

LOOK OUT TO THE WORLD**THE NATIONAL INNOVATION SYSTEM AND POLICY
IMPLICATIONS FOR ENTREPRENEURSHIP
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Abstract:

In a knowledge economy, accelerating the pace of knowledge building and the rapid acquisition of knowledge are keys to innovative development. However, the development of the commercialization of research results and formation of new start-up companies are often not as active as they should be with a lack of motivation and incentive being one of the contributing factors for the failure to take action. In Taiwan and Japan, the reason that widely advocated idea of industry-academia collaboration is to help advance the technological capabilities of research and development as well as produce economic benefit. The assistance rendered by the government during the transformation and the assessment of outcomes from entrepreneurial pursuits are key issues explored in this study. The results indicate that the network system in the national innovation system is important for entrepreneurship development. The domestic market of Taiwan is not as large as Japan and new entrepreneurs have to face global market challenges.

Keywords: *Entrepreneurship; National innovation system; University-industry cooperation.*

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4. Taiwan's innovation system***4.1. The development of the Taiwanese innovation system***

Taiwan was colonized by Japan and has close economy links with Japan. Taiwan's early infrastructure, industrial technology, and industry development were all impacted by Japan (*Eriksson, 2005*). Taiwan's science and technology policy development started from the "Guidelines for the Long-range Development of Science" approved by the Executive Yuan in 1959 in order to "solidify the foundation for science development". In 1968, the "Twelve-year Science Development Plan" was approved and

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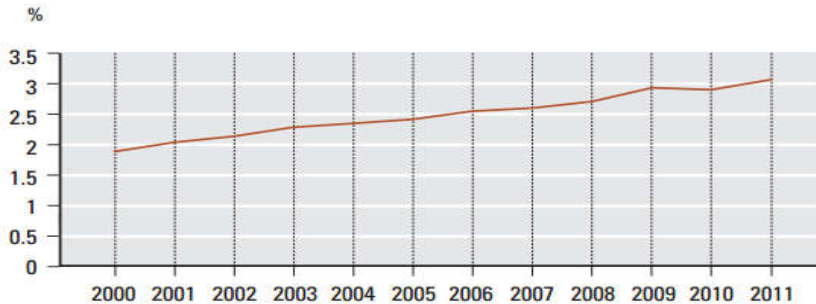
its implementation focus was to improve science education for schools at each level, to develop basic and application science research, and help science and technology correspond to national development (*Yearbook of Science and Technology, Taiwan ROC, 2010*). In 1999, the “Science and Technology Basic Law” was passed to require the government to undertake necessary measures to upgrade the national science and technology level, to facilitate economic development, and to realize the sustainable development of society.

The Taiwanese organizational system to facilitate innovation development is divided into three parts: science and technology administration organizations, intermediary institutes, and the evaluation system. The purpose to promote the administrative system is to facilitate science and technology development policies. The National Science Council (NSC) follows the “Science and Technology Basic Law” and it should hold a national science and technology meeting every four years. The NSC should later follow a consensus reached in the meeting to propose a new “Development Plan of National Science and Technology” that can be implemented after approval by the Executive Yuan. Other governmental ministries (that include the Executive Yuan and the Ministry of Education) should follow the “Development Plan of National Science and Technology” and its requirements. The members of the NSC should be served by Ministers Without Portfolio responsible for technology affairs and domestic as well as foreign scholars. In addition, the NSC is also responsible for promoting national science and technology development, supporting academic research, and the development of a National Science Park. Its purpose is to achieve technology innovation as well as value creation that realizes a quality of life vision and a sustainable society.

Intermediary institutes mainly consist of corporate institutes and academic research systems, including corporate entities such as the Industrial Technology Research Institute as well as the National Health Research Institutes, Academia Sinica and universities and colleges. They are in charge of basic research, applied research, and commercial development that helps implement the science and technology policy. In addition, a National Science Park is also an important goal for the applied research of technology and technology development as well as commercialization.

Science and technology development has high risks; therefore, to utilize resources, the government has established technology development policies as well as promoted the medium -term and long-term assessment of the plan. The purpose is to apply planned execution feedback to the formulation and execution of key science and technology plan development.

From 2007 to 2010, the average growth rate of the Taiwanese government technology budget was 4.5%. The national total R&D budget continued to increase and accounted for 2.94% GDP in 2009 and 3.02% in 2011 (Figure 8). In the R&D budget, the input from enterprise sectors had the highest percentage at 69.7% in 2011 while the second highest was for government departments at 28.9%.



