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Mechanisms and Policy Implications for Enhancing International Market Power of SRDI Intelligent Equipment Manufacturing: A Product Space Perspective

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ABSTRACT

Cultivating "Specialized, Refined, Differentiated and Innovative" (SRDI) enterprises has become a key lever for forging new international competitive advantages in China's industries. Drawing on product space theory, this paper analyses the internal mechanisms through which SRDI intelligent equipment manufacturing firms enhance their international market power from the perspective of capability evolution. The study finds that, by continuously accumulating specialised capabilities within niche market segments, SRDI firms extend their product portfolios toward nearby goods in the product space, thereby achieving gradual product leaps. Such adjacent transitions densify the regional product network and generate a self-reinforcing cycle of capability iteration and product expansion, which ultimately translates into international market power in the forms of differentiated pricing capacity and dominance over niche markets. The paper further identifies four core mechanisms: capability accumulation, adjacent product leap, cluster densification, and the construction of standard-setting discourse power. On this basis, targeted policy implications are proposed, including consolidating niche capability foundations, precisely supporting adjacent product transitions, promoting dense and coordinated industrial clusters, and competing for voice in international standard-setting.

KEYWORDS

SRDI enterprises; Intelligent equipment manufacturing; International market power; Product space

1. INTRODUCTION

The report to the 20th National Congress of the Communist Party of China explicitly calls for accelerating the building of China into a manufacturing power and promoting the high-end, intelligent and green development of the manufacturing sector. As a strategic and pioneering industry that underpins the modern industrial system, the intelligent equipment manufacturing industry serves as the core carrier for measuring a country's technological strength and its capacity to seize the initiative in global industrial competition [1]. Backed by China's ultra-large domestic market, sustained policy support, rapid technological iteration and a complete supporting industrial chain, the scale of China's intelligent equipment industry has continued to expand, and it has become the world's largest producer and consumer of such equipment. However, against the backdrop of a restructuring global division of labour and intensifying geopolitical rivalry, the high-end intelligent equipment segment remains dominated by developed economies. Coupled with the two-way squeeze of "high-end re-shoring" by developed countries and "mid-to-low-end diversion" by emerging economies, the outward-oriented

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development of China's intelligent equipment industry faces considerable external pressure. From an internal industry perspective, the bulk of domestic intelligent equipment manufacturers are small, medium and micro enterprises that generally suffer from insufficient innovation investment, weak risk resistance and low brand recognition for high-end products. They have long been locked into the low-to-mid end of the global value chain (GVC), trapped in the dual dilemma of hardened low-level market power and the absence of international pricing power and rule-making voice, while the "chokepoint" risks surrounding key core technologies have not yet been fundamentally resolved [2].

Cultivating and expanding SRDI enterprises is a critical lever for consolidating the industrial foundation, advancing sci-tech self-reliance and self-improvement, and breaking through bottlenecks in high-end equipment technology [3]. As innovation vanguards in niche segments, SRDI intelligent equipment firms focus intently on specialised fields and constitute the core force driving China's intelligent equipment manufacturing industry up the GVC and shaping new international competitive advantages [4]. Against this backdrop, how to fully release the niche-innovation advantages of SRDI firms, break through the low-end lock-in of the GVC, and continuously enhance the industry's international market power has become a shared concern of industrial practice and academic research. Existing studies mostly discuss the evolution of market power from the perspectives of innovation input, GVC and government subsidies, but rarely examine, through the capability linkages and adjacent product-leap logic of the product space, the internal mechanisms by which SRDI enterprises form international market power. Product space theory interprets the evolution of comparative advantage and industrial upgrading from the perspective of production capability carriers, and thus provides a well-suited analytical framework for dissecting product expansion, capability reconstruction and the cultivation of international competitive advantage in the SRDI intelligent equipment manufacturing industry. Accordingly, this paper first systematically reviews the literature on intelligent equipment upgrading, product space theory and international market power, and identifies the limitations of existing research; it then explicates the inherent compatibility between product space theory and the upgrading of the SRDI intelligent equipment manufacturing industry; next, it constructs a theoretical chain of "niche capability accumulation→adjacent product leap→product space densification→manifestation of market power" to reveal the mechanisms underlying the enhancement of international market power in the SRDI intelligent equipment manufacturing industry; finally, it derives targeted policy implications from the theoretical deduction, with a view to providing a theoretical reference for transforming China's intelligent equipment industry from scale advantage into sustainable international competitive advantage.

2. LITERATURE REVIEW

2.1. Research on the Development Status and Innovation Upgrading of China's Intelligent Equipment Manufacturing Industry

2.1.1. Development Status of China's Intelligent Equipment Manufacturing Industry

The intelligent equipment manufacturing industry refers to the industry that applies advanced manufacturing, information and intelligent technologies to provide advanced manufacturing equipment with functions of perception, analysis, reasoning, decision-making and control [5]. Characterised by high automation, intelligence and precision [6], it is a multi-disciplinary, technology-intensive strategic emerging industry. China's intelligent equipment manufacturing industry is dominated by small and medium-sized enterprises (SMEs) [7], which confront difficulties such as "technological dependence", "low-end lock-in" and "lack of international voice" amid fierce international competition [2]. "Specialisation, refinement, differentiation and novelty" represent the future direction of the industry and, more importantly, a key move for accelerating the resolution of "chokepoint" problems [3]. Under a complex political and economic landscape, in the face of challenges from international trade frictions and opportunities for industrial upgrading, "specialized,

refined, differentiated and innovative" SMEs have received unprecedented attention [1]. In 2021, a meeting of the Political Bureau of the CPC Central Committee explicitly proposed vigorously developing such SMEs. In February 2022, the 24th meeting of the Central Committee for Deepening Reform further emphasised strong support for SRDI SMEs to deepen reform and strengthen innovation. As vanguards of sci-tech self-reliance [4], SRDI SMEs have become the engine driving the high-quality development of China's intelligent equipment manufacturing industry.

