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Policy to encourage innovation activities of China and some Asian countries

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ABSTRACT
In the context of digital transformation and global knowledge competition, innovation is becoming a key factor determining the competitiveness and sustainable growth of countries. This study uses qualitative methods combined with comparative analysis to evaluate policies to encourage innovation activities in China, Singapore, Japan and South Korea - four typical Asian countries with different development models.The results show that, despite differences in institutions and development stages, these countries converge on three common points: (i) The State plays a role in creating and coordinating the innovation ecosystem; (ii) innovation policies are designed towards multi-instrument coordination between financial incentives, taxes, national missions and high-tech cluster development; (iii) innovation is linked to sustainable development goals, green transformation and digital society.On that basis, the study draws policy lessons for the Asian region and suggests directions for improving innovation promotion policies in Vietnam according to the model of "Innovation-creating and catalyzing state", focusing on mission orientation, public-private linkage and regional knowledge capacity development.

Keywords: Innovation policy; National innovation system; Mission-oriented policy; R&D incentives; High-tech clusters; China; Singapore; Japan; Korea; Vietnam.

I. INTRODUCTION

Innovation activities are increasingly becoming a decisive factor for national competitiveness and sustainable economic growth in the context of globalization and the fourth industrial revolution. Asian countries have quickly recognized the importance of innovation and introduced many policies to encourage investment in research and development (R&D), technology commercialization and innovation ecosystem development. According to a survey by the Economic Research Institute for ASEAN and East Asia (ERIA), the "innovation capacity" of ASEAN and East Asian countries is being improved through the development of innovation policies, but there is still a gap compared to leading countries.

For China, since the policy of transition to a science-technology and innovation-based economy, the Government has used a series of tools such as tax incentives, direct support and promotion of high-tech clusters to stimulate innovation (Li, 2018). Tian's (2020) study on Chinese enterprise data shows that R&D tax incentives do have a positive impact on R&D investment and invention in eligible enterprises.

However, despite the implementation of many policies, the effectiveness of innovation policies is uneven across countries and regions within a country. For example, Liu et al. (2021) point out that in China, there are significant differences in innovation performance across economic regions, partly reflecting implementation efficiency and institutional conditions. In Southeast Asia, an overview by OECD (2013) shows that although many countries have strengthened policies to encourage innovation, there are still large gaps in the system of framework conditions such as intellectual property rights, commercialization, and university-industry linkages.

Therefore, it is necessary to analyze and compare the policies to promote innovation between China and some other Asian countries, because it helps to better understand: (i) which policy instruments are used; (ii) the institutional conditions that affect the effectiveness of the instruments; and (iii) the applicability and adjustment of policies in other national contexts. This study aims to identify the policy "modules" that Asian countries have implemented, and draw lessons to enhance the effectiveness of promoting innovation.

More specifically, the study will focus on three groups of policy instruments: tax incentives and financial support for R&D, direct support and mission-oriented policies, and development of

high-tech clusters and startup ecosystems. The analysis will be conducted through a comparative lens between China and countries such as Singapore, South Korea, and Japan to clarify commonalities, differences, and conditions for success or challenges. The study hopes to contribute to the literature on innovation policy and provide practical policy implications for developing countries.

II. THEORETICAL BASIS

The concept of innovation and the role of public policy

Innovation is considered a fundamental driver of economic growth and social development in the 21st century. According to the Organization for Economic Cooperation and Development (OECD, 2018), it is the implementation of a new product, process or organizational method that creates value and improves productivity in the economy. The Oslo Manual 2018asserts that innovation is not limited to research and development, but also includes institutional, organizational and social improvements.

According to the World Intellectual Property Organization (WIPO,2023), innovation is "a mechanism that connects knowledge, technology and policy" to create new value, and is also a measure of long-term competitiveness and productivity. The role of the State is to create the framework conditions - institutions, human resources, knowledge infrastructure and business environment - for innovation to form and spread.

Theoretically, Freeman (1987) and Lundvall (1992) emphasize that innovation is the result of interactions between actors in a "national innovation system", where public policy plays a coordinating, guiding and overcoming "systemic failures". Edquist (2019) argues that innovation policy not only overcomes the lack of private investment, but also builds networks and promotes learning among actors.

Evidence from the World Bank (2021) shows that countries with comprehensive innovation policies - combining financial support, tax incentives and industry-academia linkages - tend to have higher productivity and technological capacity. OECD (2020) adds that modern innovation policy has shifted from "technology push" to "demand pull", linked to sustainable development goals, green energy and public health.

In the Asian region, governments such as China, South Korea and Singapore implement "State-oriented" innovation policies, combining strategic industry planning and targeted investments to promote high technology (Wu, 2020). Thus, public policy is not only a supporting tool but also a structural foundation of the innovation ecosystem, ensuring that the process of knowledge creation is maintained, disseminated and serves sustainable development.

Innovation promotion policy: Tools and goals

Innovation promotion policy is a system of State measures to promote individuals and enterprises to participate in research, development and application of new knowledge. According to Edler and Fagerberg (2017), the core objective of this policy is to overcome market failures in R&D investment and adjust the limitations of the innovation system, thereby orienting the knowledge-based economy.

OECD (2020) argues that current innovation policies are often divided into two groups: "technology push" - supporting research, infrastructure investment and scientific capacity; and "demand pull" - stimulating the market for innovative products through public procurement, standardization or mission programs. A balanced combination of these two groups of instruments creates an effective innovation ecosystem.

