

The Adaptability Theory of Industrial Structure and Higher Vocational Specialty Setting: System Integration and Model Construction

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ABSTRACT

This paper conducts a comprehensive and in-depth integration of the core concepts, theoretical systems, and interaction mechanisms between industrial structure and higher vocational education (HVE) specialty setting. By systematically sorting out key concepts such as industrial structure evolution, regional industrial differentiation, HVE characteristics, and specialty adjustment mechanisms, and based on interdisciplinary theories including system science, industrial economics, and educational economics, the study constructs a multi-dimensional adaptability theoretical model. This model clarifies the dynamic matching logic between industrial upgrading and specialty structure optimization, establishes an evaluation index system covering matching degree, supply-demand balance, and support capacity, and proposes a tripartite collaborative adjustment strategy involving governments, enterprises, and vocational colleges. The research aims to provide theoretical support and practical guidance for HVE to accurately respond to industrial changes, enhance talent cultivation quality, and serve regional economic high-quality development.

KEYWORDS

Industrial structure; Higher vocational education; Specialty setting; Adaptability theory; System integration; Model construction; Regional economy; Talent cultivation

1 Introduction

In the context of the global new technological revolution and industrial transformation, the interaction between education and economy has become increasingly close. Higher vocational education, as a critical link connecting talent supply and industrial demand, its specialty setting rationality directly affects the efficiency of regional resource allocation and industrial competitiveness. Industrial structure, as the "skeleton" of the national economy, is undergoing profound changes driven by factors such as technological innovation, consumption upgrading, and global division of labor. From the primary industry dominance to the secondary industry expansion, and then to the tertiary industry leading, each stage of industrial evolution puts forward new requirements for the type, quantity, and quality of technical talents.

However, in practice, there is often a "time lag" or "structural mismatch" between HVE specialty setting and industrial development. Some regions face problems such as outdated specialties, surplus talents in traditional industries, and shortage of talents in emerging industries, which restrict the role of HVE in supporting industrial upgrading. The root cause of these issues lies in the lack of a systematic theoretical framework to guide the adaptability construction between industrial structure and specialty setting. Existing studies either focus on macro-level industrial policy analysis or stay at micro-level specialty adjustment experience, lacking in-depth integration of theories and systematic model construction.

Against this background, this paper integrates core concepts and theoretical foundations, explores the intrinsic laws of industrial structure evolution and HVE specialty adaptation, constructs a theoretical model with clear logical relationships and operable evaluation standards, and further enriches the theoretical system of HVE and industrial coordination development. It not only helps to promote the scientification of HVE specialty setting but also provides a decision-making reference for regional industrial policy formulation.

2 Core concepts definition

2.1 Higher Vocational Education (HVE)

HVE is a type of higher education with distinct professionalism and technical applicability, which is essentially different from academic-oriented general higher education. Its core goal is to cultivate high-quality technical and skilled talents who can engage in front-line work in production, construction, management, and service, emphasizing the integration of professional ethics and practical ability. From the perspective of educational characteristics, HVE adopts a "work-study integration" teaching model, with curriculum content closely aligned with vocational post requirements, and basic theory teaching adhering to the principle of "application-oriented and sufficient".

In terms of teacher requirements, "double-qualified" teachers who possess both solid theoretical knowledge and proficient practical skills are the core of the teaching team, and they are required to participate in enterprise technical services and technology development. Internationally, HVE is generally included in the framework of "Technical and

Vocational Education and Training (TVET)" proposed by UNESCO, emphasizing the integration of "vocational orientation, technical support, and educational process" . Typical models include Germany's "Fachhochschule" focusing on school-enterprise cooperation and France's "Institut universitaire de technologie" emphasizing practical teaching .

2.2 Industrial structure and its evolution

Industrial structure refers to the composition, proportion relationship, and technical-economic connections of various industries in the national economy, including five core elements: industrial composition, technical structure, industrial layout, industrial organization, and industrial chain. It reflects the allocation pattern of production factors such as labor, capital, and technology among industries and is an important indicator of economic development stage .

The evolution of industrial structure presents obvious stage characteristics. Marx classified social material production departments into two major categories according to the final use of products: the department producing means of production and the department producing consumer goods, revealing the law of social reproduction balance . Lenin further refined it into the "agriculture-light industry-heavy industry" classification, which provided a theoretical basis for industrialization in backward countries . Fisher and Clark's three-sector classification divides industries into primary, secondary, and tertiary industries, which has become a widely used tool in modern economics . The International Standard Industrial Classification (ISIC) formulated by the United Nations and China's National Economic Industry Classification have further standardized industrial statistics and promoted international comparison .

