IMPLEMENTATION OF TECHNOLOGY-DRIVEN POLICY FOR HIGH-TECHNOLOGY SECTORS: A CASE OF MALAYSIA’S COMMERCIALISATION FUND

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ABSTRACT

The aim of this exploratory study is to investigate the impact of technology-driven growth strategies on high-technology industrialisation within developing economies. It sheds light on the issue of high technology sectors development in contexts of a developing economy like Malaysia. This study focuses on forms of initiatives that have been developed by the Malaysian government as part of technology-driven growth strategies. These strategies are argued to translate into industrial policies that guide development of the country. This study is not concerned with the highest level of industrial policy (i.e. why governments decide to pursue particular policies). Rather, it focuses on one part of industrial policy that is particularly applicable to the development of high-technology in Malaysia.

Keywords: industrial policy, innovation and implementation.

INTRODUCTION

Since starting to become a developing industrialised country, the Malaysian government aspired to further economic development. In 1991, the Malaysian government started to popularise an idea to become a fully industrialised country by 2020 (Mahathir, 1991). The Malaysian government’s aspiration has marked a series of economic diversifications that much needed by the Malaysian economy in order to break away from the developing country growth trap (Siew-Yan and Mat Zin, 2006). Within this plan, the Malaysian government envisioned a strategy to develop the economy by being dependent low-cost advantage in manufacturing sectors was not sustainable (MOSTE, 1990). Abdulai (2004) argues that other countries especially from less developed economies have been trying to implement the same set of strategies: attracting foreign investment for capital and technology. Consequently, Malaysia started to lose its position as a favourite destination for foreign investment especially in manufacturing sectors since labour costs in Malaysia became more expensive and other resources to establish manufacturing plants became scarcer (Ali, 1992; Siew-Yan and Mat Zin, 2006). Therefore, it was clear that Malaysia needed to embark on further economic diversification in order to achieve developed country status (Abdulai, 2004).

In light of finding a pathway to become a developed country, the Malaysian government underlined that Malaysia will continue to foster industrialisation with manufacturing sectors as the backbone of the economy but will emphasise its development of high technology sectors (MOSTE, 1990; Siew-Yan and Mat Zin, 2006). This was regarded as a planning fallacy by some, because the Malaysian government planning was influenced by avenues taken by governments in developed countries, especially Japan and South Korea (Jomo, 1994). Vogel (1991) suggests that the success story of Japan and South Korea in economic transformation could be explained by those countries’ abilities to rapidly develop high technology sectors. Ali (1992) suggests it was challenging for Malaysia to repeat the success story of Japan and South Korea because the local firms in those countries were able to
adopt, assimilate and innovate technology at greater pace than local Malaysian firms. Despite the critics, Ali (1992) agrees the Malaysian government decision to focus on development of the high technology sectors was the right way towards achieving a developed country status although the process is difficult, timely and costly. High technology sectors are considered the fastest growing sectors and could fuel economic development within developing economies by promoting innovation, technological competitiveness and creation of high-paid jobs (Walsh et al., 1995).

LITERATURE REVIEW

From a wider perspective, the high technology sector could foster the knowledge creation process within an economy, or vice versa (Fontes and Coombs, 2001). For developing economies, the circle of knowledge creation and development of high technology sector is viewed as a prescribed formula for a country to make a leap to developed economy (Abdulai, 2004; Özcèlïk and Taymaz, 2008). In the Malaysian context, Shapira et al. (2006) indicate that the development of high technology sectors has been approached as the foundation for creating a knowledge-based economy. To illustrate, the intensive efforts by the government to develop high technology sectors started in the 1980s before the concept of knowledge economy was picked up by the Malaysian government policy radar in the early 2000s (Malaysia, 1991; Malaysia, 2001). The rise of a knowledge economy led the Malaysian government to seize upon the idea that knowledge could be one of the unique resources into production of high technology products (Malaysia, 2001). More importantly, the knowledge creation process through the development of high technology sectors could encourage Malaysian industries to become technology producers, and subsequently uplift their industrial competitiveness (Ali, 1992). Vogel (1991) suggests that the development of the high technology sectors in newly industrialised economies (NIEs) such as South Korea and Taiwan also went through this route. Under stringent government policy mechanisms, the high technology companies in those countries were able to climb the supply chain from being original equipment manufacturers (OEM) to become original brand manufacturers (OBM) of high technology products (Rasiah, 2011). Mani (2002) concludes that the knowledge and technical know-how gained from foreign technology transfer and improvement of the technology lead the high technology companies in South Korea to be at the forefront of the high technology sectors especially in manufacturing of electric and electronics products. However, Ali (1992) argues Malaysian industries cannot rely on this route because the technology transfer from foreign MNCs worked moderately within FDI activities. Therefore, to increase the local technology capabilities, the Malaysian government decided that Malaysian industries needed to deepen the pool of technology by strengthening their efficacy to develop indigenous technology (MOSTE, 1990; Malaysia, 2001).