Among them, financial and tax incentives for R&D are the main tools to encourage private investment. Hall and Van Reenen (2000) demonstrate that tax incentives reduce the marginal cost of R&D and stimulate investment, especially in small businesses. In addition, direct funding through innovation funds and public-private research contracts helps to focus resources on strategic areas (Veugelers, 2016).

Another important trend is mission-oriented policy, in which the State proactively creates markets to address major challenges such as energy transition, health care or digital economy. Mazzucato (2018) and OECD (2021) affirm that this model creates a "pull effect" on private investment, while also orienting innovation to serve sustainable development goals.

In addition, infrastructure and institutions supporting innovation-including intellectual property laws, talent policies, high-tech parks and incubators-are prerequisites for knowledge spillovers and commercialization of research results (World Bank, 2020). Recently, new instruments such as public procurement for innovation and green finance (UNCTAD, 2022) have been applied to expand market demand and orient innovation towards environmental friendliness.

According to Archibugi and Filippetti (2018), the goal of innovation policy is not only to increase R&D spending but also to improve

national technological capabilities, business productivity and the ability to solve social problems. OECD (2022) adds that policy effectiveness should be assessed by outputs - such as new products, knowledge spillovers and social impacts - rather than just by financial inputs.

In short, the tools used to encourage innovation - from tax incentives to mission funding to institutional infrastructure - aim to build an ecosystem where the public and private sectors collaborate to create knowledge, technology and social value. The experiences of China, South Korea and Singapore show that a harmonious combination of these tools is key to sustaining national innovation capacity.

National innovation system theory

The theory of national innovation systems emerged in the late 1980s and is considered the foundation for modern innovation policy thinking. Freeman (1987) in his study of Japan was the first to assert that the success of innovation depends not only on the individual capabilities of enterprises, but on the coordination between institutions, policies and knowledge networks in the entire economy. Lundvall (1992) then developed this concept, defining NIS as "a system of organizations and institutions interacting in the creation, diffusion and use of new knowledge", in which the learning process is at the heart of innovation.

In this view, public policy is no longer a single intervention tool, but a coordination mechanism that helps link the elements of the system: businesses, research institutes, universities, investment funds, and government agencies. OECD (2019) emphasizes that the effectiveness of the innovation system depends on the level of interaction and policy coordination between sectors - from tax, education, science and technology to infrastructure investment and human resources.

In Asian countries, especially China, South Korea and Singapore, NIS theory is applied in the form of "State-led innovation model" in which the Government plays a central role in building knowledge infrastructure, providing financial support and strategic industry orientation (Wu, 2020). This model helps mobilize large resources for R&D and create policy synchronization, but also poses challenges in terms of flexibility and efficiency of resource allocation (Lee, 2019).

Recent studies by Fagerberg (2017) and OECD (2022) assert that NIS is not a fixed structure but a dynamic system that needs to be continuously adjusted to adapt to global technological changes. Strengthening the links between the public and private sectors, while increasing the openness of the system,is considered a new trend in innovation governance in the Asia-Pacific region.

In summary, the theory of national innovation systems provides a foundation for analyzing how public policies are formed and operated in promoting innovation. In Asia, the application of the NIS model in a flexible, focused, and multi-actor-based manner has contributed to creating a strong "innovation engine" that has helped many countries make breakthroughs in technological capacity and economic productivity.

R&D incentive theory and the role of tax incentives

Research and development is considered a central pillar of the innovation process, but is often hindered by high costs, high risks and uncertain returns. Therefore, countries use R&D tax incentives as an indirect incentive tool to reduce the financial burden on businesses and increase private investment in research activities.

According to Hall and Van Reenen (2000), R&D tax incentives reduce the marginal cost per unit of investment in research, thereby stimulating businesses to increase investment in new knowledge and technology. A comprehensive study by Bloom, Griffith and Van Reenen (2002) shows that the impact of R&D tax policies is highly elastic: on average, every $1 reduction in tax leads to about $1 increase in R&D spending in the private sector. This demonstrates the relative effectiveness of tax incentives compared to direct subsidies, especially in mobilizing resources from businesses.

OECD (2020) and Appelt et al. (2019) emphasize that the effectiveness of R&D tax incentives depends on policy design, including the form of deduction (full or incremental), cost caps, and accounting controls. Countries with strong monitoring and evaluation systems tend to be more effective due to the reduction of "bunching" - the overstatement of R&D costs to obtain tax benefits.

From a policy economics perspective, Reinstaller and Unterlass (2012) argue that R&D tax incentives address "market failures" by aligning socially optimal investment with private investment, but do not completely replace direct support measures. Therefore, OECD (2022) recommends a flexible combination of tax incentives and mission funding, to achieve both the general goal of encouraging innovation and long-term strategic orientation.

Recent studies have also shown the positive impact of R&D tax incentives in the Asian

region. The IMF report (2023) noted that China, South Korea and Singapore are the three countries with the highest levels of tax support for technology enterprises, with indirect support accounting for over 70% of total budget expenditure on R&D. This model not only stimulates investment but also contributes to expanding the innovation capacity of the private sector and promoting the commercialization of research results.

Thus,the theory of R&D incentives shows that tax incentives are an effective tool to reduce financial barriers, expand private investment and strengthen national innovation capacity. However, the optimal effect is only achieved when this tool is designed in sync with other innovation policy systems, in which transparency, monitoring and policy coordination play a decisive role.

