial policy has keenly captured this and amplified the diffusion effect by supporting the development of "chain master" enterprises and promoting "chain" transformation (Fujian Provincial People's Government, 2024a). This reveals that the most effective way to realize the universal digitization of SMEs may not be to directly support all enterprises in the form of "spreading peppercorns", but rather to focus resources on empowering these "chain-owning" enterprises and supporting them to build an open, collaborative Instead, we will focus our resources on empowering these "chain master" enterprises and supporting them to build an open and collaborative industry chain digitization platform, so as to "pull" thousands of SMEs onto the fast track of digital transformation.

4.4 Digitally Driven Green Transformation: From Efficiency Improvement to Sustainable Development

Digital transformation is not only an efficiency revolution, but also a profound green revolution. Digital technology provides a powerful tool for achieving environmental management and sustainable development goals by enhancing resource utilization efficiency, optimizing energy management, and achieving accurate monitoring and predictive maintenance. Its core mechanism of action is reflected in the following three aspects:

Industrial Internet of Things (IIoT) and Precise Monitoring: By deploying a large number of sensors in production equipment, energy systems, and emission outlets, companies can collect key environmental data such as energy consumption (e.g., electricity, natural gas), water usage, and pollutant emissions (e.g., VOCs, COD) in real-time and continuously. This refined data collection enables companies to accurately identify energy consumption peaks, leakage points, and emission anomalies so that they can take targeted interventions to avoid wasting resources. For example, Fujian Nengchem Group applied the IIoT system at its petrochemical base to achieve real-time monitoring of the steam network throughout the plant, successfully reducing the steam leakage rate by 15% and saving over 10 million yuan in annual energy costs.

Digital Twin and System Optimization: By creating high-fidelity virtual copies of physical assets or production processes, Digital Twin technology is able to simulate and test different operating parameters (e.g., temperatures, pressures, and material ratios) in a virtual environment to find the optimal energy-efficiency solution and the lowest emissions path without affecting actual production. This is particularly effective in the energy-intensive chemical and materials manufacturing industries. Contemporary Amperex Technology Co., Ltd. used digital twin technology to simulate and optimize its battery drying process, and by adjusting the air speed and temperature control profile, it was able to reduce the energy consumption of the process by 8%.

Big Data Analytics and Predictive Maintenance: Correlative analysis of massive production and environmental data can reveal hidden energy consumption patterns and equipment deterioration trends. The predictive maintenance system provides early warning of equipment failure, avoiding energy waste and material scrap due to unplanned downtime. More importantly, it ensures that critical equipment (e.g., air compressors, cooling towers) is always operating at optimal conditions, maintaining high levels of energy efficiency and reducing unnecessary energy consumption and carbon emissions. Ruijie Network's Smart Factory has optimized the PUE (Power Usage Effectiveness) of its data center from 1.6 to 1.3 through big data analysis, resulting in annual power savings of more than one million kWh.

Together, these mechanisms form a complete chain of digitization-enabled green manufacturing. The following case study demonstrates the practice and effectiveness of leading enterprises in Fujian Province in this chain:

4.4.1 Case Study: Contemporary Amperex Technology Co., Ltd.' Total Zero Carbon Strategy

Contemporary Amperex Technology Co., Ltd. has deeply integrated sustainable development into its core strategy, with an ambitious goal of achieving carbon neutrality in its core operations by 2025 and in its entire value chain by 2035. The implementation of this strategy is highly dependent on digital tools:

(1) Green “Extreme Manufacturing”: The “Extreme Manufacturing” system itself contains a green gene. Through intelligent algorithms to optimize energy scheduling in real time, combined with the procurement and use of renewable energy sources such as hydropower, Contemporary Amperex Technology Co.,Ltd. has successfully certified nine “zero-carbon factories”, and by 2024, the proportion of zero-carbon electricity in its core operating segments has reached 74.51%, with the intensity of GHG emissions per unit of product (Scope 1 and 2) declining by 20.97% year-on-year. 20.97%.