According to Atkinson and Ezell (2012), developing economies face a great challenge to promote high technology sectors. The process not only requires governments’ commitment to encourage local companies to utilise technology but also to support them to develop new technology into finished products or processes (Blanes and Busom, 2004). Lee and Gaertner (1994) explain that it is not a straight forward process. This notion has influenced governments’ assertiveness to introduce a number of policies as part of technology-driven growth strategies (Blanes and Busom, 2004). However, most strategies have concentrated on the promotion of research and development (R&D) activities. Indeed, R&D activities play a vital role in technology development by trying to resolve scientific and technological uncertainty (Lee and Gaertner, 1994), but more efforts are required to commercialise the R&D outputs. The commercialisation process requires, among other things, rigorous safety testing and up scaling of the invented technology at a viable cost.
Industrial policy for high-technology sectors

According to Johnson (1982), the term industrial policy has changed a lot overtime. Industrial policies were once defined as direct intervention of the state in the economy by imposing direct control to large part of the production apparatus (Johnson, 1982). This definition has underpinned an understanding that industrial policy was introduced by governments to limit certain activities within industries. Recently, industrial policies are described as variety of policies aimed at creating an environment that is favourable to industry development (Hill and Chu, 2006). This recent definition is more applicable to developing economies because the aims of the industrial policies are about supporting the industries by allocating appropriate resources for their development (Weiss, 2013).

Under the internationalist model of industrial policies, Amsden (2001) explains how such policies have been implemented to support high technology industrialisation. The Singaporean Government has been using industrial policies in form of government labs, intellectual property protection and financial incentives to encourage MNCs to set up high technology manufacturing plants. More importantly, the Singaporean government through those policies has been able to convince MNCs to set up R&D centres in that countries. Foreign companies hardly conduct R&D in developing economies therefore the presence of active foreign R&D in Singapore indeed demonstrated the intensity of their industrial policies. The magnitudes of such governments’ industrial policies have given positive impact to developing economies in terms of uplifting their industries capabilities. For instance, the Korean government under the nationalist model seems more proactive in supporting the local big corporations through industrial policies. In the case of industrialisation in petro-chemical and steel industries, the state provides the industries with an array of incentives in the form of tax benefits, subsidised loans and up to access to limited raw materials (Shin and Chu, 2006). By having such privileges through industrial policies, big corporations in Korea have been able to rapidly develop and compete in new business areas (Yong, 2003).

Governmental industrial policies designed to support commercialisation activities can be categorised into fiscal approaches, e.g. grants and soft loans, and non-fiscal approaches, e.g. infrastructure and training programmes (Hill and Chu, 2006). Industrial policies using fiscal measures emerged as a common avenue to overcome market failure in commercialisation activities (Hill and Chu, 2006). Özcelik and Taymaz (2008) highlight that fiscal measures are able to reduce companies’ financial burden, and increase their propensity towards commercialisation activities. For a similar reason, the Malaysian government introduced the Commercialisation of Research Development (CRDF) in 1997 (MASTIC, 2010).

