Government-Business Coordination and Small Enterprise Performance in the Machine Tools Sector in Malaysia

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ABSTRACT. This paper compares the performance of small and medium size subcontractors in the machine tools industry in two different states of Malaysia, Penang and Kelang Valley. It is shown that while Penang has developed a fairly successful small and medium subcontracting industry, Kelang Valley has not. The difference in performance (measured by value-added) is due in part to differences in the extent and quality of government-business coordination. In contrast to Kelang Valley, the relatively autonomous state government of Penang took a pro-active approach to business development and provided support to its small and medium enterprises (mainly Chinese-owned) in the form of public training and market-information exchange.

1. Introduction

Small and medium industries (SMIs) continue to draw considerable attention in economic debates. In addition to the scope and flexibility offered by smallness, SMIs have also been considered by a number of analysts in Malaysia as better allocators of resources (see Chee, Lee and Foo, 1981; Chee, 1986). However, the performance of SMIs in the manufacturing sector has been overshadowed by a general decline in establishments and employment over the period 1978–95 (see Figures 1 and 2). While a lack of support by the government dominated their operations in the 1970s and early 1980s, the late 1980s have seen strong support both through subsidies (e.g., preferential loans, tax exemptions, and promotion campaigns). Yet, the majority of SMIs have performed relatively poorly when compared to large foreign firms.

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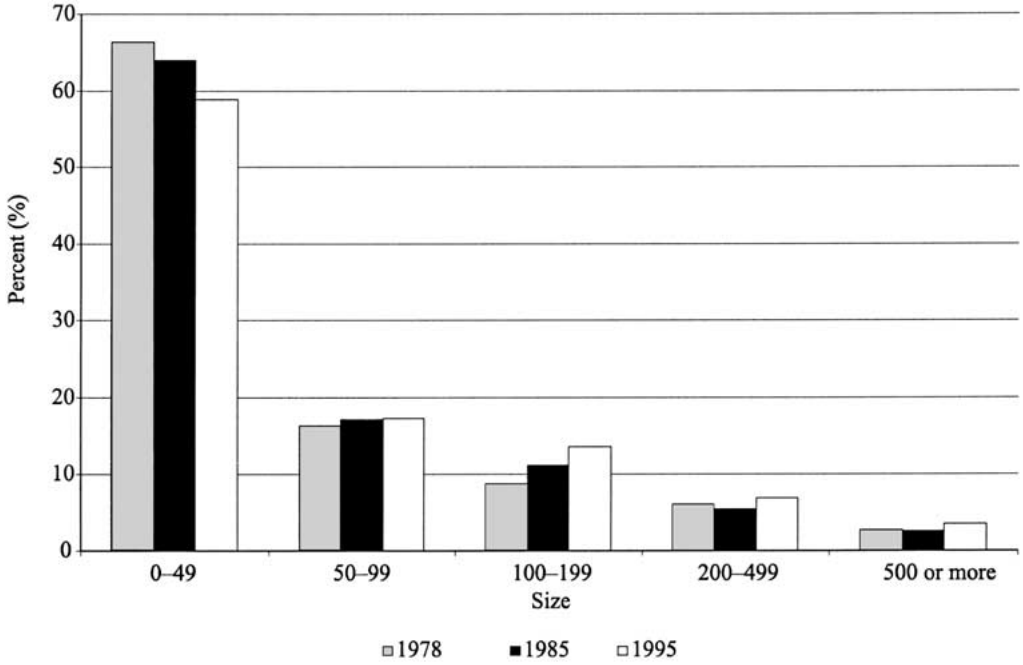
The relatively smaller role played by SMIs in Malaysian manufacturing can be partly attributed to the structure of manufacturing as well as politics in the country. First, large export-oriented manufacturing firms in Malaysia are dominated by foreign ownership competing at the technology frontier globally, while local ownership has dominated SMIs. Second, the allocation of state support to alleviate poverty and inequality in the country took on ethnic dimensions with state subsidies being directed largely at indigenous startups with little entrepreneurial experience and weak business networks.