Source: *Science and Technology Indicators, NSC of the Executive Yuan, 2012*

Figure 8. Percentage of national R&D budget in GDP

4.2. Industry-academy cooperation development and effects in Taiwan

Taiwan faces international competition and market-opening pressure; however, SMEs also face operational challenges. Therefore, the Small and Medium Enterprise Administration of the Ministry of Economic Affairs established the Innovation Incubation Center to enhance support for SMEs. It hopes the Innovation Incubation Center can become a communication media and platform that can support small and medium enterprises. This center can effectively transform the rich academic research energy of institutions of higher education into a knowledge economy that can facilitate industry-academy cooperation to better integrate and apply academic resources.

To promote the exchange and cooperative research between technical colleges and industries, the Ministry of Education integrated resources, innovation knowledge, and technology of industry, government, academy and research institutions to strengthen industrial competitiveness. Since 2002, six regional industry-academy cooperation centers were established to promote affairs of industry-academy cooperation. The positioning of industry-academy cooperation centers became a technical and strategic alliance for regional industries that serves as an integration and contact center for the resources of industry, government, academy and research institutions. These centers were responsible for the execution of industry-academy cooperation and educational training programs, integrating related

faculty, cooperatively executing industry-academy cooperation and human resource training programs, forming industrial alliances in key areas, and the promotion of development of industry-academy cooperation plans.

According to the survey of the Higher Education Evaluation and Accreditation Council of Taiwan (2011), the government budget for industry-academy cooperation was 697 million NT in 2007, 591 million NT in 2008, 934 million NT in 2009 (57% higher than that in 2008), and 727 million NT in 2010 (22.14% lower than that in 2009). It was 2.66 million NT in 2007 for the industry-academy budget of enterprises; subsequently, it increased by year to 4.06 million NT in 2012.

The income return from intellectual property also increased annually relative to industry-academy investment. According to the survey results, the income was 277 million NT in 2007, increased to 456 million NT by 64% in 2008, and 676 million NT in 2010 (Table 2).

Table 2. Intellectual Property Licensing 2007-2010

	Intellectual Property Licensing Return (million NT)	Growth Rate
2007	277.6	
2008	456.1	68.28%
2009	474.0	3.91%
2010	676.2	42.67%

Source: Higher Education Evaluation and Accreditation Council of Taiwan, 2013

4.3. Taiwan entrepreneurship development

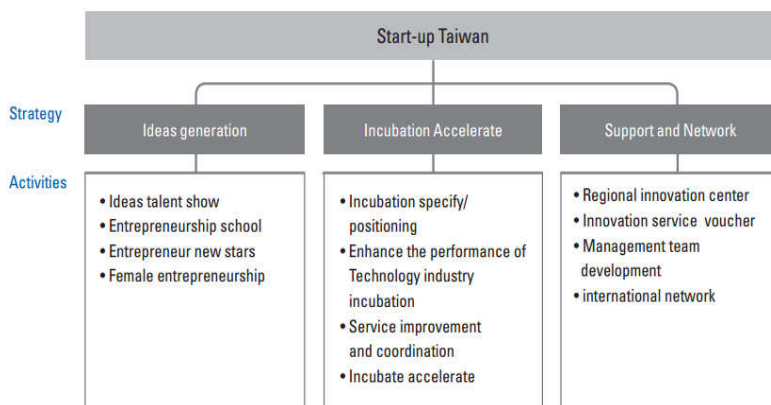
The Taiwanese entrepreneurship policy first developed from an SME policy that belonged to an extension category of the SME policy. In 1966, the International Economic Cooperation Committee of the Executive Yuan set up the “SME Counseling Work Team” to manage small industrial loans and operational fund affairs to meet the capital demands of SME owners. It had an organizational restructuring in January 1981; subsequently, the Small and Medium Enterprise Administration, Ministry of Economic Affairs was established as the dedicated counseling institute for the sound development of SMEs. Additionally, it was also responsible for the development and planning of key entrepreneurship policies that are parallel to relevant SME policies.

In 1990, to encourage entrepreneurial development, relevant governmental institutes proposed many financial load policies to encourage entrepreneurship such as the Youth Entrepreneurship Loan and the Micro-

Entrepreneurship Loan. There are also special population loans for females and aboriginals. The purpose of providing entrepreneurial loans is to make funding more accessible for entrepreneurial activities.