Mission-oriented policy theory

Mission-oriented policy is a new approach to innovation governance, emphasizing the proactive role of the State in creating and leading the market to address major social challenges. According to Mazzucato (2018), instead of just addressing market failures, the State needs to identify specific missions - such as carbon emission reduction, sustainable urban development or digital transformation - that can mobilize the participation of the public, private sectors and civil society.

OECD (2021) argues that the mission model creates “synergy effects” by focusing public resources on areas with high spillover effects, while stimulating private investment through a “demand-pull” mechanism. Larrue (2021) points out four basic design principles: defining clear and measurable objectives; prioritizing technology orientation; mobilizing multiple actors; and establishing cross-sectoral coordination and monitoring mechanisms.

In Asia, this model is strongly deployed in national innovation strategies. Japan applies it in its Society 5.0 program to address social issues caused by population aging (Foray, 2021). Singapore builds Research, Innovation and Enterprise 2025 to direct resources towards the digital economy and public health (OECD, 2022). China establishes “national missions” in its 14th Five-Year Plan, focusing on artificial intelligence, semiconductors and clean energy (UNDP, 2023).

Mazzucato and Penna (2016) argue that successful mission policy relies not only on budget allocation but on the ability to create an environment for policy testing and learning, in which stakeholders jointly adjust strategies based on real-world data.

Thus, the mission-oriented policy theory expands the scope of innovation policy from technology support to sustainable development orientation, placing the State at the center of the innovation ecosystem. Experience from Japan,Singapore and China shows that this model is becoming a strategic tool to help Asian countries both promote economic growth and address long-term social goals.

III. RESEARCH METHODS

3.1. Research approach and design

This study uses a qualitative method with a comparative-descriptive approach to analyze innovation promotion policies in China and some typical Asian countries such as Japan, Korea and Singapore. According to Creswell (2014), qualitative methods are suitable for exploring complex phenomena in practical contexts, helping to clarify how countries design, implement and coordinate innovation policies in the knowledge-based economic system.

This approach does not seek to measure quantitatively, but focuses on explaining the context, operating mechanisms and policy characteristics, from which to draw out common patterns, trends and policy lessons for the region. This approach is consistent with the direction of public policy research in the field of science and technology, where institutional factors and organizational behavior play a dominant role (Yin, 2018).

Data sources and collection methods

Research data were collected entirely from secondary sources, including:

Prestigious international reports: OECD Science, Technology and Innovation Outlook (2020, 2022, 2023); WIPO's Global Innovation Index (2021-2023); World Development Report and Innovation Policy Platform of the World Bank (2020-2023); UNCTAD World Investment Report 2022; and ADB's Asian Development Outlook publications.

Government documents: China's 14th Five-Year Plan; Singapore's RIE2025 Plan; Japan's Society 5.0; South Korea's National Innovation Strategy.

International academic articles: excerpts from the journals Research Policy, Technovation, Journal of Asian Public Policy, Oxford Review of Economic Policy, and Journal of Economic Surveys.

The selection of documents followed three criteria: (i) authenticity (published by reputable organizations or journals), (ii) timeliness (in the

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period 2018-2024), and (iii) direct relevance to the topic of innovation policy and knowledge management. In total, the research team consulted more than 60 academic and policy sources, of which 35 were directly cited.

Data analysis methods

Data were processed and synthesized using content analysis combined with thematic analysis.According to Flick (2018), this method allows for the identification of recurring themes in documents, drawing out generalized policy patterns and trends.

The analysis process is performed in four steps:

1. Coding primary data from international documents, identifying policy factors related to finance, taxation, infrastructure, human resources, and innovation governance.
2. The topic group is based on the theoretical framework in part 2 (financial incentives, mission policy, high-tech cluster ecosystem).
3. Country comparisons aim to highlight similarities, differences, and relative effectiveness among policy models.
4. Generalize policy lessons for the Asia region and Vietnam, ensuring logic between the analytical results and the proposed theoretical framework.

To increase reliability, data sources are cross-validated between international organizations (OECD, WIPO, World Bank) and academic literature.This verification method helps to minimize interpretation bias and ensure objectivity (Bryman, 2016).

Limitations of the method

Since the study is qualitative and based on secondary data, the results do not aim to quantify the impact of each policy instrument, but only to describe and compare characteristics. In addition, differences in institutions and development stages of each country may affect the ability to generalize. However, by using multiple independent data sources and cross-reference methods, the study still ensures high reliability and reference value in policy analysis.

IV. RESEARCH RESULTS AND DISCUSSION

China

Within the analytical framework outlined in Part 3, the study uses content analysis and thematic comparison to identify the components, mechanisms, and effectiveness of innovation policies. The case of China is chosen as the focus because it is a typical model of State-oriented innovation policy, with the second largest R&D investment scale in the world and a public policy system with strong coordination among ministries, sectors, and localities. The analysis of the Chinese case aims to clarify how the Government uses a combination of policy tools - from finance, tax, national mission, to high-tech cluster infrastructure - to form a national strategic innovation ecosystem.

