

Provincializing Economic Development: Technological Upgrading in the Integrated Circuits Industry in Penang and Kulim High Tech Park

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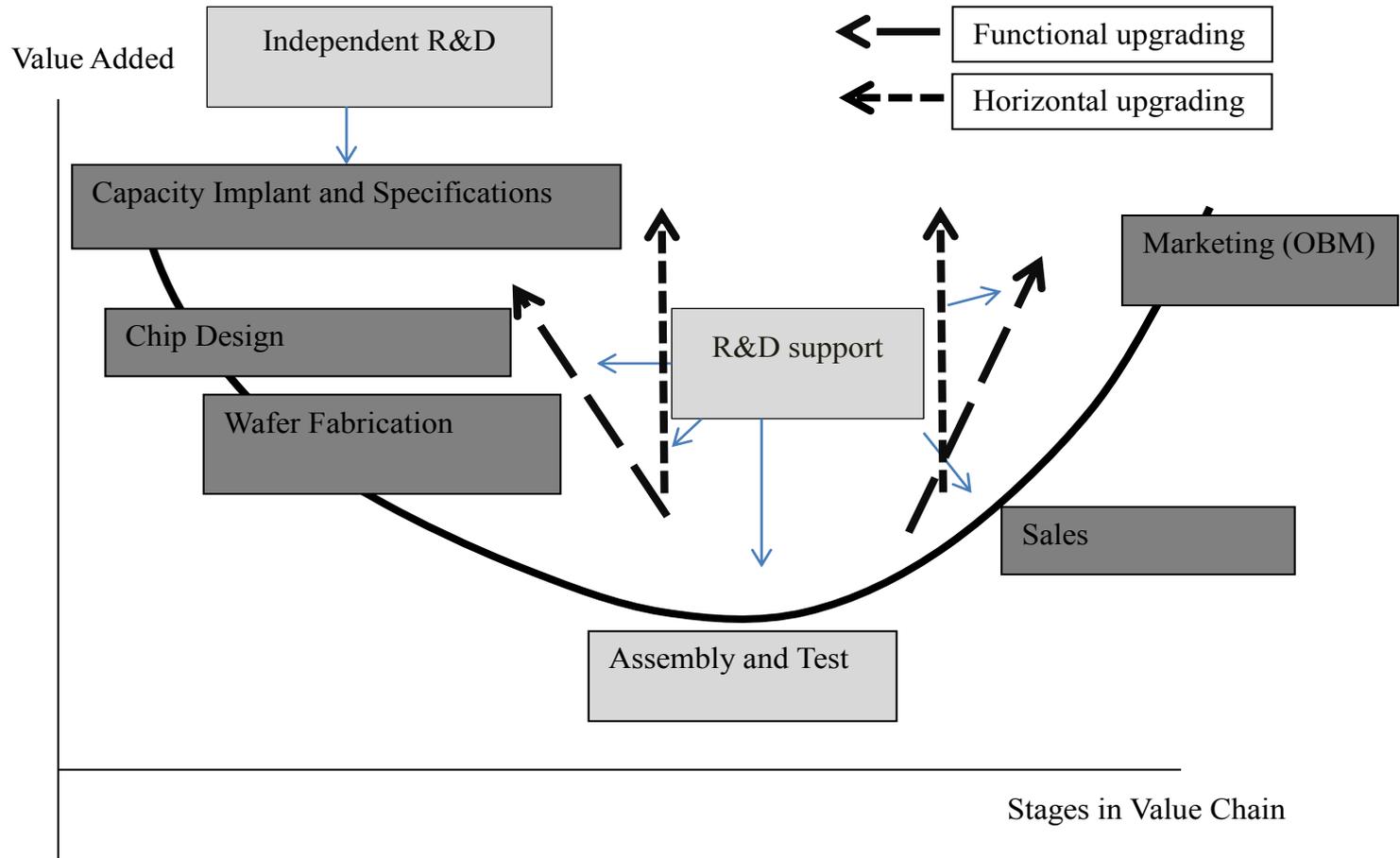
1. INTRODUCTION

- This paper discusses how provincial governments can actively play a developmental role in economic transformation by examining the role of Penang in Malaysia.
- Political economy origins drove Penang to assume a proactive role to target MNCs initially in employment generating activities and subsequently in technological upgrading activities with integrated circuits becoming a major target.