(2) Supply Chain Decarbonization (Scope 3 Emissions): Recognizing that 95% of its carbon footprint comes from its upstream supply chain, Contemporary Amperex Technology Co., Ltd. launched a supplier sustainability partnership program called “CREDIT” in 2022. The program consists of 135 assessment indicators, uses a digital platform to conduct online assessments and on-site audits of suppliers, and provides training and technical support. Most critically, it directly links suppliers' ESG performance to procurement decisions and order allocation, driving green transformation across the value chain through market incentives. By the end of 2024, the program had covered its core suppliers and completed on-site assessments for 35 suppliers.

4.4.2 Case Study: Anta's Sustainable Value Chain Innovation

Anta also places sustainability at the core of its brand values and has developed a “1+3+5” sustainability strategy blueprint, committing to achieving carbon neutrality by 2050. Its practice of integrating digitalization and greening is reflected in:

(1) Sustainable Product Innovation: Anta utilizes digital design and material tracking systems to vigorously promote sustainable materials, and by 2024, the proportion of its sustainable products has exceeded 30%. For example, the “Anta Recycling” series utilizes a digital inventory management system to accurately identify and reuse backlogged fabrics, reducing raw material waste; and the Anta Rocket 6 PRO running shoes use rPET yarn sourced from recycled plastic bottles, which consumes about 12 plastic bottles per pair of shoes.

(2) Transparent Carbon Footprint Management: Anta has completed full life cycle carbon footprint assessment for 34 core products and obtained carbon neutral certification for 26 products. Meanwhile, as one of the first sporting goods companies in China to disclose Scope 3 carbon emissions, Anta has conducted ESG

audits on 786 Tier 1 suppliers in its supply chain through its digital platform, with a 100% audit coverage rate, promoting transparency and accountability across the ecosystem.

Table 3: Quantitative analysis of digitization-driven environmental benefits of leading companies in Fujian Province

Company	Initiative/Technology	Key Performance Indicator (KPI)	2024 Outcome
Contemporary Amperex Technology Co., Ltd. (CATL)	Smart Factory Energy Management System	Greenhouse gas emission intensity per unit of product	20.97% year-on-year reduction
	Renewable Energy Sourcing	Proportion of zero-carbon electricity for core operations	74.51 percent
	“CREDIT supplier program	Supply chain (Scope 3) decarbonization	On-site assessments completed for 35 core suppliers
Anta Sports (ANTA)	Sustainable material innovation and application	Percentage of sustainable products	More than 30%
	Operational Efficiency Improvements	Scope 1 GHG Emission Intensity	21.7% year-on-year reduction
	Supply Chain ESG Management	Tier 1 supplier ESG audit coverage	100% of all suppliers

As shown in Table 3, there is a direct and significant positive correlation between digitalization strategy and environmental performance. For leading companies such as Contemporary Amperex Technology Co.,Ltd. and Anta, digitalization is not only a tool to improve productivity, but also a core competency to realize the commitment to sustainable development and build long-term competitive advantages. By creating a “chain master” platform, they have transferred their green standards and digitalization capabilities upstream, which provides an important inspiration for solving the transformation dilemma of SMEs: the most effective approach may not be to provide direct support to all enterprises in a “scattergun” manner, but rather to empower “chain leader” enterprises and support them in building open and collaborative digital platforms for industrial chains, thereby pulling thousands of small and medium-sized enterprises onto the fast track of digitalization and green transformation.

5. Crossing Barriers: Challenges and Bottlenecks on the Road of Convergence Development in Fujian Province

Despite Fujian Province's remarkable achievements in digital-real integration, the road to development has not been a smooth one. This part will objectively and prudently analyze the core challenges it faces in deepening integration, especially the transformation dilemma of SMEs and deep-rooted structural barriers.

5.1 SMEs' Dilemma: Bridging the Industrial Digital Divide

Fujian Province's huge industrial base consists of tens of thousands of small and medium-sized enterprises (SMEs), which are the capillaries of the economy and the weakest link in digital transformation. These enterprises generally face the dilemma of “not daring to transform, not wanting to transform, and not being able to transform”.

5.1.1 Analysis of Specific Obstacles

High cost and unknown return: Digital transformation requires a large initial investment, including hardware procurement, software development and system integration costs. For SMEs with thin profits and tight cash flow, this is a huge expense. What's more, the return on investment (ROI) of transformation is often unclear and the cycle is long, making business owners hesitant to make decisions (Jia & Li, 2024).