Table 1. Policy components for promoting innovation in China

Components	Typical design/policy	Enforcement mechanism	Observation results sign	Restrictions/Conditions
R&D tax incentives	Additional deduction of R&D costs (super-deduction); preferential tax rates for high-tech enterprises	Standardize R&D expenditure categories; post-audit records; interconnection between tax authorities and the Ministry of Science	Increase private R&D investment; increase the number of enterprises meeting high-tech standards; improve innovation productivity	Risk of "bundling" costs; differences in compliance capacity between localities
Mission policy	Focus on strategic technologies (AI, semiconductors, new energy, core machine tools)	Inter-ministerial coordination; clear goals, roadmap, and milestones	Increase investment in core technology; form domestic supply chains	Duplication of tasks; lack of independent assessment
High-tech cluster/zone	Torch Program and National High-Tech Park System	"One-stop" mechanism on land, tax, services;	High-tech enterprise density increases sharply; commercialization	Quality differences between zones; local competition favors

		incubation - acceleration - transfer model	time shortens	
Public procurement and innovation ordering	The government is the "first customer" for domestic technology.	Priority product list; mandatory technical appraisal	Expanding test markets; increasing absorption of new technologies	Need for transparency, avoid excessive domestic preference
Talent policy	"Thousand Talents Plan" program, supporting key research groups	Connecting institutes - schools - businesses; linking funding with output KPIs	Increase public-private R&D capacity; form interdisciplinary research groups	Dependent on subsidies; difficult to maintain long-term commitment

(Source: OECD,2022 ; WIPO,2023)

Content analysis shows that China's innovation policy is designed in a multi-layered policy integration direction,in which R&D tax incentives and high-tech zones play a fundamental role, while mission programs are macro-oriented tools.

First, R&D tax incentives have been widely implemented since 2016, allowing businesses to deduct 175-200% of eligible R&D expenses. Data linkage between tax authorities and the Ministry of Science and Technology has reduced the phenomenon of double declaration, while encouraging private enterprises to expand R&D investment. However, due to differences in accounting and monitoring capacity, policy effectiveness has clearly differed between coastal provinces and inland areas.

Second, the mission policy in the 14th Five-Year Plan clearly demonstrates the orientation of a creative State. The "national missions" focus on core technologies with pervasive effects and are monitored by inter-ministerial expert groups. Qualitative results from OECD (2022) and WIPO (2023) reports show that priority sectors have patent registration and technology transfer rates twice as high as traditional industries. However, the assessment of success is still heavily focused on input indicators (budget, number of tasks), and should gradually shift to output indicators such as commercialization rate or social impact.

Third, the national network of high-tech zones is a central tool for commercializing R&D results. The "one-stop shop" mechanism combined with incubation and acceleration services helps reduce the time to bring products from the laboratory to the market. A World Bank report (2021) shows that enterprises in NHIDZs have an average productivity of 30-40% higher than enterprises outside the zones. However, the quality between zones remains uneven, due to differences in local management capacity and the level of engagement with institutes and universities.

Fourth, public procurement for innovation is being expanded to encourage "testing - certification - standardization" of new technologies. The government becoming a "first customer" reduces commercial risks, but requires transparency in the selection process to avoid bias against large domestic enterprises.

Finally, science and technology talent development policies such as the Thousand Talents Plan have helped create key research groups, contributing to China becoming the leading country in Asia in terms of the number of publications and patents. However, the sustainability of the program depends on its ability to create endogenous incentives rather than relying solely on subsidies.

The above results show that China's innovation policy operates on a "top-down" logic but is reinforced by a multi-layered policy network. This model is effective in the period of rapid industrialization and requires concentrated resources, but in the long term, it needs to increase transparency, independent evaluation mechanisms and spread to the small and medium-sized enterprise sector to ensure sustainability. China's policy demonstrates an important principle: the coordination of financial instruments, institutions and strategic missions can create national innovation capacity if accompanied by policy feedback mechanisms and continuous learning.

Singapore

In the context of globalization and knowledge competition, Singapore is one of the early Asian countries to adopt a mission-oriented approach combined with unified policy coordination at the national level. Analyzing the

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 11 Nov. 2025, pp: 81-95 www.ijaem.net ISSN: 2395-5252

Singapore case helps clarify the "Strategic Innovating State" model - where the Government not only plays a supporting role but also designs and leads the innovation ecosystem through targeted investment mechanisms, public-private partnerships and output-based evaluation. TheData compiled from the Research, Innovation and Enterprise 2025 (RIE2025) report, OECD STI Outlook 2022, and World Bank Innovation Policy Platform (2021).

Table 2. Policy components to encourage innovation in Singapore

Components	Typical design/policy	Enforcement mechanism	Observation results sign	Restrictions/Conditions
Mission orientation	RIE2025 Strategy with 4 key areas: advanced manufacturing, healthcare, sustainable cities, smart nation & digital economy	Program-based budget allocation; multidimensional output KPIs	Concentrated investment flows; increased public-private partnership; rapid knowledge diffusion	Need to be flexible in updating goals as technology changes
Financial and tax tools	R&D tax credits, co-investment between the state and the private sector	Matching fund; prioritizes fast-growing startups	Increase commercialization and private investment	Risk depends on project screening capacity
Cluster ecosystem	One-north zones: Fusionopolis, Biopolis; Corporate Labs	Sharing infrastructure, services, testing standards	Promote rapid technology transfer; integrated supply chain	High infrastructure costs; small domestic market size
Public procurement and open innovation	GovTech, Open Innovation Platform; experimental sandbox mechanism	Real-world testing; early user feedback	Create early demand for new technology; increase regulatory flexibility	Avoid overly detailed technical requirements that hinder small businesses.
Talent and intellectual property policy	Transparent IP policy, business engagement scholarships, expert visas	Mechanism for sharing benefits from intellectual property	Attract international experts; accelerate spin-offs from institutes and schools	Competition for high-quality human resources in the region is growing.