2. THEORETICAL CONSIDERATIONS

- Accounts of latecomer technological catch up began first when Veblen (1915) explained Germany's industrialization.
- Subsequently, Gerchenkron (1952) and Abramovitz (1956) attempted to explain why it is easier for latecomers than for first movers to catch up.
- Subsequently a series of works emerged to explain the developmental path taken on successfully by Japan (Johnson, 1982), Korea (Amsden, 1989; Kim, 1997a) and Taiwan (Fransman, 1985; Wade, 1990).
- Existing works dominated by the role of national states.
- Technological capability assessments were then advanced by Rosenberg (1976), Dahlman (1984), while Lall (1992), Bell, Figueiredo (2002) and Rasiah (2004) advanced the conceptualization and methodology of capturing technological upgrading.
- An stylized evolutionary framework of technological capability catch up for the IC industry is shown in Figure 1.

Figure 1: Stylized Framework for Examining Technological Upgrading, ICs, 2012

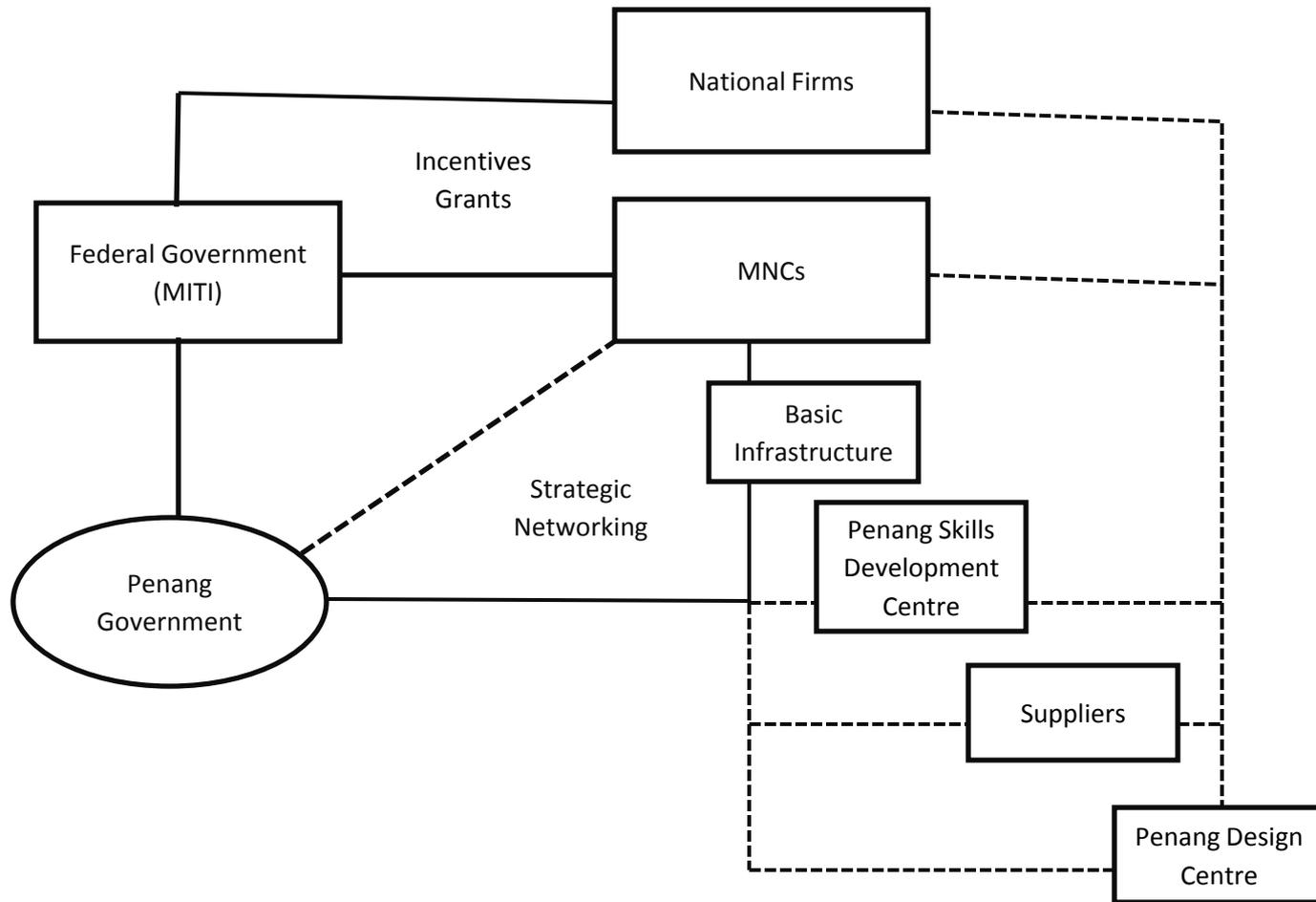


Source: Adapted from UNCTC (1986: 87-101)