Extreme lack of specialized talents: Developing new quality productive forces requires complex talents who understand both industrial processes and digital technologies. SMEs are unable to compete with large

enterprises in terms of remuneration and development platforms, making it difficult to attract and retain much-needed digital professionals (Jia & Li, 2024).

Insufficient cognition and unclear path: Many SME owners lack a clear understanding of the value and path of digital transformation; they are used to the traditional business model and worry that the transformation will disrupt the existing production order and bring uncontrollable risks (Jia & Li, 2024).

The phenomenon of "data silos" is serious: Even though some SMEs have sporadically adopted some digitalization tools (e.g. financial software, CRM systems), these systems are often not connected to each other, forming "data silos", which are unable to bring the synergistic value of data into play, but instead increase the complexity of management. On the contrary, it increases the complexity of management (Economic Herald, 2023).

Although Fujian Province has introduced a series of supportive policies, including financial subsidies and the construction of public service platforms (Department of Industry Information Technology of Fujian Province, 2025), there is still an obvious supply-demand mismatch between these universal, supply-side policies and the highly personalized and specific needs of SMEs. What a shoe manufacturer needs is not a grand industrial Internet platform, but a low-cost SaaS application that can accurately manage inventory and reduce waste. In contrast, when supporting the transformation of SMEs in Guangzhou, the city has explicitly proposed the promotion of "small, fast, light, and accurate" (small investment, quick results, light application, and accurate problem solving) digital products and solutions (Guangzhou Municipal Bureau of Industry Information Technology, 2024), which is a targeted strategy that is more closely related to the actual needs of SMEs. Although the policy system in Fujian Province also mentions standardized and modular solutions, there is still room for improvement in its emphasis and refinement. This suggests that Fujian Province needs to shift from the macro supply-side thinking of "build platforms and give subsidies" to fostering a vibrant service provider ecosystem that can provide a large number of "small, fast, light and accurate" solutions.

5.2 Systemic and Structural Challenges

In addition to the individual plight of SMEs, Fujian Province's digital integration also faces deeper institutional barriers.

The data governance and security system has yet to be perfected: although Fujian is at the forefront of public data openness in the country (Fujian Provincial People's Government, 2024b) and is actively exploring the reform of market-based allocation of data elements (Fujian Daily, 2024), it still inevitably faces common national challenges. The legal and regulatory system on core issues such as data property rights attribution, data asset pricing, cross-border flow of data, data transaction standards and definition of security responsibilities are still imperfect (National Development Reform Commission of the People's Republic of China, 2022). These institutional uncertainties greatly constrain the willingness and ability to engage in deep data integration among enterprises, especially cross-industry enterprises.

Structural gaps in the talent ecosystem: The development of new productivity calls for a large number of "composite talents" capable of cross-border integration (National Development and Reform Commission of the People's Republic of China, 2024). However, there is a structural gap between the current talent cultivation system and industrial demand (Jia & Li, 2024). The curricula of colleges and universities cannot keep up with the technology, and there is a gap between the practical training content of vocational education and the actual application scenarios in factories. Although the government work report of Fujian Province has put forward the ambitious goals of building a "youth development-oriented province" and a "provincial academy of engineers of excellence" (People's Daily Online, 2025), it is important to turn the blueprints into reality and to build a vocational education system that can consistently and steadily produce qualified "new-quality workers" and "new quality workers". However, transforming the blueprint into reality and building an ecosystem that can continuously and steadily cultivate qualified "new quality workers" is a long-term and arduous task.

Institutional innovation is lagging behind technological development: this echoes the central point made in Part 1 that the rapid development of productive forces is forcing changes in production relations. Currently, the pace of technological and infrastructural progress has outpaced the evolution of relevant laws, regulations,

industry standards and market regulatory mechanisms. As pointed out in official documents, the development of new productivity is still facing many “blockages” (The Central People’s Government of the People’s Republic of China, 2024). These “choke points” may be an outdated industry entry standard or a regulatory system that does not adapt to the data-driven model (National Development Reform Commission of the People’s Republic of China, 2022). This lag is a fundamental constraint that limits the progress of digital integration in Fujian Province to a deeper level.