(Source: RIE2025 ; OECD STI Outlook 2022, World Bank,2021)

It can be seen that Singapore has built a systematic and clearly oriented innovation model, in which the State plays the role of "institutional creator and strategic co-investor".

First, RIE2025 is a central coordination platform for all science and technology activities, combining four mission areas linked to specific socio-economic goals. The government establishes a mechanism for programmatic budget allocation and measures it using a set of multidimensional indicators (KPIs) including: economic impact, technological outcomes, public-private partnerships, and social benefits. This approach helps ensure policy coherence between growth and social welfare, which is rare in developing economies.

Second, financial and tax policies for R&D are operated in the direction of "sharing risks and benefits". The government does not provide direct funding but co-invests with the private sector through innovation funds or matching funds, ensuring commercialization and market discipline. Programs such as Startup SG Equity and Enterprise Development Grant have promoted the formation of a wave of high-tech startups, especially in the fields of fintech and artificial intelligence.

Third, the innovation cluster model is a prominent feature of Singapore. The one-north zone integrates three spaces of research, production and trade, creating conditions for enterprises, research institutes and universities to co-develop solutions. The "co-location" approach helps reduce knowledge transaction costs and accelerate technology transfer. However, due to high infrastructure costs, Singapore must maintain regional cooperation to expand market scale.

Fourth, innovation-driven public procurement is implemented through GovTech and

International Journal of Advances in Engineering and Management (IJAEM)
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the Open Innovation Platform (OIP). The government becomes the "first consumer" of technology solutions in public services and urban management. The application of a "sandbox" mechanism allows policy testing in a controlled environment, enabling businesses to test new products without heavy legal constraints. This model contributes to the diffusion of innovation to the private sector.

Finally, Singapore's talent and intellectual property (IP) policies are what differentiate it from other countries in the region. The government ensures clear rights between institutes, universities and businesses in commercializing research results. This encourages researchers to boldly start businesses and engage in public-private partnerships. In addition, visa and scholarship policies that connect businesses help attract international experts, creating a multicultural and dynamic working environment.

Qualitative results show that the Singapore model is highly effective thanks to institutional unity, transparency and continuous policy learning. However, this model only works optimally under conditions of effective governance, stable public budgets and highly qualified human resources. For developing economies, the Singapore experience suggests that:(i) Innovation policies need to be directly linked to measurable social missions;(ii) Public-private co-investment and public procurement mechanisms are key levers for forming innovation markets;(iii) The cluster ecosystem needs to be designed as a "knowledge platform" - a place that connects people, data and businesses in an open, interactive space.

Overall, Singapore represents a model of mission-driven innovation - integrated governance, where innovation performance is measured not only by the number of patents, but also by the extent of knowledge spillover, public-private collaboration and social impact of technology. This is an advanced model to compare and contrast with other Asian countries in the next section.

Japan

Japan has a long tradition of integrating science and technology policy and social development, and is considered a pioneer in Asia in transforming from a "technology-driven innovation" model to a "socially driven innovation" model through the Society 5.0 program. From the qualitative method perspective presented in Part 3, the case of Japan is chosen to demonstrate the integration of mission policy, innovation governance and institutional reform, in which economic goals are closely linked to social goals and sustainable development.

The data are compiled mainly from OECD STI Policy Review Japan (2022), the Japanese Government's Society 5.0 Implementation Framework report (2021), and research works on Research Policy and Technovation in the period 2019-2023.

Table 3. Policy components for promoting innovation in Japan

Components	Typical design/policy	Enforcement mechanism	Observation results sign	Restrictions/Conditions
Mission policy	Society 5.0 Program, "Cross-ministerial Strategic Innovation Promotion (SIP)"	Inter-ministerial coordination; goals linked to social challenges	Promoting digital technology, healthcare, smart cities, green energy	Need to speed up implementation at local level
Financial and tax policy	R&D Tax Credit and Theme-Based Funding (NEDO, METI)	Results-based contracts	Maintain R&D capacity of large enterprises; support technology SMEs	Limited access for SMEs; complex processes
Regional innovation clusters	Regional Innovation Ecosystem ; industrial and university zones	Local cooperation mechanism, technology transfer	Increase institute-school-enterprise linkage; spread regional knowledge	Regional disparities and local labor shortages

International Journal of Advances in Engineering and Management (IJAEM)
Volume 7, Issue 11 Nov. 2025, pp: 81-95 www.ijaem.net ISSN: 2395-5252

Public procurement for innovation	Order social solutions (robots, sensors, digital health)	Product testing in real context; user collaboration	Expanding markets for social technologies; promoting standardization	Need to simplify testing process
Talent policy and IP institutions	Open intellectual property policy; flexible movement of R&D labor	Encourage IP sharing between businesses and research institutes	Accelerating open innovation and cross-sector collaboration	Risks of IP ownership fragmentation; need for clearer benefit-sharing mechanisms

(Source: OECD STI Policy Review Japan,2022 ; OECD, 2022)

Japan has undertaken a comprehensive restructuring of its national innovation system (NIS) to shift from a technology-centric to a social-centric focus.