3. METHODOLOGY AND DATA

- MNCs in Penang and in KHTP rely on their state governments for all basic infrastructure under their disposal. However, the early links developed through the provision of efficient coordination with the MNCs helped attract strong collaboration from MNCs seeking to solve collective action problems in other areas.
- These developments saw MNCs and the state government establishing the Penang Skills Development Centre in 1989, and subsequently the Penang Design Centre.
- The state government and MNCs have also strongly promoted the establishment and upgrading of suppliers to support the self-expansion plans of MNCs since the late 1970s.
- The strategic networking established over the period since the 1970s saw the Penang government using the lines of cooperation to influence the federal government to offer grants to MNCs since 2005, as well as, attract incentives and grants to support the activities of PSDC and Penang Design Centre (Figure 2).
- The framework of research and analysis is shown in Figure 2 with interviews with all captains of organizations and firms being the prime source of information gathering.

Figure 3: Analytic Framework of Strategic Networking by Penang Government

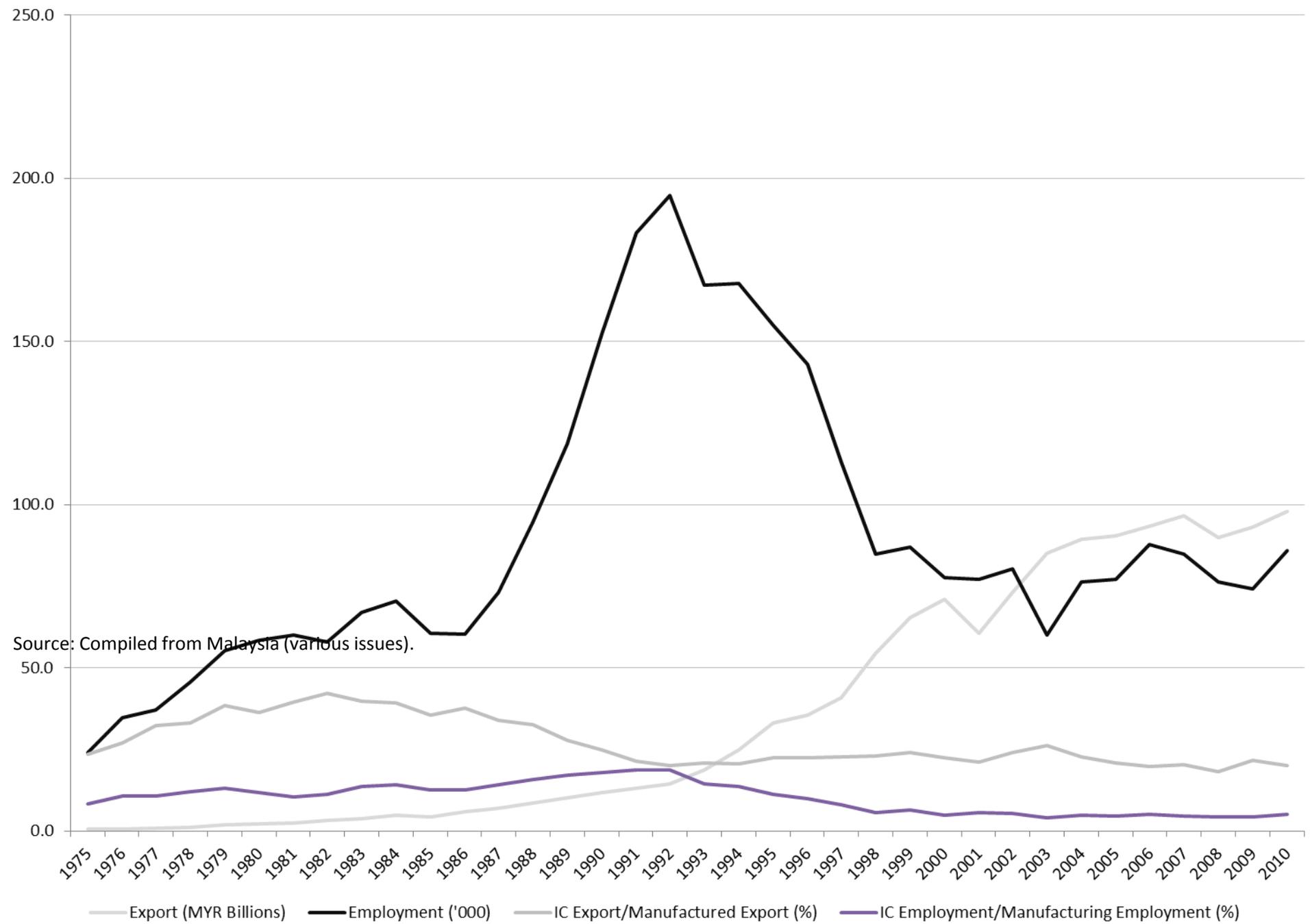


Source: Authors

4. DEVELOPMENT OF THE IC INDUSTRY

- Employment and exports expanded sharply from 1972 until 1992.
- Labour shortages and gradual removal of financial incentives against newly emerging sites resulted in a contraction of employment but exports continued to rise as firms upgraded production technologies
- A number of firms upgraded from assembly and test to designing, R&D as new firms relocated wafer fabrication activities since the 1990s but especially from 2005.

Figure 3: Exports and Employment, Integrated Circuits Industry, Malaysia, 1975-2010



	Origin	Year	Main activity	Upgrading
AMD	US	1972	Assembly and Test	R&D operations to support assembly and test
Altera	US	1994	Designing	R&D to support designing
ASE	Taiwan		Assembly and Test	Best practice OEM
AT	Singapore	1995	Assembly and Test.	R&D to support assembly and test of analog, mixed-signal, and optoelectronic components
Fairchild	US	1971	Assembly and Test	R&D operations to support Assembly and test
Globetronics	Malaysia	1991	Saw, sort & plating, & assembly of LEDs	R&D to support production activities
HP*	US	1972	Assembly and Test	Spun out Agilent, which moved into supporting other electronics firms. HP no longer in Penang.
Infineon	Germany	2005	Wafer Fabrication	Engaged in 8” powerchip fabrication. Has R&D to support wafer fabrication.
Intel	US	1972	Assembly and Test	R&D to support assembly and test
Intel	US	1991	Designing	IC design and supporting R&D