2.3 Regional industrial structure

Regional industrial structure is a subsystem of the national industrial structure, referring to the composition status, development level, and production connection of various industries within a region . It is the product of the combination of social division of labor and regional division of labor, affected by factors such as resource endowment, technical level, and policy guidance . Its core elements include leading industries that drive regional economic growth, related industries that provide supporting services, basic industries that guarantee public services, pillar industries with large economic scale, and potential industries with development prospects .

Regional industrial structure shows significant differentiation. For example, coastal developed regions tend to focus on advanced manufacturing and modern services, while inland regions may rely more on agriculture and resource-based industries . The optimization of regional industrial structure mainly relies on technological innovation to promote traditional industries to high value-added transformation, and relies on regional cooperation to form complementary advantages .

2.4 HVE specialty setting

HVE specialty setting is a systematic project that connects HVE and social needs, which needs to follow the principles of scientificity, integrity, and regionality . The scientificity principle emphasizes student-oriented development, professional sustainability, and optimal allocation of educational resources . The integrity principle requires overall planning based on school resources, faculty, and disciplinary characteristics, and establishing resource sharing mechanisms . The regional principle highlights the adaptation to local economic characteristics and industrial structure, and realizes the docking with enterprise needs through school-enterprise cooperation .

Specialty setting has both stability and dynamics. Stable specialties help form educational characteristics and brand effects through continuous investment in faculty, experimental training conditions, and practice bases . At the same time, it needs to dynamically adjust according to industrial changes: eliminating outdated specialties, adding new specialties for emerging industries, and optimizing existing specialties by adjusting directions and quantities. Its fundamental goal is to provide technical and skilled talents for industrial development and reflect the characteristics of "social demand orientation" and "market sensitivity".

3 Theoretical foundations

3.1 System science theory

System science theory provides a holistic perspective for understanding the relationship between industrial structure and HVE specialty setting. It holds that a system is an organic whole composed of interacting elements, and the overall function depends on the synergy between elements . HVE, as a subsystem of the social system, forms a closed loop with other subsystems through the chain of "vocational education - talent cultivation - employment - production - social service" .

In this system, industrial structure changes transmit demand signals to HVE, promoting specialty structure adjustment; HVE outputs talents to promote industrial efficiency improvement and structure upgrading, forming a positive feedback mechanism. For example, Germany's "dual system" vocational education closely connects with the manufacturing industry system, realizing the efficient matching of talent supply and demand, which has become an important support for Germany's manufacturing competitiveness.

3.2 Industrial structure theories

3.2.1 Petty-clark theorem

Proposed by Clark based on Petty's research, this theorem points out that with the increase of per capita national income, labor force shifts from primary industry to secondary industry, and finally to tertiary industry. The driving force comes from the income gap between industries and the change of consumer demand structure: the demand for agricultural products grows slowly, while the demand for industrial products and services increases significantly. This theorem reveals the basic law of industrial structure evolution and provides a theoretical basis for analyzing the direction of labor force flow.

3.2.2 Kuznets' industrial structure theory

Kuznets systematically explored the relationship between economic growth and industrial structure through long-term statistical data analysis. He divided industrial structure evolution into three stages: agricultural leading stage, industrialization stage, and service leading stage, emphasizing that industrial upgrading is driven by demand structure change, technological progress, and capital accumulation. Different from Petty-Clark Theorem, Kuznets pays more attention to the two-way interaction between industrial structure and economic growth, and reveals the relationship between national income distribution and industrial structure.

3.2.3 Chenery's standard industrial model

Chenery divided economic development into six stages through cross-country comparative studies: traditional society, initial industrialization, middle industrialization, late industrialization, post-industrial society, and modern society. The model found that industrial structure changes show regularity with economic growth: the proportion of primary industry decreases, secondary industry first rises and then stabilizes, and tertiary industry continues to rise. It also revealed the non-linear relationship between per capita GNP and consumption rate, and the threshold effect of employment structure change.

3.2.4 Rostow's stages of economic growth

Rostow proposed that economic development goes through six stages: traditional society, pre-conditions for take-off, take-off, maturity, mass consumption, and pursuit of quality of life. Each stage has a leading industry with diffusion effect, which drives the development of other industries. For example, the take-off stage is dominated by labor-intensive manufacturing, and the maturity stage is dominated by capital-intensive industries such as coal and steel. This theory provides a reference for judging the industrial development stage and selecting leading industries.

3.3 HVE development theory

HVE development theory clarifies the nature, function, and development path of HVE. It points out that HVE is an important part of higher education with the characteristics of "type education", which undertakes the dual mission of cultivating technical talents and promoting social and economic development. In terms of function, HVE not only serves regional economy by cultivating applied talents but also promotes personal all-round development by improving vocational ability, practical ability, and innovative consciousness.