First, the Society 5.0 mission policy is designed to integrate digital technology development with addressing social issues such as aging populations, labor shortages, and sustainable urban development. According to OECD (2022), this is one of the first examples of a government defining innovation not only as a driver of economic growth but also as a tool to achieve overall social well-being. This approach has led to the creation of many cross-sectoral projects, connecting the technology, health, and infrastructure sectors.

Second, R&D financing and tax instruments remain the traditional foundation of Japan's innovation policy, but have been improved in a "results-oriented" direction. The funding programs of the Japan Energy and Industry Agency (METI) and the New Energy Development Agency (NEDO) require specific output reports on products, patents, and research institute-enterprise cooperation. This helps ensure the efficiency of public investment and reduces duplication of tasks. However, SMEs still face difficulties in accessing funding due to complex processes and high technical requirements.

Third, regional innovation clusters are seen as a pillar for spreading knowledge from the center to the local area. Japan focuses on connecting universities with businesses in the same region, forming innovation centers specializing in robotics, biotechnology or energy. According to Foray (2021), these clusters play the role of "knowledge convergence points", helping to shorten the gap between research and application. However, the disparity between regions and the shortage of local technology human resources remain major challenges.

Fourth, innovation-driven public procurement has been developed as an effective demand-side tool. The Japanese government plays the role of "strategic consumer" by ordering products for social services, such as elderly care robots, medical sensor systems or smart infrastructure. Experimentation in real-world settings helps companies perfect the technology and quickly commercialize it. However, OECD experts recommend simplifying the procurement process and increasing transparency to avoid procedural barriers for small and medium-sized enterprises.

Finally, Japan's talent policy and intellectual property regime have made significant strides in allowing the mobility of R&D workers between the public and private sectors and encouraging the sharing of IP between research institutes and businesses. This policy facilitates the formation of interdisciplinary projects, encourages open innovation, and reuses research results across multiple fields.

Overall, Japan's innovation model illustrates the evolution of public policy from a technological to a social one, reflecting the State's long-term vision of ensuring welfare and sustainable development. Compared to China and Singapore, Japan focuses more on "humanistic innovation" - that is, putting technology at the service of people. However, to maintain effectiveness, the country needs to improve institutional flexibility and strengthen coordination capacity between the central and local levels.

Qualitative results show that Japan's experience has important implications for developing countries:(i) Innovation policies need to be closely linked to social development strategies;(ii) It is necessary to combine tax incentives and results-based funding mechanisms ; (iii) Regional innovation cluster networks are effective tools for knowledge diffusion, but must be

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supported by talent policies and synchronous infrastructure.

In summary, Japan is a typical model of socially oriented mission policy, in which the State is not only a creator but also a "policy learner and adaptor", helping the national innovation system operate more flexibly and sustainably in the period of digital transformation and population aging.

Korea

South Korea is one of the typical Asian countries in building an industrial-oriented innovation policy, with a close combination of R&D financial and tax incentives, mission policies, and high-tech cluster development. Since the 1997 Asian financial crisis, the Korean government has restructured the science and technology system, shifting from a "large enterprise-led" model to a "multi-agent innovation ecosystem" model, in which small and medium-sized enterprises and public research institutes play an increasingly important role.

above methodological framework, the research data were compiled from Korean Innovation Strategy 2022-2025,OECD Science, Technology and Innovation Outlook 2023,World Bank Korea Case Study (2021) and academic works by Lee (2019), Kim & Park (2020). The objective of the analysis is to clarify how Korea operates a combination of policy instruments to maintain technological competitiveness and expand innovation beyond the scope of traditional chaebols.

Table 4. Policy components for promoting innovation in Korea

Components	Typical design/policy	Enforcement mechanism	Observation results sign	Restrictions/Conditions
R&D tax policy	High tax incentives for small businesses; tax credits based on scale and cooperation	R&D cost aggregation; flexible ceiling and floor regulations	Increase R&D investment in SMEs; expand innovation in services	Complex procedures, need to reduce compliance costs
Mission policy and priority sectors	Development orientation of ICT, semiconductors, batteries, energy and biology	The industrial policy-innovation link	Increase global market share in core technology	Need to diversify into new fields, avoid over-concentration
Innovation ecosystems and technology clusters	Semiconductor-electronics cluster, AI and robotics cluster in Seoul, Daejeon	Institute - school - enterprise cooperation, technology testing	Shorten time to commercializati on; spread knowledge quickly	SMEs find it difficult to join large clusters; regional differences
Innovation-oriented public procurement	KONEPS Electronics; new technology orders for SMEs	Digitalization process; legal sandbox	Open initial markets for new technologies; increase transparency	Post-commercialization impact monitoring needed
Talent and Entrepreneurship Policy	TIPS Program, Regional Innovation Center (CIC)	Connecting advisors - capital - customers; early stage funding	Rapidly increasing number of technology startups; good scalability	Need to increase survival rate after 3-5 years; compete for investment capital

(Source: Korean Innovation Strategy,2023 ;World Bank Korea Case Study,2021)

The content analysis results show that Korea's innovation policy is designed in a multi-instrument coordination direction,emphasizing the role of the State in both supporting and "activating" the innovation capacity of the private sector.

First, Korea's R&D tax incentive policy is considered one of the most effective models in the region. The government applies a flexible R&D expense deduction mechanism based on the size of the enterprise, allowing small and medium-sized enterprises to benefit proportionately without being unfairly competitive with large corporations. According to the OECD (2023), Korea's R&D tax credit averages 0.25% of GDP - much higher than many other OECD countries - and has a direct impact on the rate of private investment in research. However, the procedure for proving eligible expenses remains complicated, reducing the accessibility of some young technology SMEs.