Studies of industrial policies like the CRDF have focused largely on the supply side (i.e. intervention by the government, establishment of support structure) and concentrated less on the demand side (i.e. the performance of the beneficiaries)(Hill and Chu, 2006). In Malaysia, this notion could be considered as overwhelming because the rate of commercialisation of research outputs within public research institutes has decreased from 5.1 per cent to 3.4 per cent between 1991 and 2005 (MASTIC, 2010). Thus, it is the objective of this study to investigate and analyse the operation of CRDF. This is justified by several reasons. First, the Malaysia case offers a perspective from a mid-ranking developing economy that made advances in building up its manufacturing based economy but wants to progress to a knowledge-based economy by promoting high-technology industrialisation (Mahadevan, 2007). The CRDF is a key policy initiative set up to achieve that objective. Second,
although the Malaysian government’s industrial policy is important for commercialisation activities, less attention has been given to the utilisation of financial resources by awardees (Mani, 2004). Finally, the existing literature on commercialisation activities in Malaysia focuses on financial assistance for universities and research institutes (Siew-Yan and Mat Zin, 2006) rather than policies designed to support SMEs.

**METHODOLOGY**

The overall approach to the research was qualitative and inductive using an analysis of secondary sources and semi-structured interviews. The reason for this were the exploratory nature of the study and the generalisation regarding the key issues. Besides that, this study also dependent on extensive experience of the interviewees. The investigation comprised of two phases. The first phase was to conduct documentary analysis. This data collection technique regarded as a useful data collection technique in qualitative research (Creswell, 2013). Documents can be used to provide further evidence of the issue being researched and more importantly this data collection technique can be conducted without disturbing the research setting. Documentary evidence acts as a method to cross validate information gathered from other data collection techniques (i.e. interview and observation) given that sometimes what people say may be different from what people do.

The second phase of the study involved in-depth interviews with executives working for Malaysian Technology Development Corporation (MTDC). A ‘purposive’ sampling approach (Saunders et al., 2009), was used in selecting the interview sample, in order to include interviewees well placed to comment on details of implementation of the CRDF. The sample include individuals that are designated to manage the CRDF. The interviewees included two directors and two operational officers within the MTDC. Although the number of interviews was relatively small, the fact that the sample included senior managers whom are able to comment in detail about the CRDF in terms of its background and implementation. Each interview was digitally recorded. Field notes were also made. The data were analysed manually, which was manageable given the number of interviews. Data reduction, designed to sharpen and focus the data, was undertaken by coding the transcripts and field notes.

**FINDINGS**

The CRDF is managed under the purview of MTDC. This scheme is offered to Malaysian SMEs for mass production of indigenous high-technology products (MASTIC, 2010). The CRDF is considered an important technology-driven growth strategy to support Malaysia’s high-technology industrialisation by focusing on the development of new and emerging industries (Siew-Yan and Mat Zin, 2006). Prior to the CRDF, there were no support measures to commercialise the findings of the various research projects sponsored under the Intensification Research Priority Areas (IRPA). IRPA is a grant scheme introduced in 1986 offered to academics and researchers to conduct research in specific areas determined by the Malaysian government through the MOSTI. Basically, the CRDF is the first direct government support for commercialisation of R&D outputs. Before this, government initiatives concentrated on offering research funding to universities and research institutes. In fact, the idea of this policy initiative was proposed by a task force for Action Plan for Industrial Technology Development in 1990. The Action Plan identified five basic structural weakness in Malaysian technology development (i.e. inadequate institutional structure, low private sector participation, poor human resource base, lack of awareness and focus on critical generic technology, and lack of awareness among societies in science and technology issues) and offered 42 recommendations to develop Malaysia’s innovation system (Jomo et al., 1999).
The MTDC manages the CRDF. The main tasks of MTDC are to nurture technology based enterprises by providing financial assistance to companies, particularly SMEs, involved in high technology businesses and providing other support services for commercialisation of R&D outputs. The major objectives of CRDF are to enhance the competitiveness and capacity of Malaysian industrial sectors by: 1) promoting the commercialisation of indigenous technology, 2) accelerating commercialisation of R&D efforts by local universities, public research institutes or companies, and 3) facilitating the development of new products and production processes, and assisting participating companies to increase production capacity (MTDC, 2012).