2.1.2. Research on Innovation Upgrading in China's Intelligent Equipment Manufacturing Industry

The innovation capability of artificial intelligence (AI) technologies is the core driver of innovation upgrading in the intelligent equipment manufacturing industry [8], and it is also the essential foundation for firms to gain high recognition, capture market share and maintain leadership in international markets. Innovation upgrading in this industry generally takes the form of evolutionary innovation—continuous optimisation and improvement of existing products or services—and exhibits strong path dependence [9], being influenced primarily by factors such as technological accumulation, factor endowments, industrial capabilities, supply-chain configuration, market size and the policy environment [10]. SRDI SMEs concentrate on niche markets and deep tillage of "small units", enabling rapid adjustment and iteration and facilitating flexible product innovation [11]. Intelligent equipment products are characterised by high technological input, high intellectual-property barriers and long R&D cycles. The upgrading of the industry, marked by product-iteration innovation, is a dynamic process in which new products emerge from complex interactions within a technological knowledge base, constituting a complex systemic endeavour encompassing innovation input, industrial synergy, human capital and institutional incentives. From the perspective of import supply, Yu LiuMing and Huang XianHai point out that imports of intelligent equipment exert heterogeneous effects on the innovation quality of domestic manufacturing firms; this indirectly indicates that the supply structure of high-end intelligent equipment directly constrains the leap of local firms' innovation capability, and also implies that breaking free from external technology-supply dependence and autonomously accumulating innovation capability is an important path for SRDI firms to improve innovation quality [12]. Existing literature has identified multiple drivers of upgrading in the intelligent equipment industry, but most treat firms as homogeneous entities, paying insufficient attention to the innovation characteristics of SRDI SMEs—"small track, strong focus, high capability specificity"—and rarely discussing how such entities transform niche technological advantages into global market competitive advantages.

2.2. Research on Product Space Theory, Product Space and Industrial Upgrading

2.2.1. The Connotation, Analytical Framework And Applications of Product Space

Product space theory, also known as the theory of comparative advantage evolution, describes the correlation and similarity among different products [13]. Drawing on social network theory and methods, it incorporates capabilities embodied in products and inter-product linkages into a product network structure, visually displaying the technological connections among products and the evolutionary trend of the product space structure [14]. Product space theory holds that a product itself embodies information on a country's or region's factor endowments such as capital, labour and technology. There exists a certain degree of similarity between products and industrial sectors: the particular combination of production factors required for producing one type of good can be partially reused to produce another similar good. Thus, the structural characteristics of the product space determine the evolutionary path of industrial comparative advantage [15]. In summary, the basic connotation of product space is as follows: products are heterogeneous; they are carriers of production knowledge and capabilities, and different products require different production capabilities; different products constitute a heterogeneous, discrete product-space network; the heterogeneous product space evolves dynamically, with upgrading from simple to complex products and the transition of

product space from sparse to dense representing a country's economic development process; and the denser the product space, the higher the probability of product upgrading [16]. Product space serves as a distance-measurement tool that integrates endowment and market information. As a theoretical analytical framework, it emphasises that entrepreneurs face costs and risks in discovering new products, along with substantial information and technological externalities. It has been applied mainly to topics such as industrial upgrading and policy choice, corporate strategic decision-making, high-quality economic development, and the structural transformation and upgrading of export products [17].

2.2.2. Industrial Upgrading Under The Product Space Framework

Industrial upgrading under the product space framework does not focus on the simple recombination of a few broad production factors, but rather on the accumulation of industrial capabilities [18]. From a product perspective, a country's economic structure is a composite formed by thousands upon thousands of products, and the upgrading of the economic structure consists of a shift from a product portfolio dominated by few, simple-process, low-technology-intensive goods to one dominated by diverse, complex-process, high-technology-intensive goods. The industrial upgrading of a country or region is a function of its production capabilities [17], and producing new goods or transforming into new industries is determined by existing production capabilities [19]. A country tends to use the capabilities it already has and can possess; that is, "what a country produces comes from what it knows." The proximity among products constitutes the product space, reflecting the state of the existing capability set the country holds. The evolution of the product space is guided primarily by technological, organisational and institutional capabilities accumulated at the local level, and a country's position in the product space determines the path of industrial upgrading. Industrial upgrading under the product space framework exhibits significant path dependence [19], depending mainly on industrial capability endowments, the similarity between the capability endowments required for new products and those of existing products, and the government's guiding role regarding industrial capability endowments. Domestic scholars have focused mainly on the following topics: economic complexity, product distance and industrial upgrading; upgrading paths of specific industrial structures and evaluations of industrial policy [20]; and cross-national economic or industrial complexity research [21]. Cheng JiaJia et al., from the perspective of product linkages, further supplement that the linkage endowments within the product space can significantly enhance the resilience of manufacturing exporters. This implies that a dense product-linkage network not only favours industrial upgrading but also helps firms withstand external trade shocks, providing new evidence for understanding the outward competitive value of product space structure [22]. Dong JieMiao et al., by distinguishing internal and external product networks, confirm from the information-flow perspective that product networks can empower enterprise innovation through knowledge transfer. This reveals that the product space is not merely a static carrier of capability distance but also a dynamic network carrying interactive innovation information, providing a micro-foundation for understanding the innovation-amplifying effect of product-space densification [23]. Overall, the product-space literature excels at explaining the evolution of comparative advantage and the path of industrial leap, but existing studies mostly stop at export structure and industrial transformation, rarely extending to niche equipment industries, and seldom establishing direct mechanistic links between network position in the product space, adjacent leaps, and competitive outcomes such as market power and pricing capability.