However, the success of firms in particular settings cannot just be explained by size. *Inter alia*, industry differences and the coordination networks firms embed also explain why firms succeed in some places and fail in others. The latter has become increasingly important following the growing knowledge disparity (creation and appropriation) between sites, which is particularly significant in the electronics and related industries where the miniaturization process and product cycles have been developing exponentially. The competitiveness of firms is not just determined by the actions of the individual firms, but also the whole network (relationships) they are tied to.

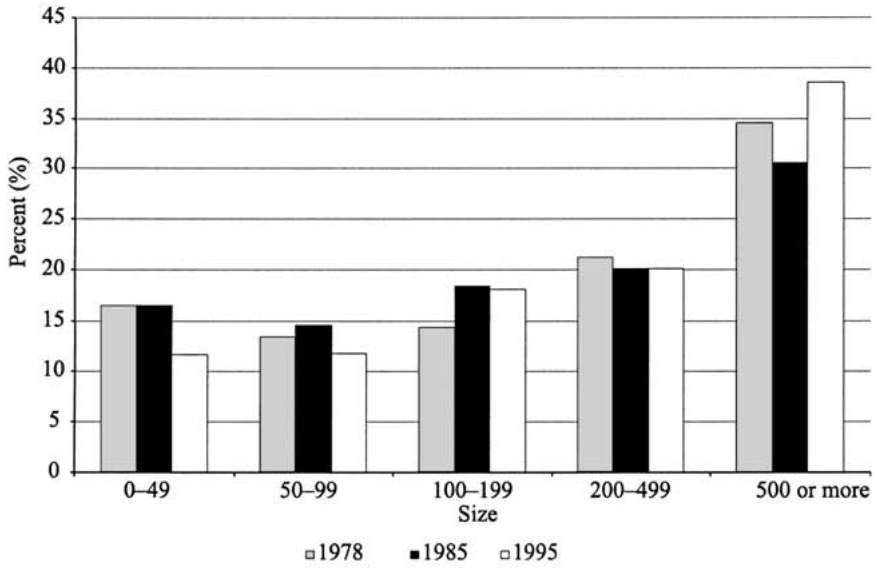
The significance of business networks and outsourcing have stimulated the demand for proximate sourcing when involving requirements that need quick and reliable supplies. Given the imperfections associated with markets, firms have also relied on trust and loyalty to augment outsourcing relationships. Government support has also become important to support the creation and maintenance of institutions and other supplier support instruments such as subsidies to establish supplier firms. However, given the potential for

Small Business Economics **18**: 177–195, 2002.



Source: Compiled from data supplied by the Statistics Department, Malaysia.

Figure 1. Distribution by establishments, manufacturing, Malaysia, 1978–95.



Source: Compiled from data supplied by the Statistics Department, Malaysia.

Figure 2. Distribution of Manufacturing Firms by Employment, 1978–95.

government failure, firms have also often resorted to systemic relationships that require business coordination of government support. The Silicon Valley (Saxenian, 1997), Keihin District (Best, 1990), and Emilia Romagna (Brusco, 1982) are examples of relatively successful examples of effective industrial networks.

This paper examines the role of government-business coordination in the differential performance of machine tool supplier firms linked to foreign microelectronics multinationals in Malaysia. Section 2 provides an overview of the regulatory environment in Malaysia within which SMIs have operated. Section 3 discusses local-level socio-political factors which have affected SMI development in Malaysia and provides an empirical analysis for the case of the machine tools industry in two states, Penang and Kelang Valley. Section 4 takes a detailed look at the performance of selected machine tool industries in these states in terms of growth and technological deepening. Section 5 concludes.

2. SMIs and the overall regulatory environment

The development of SMIs in Malaysia's manufacturing sector was initially constrained by weak government support. During colonialism, the British introduced financial support for small and craft industries under the Rural Industrial Development Authority (RIDA), largely to reduce discontent among the Malays (see Rasiah, 1995, chapter 3). Such lukewarm initiatives were continued with greater financial support after independence under the Rural Development Ministry. It was not until the late 1970s that official policy attempted to earmark SMIs for support, albeit its development remained uncoordinated and cumbersome until SMI activities were given direct prominence by the Ministry of Industrial development following the launching of the Industrial Master Plan in 1986. The umbrella concept of marketing, originally introduced in 1983, was augmented with the Subcontract Exchange Program (SEP) in 1986 and the Vendor Development (VDP) Program in 1992. In addition to the extension of export-oriented double tax deductions to SMIs from 1986, the government introduced the Industrial Technical Assistance Fund (ITAF) and complementing credit guarantee supports as well as matching efforts in the late 1980s. A separate Small and Medium Industries Development Corporation (SMIDEC) was incorporated in the 1990s to govern their activities.