5.3 Constructing Effective Evaluation and Feedback Mechanisms

In order to ensure that the policy truly promotes the digital transformation of SMEs, it is necessary to establish a set of effective evaluation and feedback mechanisms. Current subsidy policies are mostly “one-time” inputs that lack continuous tracking and dynamic adjustment of transformation effects, making it difficult to ensure the effective use of funds and long-term effectiveness. For this reason, it is recommended that a system of “digital transformation vouchers” be introduced and that a closed-loop evaluation and feedback system be constructed.

First of all, the Government can issue “digital transformation vouchers” to eligible SMEs, with which enterprises can purchase “small, fast, light and accurate” digitalization solutions from certified service providers. This can match funds directly with enterprise needs and solve the problem of “mismatch between supply and demand”. Second, establish a system for evaluating the effectiveness of digital transformation. The system should include quantifiable key performance indicators (KPIs), such as productivity improvement rate, unit energy consumption reduction rate, inventory turnover rate, order delivery cycle reduction rate. Service providers are required to submit initial effectiveness reports after project delivery.

Most critically, a dynamic feedback and optimization mechanism is established. Government departments or third-party assessment agencies should conduct regular (e.g., quarterly or semi-annually) return visits and data verification for enterprises using transformation vouchers to assess the actual effects of their digital applications. The assessment results should be used as an important basis: on the one hand, for optimizing the issuance strategy and criteria of “transformation vouchers”; on the other hand, for rating and dynamic management of service providers, eliminating those with poor service results, and incentivizing service providers to continue to innovate and improve service quality. Through this closed loop of “application-implementation-assessment-feedback-optimization”, the policy support will change from static “blood transfusion” to dynamic “blood creation”, forming a demand-driven, performance-oriented, and continuously evolving digital transformation support ecosystem, and thus bridging the industrial digital divide more effectively.

6. Strategic Outlook: Comparative Reference and Fujian Paths

Based on a comprehensive analysis, this section proposes a set of forward-looking and actionable strategic recommendations aimed at accelerating its high-quality development by comparing it with advanced provinces in China and combining it with Fujian's own unique advantages.

6.1 Insights from Benchmarking: Comparative Analysis with Guangdong and Zhejiang

By benchmarking with Guangdong Province and Zhejiang Province, the two major highlands of digital economy development in China, Fujian's strengths and development direction can be more clearly positioned.

Guangdong's “chain transformation” model: Guangdong's strategy centers on “seizing the leading role and driving the whole chain”. Its policies are precisely focused on “one policy for one enterprise”, “one policy for one line” and “one policy for one chain”. By supporting “chain master” enterprises (e.g. Huawei, Midea) to build digital collaboration platforms around specific industrial chains (e.g. automobiles, home appliances, electronics and information), it drives small and medium-sized enterprises (SMEs) upstream and downstream of the whole industrial chain to realize batch and group transformation (National Development Reform Commission of the People’s Republic of China, 2021).

Zhejiang's “Platform Economy and Digital Ecology” model: Zhejiang's success is due to the fact that it has fostered a vibrant digital ecosystem centered on giant platform companies such as Alibaba. Its policy focuses

on creating an optimal environment for the development of the platform economy, encouraging data sharing and model innovation, and allowing digital capabilities to penetrate all corners of the economy and society through platforms like water and electricity (Zhejiang Provincial Department of, 2021).

Fujian's Hybrid Model and Unique Advantages: In contrast, Fujian Province is exploring a hybrid model. It has world-class "chain owners" like Contemporary Amperex Technology Co.,Ltd. and Anta, which have the potential to implement "chain transformation"; at the same time, the government-led construction of "Digital Fujian" has laid the foundation for a strong public digital infrastructure. At the same time, the government-led construction of "Digital Fujian" has established a strong public digital infrastructure. However, Fujian has a unique geographic and economic advantage that neither Guangdong nor Zhejiang possesses - deep ties with Taiwan.