2.3. Research on International Market Power, Industrial Upgrading and International Market Power

2.3.1. The Connotation, Measurement and Determinants of International Market Power

International market power refers to a firm's ability to influence product prices in international markets and obtain excess profits, manifested primarily in five aspects: firm growth, market share,

profitability, investment capability and the firm's markup rate [24] — that is, better growth ability, larger market share, stronger profitability, more investment opportunities and higher monopoly profits. International market power is a dynamically evolving capability: firms can win a market monopoly position through technological innovation, organisational change, optimised supply-chain management and other means, thereby obtaining extra returns. Existing literature measures international market power mainly along three dimensions: first, direct measurement indicators, such as market concentration, the Lerner index, and the product of a firm's sales share and the Lerner index [25]; second, indirect model inference, which estimates market power indirectly through indicators such as demand price elasticity and residual demand elasticity [26]; and third, the Solow residual approach, mainly conducted through the Hall model and its extensions [27]. In addition, the construction of international market power is a complex system that depends not only on an industry's own production efficiency and technological level but also on factors such as the trade environment, market demand and policies and regulations [28]. To enhance firms' international market power, governments and enterprises should work together to further optimise the policy environment, improve technological innovation capability and added value, price products reasonably, and actively participate in international competition and cooperation.

2.3.2. The Relationship Between Industrial Upgrading and International Market Power

Industrial upgrading refers to the improvement of industrial structure and the enhancement of industrial quality and efficiency [29]. If firms wish to obtain greater market power, they must move toward the high end of the industrial chain. Market power is closely related to industrial structure: upgrading the industrial structure means firms shift from producing low-value-added products to producing high-value-added products, which correspondingly increases their profit margins and brand influence, thereby strengthening their international market power. At the same time, firms with strong international market power can more easily achieve optimised allocation of resources worldwide, providing strong support and guarantees for industrial upgrading. By constructing market power, China can form a virtuous cycle in which market power and innovation interact, thereby promoting the optimisation of production structure and the commodity structure of exports [30]. There exists a dynamic interactive relationship between industrial upgrading and international market power, and the virtuous cycle between the two jointly drives the sustainable development of industry. If firms lack market power, they can only act as price takers, earning average or even below-average market profits; once firms possess sufficient market power, they will raise market concentration through mergers or restructuring, alter the industrial structure within the sector, achieve control over the business environment, and increase monopoly profits and market power [31]. Domestic empirical studies find that the similarity of export commodity structures among firms is the main reason for the lack of international market power among Zhejiang's textile industry firms [27]. However, existing studies mostly discuss market power from the perspectives of value chains, innovation input and export similarity, and rarely explain the generative logic of market power from the perspective of capability evolution, neglecting the underlying role of capability proximity in product networks and opportunities for new-product expansion in the leap of market power.

Overall, existing research has conducted thorough discussions on the upgrading of the intelligent equipment industry, product space theory, and the connotation, measurement and driving factors of international market power, laying a solid theoretical foundation for this paper. Nevertheless, three notable gaps remain. First, there is insufficient targeted research on SRDI entities. Most studies on intelligent equipment upgrading do not distinguish the heterogeneity between SRDI SMEs and large enterprises, and rarely address how SRDI firms rely on specialised innovation in niche segments to shape international competitive advantages. Second, the theoretical perspectives are fragmented and lack cross-integration. Product space research focuses on explaining the evolutionary path of comparative advantage but stops at industrial upgrading without further connecting to international market power; market power research concentrates on innovation, trade and value-chain factors, without constructing mechanisms from the evolutionary perspective of product capability networks

and adjacent product leaps. Third, the complete transmission chain has not yet been revealed: how SRDI firms, by relying on adjacent product expansion, capability accumulation and optimisation of network position in the product space, transform these into enhanced international market power. To address these gaps, this paper attempts to build an analytical framework from the product space perspective, clarify the internal mechanisms underlying the enhancement of market power, and derive precise industrial policy implications, thereby supplementing empirical evidence and theoretical explanations in this direction.

3. THE COMPATIBILITY BETWEEN PRODUCT SPACE THEORY AND THE UPGRADING OF THE SRDI INTELLIGENT EQUIPMENT MANUFACTURING INDUSTRY

Product space theory provides a highly compatible analytical framework for understanding the upgrading of the SRDI intelligent equipment manufacturing industry. Its theoretical core is deeply aligned with the innovation logic of firms in this sector at three levels: capability carrier, evolutionary path, and upgrading mechanism.

Product space theory posits that products are not isolated outputs but material carriers of specific combinations of production factors and production capabilities. Different products are "near" one another because the capabilities they require are similar, and all products along with their proximity relations form a heterogeneous network structure. At the operational level, product proximity is typically characterised by the joint probability that two products simultaneously exhibit comparative advantage in the same economy; the higher the proximity, the more similar the capability combinations required for producing the two products. The product space is precisely the network woven by these pairwise proximity relations, with products of varying complexity distributed across different network positions: products in the dense core are closely technologically linked and highly mutually accessible, whereas products at the sparse periphery are isolated from one another and difficult to leap to. Accordingly, industrial upgrading is not simply an increase in output or quality within a given product set, but rather a "product leap" built on existing capability accumulation: economic agents tend to start from current products and expand toward new goods along the directions with the shortest capability distance and highest proximity, with comparative advantage evolving in the product space from sparse to dense [14]. This theory reveals the fundamental constraint on upgrading—the capability boundary of industrial upgrading depends on the set of production capabilities embodied by existing products and their position in the product space. The higher the product proximity and the denser the product space, the easier it is to achieve nearby leaps; conversely, if existing capabilities are too far from the target product, upgrading faces an insurmountable capability gap. Therefore, product space theory characterises upgrading as a continuous process of strong path dependence, heavy emphasis on capability accumulation, and breakthroughs step by step along adjacent products. This is highly consistent with the upgrading characteristics of the intelligent equipment manufacturing industry, which emphasises technological accumulation, gradual iteration, and product extension based on existing process capabilities, providing direct theoretical support for analysing its upgrading mechanism from the perspectives of product proximity and capability accumulation.

