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RESEARCH ON MALAYSIA'S SCIENCE AND TECHNOLOGY INNOVATION POLICY: R&D AND INVESTMENT IN THE MANUFACTURING SECTOR

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ABSTRACT

This paper intends to review the implementation of Science, Technology and Innovation (STI) on industries and its competitiveness. The main STI Policies include the STI Master Plan 2020-2030. The Government has established several STI government agencies to promote STI including Malaysian Technology Development Corporation (MTDC), Malaysian Industry-Government Group for High Technology (MIGHT), MyIPO and Collaborative Research in Engineering, Science and Technology (CREST). For high value-added industries and science and technology parks, several industrial parks have been set up, including the Kulim High-Tech Park (KHTP), Technology Park Malaysia (TPM), MSC Malaysia, Senai High-Tech Park, Penang Science Park and North Penang Science Park. In terms of high-tech research and development investments in firms, Malaysia ranked fourth as manufacturing hub places, Malaysia is ahead from other countries in Asia. In the industry, there are MNCs, mostly from the USA, EU, Japan and other Asian countries i.e. South Korea, China and Taiwan. Among the government-linked companies (GLCs) investing in R&D are Petronas and Sime Darby. R&D investments are identified in the automobile sector and E&E cluster. sufficient integration on the innovation culture within local businesses should be instituted. As a windup, future improvement should integrate the enhancement of STI awareness and match the needs of innovation-led development.

Keywords: *Foreign Direct Investment, Manufacturing, Research and Development, Science, Technology and Innovation Policy, Technology Transfer.*

1.0 INTRODUCTION

The science and technology innovation policy has played an important role in the process of economic transformation and development in Malaysia. The Malaysian public has a high degree of interest in technological innovation and awareness of policies, but relatively low participation in the implementation of the plan. Improvement in science and technology leads to fast-paced economic development with talents as the inputs that can create a culture of scientific-based development. It has been reported that the tremendous improvement in industrialised countries such as South Korean innovation is driven by the South Korean government.

Malaysia ranks the eighth in Asia and the 33rd in the Global Innovation Index (GII) 2020 report released by the World Intellectual Property Organization (WIPO). Among the upper middle-

income economy, Malaysia ranked 33rd which is the second-most innovative after China. Malaysia is the top in the net exports of high-tech. The improvement of Malaysia's position is reinforced by high achievement in five of the seven pillars of GII, namely Market Sophistication, Human Capital and Research, Business Diversity, Knowledge and Technology Output, and Creative Output. Malaysia (33) and the Philippines (50) are the only two countries that have moved up the ranking in the Southeast Asia for their first-class tertiary education system, sophisticated capital market and vibrant private sector. The report said that Malaysia improves its rank in the Innovation Output Sub-Index (36th) and remains stable in the Innovation Input Sub-index (34th). From the input-side, sub-pillar tertiary education (8th) is the strength of the country, where it ranks fourth in terms of its science and engineering graduates and 17th in the quality of top three universities. It has been reported as four out of the top ten universities by QS World University Rankings in middle- or low-income economies, excluding China as No. 1. University of Malaya, 70; No. 8. University Putra Malaysia, 159; No. 9. The National University of Malaysia, 160 and No. 10. University of Science, Malaysia, 165.

2.0 SCIENCE AND TECHNOLOGICAL INNOVATION (STI) POLICIES

The Malaysia industrial master plans were introduced into The Industrial Master Plan (IMP1) 1986, The Second Industrial Master Plan (IMP2) 1996 and The Third Industrial Master Plan (IMP3) 2006 for industrial planning until 2020.

On the other hand, the technological innovation policies are National Science, Technology and Innovation Policy 1 and National Science, Technology and Innovation Policy 2 (2013-2020).

The current Science, Technology and Innovation Master Plan 2020-2030 enhances the national capabilities and R&D capacities, forges public research organizations and industries, improving commercialization and developing new knowledge-based industries.

The STI aims are (1) to increase R&D spending to 2% or more of GDP and (2) to achieve 70 per 10,000 or more researchers, scientists and engineers (RSEs) in the labour force by year 2020. The policies stress on university–industry collaborations and initiatives to adopt their greater links.

Nevertheless, the most research projects were commenced by government-linked companies (GLCs), e.g. Petronas, MNCs or local companies rather than higher education institutions, business sector or public research institutions (Suresh & Lai, 2015).

National Policy on Industry 4.0 (Ministry of International Trade and Industry (Malaysia)[MITI], 2018) states that most of the manufacturing firms are SME which generally have lower level of research, limited access to high performing talents and lack of capital to invest in strategic planning. Thus, the policy aims for transformation in terms of technology via the access to smart technologies and standards.

3.0 SCIENCE AND TECHNOLOGICAL INNOVATION (STI) GOVERNMENT AGENCIES

The Malaysian Technology Development Corporation (MTDC) was set-up in 1992 to help the commercialisation of public research findings. The Malaysian Industry-Government Group for High Technology (MIGHT) studies technology developments and identifies business opportunities. In 1996, the government established a multimedia super corridor (MSC). MyIPO was set-up in 2003, raising the need to strengthen the patent registration and management system. Several agencies established were National Science and Research Council, Yayasan

Inovasi Malaysia and higher order thinking skills for schools and higher education institutions. Doraisami (2015) opined for the lack of local firms exporting their own products, limited industrialisation to final products, with most manufacturing industries being internationally owned. MOSTI offers research grants and founded MASTIC and the Collaborative Research in Engineering, Science and Technology (CREST).

In nurturing the local enterprises, the Small and Medium Industries Development Corporation (SMIDEC) was established in 1996 to support the development of SMEs. There are also specific programs under the Ministry of International Trade and Industry (MITI) to promote the growth of Small and Medium Enterprises (SMEs), Vendor Development Program (VDP) and Large Corporation-SME partnership program.