Second, the mission and priority industry policy focuses on high-value strategic sectors such as information technology, semiconductors, batteries, clean energy, and biotechnology. The government sets "national missions" with specific technology roadmaps and links between innovation, manufacturing, and exports. This model enables Korea to maintain its leading position in the global supply chain of semiconductors and electronics while expanding into green technologies. However, too much concentration in a few sectors may expose the economy to the risk of technological cycle dependence.

Third, high-tech innovation clusters and ecosystems play a central role in national development strategies. The semiconductor cluster in Daejeon, the robot cluster in Seoul or the Pangyo Techno Valley are typical examples of cooperation between enterprises - research institutes - universities. According to Lee (2019), these clusters help shorten the average time to commercialize products from 3 years to about 18 months. However, SMEs still face barriers when joining clusters due to high technological capacity requirements and investment costs, while the regional gap between the capital and localities has not been overcome.

Fourth, innovation-oriented public procurement is effectively implemented through the KONEPS electronic system - a platform that makes the entire bidding process transparent and allows small businesses to test new technologies in public projects. The government uses a "legal sandbox" mechanism to test regulations in a controlled environment, thereby encouraging innovation while ensuring legal security. However, many studies (Kim & Park, 2020) suggest that post-commercialization evaluation should be strengthened to measure the actual impact of the technology being procured.

Fifth, the talent and technology startup policy is a bright spot in Korea's innovation model. This program creates a network of connections between private investors, advisors and startups, and is supported by capital from state funds. Thanks to that, Korea has become the leading technology startup hub in Asia, second only to Singapore. However, the current challenge is maintaining the survival rate of startups after 3-5 years, due to competition for capital and high operating costs.

In summary, the Korean innovation policy model reflects a shift from "production-oriented innovation" to "ecosystem-based innovation," where the government plays a catalytic role and businesses and research institutes are the centers of value creation. The lessons learned are:Flexible R&D tax incentives for SMEs should be designed, combined with an automated post-audit mechanism to reduce administrative costs;The national technology mission must balance short-term export goals with long-term sustainability goals;High-tech clusters and digital infrastructure are core conditions to shorten the commercialization cycle and accelerate knowledge diffusion;Public procurement and regulatory sandboxes are powerful demand-side tools, creating testing grounds for new technologies;Talent and entrepreneurship policies need to be geared towards long-term viability, not just the start-up phase.

Thus, Korea clearly demonstrates the "Innovation Catalyst State" model,in which the role of the Government is to create institutional foundations, encourage public-private partnerships, and maintain a continuous policy learning mechanism. This is a valuable lesson for developing economies in the process of building policies to encourage innovation associated with industrialization and digital transformation.

Synthesize results and compare international experiences

An analysis of four case studies - China, Singapore, Japan and South Korea - shows that innovation promotion policies in Asia, while diverse in form, converge on the common goal of creating a dynamic, sustainable and socially oriented innovation ecosystem.

Despite differences in economic size, industrial level and institutions, these countries exhibit three prominent trends:(i) shift from "technology push" to "mission-oriented" policy;(ii) combining supply-side (finance, tax, talent) and demand-side (public procurement, standards, social needs) instruments;(iii) consider the State as an "institutional creator" instead of just a "market intervener".

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Table 5. Summary comparison of innovation promotion policies in four Asian countries

Main topic	China	Singapore	Japan	Korea	General comments
Mainstream policy model	State-driven innovation	Mission-oriented innovation with central coordination	Socially Oriented Innovation (Society 5.0)	-private ecosystem	Different models but all have the State as the coordinating center
Financial instruments - R&D tax	R&D expense deduction; incentives for high-tech enterprises	Matching fund, co-investment, R&D tax incentives	R&D Tax and Theme Funding	Flexible tax credits, prioritizing SMEs	Highly effective when combined with cost standards and transparent post-audit mechanisms
Mission policy	Focus on core technology and national security	RIE2025 Four-Area Orientation	Solving social problems through Society 5.0	Strategic industries: ICT, semiconductors, clean energy	Mission is a long-term guiding tool that requires specific measurable goals.
Innovation ecosystems and clusters	Torch Zone and High-Tech Zone Network	One-north area integrating research - production - trade	Regional innovation clusters, industrial parks - universities	Pangyo Techno Valley and specialized clusters	Clusters are infrastructures for knowledge diffusion and shortening commercialization cycles.
Public procurement and sandbox	Pilot public procurement for domestic products	GovTech, Open Innovation Platform	Order social solutions	KONEPS electronic system and legal sandbox	Demand-side tools are increasingly important, creating test markets for new technologies
Talent and IP policy	Thousand Talents Plan; linking funding to output	Transparent intellectual property, expert visas	Open IP policy, encouraging sharing	TIPS Network and Regional Innovation Hub	Talent is the deciding factor; transparent IP and clear benefit sharing are needed

(Source: author's synthesis; 2025)

The synthesis results show that Asian countries are gradually converging on a "three-tier" structure in innovation policy:

First, at the strategic level, the government plays a role in creating and guiding "national missions" to focus resources on goals with large spillover effects. China focuses on core technology, Singapore aims for green growth and the digital economy, Japan focuses on social welfare, and South Korea considers innovation as a pillar to maintain high-tech export capacity.