As for the SRDI intelligent equipment manufacturing industry, the characteristics of its main entities are naturally compatible with the evolutionary logic of the product space. On the one hand, SRDI SMEs take "specialisation, refinement, differentiation and novelty" as their core, focusing on niche segments over the long term and deepening specific products, thereby forming highly specialised and difficult-to-replicate process and capability accumulation in a narrow domain [3]. This "small-unit, deep-accumulation" characteristic is precisely a typical manifestation of the "capability carrier" attribute emphasised by product space theory—the upgrading potential of a firm is embedded mainly in the capability stock it has accumulated on niche products. On the other hand, upgrading in the

intelligent equipment manufacturing industry generally manifests as evolutionary innovation, i.e., continuously optimising existing product and process knowledge bases and gradually expanding product lines [1], exhibiting significant path dependence. This upgrading mode corresponds to the logic in product space of "leaping along adjacent products and extending on the basis of existing capabilities": SRDI firms do not cross into entirely new fields out of thin air, but gradually accumulate comparative advantage and expand producible product combinations within their own product-neighbourhood. It is precisely because of this structural correspondence between firm capabilities and the product space that product space theory can effectively depict the internal cycle of "the stronger the capability, the easier the access to adjacent products, and the smoother the upgrading" for SRDI intelligent equipment firms, thereby providing a suitable theoretical perspective for analysing their upgrading mechanism.

More crucially, the compatibility between product space theory and the upgrading of the SRDI intelligent equipment manufacturing industry points not merely to a descriptive framework but, more importantly, to the deeper mechanism by which international market power is enhanced. On the one hand, the strength of international market power depends essentially on the position a firm occupies in the global division of labour and product network and the level of capabilities it carries; every capability leap in the product space means that the firm's producible product portfolio expands toward higher complexity and added value, thereby changing its position in international market pricing, bargaining and profit capture [19]. SRDI firms' achievement of product leaps through niche capability accumulation is precisely the micro-foundation for breaking through low-end lock-in and climbing from the mid-to-low end of the GVC to high-end segments. On the other hand, product-space densification and capability accumulation exhibit positive-feedback characteristics: after a firm successfully leaps along adjacent products, its capability set expands, which further reduces the proximity distance for subsequent upgrading, forming a spiralling upward path of "capability accumulation→product expansion→enhanced market power→further upgrading." This mechanistic framework can precisely explain how SRDI intelligent equipment firms transform niche technological advantages into international competitive advantages, providing a direct theoretical interface for dissecting the enhancement mechanism of international market power from the product space perspective and thereby deriving policy implications. It should be noted that this compatibility is not an abstract theoretical analogy; rather, it is built upon the shared underlying logic of "capability-constrained upgrading." SRDI firms, constrained by limited resources, can only expand gradually within the proximity of existing capabilities. Product space theory precisely elevates this micro-level constraint into observable structural indicators such as proximity, density and network position, enabling the process of capability accumulation to be accurately characterised and measured. It is precisely through this correspondence that policy instruments can shift from previous blanket R&D subsidies and scale support to precisely identifying "leap nodes" in the product space, guiding firms to upgrade orderly along adjacent paths so as to amplify their international market power; it also allows product-space indicators to become operational handles for measuring capability leaps and changes in market power. Thus, product space theory and the upgrading of the SRDI intelligent equipment manufacturing industry are highly compatible at the three levels of capability carrier, evolutionary path and upgrading mechanism. This compatibility not only provides a theoretical interface for mechanistic analysis but also identifies the focal points for precise industrial policy aimed at niche segments.

4. MECHANISMS UNDERLYING THE ENHANCEMENT OF INTERNATIONAL MARKET POWER IN THE SRDI INTELLIGENT EQUIPMENT MANUFACTURING INDUSTRY: A PRODUCT SPACE PERSPECTIVE

International market power is essentially the manifestation of a firm's positional advantage in the global product network. Its enhancement is not directly determined by isolated factor inputs, but is jointly driven by capability accumulation, adjacent product leaps and network densification in the product space. Accordingly, based on the progressive mechanistic chain of "capability accumulation→positional leap→manifestation of market power," this section elaborates on the mechanisms underlying the enhancement of international market power in the SRDI intelligent equipment manufacturing industry.

4.1. Niche Capability Accumulation: The Fundamental Premise for Upgrading Position in the Product Space

The first mechanism of international market power enhancement lies in SRDI intelligent equipment firms reshaping their initial position and upgrading potential in the product space through continuous capability accumulation in niche fields. Product space theory shows that products are material carriers of production capabilities, that product proximity depends on the similarity of the capabilities required to produce two products, and that economic agents can only expand their production portfolio along adjacent directions reachable by existing capabilities. In other words, which products a firm can leap to is essentially constrained by the capability stock it has already accumulated: the deeper the capability, the broader the range of new products that can be developed along adjacent directions, and the higher the reachable density in the product space. For SRDI intelligent equipment firms, with "specialisation, refinement, differentiation and novelty" as their core, they have long cultivated a specific niche segment and formed highly specialised, difficult-to-replicate knowledge accumulation in specific processes, materials, control and integration technologies [3]. Such niche capability accumulation exhibits three characteristics: first, depth—the firm pushes individual capabilities to the extreme in a narrow field, forming significant specialised assets; second, sedimentation—capabilities are embedded in production processes, tooling and fixtures, and tacit process knowledge, making them difficult for competitors to simply imitate; and third, extensibility—niche capabilities do not exist in isolation but, as "capability nodes" in the product space, connect through proximity relations to more complex, higher-value-added product portfolios. Thus, capability accumulation continuously raises the initial position of SRDI firms in the product space, expanding the set of adjacent products they can leap to and increasing the probability of crossing capability gaps, thereby providing the most fundamental precondition for enhancing international market power. It should be emphasised that, unlike general manufacturing firms that rely on scale expansion and the proliferation of generic capabilities, SRDI firms' capability accumulation emphasises the focused logic of "using specialisation to drive refinement, and refinement to drive strength." Under the constraint of limited resources, by making niche capabilities industry-leading, firms first establish comparative advantage at a given product node and then use it as a foothold to extend into adjacent fields. This "less-but-refined" capability accumulation path precisely fits the core assumptions of product space theory regarding capability carriers and proximity relations, enabling firms with insufficient capability stock to nonetheless achieve a pioneering local positional leap through concentrated investment, thereby opening a window for subsequent cultivation of international market power.