The CRDF is a policy initiative to support commercialisation activities within local Malaysian firms. In other words, the CRDF is a financial grant established by the Malaysian Government to fund the commercialisation activities of locally developed technologies undertaken by Malaysian-owned companies. It is a part of financial initiatives by Malaysia Government to spur research, development and commercialisation activities. In terms of eligible technologies, they can be those developed by public institutions such as universities or be the output of in-house R&D by Malaysian firms. The CRDF has the following objectives:

1) to enhance the competitiveness and capacity of the Malaysian industrial sector by promoting the commercialisation of indigenous technology
2) to accelerate the commercialisation of R&D results undertaken by local universities and research institutions, companies, and individual researchers or inventors.

There are three types of CRDF grants, namely, CRDF 1, CRDF 2 and CRDF 3. Both the CRDF 1 and CRDF 2 are grants for the commercialisation of R&D output from public and private universities or Government Research Institutes by spin-off firms. The CRDF 3, on the other hand, is a grant for the commercialisation of any indigenous technologies by local SMEs. The maximum amount of the CRDF funding is MYR4 million. (USD1=MYR4.05). The case studies are made up of ten firms that received CRDF 3.

In the implementation process, the MTDC establishes a dedicated team to assess applications. One respondent, a processing officer explain that this team is known as Processing of CRDF and TAF. The officer holds a Master degree in environmental bio-technology. The assessment starts by conducting a preliminary checking on the submitted documents. This process ensure that applicants have submitted the right documents such as application forms, company’s profile and operation plan. The interviewee gave the following account: “There is pre-assessment, then we will continue with real assessment”. The next assessment focuses on technicality of the technology and also

For the technical assessment, the Processing team will go in-depth about the technology, financial viability and also marketing strategy. At this stage, team evaluate the applications based on five specific criteria. Another interviewee, the acting head of Processing of CRDF/TAF, asserted: “For this purpose, we evaluate the technology novelty, profitability, sustainability, marketability and feasibility of the project”. The interviewee is an engineer by profession and he is graduated from a Japanese university. In terms of novelty, MTDC only consider new technology that can be turned into finished products. The interviewee added: “If the technology is available in the market, firms can go to banks for financing”. MTDC also benchmarks the proposed technology with other established companies. For example, for technology that are embedded in medical devise, the processing officers will benchmark them with BBraun, a well-established company based in Germany.

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5 The MTDC is a quasi-government corporation with 100% shareholding by Khazanah Nasional, the government investment arm.
DISCUSSION

There was a lot of speculation about whether policies could be used to enhance local firms’ technological capacity (Kim and Nelson, 2000; Wade, 2012). This assertion is also applicable to the CRDF because it is a major policy initiative to facilitate innovation by ensuring research and discovery will reach the market. In Weiss’s work (2013), he suggests that governments have to put significant efforts into the refinement of policies to make them more rigorous. This means policy documents need to explain clearly the objectives, aims and implementation mechanisms. This improvement is essential to minimising risk of a policy failure (Porter, 1998; Weiss, 2013). The case study presented here establish that the CRDF has been well managed by the MTDC. This issue will be looked at first because this policy initiative aims to facilitate appropriate firms to carry out innovation projects and the MTDC as a policy implementer tries to make sure that the CRDF reaches its goals. The evidence shows that MTDC has been able to convey clearly the CRDF’s implementation mechanism to the target group.

Literature on public support for R&D (e.g. Lerner, 1999 and Hall and Maffioli, 2008) usually discusses government policy initiatives in terms of picking winners for dedicated programmes. However, there is also speculation that the screening process in government-backed programs might be not as well established as funding schemes managed by private investors (Lerner and Kegler, 2000). This study, however, shows that the evaluation process in a government-backed scheme is complex. This study has found out that the MTDC maintains a rigorous and effective screening process to shortlist potential recipients and subsequently to select successful firms for CRDF funding. This finding also suggests that underperforming government backed funding programmes could be strengthened by developing a structured, in-depth and multi-layered screening process to select their recipients. Indeed, this is an important process for government interventions to be constructive to overcome the market failure in commercialisation of indigenous technology (Salmenkaita and Salo, 2002). The finding on the screening process of the CRDF is summarised as per Figure 1:
Figure 1: CRDF application processing

Note: This figure is extraction of documentary analysis on CRDF application standard operating procedure and interview sessions with MTDC personnel.