IDT	US	1987	Assembly and Test	Best practice OEM
MT	US	2006	Designing	Fabless firm. Has supporting R&D.
Osram	Germany	1972	Wafer Fabrication	Upgraded from assembly and test to include wafer fabrication in 2005. Has supporting R&D.
Renesas	Japan	1981	Assembly and Test	Best practice OEM. Name changed from Hitachi Semiconductor in 2003 following merger with Mitsubishi
Renesas	Japan	1972	Assembly and Test	Upgraded to include R&D support since 1980 but expanded it in 2005
Renesas	Japan	2008	Design	Specialized designing operation. Has supporting R&D
Silterra	Malaysia	1995	Wafer fabrication	R&D to support wafer fabrication

5. The Dynamics of Networking

- Chief Minister's initiative to bargain with federal government to attract MNCs
- Role of PDC used to establish and strengthen collaboration with MNCs – FREPENCA
- Promotion of local suppliers as MNCs sought proximate supply.
- Establishment of collaboration with USM to shape industry-oriented engineering and IT courses.
- Establishment of PSDC in 1989
- Coordination with federal government to renew incentives – 1985 (financial incentives), 2005 (grants)
- Establishment of Penang Design Centre

6. CONCLUSIONS

- While Penang's achievement in technological upgrading in the IC industry has not met the heights of Korea, Taiwan and Singapore, its success in stimulating upgrading to supportive R&D operations and the functional activities of IC design and wafer fabrication is no less spectacular.
- It may prove even more noteworthy as the province had to steer carefully its strategies to work within a national framework where the federal government has been more concerned with ethnic-based equity issues in the country.
- Penang's experience obviously offers lessons for provinces and other locations to stimulate industrialization and technological upgrading in medium and large countries.
- Strategic networking links a la the Penang experience can be critical in building linkages and pathways for stimulating firm-level technological upgrading.
- Penang's provincial framework became successful because of the potency of the productive networking evolved between the foreign MNCs, and the provincial agencies, and the federal government.
- Penang managed to convince the federal government to offer incentives to attract from abroad low value stages of assembly and test of MNCs from 1971 until the late 1980s, and from 2005 grants to stimulate functional upgrading.
- While foreign MNCs have indeed played a critical role in the integration and subsequent upgrading of the IC industry in Penang, the story will not be complete without a strong mention of the leadership role played by local actors.