4.2. Adjacent Product Leap: Reconstructing Comparative Advantage and Improving International Competitive Position

The second mechanism of international market power enhancement lies in SRDI firms' step-by-step leaps along product proximity directions on the basis of existing capabilities, thereby achieving increased complexity of the production portfolio and reconstruction of comparative advantage, and fundamentally improving their international competitive position. From the product space perspective, industrial upgrading is not aimless cross-sector expansion but a process of moving step by step along the product proximity network: an economy tends to start from its current products and expand toward new goods along directions with the shortest capability distance and highest accessibility, with comparative advantage evolving from low-technology-intensive product portfolios to high-technology-intensive ones [19]. This logic has particular applicability to SRDI intelligent equipment firms. On the one hand, upgrading in the intelligent equipment manufacturing industry generally manifests as evolutionary innovation—continuously optimising existing product and process knowledge bases and gradually expanding product lines—exhibiting significant path dependence [1]; SRDI firms precisely take their own niche products as fulcrums and leap step by step along adjacent product lines toward higher-end equipment, more complex systems and higher-value-added links, for example, progressing from single-function components to integrated equipment, and from low-end processing equipment to intelligent complete sets. On the other hand, every successful adjacent leap brings about a reconstruction of comparative advantage: the increased complexity of the firm's producible product portfolio means that the technological links it can undertake in the global division of labour move upward, and export products shift from highly substitutable homogeneous goods toward differentiated, high-barrier products. It should be further clarified that adjacent leaps are not achieved overnight but are a multi-stage process from near to far and from easy to difficult. SRDI firms usually first complete small leaps within the adjacent layer of existing products, consolidating and testing newly added capabilities, and then advance layer by layer toward products of higher complexity; each stage accomplishes capability expansion with a relatively small capability distance and lower risk. Such gradual leaps not only reduce the failure probability of a single upgrade but also keep capability accumulation in step with product expansion, avoiding the capability gap brought by blind cross-sector expansion. It is particularly worth emphasising that, because SRDI firms have limited resources and find it difficult to simultaneously deploy multiple product lines, gradual adjacent leaps precisely provide them with an upgrade channel that is risk-controllable and allows concentrated investment: firms can focus their limited resources on a few high-proximity leap nodes, achieving capability breakthrough while maximising the reduction of trial-and-error costs and sunk losses. It is precisely through such orderly and controllable adjacent leaps that SRDI firms can steadily move upward in the product space, continuously accumulate comparative advantage, and lay a solid product foundation for the enhancement of international market power. Existing studies confirm that homogeneity in export product structure is precisely an important reason for the lack of international market power among local firms [27]; conversely, firms that achieve product-complexity leaps along adjacent paths can obtain stronger differentiated pricing power in international markets, breaking away from the passive status of mere price takers, gradually climbing from low-value-added to high-value-added links, and thereby improving the overall level of international market power.

4.3. Positive Feedback from Product Space Densification: The Cumulative Amplification of Market Power

The third mechanism of international market power enhancement lies in the positive-feedback mechanism between product-space densification and capability accumulation, which causes the international market power of SRDI firms to accumulate and amplify in a spiralling fashion. Product space theory emphasises that the product space is not static but densifies dynamically with capability accumulation: after a firm successfully leaps along adjacent products, its capability set expands,

which further reduces the proximity distance for subsequent upgrading and increases the probability of crossing gaps, thereby forming a self-reinforcing cycle of "capability accumulation→product expansion→further accumulation" [19]. This positive feedback is of great significance for SRDI intelligent equipment firms. First, positive feedback lowers the marginal cost of upgrading. The deeper the capabilities of SRDI firms in niche fields and the denser the products they have entered, the shorter the technological distance for developing new products along adjacent directions, the lower the required input, and the easier it is for upgrading to continue. Second, the densified product space strengthens firms' bargaining position in international markets. The denser a firm's producible product set and the closer the technological linkages, the stronger its bargaining power over upstream and downstream firms, its influence on standards and pricing rules, and the more difficult its products are to substitute in international markets, with market power strengthening accordingly. Third, positive feedback forms first-mover advantages and lock-in effects: firms that take the lead in achieving capability accumulation and adjacent leaps can build technological barriers and customer stickiness in niche segments, forming cumulative advantages that competitors find difficult to catch up with. Thus, product-space densification constitutes a dynamic amplifier for the enhancement of international market power, enabling SRDI firms to gradually evolve from small-but-refined advantages in niche markets into an unshakable market-dominating force in global niche fields. Furthermore, this positive feedback is further strengthened through agglomeration and synergy effects: when a cohort of SRDI firms leaps along adjacent products, their mutual product proximity relations enable them to jointly constitute a dense industrial network, through which they can share upstream supply, technical talent and knowledge spillovers, and reduce product supporting costs through upstream-downstream collaboration, thereby amplifying the returns to individual firms' capability leaps. In other words, the collective densification of SRDI firms not only enhances the market power of individual firms but also, through cluster effects, strengthens the overall bargaining power of the entire intelligent equipment industry in international markets and its ability to withstand external shocks, forming an amplification mechanism in which individuals and the group mutually reinforce each other.

4.4. The Manifestation of Market Power: From Product Space Position to International Competitive Outcomes

The three mechanisms above ultimately converge in the manifestation of international market power—the improvement in product-space position must be translated into observable, measurable international competitive outcomes for the firm. International market power usually manifests as a firm's dominant ability to influence product prices and obtain excess profits in international markets, reflected in dimensions such as firm growth, market share, profitability and markup rate, and its formation is jointly constrained by the firm's technological level, product structure and international competitive landscape [27]. From the product space perspective, the capability accumulation, adjacent leaps and network densification of SRDI firms are ultimately manifested as international market power through three channels: first, the differentiated pricing channel—increased product complexity enables firms to break away from homogeneous competition and obtain a price markup above marginal cost; second, the market-dominance channel—the densified product space strengthens firms' control over niche-market supply, raising their market share and bargaining position; and third, the dynamic upgrading channel—the positive-feedback mechanism enables firms to continuously leap toward higher-end products, sustaining the improvement of profitability and growth momentum. However, the manifestation of market power does not necessarily occur simultaneously: the elevation of product-space position provides a potential foundation for market power, but whether it can be converted into actual market power also depends on the firm's degree of participation in international rules, standard-setting and brand building, as well as the precise guidance of government industrial policy toward leap nodes and capability gaps. In other words, the path from product-space position to international market power is not automatically connected; along the way there exist real obstacles such as capability gaps, market-access barriers and competition for

standard-setting voice, which require collaboration between firms and government to resolve. Therefore, the enhancement of market power is the result of the joint action of product-space position, firms' competitive behaviour and the policy environment.