Second, at the policy instrument level, countries have coordinated tax incentives, co-investment funds, and institutional support mechanisms. The effectiveness of financial instruments depends not only on the level of spending, but also on how outputs are measured - for example, Singapore and Japan evaluate innovation projects based on commercialization and social impact rather than R&D inputs.

Third, at the operational level, the cluster ecosystem and innovation platforms become the main driving force. Clusters such as Torch (China), one-north (Singapore), or Pangyo (Korea) play the role not only as technology hubs but also as knowledge collaboration environments, helping to shorten the commercialization cycle and enhance interactions between institutes, businesses and the government.

The comparative analysis also shows the relationship between policy effectiveness and institutional capacity: countries with transparent governance systems, independent policy evaluation mechanisms and open data (such as Singapore, Japan, South Korea) achieve better innovation diffusion results than countries with a more

centralized administrative leadership model. However, the Chinese model still stands out in terms of investment scale, implementation speed and resource mobilization capacity.

From an academic perspective, this result reinforces the argument that innovation promotion policies are most effective when the State is both a policy guide and a policy learner.A national innovation system is only truly sustainable when it has the ability to continuously feedback between planning, implementation and adjustment based on practical evidence.

Thus, the international experiences analyzed here not only illustrate four different models of innovation policy in Asia, but also reveal a general trend: the convergence between technological innovation and social innovation, in which the role of public policy is increasingly more ecosystem-creating and coordinating than traditional administrative intervention.These lessons will be an important basis for establishing a suitable approach for Vietnam in the context of digital transformation, green growth and global economic integration.

V. CONCLUSION AND POLICY IMPLICATIONS

The research results have confirmed that innovation promotion policies are becoming the leading strategic tool of Asian countries in the new stage of development. Although pursuing different models — from China's "state-oriented innovation", Singapore's "mission-oriented innovation", Japan's "social innovation", to South Korea's "ecosystem-based innovation" — all represent a fundamental change in the role of the State, from "market intervention" to "innovation market creation and coordination".

Qualitative evidence gathered from academic literature, reports by OECD, WIPO and World Bank shows that the success of innovation policy does not depend solely on the level of R&D spending, but on the degree of coherence between financial policy, institutions, human resources and social goals. In other words, the effectiveness of the national innovation systemnot from individual tools, but from the harmonious coordination of "innovation policy clusters" and the ability of management agencies to continuously learn.

A highlight of successful models is the integration of innovation with sustainable development orientation, through national mission programs focusing on social challenges such as digital transformation, clean energy, healthcare, smart cities and creative education. This is the global transformation trend: from innovation for productivity to innovation for quality of life and inclusive development.

Policy recommendations for the Asia region

First, innovation policies need to be mission-driven, defining measurable social objectives, such as green growth, digital transformation, or technological security. Defining a "national mission" helps focus resources, encourage public-private partnerships, and create cross-sectoral spillovers.

Second, the state needs to act as an "innovation catalyst," rather than just an investor. This requires inter-ministerial coordination mechanisms, open policy data systems, and independent evaluation bodies to monitor program effectiveness. Countries such as Singapore and South Korea have demonstrated that policy feedback loops are crucial to maintaining the sustainability of innovation systems.

Third, coordinate policy instruments according to the "two-way" principle - supply and demand. Supply-side instruments (tax incentives, research funds, human resource training) need to be accompanied by demand-side instruments (public procurement, technical standards, commercialization support). When these two groups of instruments are deployed synchronously, innovation will not stop in the laboratory but spread to the market and society.

Fourth, build regional innovation capacity and local linkages. Lessons from Japan and South Korea show that regional innovation cluster networks help create a "local knowledge economy", accelerating the commercialization and diffusion of technology. For Asian countries with large regional disparities, this is a necessary direction to ensure inclusiveness of innovation growth.

Ultimately, digital talent and knowledge are the foundation of any innovation system. Governments need to focus on STEM education, digital skills, encourage lifelong learning, and create innovative work environments. At the same time, transparent and flexible intellectual property regimes will encourage scientists and businesses to commercialize research results more quickly.

Orientation for Vietnam

From the international experiences compared, some orientations can be drawn for Vietnam in perfecting innovation encouragement policies in the coming period:

First,Shift from a supportive mindset to a constructive mindset.Vietnam needs to establish the role of the State not only as a "funder" but also as

an "innovation ecosystem coordinator", with the function of leading, learning and providing policy feedback based on empirical evidence.

Second,define clear and measurable national innovation missions.Potential areas include: digital transformation in small and medium enterprises, renewable energy, smart agriculture, cultural industries and public health. Each mission should be linked to specific goals, implementation roadmap and a set of quantitative assessment indicators.

Third,develop regional innovation clusters associated with universities and high-tech zones.The "State - Institute - Enterprise - Society" (Quadruple Helix) linkage model should be applied to form local knowledge dissemination and technology incubation centers.

Fourth,expand public procurement mechanisms for innovation.The government should become the "first customer" of innovative products in public sectors such as clean energy, digital education, smart healthcare - similar to the experiences of Singapore and South Korea.

Fifth,increase investment in human resources and knowledge data.Vietnam needs to prioritize budget for digital skills training, reform higher education, and build an open research database system to support learning and policy evaluation.

These orientations, if implemented synchronously, will help Vietnam move from the stage of "passive innovation" to "active innovation", thereby enhancing national competitiveness and creating momentum for the development of a knowledge-based, green and inclusive economy in the coming decade.

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