The evaluation process was carried out by a dedicated team (i.e. Processing Team of Technology Ventures Division). The team is comprised of qualified executives. For example, the team leader was a trained research engineer in a Japanese multinational company. In the initial stage, each application for the CRDF is examined closely in terms of documentation, technical efficacy and governance. The process involves screening of detailed information about applicant firms including information on the financial condition, operations and human resources. Meanwhile, the technical efficacy of the proposed technology focuses its novelty and market performance projections for the product. For technology novelty, the assessment is dependent on the MTDC executives’ experience and technical
background in engineering, bio-technology and environmental science. For example, the executives will refer to technical journals to determine the technology’s novelty. However, the screening process is not only confined to MTDC’s expertise. If the technology is not within the evaluation team expertise, MTDC will appoint independent experts from universities and research institutes to assist with the evaluation of the application. For example, in oil palm technology, MTDC seeks expertise from the MPOB. This process ensures that the proposed technology is correctly deemed as new to the market.

This finding complements and at the same time contrasts with work of Wessner (2008), who also highlighted the importance of carrying out detailed assessment to select potential recipients for government-backed grants. The study by Wessner (2008) investigates effectiveness on Small Business Innovation Research (SBIR), which is quite similar to the CRDF as it allocates funding to firms in order to commercialise research outputs. However, both studies do not share the same context because Wessner’s work was conducted in the United States, an advanced developed economy compared to a developing economy like Malaysia. The findings of the present study show that the CRDF is a narrower programme compared to SBIR because the programme requires firms to have inventions and is also strictly limited to manufacturing products. In contrast, the SBIR’s terms of eligibility are much looser as its recipients are allowed to spend funds in more flexible ways. This means, the use of funding by the firms is not only confined to manufacturing related activities but also services, such as registration of intellectual property. Indeed, this finding highlights the substantial difference of innovation support programmes between developing and developed economies. Despite this difference, the studies have similar findings regarding the dependency of both policy initiatives (i.e. the CRDF and the SBIR) on internal and external reviewers for technology assessment. It means both studies acknowledge that government agencies have limitations in their scope of work and require external expertise for evaluation purposes due to the complexity of the proposed technology. This element is paramount to ensure both policy initiatives are managed in a prudent manner.

CONCLUSION

The development of high-technology sectors is an important strategy for Malaysia to catch-up technologically with advanced and developed economies. The main rationale is because in the past, Malaysia has been successful in developing its manufacturing based industries in areas like the production of electric and electronics products through FDI. The strategy of FDI resulted in encouraging GDP growth but the country only became an assembly-type hub for MNCs. In this sense, the Malaysian government clearly recognised that if the country wants to develop further to become a fully developed economy, it has to develop high technology sectors to propel the knowledge based economy. Overall, the country needs to develop innovation capabilities for NPD processes within its local firms. This strategy entails the development of indigenous technology which became the focus of the CRDF.

The findings of this research show that the CRDF is clearly targeted at uplifting firms’ innovation capabilities. As such, this government initiative can be considered an example of an industrial policy. This fits into the concept of industrial policies which in turn highlights a government’s role to develop industries through industrialisation (Tregena, 2009; Weiss, 2011). In this sense, this study shows that the Malaysian Government has adopted industrial policies for a knowledge based economy. This is based on the fact that this particular policy (i.e. the CRDF) focusing on technological development within small firms. In fact, this study highlights that the CRDF can be considered as a new form of industrial policies as the overall goals of the policies have changed. Previously, Malaysian industrial policies focused on attracting FDI for capital and technology. Recently, Malaysian industrial policies
focus on enhancement of small high technology based firms on the ground that these firms were able to develop innovative capabilities through the CRDF. This particular policy of the CRDF focused on high technology sectors. Hence, the CRDF is definitely an example of industrial policies because it has contributed to the process of industrialisation by improving and enhancing innovation capabilities in indigenous high technology firms in terms of development of new high technology products. It is a particular type of an industrial policy, one targeted at innovation, high technology sectors and a specific group of local firms. Therefore, this study shows how industrial policies can be used to aid industrialisation.

REFERENCES