In summary, from the product space perspective, the enhancement of international market power in the SRDI intelligent equipment manufacturing industry follows the progressive mechanistic chain of "niche capability accumulation→adjacent product leap→product-space densification→manifestation of market power." This chain takes capability accumulation as its foundation, adjacent leaps as its path, positive feedback from network densification as its driving force, and the manifestation of competitive outcomes as its endpoint. The four links are closely interlocked, progressively layered and indispensable, jointly constituting a complete closed-loop mechanism. It systematically reveals the internal mechanism by which SRDI firms transform niche technological advantages into international market competitive advantages, and also identifies the capability gaps and leap nodes where government policy should intervene, providing a theoretical basis for deriving policy implications aimed at enhancing the international market power of the intelligent equipment manufacturing industry.

5. POLICY IMPLICATIONS FOR ENHANCING INTERNATIONAL MARKET POWER IN THE SRDI INTELLIGENT EQUIPMENT MANUFACTURING INDUSTRY FROM THE PRODUCT SPACE PERSPECTIVE

The preceding analysis revealed the mechanistic chain of international market power enhancement in the SRDI intelligent equipment manufacturing industry from the product space perspective, namely "niche capability accumulation→adjacent product leap→product-space densification→manifestation of market power." This chain provides clear focal points for industrial policy: the enhancement of market power cannot be directly brought about by R&D subsidies or scale support alone, but requires policy to exert precise and coordinated efforts at four links—capability accumulation, leap nodes, densification agglomeration and standard-setting discourse—forming systemic policy support. Accordingly, this paper proposes policy implications along four dimensions.

5.1. Strengthen Niche Capability Accumulation and Consolidate the Capability Foundation of SRDI Firms

Capability accumulation is the fundamental precondition for enhancing the international market power of SRDI firms, and the primary focal point of policy lies in helping firms build a solid capability stock in niche fields. First, improve a focused innovation-support mechanism. Given that SRDI SMEs take "specialisation, refinement, differentiation and novelty" as their core and accumulate specialised capabilities in narrow fields [3], policy should guide capital, talent and platforms to agglomerate toward firms' core niche segments, avoiding the "sprinkling-pepper" style of blanket support, and focus on supporting firms in continuously iterating processes, materials and control technologies around their dominant products, forming difficult-to-replicate specialised capability assets. It should be noted that the essence of capability accumulation lies in transforming dispersed innovation inputs into firms' sustainable production capabilities, rather than simply pursuing the expansion of R&D expenditure; therefore policy assessment should place greater emphasis on the capability depth, process maturity and product-value-added improvement of firms' dominant products, guiding firms from a "wide-net-casting" layout toward "focused deep cultivation," so that limited innovation resources are effectively deposited as capability nodes in firms' product space, thereby consolidating the capability foundation for enhancing their international market power. Second, improve the articulation between basic research and applied research. The high-end development of intelligent equipment relies on the support of generic technologies such as underlying materials, core components and industrial software, which firms alone find difficult to break through independently; policy should promote the co-construction of joint problem-solving

platforms by research institutes, universities and SRDI firms, embedding generic-technology supply into the process of firms' capability accumulation and filling basic gaps in the capability system [4]. Third, strengthen the protection of intellectual property and the supply of talent factors. The key to capability accumulation lies in knowledge sedimentation and human capital; policy should improve the incentive mechanisms for intellectual-property protection and the commercialisation of research results, support firms in solidifying technological accumulation into patents, process standards and tacit knowledge, and enrich the supply of high-skilled talent in niche fields through industry-education integration and flexible talent introduction, so that capability accumulation has a sustainable factor foundation.

5.2. Precisely Guide Adjacent Product Leaps and Resolve Capability Gaps and Leap Obstacles

Adjacent product leaps are the path for SRDI firms to reconstruct comparative advantage and improve their international competitive position; policy should precisely identify and guide firms to upgrade step by step along product-proximity directions, breaking through capability gaps in the leap process. First, establish a product-space-oriented leap identification and guidance mechanism. Product space theory shows that firms tend to expand toward new products along directions with the highest proximity and shortest capability distance, and the high heterogeneity of the product space determines that different firms have differentiated upgrading potential at different product nodes [19]; policy should draw on product-space measurement methods to dynamically identify sets of adjacent products with high accessibility and high added value within the niche track where SRDI firms are located, forming a "leap-node list," guiding firms to expand orderly toward high-end equipment, complex systems and high-value-added links, and avoiding blind cross-sector expansion. Second, establish special problem-solving policies targeting capability gaps. Leaps are not achieved overnight; when SRDI firms upgrade along adjacent paths, they often face gap constraints such as the absence of key generic technologies, verification platforms and pilot-scale conditions; policy should benchmark the capability gaps required for firms' leaps and directionally allocate key projects, pilot bases and first-set application scenarios, helping firms cross capability gaps so that every adjacent leap can be landed. Third, optimise the risk-sharing mechanism for leaps. Although gradual leaps are relatively controllable in risk, high-end equipment R&D involves high investment and long cycles, and SMEs have limited risk resistance; policy should share leap costs with firms through additional R&D super-deductions, risk-compensation funds and industrial guidance funds, reducing their trial-and-error and sunk losses, and enhancing firms' willingness and ability to continue leaping, so that they dare to steadily break through at the capability boundary and move upward continuously.