The Fujian government work report has already mentioned the establishment of the mainland's first cross-strait industrial investment fund initiated by Taiwanese businessmen, and the cumulative development of 285 cross-strait common standards, among other achievements (People's Daily Online, 2025). Taiwan possesses the world's top technology and management experience in the fields of semiconductors, precision manufacturing, and information and communication technology (ICT), which are precisely the key elements for the development of new quality productive forces. Fujian's industrial structure in electronics and information technology is highly complementary to that of Taiwan. Therefore, Fujian's strategy towards Taiwan should not be confined to the traditional level of attracting investment and expanding trade, but should be elevated to the strategic level of jointly cultivating new quality productive forces. This means that Fujian can go beyond the simple undertaking of industrial transfer and work with Taiwan to build a future-oriented collaborative R&D platform, an integrated supply chain for advanced manufacturing, and a joint training system for high-end digital industrial talents. This is not only economic cooperation, but also a strategic layout to jointly shape the future competitiveness of industries, which is a unique "trump card" that Fujian can play in the new round of regional competition.

6.2 Strategic Suggestions for Accelerating High-quality Development

Based on the above comprehensive analysis, in order to promote Fujian Province to realize leapfrog development on the track of new quality productive forces, the following four strategic recommendations are proposed:

Recommendation 1 (for the government): From "provider" to "eco-enabler", leading development with institutional innovation

Given the fundamental bottleneck of "production relations lagging behind the development of productive forces", the core role of the government should be changed from a "provider" that directly invests in the construction of infrastructure to an "ecological enabler" that creates rules and optimizes the environment. ".

Strive to create an advanced zone for the reform of market-oriented allocation of data elements: on the basis of the existing good foundation (Fujian Daily, 2024), boldly early and pilot implementation of provincial-level data asset assessment, registration, listing, trading and security protection of the implementation of the rules and local laws and regulations. Set up a "digital economy regulatory sandbox" to provide a safe space for data-driven new business models to tolerate mistakes and trial and error.

Promote industrial upgrading through standards and procurement: Revise and implement industry standards for the digital era. In government procurement and major project bidding, explicitly tilt toward products and services that use digital technology and meet green and low-carbon standards, and use the government's purchasing power to create market demand and guide business transformation.

Deepen the construction of digital government and break down internal barriers: In accordance with the Digital Government Construction Plan (People's Daily Online, 2025), resolutely break down data barriers between government departments, take the lead in realizing "one network sharing and one network handling" of government data, set a benchmark for the integration and utilization of data in the whole society, and improve the efficiency of public services.

Recommendation 2 (industry-oriented): Cultivate a collaborative platform led by "chain masters" to systematically promote SMEs.

Based on the analysis of the "chain master effect" and the "plight of small and medium-sized enterprises", the most efficient path to digitalization popularization is to conduct and empower leading industrial chain enterprises.

Special support for the construction of industry chain collaboration platforms: Set up special funds and supporting policies, focusing on supporting "chain master" enterprises in various industries, such as Contemporary Amperex Technology Co.,Ltd., Anta, Fuyao Glass, etc., to take the lead in constructing open and low-threshold industry chain digital collaboration platforms for their upstream and downstream suppliers and partners.

Create a "small, fast, light and accurate" solution supermarket: guide and support these collaboration platforms to join hands with excellent digital service providers to develop and provide a series of proven, low-cost, high-return digital solutions that are "small, fast, light and accurate", forming a "plug-and-play" solution catalog.

Implementation of "on-platform" precise incentives: extend incentives such as financial subsidies or tax concessions from purely subsidizing "chain-owning" enterprises to SMEs that have successfully accessed and are active in these collaborative platforms, so as to stimulate demand-side enthusiasm and create a "chain-owning" enterprise that is able to use these platforms. By stimulating the enthusiasm of the demand side, a virtuous cycle will be formed in which "chain owners" are willing to build and SMEs are willing to participate.

Recommendation 3 (for innovation system): Launch a systematic cultivation program for "new quality workers".

Talent is the first element of the new quality productive forces (National Development and Reform Commission of the People's Republic of China, 2024), and solving the structural talent gap is the fundamental guarantee for Fujian Province to maintain long-term competitiveness.

Building a community of deep integration between industry and education: Coordinate at the provincial level to promote the establishment of a real community of integration between vocational colleges, applied undergraduate colleges and key enterprises. This should go beyond the traditional internship model, realizing curriculum co-construction, mutual hiring of teachers, co-management of laboratories, and promoting the "dual-mentor system", so that students can deeply participate in the actual projects of enterprises during their school years.