Being generally small and medium in size and dominated by Chinese ownership, local machine tool firms did not have a promising future. Much of the initial federal support for the evolution of machine tool firms came indirectly, and in some sense fortuitously. There was no clear effort to attract microelectronics firms with the purpose of spawning local machine tool firms when the government first launched its export-oriented industrialization policy following the Investment Incentives Act in 1958. Microelectronics multinationals only began relocating in Malaysia after the Free Trade Zone Act was enacted in 1971 and the subsequent opening of the zones in 1972. National Semiconductor, the first semiconductor firm to commence operations in Malaysia, built its factory in Bayan Lepas in 1971 and started production in 1972.

Government efforts to woo export-oriented manufacturing firms have been critical at least in four important ways: (1) The federal government's free trade zone (FTZ) legislation offered financial benefits in the form of pioneer status, which gave tariff exemptions on imports and exports and tax holidays over a period of 5–10 years (firms were thus exempted from corporate income tax of 35 percent and development tax of 5 percent); on expiry of the pioneer status, where firms have often been granted investment tax credit[1] that has given further tax exemptions for 5–10 years (the exemptions have been equivalent to approved investment, and losses during the allowance period can be replaced after the period); and in the form of licensed manufacturing warehouses (LMWs) where FTZs could not be established (LMWs share similar privileges as firms located in FTZs). (2) Amendments to the Employment Act of 1955 in the late 1960s and the Industrial Relations Act of 1967 imposed tighter controls on labor organization. The government did not allow unions in the semiconductor industry until 1989. (3) Government leaders offered unofficial guarantees to safeguard multinational corporate interests to ensure effective production coordination (e.g., for power supplies and customs regulation). (4) The

local state government offered subsidized land, water, electricity, and other physical infrastructure.

Though the potential for the development of local machine tool firms emerged through the redeployment of multinationals, the regulatory environment generally disadvantaged their development until the late 1980s. Because the local machine tools firms were primarily ethnic Chinese controlled, official policy towards them was generally discriminatory. Firms with an employment size of 25 and above and a paid up capital exceeding 250,000 were required to obtain licensing that often necessitated compliance with national ethnic restructuring conditions.

More importantly, regulations seriously restricted local enterprises from supplying multinationals located in FTZs and LMWs. Until the 1990s government legislation defined sales and purchases to and from FTZs and LMWs as exports and imports, respectively, and therefore subjected such transactions to the normal customs duties (see Rasiah, 1992). Multinationals preferred imports to service their inputs rather than acquiring those inputs from firms located in the principal customs area to avoid cumbersome customs procedures. Also, machine tool firms operating in the principal customs area have generally relied on imports of metals and machinery, which have generally been subjected to tariffs. Multinationals, thus, had the option of purchasing machine tool supplies from local manufacturers relying on tariff-imposed imports against tariff-free imports from abroad. Under such circumstances, ceteris paribus, multinationals for long preferred sourcing their supplies from abroad than from local suppliers. Hence, official government policy generally erected enormous obstacles to the development of local machine tool firms.

Machine tool firms generally enjoyed little state support because they were Chinese owned. In fact, the machine tool industry received strong impetus only following its classification among the promoted industries in the Industrial Master Plan of 1986. Being complementary to the operations of the strategic industries such as electronics, the industry enjoyed similar incentives, though, the extent of foreign direct investment was extremely small. The Promotion of Investment Act of 1986 offered the industry equal duty exemptions if located in FTZs or LMWs and export incentives such as the double tax deduction on exports and export credit refinancing. The extent of take up was, however, small owing to information asymmetry involving the tooling industry, which is largely characterized by small and medium firms, and the lack of multinational deployment of machine tool production owing to the smallness of the Malaysian market.