5.3. Promote Densified Agglomeration in the Product Space and Amplify Positive-Feedback and Cluster Synergy Effects

The positive-feedback mechanism of product-space densification causes market power to accumulate and amplify, and policy should focus on fostering an industrial ecosystem favourable to capability agglomeration and the dense layout of adjacent products. First, cultivate SRDI enterprise clusters and strengthen adjacent product networks. When a cohort of SRDI firms leaps together along adjacent products, they constitute a dense industrial network, through which they can reduce supporting costs and amplify leap returns by sharing upstream supply, technical talent and knowledge spillovers; policy should rely on existing industrial clusters to guide SRDI firms to agglomerate in upstream-downstream and functionally similar adjacent links of the industrial chain, promoting the formation of an industrial community characterised by complementary linkages and coordinated upgrading. It should be emphasised that cluster cultivation should respect the internal linkages of the product space, giving priority to supporting combinations of firms that are technologically adjacent, capability-complementary and strongly synergistic, and avoiding mechanistic, platter-style agglomeration divorced from technological linkages, so that the knowledge spillovers and supporting effects brought

by densification can be effectively transformed into firms' leap capabilities. Second, build innovation-collaboration and knowledge-sharing platforms. The key to the value-added effect of densified agglomeration lies in the technological linkages and knowledge flows among firms; policy should support the construction of industry generic-technology platforms, verification and testing centres, and open-source industrial software ecosystems, promote technological coupling and collaborative innovation among SRDI firms, and translate cluster advantages into group-level international market power. Third, promote the coordinated supporting linkage between SRDI firms and leading enterprises. The intelligent equipment industrial chain exhibits clear division-of-labour characteristics between leading firms and supporting firms; policy should encourage SRDI SMEs to embed themselves in the global supply chains and innovation networks of leading enterprises, enhance their capabilities and product levels along adjacent directions in the course of supporting collaboration, and leveraging the market channels and brand radiation of leading enterprises to strengthen their own international competitiveness, forming a virtuous pattern of large-and-small-firm coordination and product-space densification, so that the overall advantages of industrial clusters are transformed into group-level international market influence.

5.4. Compete for International Standard-Setting Discourse Power and Promote the Manifestation of Market Power

The manifestation of market power depends on firms' participation in international rules, standard-setting and brand building; policy should take international standard-setting discourse power as the key lever for promoting the landing of market power. First, support SRDI firms in participating in international standard-setting. International market competition in intelligent equipment is largely a competition of standards; firms that can lead or deeply participate in international standard-setting often occupy the initiative in rule-making and bargaining; policy should encourage SRDI firms to transform their advanced processes and product technologies into industry standards, national standards and even international standards, and support firms in participating in the activities of international standardisation organisations, gradually enhancing the discourse power of Chinese intelligent equipment within the global rule system. Standard-setting discourse power is an advanced form of the manifestation of market power: firms with standard-setting power can obtain sustained excess returns in the global market by setting technical thresholds and leading compatibility rules, and their market power is no longer reflected merely as a price markup at a given point in time, but rises to long-term, stable rule-based dominance. Therefore, policy should treat the construction of standard-setting discourse power as a strategic project for cultivating market power, and through special programmes for standard development, cultivation of standard talent, and international mutual-recognition mechanisms, help firms complete the leap from technological advantage to rule-based advantage. Second, strengthen the international layout of intellectual property and brand internationalisation. The realisation of market power requires the support of differentiated barriers and brand premiums [27]; policy should guide SRDI firms to strengthen overseas patent layout and conduct international trademark registration, enhance the visibility of independent brands through international exhibitions, cross-border e-commerce and overseas marketing networks, and transform niche technological advantages into brand value recognised by international markets. Third, foster a fair and open international competitive environment. At the policy level, we should rely on free trade agreements, standard mutual recognition and intellectual-property protection cooperation to secure a fair market-access and rule environment for firms, and support SRDI firms in expanding overseas markets through financial, credit-insurance and other instruments, helping firms effectively translate product-space position into observable, measurable international market power.

6. CONCLUSIONS

Against the backdrop of the deep restructuring of global industrial chains and intensifying great-power technological competition, promoting the cultivation of international market power in the SRDI intelligent equipment manufacturing industry is an important practical requirement for China to break through the low-end lock-in of high-end equipment and realise the strategy of building a manufacturing power. Based on product space theory and centring on the logical chain of "niche capability accumulation→adjacent product leap→product-space densification→manifestation of market power," this paper conducts a theoretical deduction of the internal enhancement mechanisms of international market power in the SRDI intelligent equipment manufacturing industry, and draws the following conclusions.

First, the accumulation of specialised capabilities in niche fields is the fundamental precondition for enhancing the international market power of the SRDI intelligent equipment manufacturing industry. Relying on focused innovation, SRDI firms accumulate difficult-to-replicate process and technical knowledge in niche tracks, reshape their network position in the product space, expand the set of adjacent products amenable to upgrading, and lay the capability foundation for subsequent iterative comparative advantage—differentiating them from general manufacturing firms that achieve upgrading through scale expansion.

Second, gradual leaps along product-proximity directions are the core path for reconstructing industrial comparative advantage and improving international competitive position. Influenced by resource constraints and the evolutionary-innovation characteristics of intelligent equipment, SRDI firms are well suited to expanding adjacent products on the basis of existing capabilities, raising product complexity through stepwise product iteration, reducing upgrading trial-and-error costs, driving export products to shift from homogeneous competition to differentiated competition, and breaking away from the passive situation of being price takers in international markets.

Third, product-space densification forms a self-reinforcing positive feedback that can continuously amplify international market power. The capability leap of an individual firm expands its own capability set; at the group level, industrial agglomeration and knowledge spillovers further promote the densification of the regional product network, forming a cumulative effect of individual–cluster synergy, building technological barriers in niche tracks, and strengthening the industry's overall external bargaining power.

Fourth, the positional advantage of the product space does not automatically translate into actual market power; the manifestation of market power is also constrained by external conditions such as standard-setting discourse power, international market access and brand building, requiring collaboration between firms and policy to remove transformation obstacles. Based on the above mechanisms, precise industrial policy should be implemented along four dimensions: consolidating the niche capability foundation, guiding adjacent product leaps, promoting dense and coordinated cluster development, and competing for international standard-setting discourse power.

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REFERENCES

[1] Li, Z. D., Mei, L., Zhu, Z. Q., et al. (2023). Digital innovation strategy and its configurational adaptation in manufacturing single-champion enterprises. Journal of Management World, 39(2), 186–208.