4.0 SCIENCE AND TECHNOLOGY PARKS

Several science parks have been set up, these include the Kulim High-Tech Park (KHTP) in 1993 and Technology Park Malaysia in 1996. Companies established in KHTP include BASF, Celestica, First Solar, Fuji Electric, Hoya, Infineon, Intel, Osram Opto Semiconductor and Panasonic Energy (Kulim Industrial Tenant Association, 2020). The third park is MSC Malaysia in Cyberjaya which has attracted MNCs such as Al Jazeera, AMD, AT&T, Dell, DHL, Ericsson, Fujitsu, HSBC Bank, IBM, Nokia, NTT, Panasonic and Shell (Cyberjaya Directory, 2020).

Other technology parks have also been set-up i.e. Senai High-Tech Park, established in 2011. State governments through its development arm such as Penang Development Corporation also established the state's own *Penang* Science Park and North Penang Science Park (Penang Development Corporation, 2017).

5.0 HIGH TECH RESEARCH AND DEVELOPMENT INVESTMENTS IN FIRM

According to Cost of Doing Business Index published by KPMG, Malaysia ranked fourth as manufacturing hub places, Malaysia is ahead of other countries in the Asian region such as China, Japan, Vietnam and India (KPMG Malaysia, 2020). Malaysia's high-tech export performance is via the assembly of imported components as our country does not have a strong technology-based SME sector that can be a stable source of supply (Mani, 2004). The spillover effects of technological can be either via horizontal linkages or through vertical linkages. Both studies Choo(2012) and Kam (2016) found no evidence of vertical forward spillovers.

The basis of the investment incentives is reflected in the Investment Incentive Act of 1968 and the Free Trade Zone Act in 1971 to the Industrial Co-ordination Act in 1975. Tax Incentives provided by the government include Double deduction on R&D expenditures and export promotion. In addition, Domestic Investment Strategic Fund (DISF) has been set-up to promote the move to high value-added, high technology, knowledge-intensive and innovation-based industries among local manufacturers.

In the industry, there are MNCs, mostly in the electronics industry from the USA such as Altera, Dell, Intel, Keysight Technologies, Motorola Solutions, National Instrument, Romer Labs and Western Digital; from EU such as B Braun Medical, Dyson, Osram, Robert Bosch, and Unilever; from Japan such as Clarion, Panasonic, Sony, and Toray; from other Asian countries e.g. Coway (South Korea), JinkoSolar (China) and PixArt Imaging (Taiwan); from the local e.g. Aemulus, Hovid, Pensonic, Pentamaster, Texchem and Vitrox. These MNCs have progressed from labour-intensive operations to R&D activities. Among the government-linked companies

(GLCs) are Petronas and Sime Darby. R&D investments in the automobile sector are invested by companies such as PERODUA and PROTON for design capabilities being at the forefront of the automotive industry.

The E&E cluster in Penang (“Silicon Valley of Malaysia) has achieved some measure of success, some SMEs have become global vendors to MNCs which are positively associated with innovation (Suresh & Lai, 2015).

The country’s industrial eco-system, IP protection and well-established semiconductor and supporting industries, has contributed in attracting major solar photo voltaic producers to set up production facilities in Malaysia (Au Yong & Tan, 2017).

6.0 CONCLUSIONS

The R&D investment is necessary to stimulate sustainable growth having the strength of R&D should be geared to 'late-comer catch-up' industries to close and integrate with the production process.

According to Mani (2004), the major weakness is the lack of technically skilled manpower to involve in R&D. Therefore, it is essential to continue to stir the interest in STEM education, and to promote spending of R&D to 2% of GDP or more and to achieve 70 per 10,000 or more researchers, scientists and engineers.

Facing the future needs of scientific and technological innovation, the improvement should work together, integrating the enhancement STI awareness, and matching the innovation-led development requirements.

REFERENCES

Au Yong, H.N., & Tan, K.L. (2017). Renewable energy and trade disputes: Implications on solar photovoltaic manufacturing in Malaysia. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, *15*(1), 55-64

Choo, F.S. (2012). Technology transfer and productivity spillovers via foreign direct investment: an empirical study of the Malaysian manufacturing sector using establishment-level data*. Departmental Bulletin Paper*

Cyberjaya Director. (2020). *Companies*. http://www.cyberjayadirectory.com/companies/

Doraisami, A. (2015) .Has Malaysia really escaped the resource curse? A closer look at the political economy of oil revenue management and expenditures. *Resources Policy*, *45*, 98-108

Kam, A.J.Y. (2016). Death of linkages in host countries? A firm-level study on the channels of productivity spillovers in the Malaysian manufacturing sector. *Asia Pacific Economic Literature, 30*(1), 65–79

KPMG Malaysia. (2020). *Malaysia ranks among the top in cost of doing business index, says recent KPMG study*. https://home.kpmg/my/en/home/media/press-releases/2020/11/my-ranks-among-the-top-in-codb.html

Kulim Industrial Tenants Association(KITA).(2020).*Members of KITA*. https://www.mykita.com.my/about_us.html

Mani, S. (2004). Government, innovation and technology policy: An international comparative analysis. *International Journal of Technology and Globalisation*, 1(1),29 - 44. DOI: 10.1504/IJTG.2004.004549

Penang Development Corporation (2017). *Penang Science Park*. https://www.pdc.gov.my/index.php/en/industrial-land-sbmn/penang-sc-park

Suresh N., & Lai Y.W. (2015). *Innovation in Malaysia in Innovation Policy in ASEAN*. Economic Research Institute for ASEAN and East Asia (ERIA)