Under such circumstances the machine tool industry did not develop as fast as the industries it was expected to service, especially the electronics and automobile industries. Imports have consistently exceeded output over the years 1984–94.[2] The widening gap between sharply rising demand from user industries and slow growth in domestic production capabilities has continued to aggravate the trade deficits involving the industry. Demand slowed in 1985 owing to a fall in GDP, but imports still grew. Unlike Taiwan where domestic production capabilities rose to reverse imports so that the trade balance began improving strongly since the 1970s (see Fransman, 1985), it has consistently shown high deficits in Malaysia (see Table I). The share of imports in machine tool domestic demand gradually rose between 1984–90 before falling slightly in 1994.

3. SMI and Local Level Government-Business Coordination

Institutions play important roles to solve collective action problems and enhance coordination between firms and between firms and the government. In Malaysia, ethnic-based political economy conditions have underpinned the nature of institutional development. Small- and medium-sized non-*Bumiputera* ethnic businessmen have often faced difficulties accessing benefits offered by the federal government. Favorable ethnic and class similarities supported state–firm networking in Penang. Local Chinese management in microelectronics firms, machine tool firms, most leaders of the Gerakan Party, and state parastatals with past schooling and other peer group relationships helped greater networking in Penang. The lack of federal support and the pressure from two alternative ethnic parties, one largely led by bourgeois Chinese within the ruling government (i.e., the Malaysian Chinese Association) and the other by a populist opposition party (i.e., the Democratic

TABLE I
Machine tool industry in Malaysia, selected statistics 1984–94

	1984	1985	1990	1994
Gross output ('RM million)[a]	358.0	226.1	566.5	1,337.3
Import ('RM million)[a]	256.8	267.3	1,191.2	2,537.3
Export ('RM million)[a]	10.3	20.6	54.8	172.7
Imports in domestic demand[b]	59.2	56.5	70.0	68.5
Export share in output[c]	4.0	9.1	9.7	12.9
Trade balance[d]	–94.4	–85.7	–91.2	–87.3
Mean employment[e]	24.9	25.8	36.5	43.0

[a] Figures in current prices.
[b] Percentage of imports in domestic demand measured as output plus imports minus exports.
[c] Percentage of exports in output.
[d] Percentage of net exports in total machine tool trade measured as exports plus imports.
[e] Employment per establishment.
Source: Malaysia, External Trade Statistics, various issues; Malaysia, Industrial Surveys, various issues.

Action Party) encouraged greater networking and offered the checks and balances to reduce unproductive collusion efforts. While the Chinese face cultural differences, the differences cannot be considered significant enough given the integration through their intra-ethnic networking since 1970. Similarly, the cultural differences among Malays in Penang and the Kelang Valley cannot be considered significant. Also, both microelectronics firm locations show strong concentrations of Chinese population.

The structural differences between Penang and Kelang Valley produced two distinct sets of local machine tool development experiences in Malaysia. Machine tool firms located in Penang have experienced rapid growth from the early 1980s, while firms in the Kelang Valley have generally performed poorly. The official regulatory environment that faced Penang firms can be said to have emerged only indirectly and has largely been similar to that faced by Kelang Valley firms. Government policy stimulated the redeployment of microelectronics multinationals to Malaysia. Microelectronics multinationals have become the prime technology suppliers and output purchasers of machine tool firms in Penang. These firms emerged as a direct response to the federal and local state governments' efforts to encourage foreign direct investment. The intermediary role by the local state government and its development corporation were critical in the establishment of initial links with foreign multinationals and subsequently effective supply of infrastructure and other facilities, including federally coordinated incentives from 1989. Like Kelang Valley firms, Penang's machine tool firms' production technology and markets were simple and small until microelectronic multinationals fostered their expansion. The initial period of emergence and expansion of output was also characterized by little federal government support, including anti-linkage biases generated by cumbersome customs regulations associated with FTZ coordination. The local state, embodied by a strong ethno-political relationship with the management of both the microelectronics firms and machine tool firms, played a critical role in the establishment of buyer-supplier ties in Penang. The lack of similar conditions and relationships restricted such developments in the Kelang Valley.