In regards to Taiwanese academic research results, Taiwan's SCI and SSCI publications were 16th worldwide in 2010, and the number of citations ranked 19th worldwide. As for the patent applications in the top five international patent offices, Taiwan had most patent numbers in mainland China (22,419), the US (20,151), and Japan (3,240). However, Taiwan has less control of business development opportunities. Many regional universities have established incubation centers to facilitate commercialization development; however, there are qualification requirements and only incorporated enterprises are eligible to enter and operate in the center.

To effectively facilitate research and the commercial development of R&D results, the Small and Medium Enterprise Administration proposed the "Start-up Taiwan" project in 2012 that targets the integration of all previous entrepreneurship resources offered to SMEs in order to facilitate the development of startups. The key operational strategies are the "Start-up Taiwan" project that include the "Ideas Generation", "Incubation Accelerate", and "Support and Network" (Figure 9).



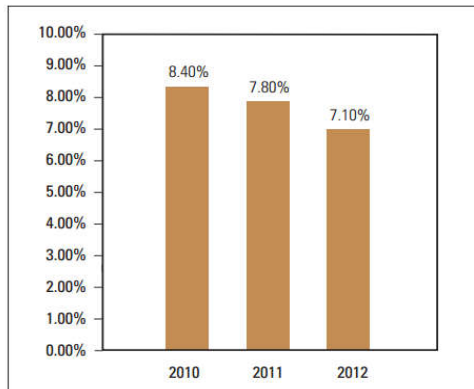
Source: Small and Medium Enterprise Administration, 2013

Figure 9. Start-up Taiwan project

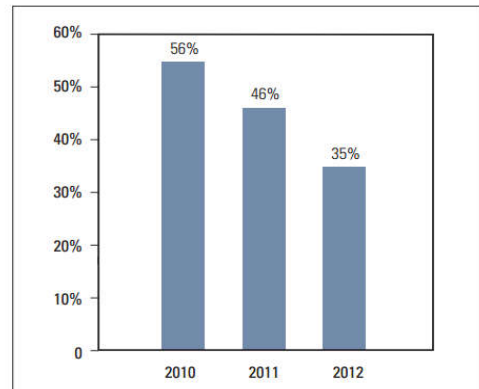
4.4. The development of Taiwanese startups

According to the study of entrepreneurial activity in the GEM Executive Report, the statistics show that the Taiwanese percentage of "Total Entrepreneurial Activity (TEA)" has decreased in recent three years from

8.4% in 2010 to 7.10% in 2012 (Figure 10); however, the percentage of “nascent entrepreneurship” has decreased from 56% to 35% (Figure 11).



Source: Global Entrepreneurial Monitor report (2012)



Source: Global Entrepreneurial Monitor report (2012)

Figure 10. Total Entrepreneurship Activity (TEA)

Figure 11. Nascent Entrepreneur

According to the GEM survey results for Taiwan and the world yearbook in 2010 (Kelley, Bosma, & Amorós, 2010), the perception of Taiwanese citizens on entrepreneurship opportunities was 29.6% and the perception of entrepreneurial capability ranked 3rd from the bottom. The GEM also surveyed citizens not involved in entrepreneurial activities in order to investigate entrepreneurial intent over the following three years; subsequently, the percentage for Taiwan was 25.1%.

Taiwan is an export-oriented economy and emphasizes market internationalization. The GEM 2010 survey data indicates that Taiwan has 11.9% as a high-internationalization orientation (with more than 25% of customers as overseas customers) in TEA and 19.56% as low-internationalization orientation (with 1-25% customers as overseas customers). The Taiwanese TEA indicates only 31.46% with a certain level of internationalization performance and percentage is slightly higher than the average percentage of factor-driven economies (27.69%); however, lower than that of efficiency-driven economies (42.18%) and that of innovation-driven economies (56.94%). This shows that the internationalization level of Taiwan’s TEA is relatively low.

Commercial development must be established on access to market information to help startups to become market-oriented. In this phase, it is important to have significant access to market information and financial support. The government Ministries of Taiwan have provided relevant

policies and financial resources to facilitate innovation and entrepreneurship development. Since 1990, Taiwan has started to promote entrepreneurship-relevant policies that provide entrepreneurship loans to help startups resolve financing problems. Since 2012, the Small and Medium Enterprise Administration has been in charge of the promotion of the “Start-up Taiwan” project to integrate all available entrepreneurship resources and encourage the development of startups. Financial support is a challenge for startups in Taiwan. Most of the entrepreneurship funding is from the public sector and rarely from venture capital. There is no risk money for entrepreneurship development at universities. Venture capital is not as active in Taiwan as in Western countries.