[2] Li, S. H., & Rong, F. Y. (2022). The gradual logic of industrial chain modernisation: Breaking lock-in and enhancing resilience. Social Science Journal of Guangdong, (5), 37–47.

[3] Cao, H. J., Zhang, S., Ouyang, Y., et al. (2022). Innovation policy and the innovation quality of "specialized, refined, differentiated and innovative" SMEs. China Industrial Economics, (11), 135–154.

[4] Dong, Z. Y., & Li, C. M. (2021). High-quality development trends and path selection of "specialized, refined, differentiated and innovative" SMEs. Reform, (10), 1–11.

[5] Chen, J. (2022). Research on the evaluation of China's intelligent manufacturing international competitiveness. Technical Economics & Management Research, (5), 118–122.

[6] Liu, J. R., & Yin, M. (2022). Research on the development of China's intelligent terminal industry and policy recommendations. Review of Industrial Economics, (6), 5–18.

[7] Feng, T., Guo, L. H., & Dong, J. W. (2023). Venture capital portfolio, upstream enterprise collaboration and breakthrough of key core technologies: Empirical evidence from the high-end medical equipment industry. Journal of Shanxi University of Finance and Economics, 45(1), 85–98.

[8] Dong, T. Y., & Meng, L. X. (2022). Ways for the dual-circulation strategy to enhance the competitiveness of China's artificial intelligence industry. Studies in Science of Science, 40(2), 230–236, 287.

[9] Liu, Z. C., Chen, W. W., & Wei, S. C. (2023). Research on the influence of artificial intelligence on China's economic growth path from the perspective of technological deconstruction. Chinese Journal of Management, 20(10), 1506–1514.

[10] Zhang, M. X., Guo, X. X., & Li, Y. H. (2020). Research on the mechanism of overseas high-end consumption reflow on the upgrading of China's digital and intelligent industries. World Economy Studies, (1), 107–120, 137.

[11] Zhang, M. E., Ren, T. F., & Huang, S. T. (2023). Research on the patent effect of the selection and cultivation policy for "specialized, refined, differentiated and innovative little giants". China Soft Science, (5), 33–43, 53.

[12] Yu, L. M., & Huang, X. H. (2025). Research on the relationship between intelligent equipment imports and the innovation quality of manufacturing enterprises. China Soft Science, (6), 41–51.

[13] Hausmann, R., & Klinger, B. (2007). The Structure of the Product Space and the Evolution of Comparative Advantage (CID Working Paper).

[14] Wu, Y. J., Zhang, Q. Z., & Xu, J. (2012). A review of product space and the evolution of comparative advantage. Economic Review, (4), 145–152.

[15] Liu, S. Y., & Yang, J. D. (2019). The evolution and policy choice of China's industrial upgrading: A product space perspective. Journal of Management World, 35(6), 81–94, 194–195.

[16] Lyu, C., & Ying, C. (2022). A new perspective on understanding high-quality economic development: An explanation based on product space theory. Journal of Southwest Minzu University (Humanities and Social Sciences), 43(6), 150–157.

[17] Wang, R. M., & Huang, X. R. (2022). Product space: A systematic perspective on the upgrading of China's artificial intelligence industry. Journal of Systems Science, 30(2), 41–47.

[18] Ma, H. Y., & Liu, L. Q. (2017). Competitiveness evolution and upgrading path selection of BRICS countries: A product space perspective. Business and Management Journal, 39(11), 21–38.

[19] Zhang, Q. Z., & Li, H. (2013). Identifying opportunities for China's industrial upgrading. China Industrial Economics, (5), 44–56.

[20] Zhang, H. (2019). Research on China's industrial upgrading path from the perspective of product space structure. Journal of Jinan University (Philosophy and Social Sciences Edition), 41(4), 90–106.

[21] Zhang, T., & Liu, L. Q. (2019). A comparative study of the mechanism of product characteristics in China and the United States on industrial upgrading: Based on product space theory. Science & Technology Progress and Policy, 36(10), 49–58.

[22] Cheng, J. J., He, C. T., & Zhang, Y. (2025). The influence of product linkages on the resilience of manufacturing exporters. Nankai Economic Studies, (11), 147–167.

[23] Dong, J. M., Yu, Z. X., & Ma, J. (2026). Internal and external product networks and enterprise innovation: A perspective based on information flows. Management Review, 38(6), 128–139.

[24] Jiao, H., Yang, J. F., & Ying, Y. (2021). A review of dynamic capability research and suggestions for conducting China-contextualised research. Journal of Management World, 37(5), 191–210, 14, 22–24.

[25] Deng, Z. Q., Pang, R. Z., & Chen, Y. J. (2022). From market power to effective market power: Taking China's chemical pharmaceutical preparation industry as an example. Journal of Management World, 38(1), 90–108.

[26] Zhu, X. H., Zhang, H. W., & Li, X. Y. (2018). Research on the measurement of China's rare earth international market power and policy effectiveness. Journal of International Trade, (1), 32–44.

[27] Huang, X. H., & Chen, X. H. (2007). Measurement and analysis of the international market power of Zhejiang enterprises: Taking the textile and garment industry as an example. Zhejiang Social Sciences, (6), 41–46.

[28] Qian, X. F., & Wang, B. (2020). The international competitiveness of Chinese enterprises: Historical evolution and future policy choices. Journal of Beijing Technology and Business University (Social Sciences Edition), 35(4), 43–56.

[29] Wang, Y., Fan, Z. C., & Li, X. Z. (2022). Factor endowment structure, R&D innovation and industrial upgrading. China Industrial Economics, (9), 5–23.

[30] Zhang, X. D., & Zhu, Q. (2007). On the virtuous interaction between innovation and market power construction of Chinese enterprises in the global value chain. China Industrial Economics, (5), 30–38.

[31] Guo, X. L., Li, K., & Shi, J. G. (2021). Buyer market power, market competitive environment and R&D investment: Empirical evidence from high-tech listed companies. Science Research Management, 42(11), 129–136.