Socio-political factors restricted effective coordination in the Kelang Valley while enhancing it in Penang. There has been greater collaboration between the small- and medium-scale Chinese businesses and the Gerakan-led Penang state government than between the Chinese businesses and the United Malays National Organization (UMNO) led Selangor state government. Chinese middle class leadership of the Gerakan party helped the poorer and lower middle class Chinese owners of machine tool SMIs access local state support for their activities. Support for the historically dominating ethnic Chinese in medium- and small-scale businesses has helped greater institutional coordination in the former than in the latter. Unlike large businesses where the politically

connected ethnic *Bumiputeras* have often been important partners with ethnic Chinese, interethnic business collaboration among small- and medium-scale enterprises has generally been very thin. The Penang government, thus, has played a more important role in the development of the absorptive capacity of the entrepreneurially better-equipped Chinese in Penang than their counterparts in the Kelang Valley. Better coordination in Penang led to the formation of the Penang Skills Development Centre (PSDC) in 1989 to resolve the growing shortage of industry-specific skills training. The center enjoyed substantial support from the state government, including rental of only RM1 annually for its huge building.

In addition, the operations of Micro Machining (later re-incorporated as Micro Components Technology), owned by National Semiconductor but sold in the 1990s to Towam, helped generate some amount of human capital in Penang. Five firms reported either being owned by Micro Machining's former employees or absorbing staff from that firm. While the contribution of Micro Components Technology in the success of BG, BI, BJ, and CB was reported important in the interviews we conducted, it was not statistically significant in our regressions for the whole sample (see Appendices 1 and 2). Only the founders of the first three firms had engineering qualifications. Hence, the results were discarded. Similarly, investigations on wage differences to examine if better conditions in Penang attracted more skilled workers to Penang firms also proved largely insignificant. The average starting wage of manufacturing firms in Penang, and in Ulu Kelang and Sungai Way (in the Kelang Valley), in 1998 was RM400 monthly.

To test statistically the significance of government-business coordination in the performance levels of machine tool firms in Penang over Kelang Valley holding other variables constant, a control dummy was introduced in the normal Cobb Douglas function (see Appendices 1 and 2). Since it is effective government-business coordination that is being examined, two regressions were run, one with a location dummy (Penang = 1; Kelang Valley = 0) and the other with the former as a dummy (effective government-business coordination = 1; otherwise = 0). While the location dummy is easily defined, firms responses were coded for government business coordination. By using a Likert scale of 1–7, firms were asked to rank their order of preference on five aspects of government business coordination. Because it is extremely difficult to distinguish levels of better government-business coordination, the statistical findings should be secondary to the qualitative analysis in the paper. Firms were considered to enjoy strong government-business relationships if those firms reported effective coordination efforts from between them and state development corporations, federal institutions such as the Ministry of International Trade and Industry (MITI), Industrial Coordination Councils, or other related organizations (see Appendix 2). To improve the significance of the estimates, additional data, albeit all from Penang, were included so that $N = 32$. Efforts to obtain more supplier firm information from the four multinationals in the sample in the Kelang Valley did not materialize. The role of SMIDEC was not statistically tested because it was not formed by then. Followup interviews in 1998 showed that none of the firms in the sample, whether in Penang or in the Kelang Valley, considered SMIDEC as useful in their operations. In the Likert scale of 1–7 (1 being excellent; 2, very strong; 3, strong; 4, undecided; 5, weak; 6, very weak; 7, nonexistent or negative), two firms reported as weak, three as very weak, two as neither weak nor strong, and 25 as nonexistent. Nevertheless, SMI support from the government was examined through the role of MITI. The following basic regression models were used:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \mu \quad (1)$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_4 X_4 + \mu \quad (2)$$

Where Y is ln (value added); X_1 is ln(employment); X_2 is ln(fixed assets); X_3 is the dummy, location; X_4 is the dummy, government-business coordination; the coefficients β_1 and β_2 value added elasticities of employment and fixed assets, respectively; β_3 the coefficient of the dummy, location; β_4 is coefficient of the dummy, government business coordination; and μ is error term.

While both produced significant results, regression (2) by using government business coordina-

tion over location generated stronger results (see Table II): $\beta_4 > \beta_3$.[3] Hence, while the synergies involving a common location has been attractive, it appears that firms enjoying better government-business links have done even better.