Focus on "digital blue-collar" and "Industrial Engineer 4.0": Talent cultivation program should set up two key directions: The first is "digital blue-collar" skilled personnel for the operation, maintenance and debugging of smart factories; the second is "Industrial Engineer 4.0" composite talents for the design, deployment and optimization of smart manufacturing systems.

Activate the advantages of talent cooperation with Taiwan: Make full use of the unique advantages of Taiwan and set up special programs to actively introduce Taiwan's senior experts and technology leaders in the fields of precision manufacturing, semiconductors, ICT, etc. to serve as visiting professors, chief scientists or project consultants to Fujian's colleges and universities and enterprises, so as to rapidly enhance the level of local talent cultivation and R&D capabilities.

Recommendation 4 (for future growth): Set up a "digital sandbox" to cultivate future industries in a forward-looking manner.

The development of new productivity requires not only upgrading the stock, but also laying out the increment (The Central People's Government of the People's Republic of China, 2024). Fujian Province has identified future industries such as low-altitude economy and commercial spaceflight (Southeast Net, 2025), which require creative policy tools to accelerate the incubation process from concept to industry.

Creating an "application-first" digital sandbox: The government defines a physical or policy "sandbox" area for a specific future industry. Within the sandbox, a highly open policy environment (e.g., airspace use,

data sharing), comprehensive digital infrastructure (e.g., 5G-A network, high-precision positioning services), and a certain amount of startup capital are provided to attract global startups and scientific research teams to come to test and validate their application scenarios.

Focus on digital-native future industries: Prioritize industrial directions that are highly bound to digital technology and Fujian's resource endowment. For example, the development of a data-driven "smart ocean" economy with the advantage of a long coastline; the development of commercial satellite data application services around the "Haisi Constellation" satellite project (Fujian Provincial & Reform Commission, 2025); and the provision of digitized intelligent logistics and airspace management solutions for the low-altitude economy. The solution is to provide digitalized intelligent logistics and airspace management solutions for the low-altitude economy. In this way, we can ensure that the next wave of industries in Fujian Province will have the "digital gene" of new productivity from the very beginning.

7. Conclusion

This study explores the paths, challenges and policy responses to the deep integration of the digital economy and the real economy from the perspective of new quality productive forces in Fujian Province. The study finds that the integration of digital and real economy in Fujian Province presents a "dual structure": leading enterprises such as Contemporary Amperex Technology Co.,Ltd. and Anta have deeply applied digital technology to realize the leap from efficiency enhancement to value creation and green transformation, and their status as "chain masters" has a significant leading role in upgrading the industrial chain. However, the majority of small and medium-sized enterprises (SMEs) are still generally facing the predicament of "not daring to switch, not wanting to switch, and not knowing how to switch", forming an obvious industrial digital divide and restricting the development of the region's overall new quality productive forces.

The importance of this study lies in the fact that it not only validates the digital-real integration as a key path to develop new quality productive forces, but also reveals its internal non-equilibrium and complexity. The study emphasizes that the role of the government should be changed from a direct financial provider to an efficient ecological enabler. To this end, this paper proposes the construction of a new type of support system, which takes "chain master" enterprises as the traction, "small, fast, light and accurate" solutions as the supply, and "digital transformation vouchers" as the carrier, evaluated through a data-driven dynamic feedback loop, aiming to accurately match supply and demand and improve policy effectiveness.

The limitation of this study is that the case study mainly focuses on head enterprises, and more in-depth field research and quantitative verification are needed to investigate the micro-decision-making process of SMEs' transformation and the actual diffusion effect of the "Chain Master" platform. Future research could further track the pilot effect of the "transformation voucher" mechanism or use econometric methods to assess the actual impact of different policy tools on SMEs' digitization level.

Overall, bridging the "dual structure" gap and promoting digital integration in a broader, deeper and greener direction is the key to realizing high-quality development in Fujian Province and the whole country. The policy design should pay more attention to systematic, precise and sustainable, and lay a solid foundation for the vigorous development of new quality productive forces by building an open, collaborative and resilient ecosystem for digital transformation.

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Conflicts of Interest

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