Internationally, typical HVE models include Germany's "dual system" focusing on school-enterprise cooperation, the United States' emphasis on vocational qualification certification, and Singapore's "teaching factory" model integrating factory environment into teaching. These models provide experience for China's HVE reform in aspects such as specialty setting, teaching model, and faculty construction.

3.4 Adaptability theory of industrial structure and specialty setting

This theory is an interdisciplinary integration of industrial economics, educational economics, and labor market theory.

From the perspective of industrial economics, industrial structure evolution determines talent demand structure, and specialty setting must adapt to the change of industrial technology and post requirements. Educational economics holds that education structure should match economic structure, and rational specialty setting can improve the efficiency of human capital investment (Gao & Wu, 2018). Labor market theory emphasizes that specialty setting should balance supply and demand to avoid talent surplus or shortage.

The adaptability construction needs to consider regional differences. Higher vocational school should set specialties according to local industrial characteristics, such as developing port logistics in coastal areas and modern agriculture in inland areas. It also requires establishing a dynamic adjustment mechanism, using evaluation indexes such as specialty-industry matching degree and graduate employment quality to guide specialty optimization.

4 Adaptability model construction

4.1 Model framework

Based on the above theories, this paper constructs a "three-dimensional interactive" adaptability model, which includes three core dimensions: industrial demand transmission, specialty structure response, and adaptability evaluation feedback.

(1) Industrial demand transmission: Industrial structure evolution generates demand signals through channels such as enterprise talent demand, industrial policy guidance, and labor market changes, which are transmitted to HVE institutions through government platforms and industry associations.

(2) Specialty structure response: HVE institutions adjust specialty setting, curriculum system, and training mode according to demand signals, including adding new specialties, eliminating outdated ones, and optimizing course content.

(3) Adaptability evaluation feedback: Evaluate the matching effect through multiple indexes, and feed back the results to the demand transmission and response links to form a closed-loop adjustment.

4.2 Evaluation index system

The evaluation system includes four first-level indexes and twelve second-level indexes:

Table 1

First-level Indexes	Second-level Indexes
Matching Degree	Correlation between specialty proportion and industrial output value proportion; Post-specialty correspondence rate; Curriculum-industry technology matching rate
Supply-demand Balance	Graduate employment rate in related industries; Enterprise talent satisfaction; Talent shortage rate in key industries
Support Capacity	Contribution rate of specialty graduates to industrial efficiency improvement; Number of collaborative innovation projects with enterprises; proportion of specialties for emerging industries
Adjustment	Time lag of specialty adjustment; proportion of eliminated outdated specialties;
Efficiency	Resource utilization rate of new specialties

4.3 Tripartite collaborative adjustment mechanism

4.3.1 Government: policy guidance and platform construction

The government should formulate industrial talent demand forecasting plans, issue specialty setting guidance catalogs, and establish information sharing platforms for industrial development and talent cultivation. It should also provide financial support for the construction of key specialties and "double-qualified" teachers, and improve the incentive mechanism for school-enterprise cooperation.

4.3.2 Enterprises: deep participation in talent cultivation

Enterprises should participate in the whole process of specialty setting, curriculum design, and practical training as important subjects. They can provide internship bases, send technical backbones as part-time teachers, and jointly develop talent training programs to ensure that the cultivated talents meet the actual needs of posts.

4.3.3 HVE Institutions: dynamic adjustment and quality improvement

Vocational colleges should establish a specialty adjustment committee composed of industry experts, enterprise representatives, and faculty, and regularly track industrial development trends. They should strengthen the construction of practical teaching systems, improve the proportion of practical courses, and promote the integration of "teaching, learning, and doing".

5 Conclusion

The adaptability between industrial structure and HVE specialty setting is a dynamic process of mutual promotion and coordinated development. This paper clarifies the connotation of core concepts such as industrial structure, regional industrial structure, and HVE specialty setting, and constructs a theoretical framework integrating system science, industrial structure theory, and HVE development theory. The proposed "three-dimensional interactive" model and evaluation index system provide a clear logical path for measuring and improving adaptability, and the tripartite collaborative mechanism offers practical strategies for promoting the precise docking between HVE and industrial development.

Future research can carry out empirical studies based on this model, select typical regions for case analysis, and verify the validity and operability of the model through quantitative data. It can also explore the impact of new technologies such as artificial intelligence on the adaptability between industrial structure and specialty setting, and enrich the theoretical system in combination with the new characteristics of industrial transformation.

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