5. Conclusion

The Taiwanese and Japanese governments have exercised comprehensive measures to improve national competitiveness in order to improve national competitiveness when challenged by global economic turmoil and internationalization. Using science and technology policy can lead to industrial development; subsequently, technology has become a key strategy. Taiwan and Japan have established long-term economic trade relations and historical interactions. A comparative study of these two countries is concluded with several prominent characteristics that serve as references.

5.1. Innovation system development structure

Taiwan and Japan both have a basic law basis for their innovation system development structures to implement the development of the science and technology policies. Japan has the 1995's Science and Technology Basic Law and formulates a science and technology basic plan every five years to serve as the central principle for science and technology and industry development. Taiwan has the Science and Technology Basic Law of 1999 and holds national science and technology meetings every four years to formulate a development plan for national science and technology. Taiwan and Japan have similar entities for innovation system development. However, Japan has higher input than Taiwan in regards to the R&D expenditure percentage. The established Japanese R&D and basic technology support can serve as a reference for Taiwan.

5.2. Industry-academy cooperation development

The development of industry-academy cooperation and application linkage of practices are helpful for the commercial application of research results. A comparison of Taiwan and Japan shows that the major funding sources of

industry-academy cooperation are government-led funds and the percentages of enterprise funding that have only recently increased. Practical economic benefits and licensing returns have gradually increased in recent years and shows that enterprises have a higher gradual demand for and emphasis on research results from academia and research institutes. This observation is very meaningful for innovation system activities.

5.3. International expansion of entrepreneurial activities

Compared to Japan, Taiwan has promoted the “Start-up Taiwan” project and has a definite entrepreneurship development plan. Its value expansion of entrepreneurial activities focuses on taking advantage of market opportunities and on increasing market values. Taiwan enterprises have small scope of domestic market; therefore, the main markets for startups are international markets. This increases the importance of taking advantage of market opportunities and value chains.

The GEM survey shows that the Taiwanese internationalization level percentage for TEA is higher than that of Japan (20.77%) and China (19.41%); however, lower than South Korea (44.65%), Israel (55.28%), or the US (80.82%). Compared to the Japanese focus on the domestic market economy, the Taiwanese economy is export-oriented and emphasizes international development. Taiwan should pay attention to internationalization in order to facilitate commercialization development and value upgrade. However, international market expansion requires significant resource investment and startups generally short of adequate capital to develop international markets. Therefore, startups may have difficulties to increase their business size.

The research analysis of this study provides several suggestions for the current entrepreneurship policy development of Taiwan:

5.3.1. Support and establish a network environment for startup development

Taiwan has higher entrepreneurial motivation and more active entrepreneurial activities than Japan; however, there is room for improvement. Entrepreneurship development is based on quality research and continuous interaction with an established network; therefore, the innovation system should continue to establish an environment and mechanism for industry-academy interaction. In addition, it should improve and enhance entrepreneurship counseling mechanisms. The analysis of Taiwan and Japan shows that it is difficult to understand the real value of capital investment, especially the investment by venture capital. The capital environments of Taiwan and Japan are relatively weak when compared to

the US entrepreneurship environment; subsequently, there should be a mechanism to monitor capital flow and startups in order to understand the capital system and capital demand of entrepreneurial activities. The current system can connect with venture capital; this system can be reinforced through a connection of the networks of domestic and international venture capital.

5.3.2. Counseling for expansion into international markets

To expand into international markets, enterprises will need sufficient resources and access to market demand dynamics. Startups have limited resources and have difficulties expanding into international markets. Therefore, the government can establish an international network; in addition, mentorship resources and government overseas trade institutes can be connected to provide startup assistance to enter international markets. The government can provide adequate subsidies or help them in financing when startups need capital for international marketing; subsequently, so these startups can enter international markets and increase the market value of new technology and services. Furthermore, the government should timely review and improve core capabilities and values for the development of existing startup technology or service design. Most enterprises decrease their R&D investment or slow down their innovation technology development after setting up their startups that later effect their international competitiveness.

A venture capital investment society in Taiwan and Japan is not active as the United States. Financial support is important but difficult for new entrepreneurs in Taiwan and Japan. Government funds are the major source for both countries and the venture system plays an important role in the entrepreneurship environment.

By observing the innovation system and entrepreneurial activities of Taiwan and Japan, we can find that continued R&D investment is a real government policy commitment and the application of output results will require more opportunities and interaction to connect innovation system activities and entrepreneurship./.

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