The local state government and its Penang Development Corporation (PDC) worked closely with multinationals to stimulate export-oriented processing, assembly, and testing activities. The state got involved actively to reduce information imperfection linking multinationals with potentially capable local machine tool firms. The multinationals also identified potential local suppliers to meet their self-expansion plans. With multinationals managed by local employees, the room for seeking local supplies tended to be larger. Local private employees working for multinationals enjoyed greater ability to identify potential suppliers than state officials. Local firms without participation in high precision machine tool niches were not initially involved in multinationals quantitative and qualitative plans. The multinationals obtained state support to attract participation from potentially capable local suppliers reluctant to venture into risky and uncertain businesses such as precision engineering. The initial networks were formed around past suppliers in low-order sourcing, business associations, old boys associations, and past employment contacts, which expanded information on potentially capable local machine tool firms. To expand local businesses in the economy, the state leadership began to encourage strongly the formation of consultation committees to assist their development. Hence, when developments in microelectronics multinationals stimulated proximate machine tool sourcing, the channels for matching local SMIs with them began to develop.

Institutions were created or strengthened in Penang. The Chinese Chamber of Commerce worked closely with the state leadership and the PDC. The chief minister also actively promoted spinoffs between local businessmen and multinationals, including increasingly advising the PDC to promote local sourcing of components by multinationals.[4] Especially in the 1980s, systemic relations within intra-ethnic networks became fairly strong. Multinationals' reliance on the PDC to coordinate effectively security, infrastructural support, and to quell labor unrest helped strengthen the relationship between the local state and the multinationals. All eight microelectronics multinationals in Penang, irrespective of ownership, considered the state government as proactive in stimulating machine tool spinoffs (Rasiah, 1993). The PDC compiled a list of local suppliers in metal, plastics, and packaging industries from 1985 and has been upgraded annually since showing detailed information on their productive capacities. The PDC has also actively organized meetings, visits, and promotions to match and strengthen links between foreign multinationals and local firms. Given serious information asymmetry problems associated with backward small and medium firms, PDC's role here has been critical in effecting linkage coordination. Business council meetings between state officials and local managements of microelectronics multinationals have also been important in the promotion of local machine tool sourcing. Intel's strong support for local machine tool sourcing owes much to its former managing director's, Lai Pin Yong, active

TABLE II
Statistical results of regression Equations (1) and (2)

	α	β_1	β_2	β_3	β_4	
Equation (1)						$N = 32$
Coefficient	–0.382	0.988	0.601	1.054		Adj $R^2 = 0.861$
t-statistics	–0.278	6.419[a]	5.308[a]	3.478[a]		F-stats = 64.83[a]
Equation (2)						$N = 32$
Coefficient	–0.206	0.713	0.670		1.189	Adj $R^2 = 0.926$
t-statistics	–0.206	5.781[a]	8.081[a]		6.866[a]	F-stats = 129.40[a]

[a] Significant at 1 percent level.
Source: Computed from Appendices 1 and 2.

promotion of local vendors. The ethnic Chinese background of the state leadership that feared increased federal efforts to raise *Bumiputera* participation in the economy, local suppliers, and purchasing officers in multinational firms helped strengthen intra-ethnic networking (Khong, 1991).

Also, the development of local machine tool firms in Penang received a strong fillip following the opening of Micro Machining in the 1970s by National Semiconductor, a U.S. microelectronics subsidiary located in Penang. Micro Machining later changed its name to Micro Components Technology (MCT) before it was sold to Japanese controlled Towam in the 1990s. This machine tool firm acted as the prime training ground for cutting edge hardware machine tool activities and developed the founders of BG, BI, and BJ. CB reported having a skilled machinist who had worked previously at MCT.

Socio-political complementarity in Penang, particularly the small- and medium-scale business community aligned with the Gerakan party, enabled relatively strong political support and direct matching efforts linking microelectronics multinationals with local machine tool firms. This along with the state leadership's relative autonomy from the federal government allowed strong efforts to stimulate local machine tool sourcing by microelectronics multinationals. The smooth coordination role played by the Penang state government and the PDC has created strong cooperative relations between the state government and the PDC, local firms, and the multinationals. Hence, despite starting with backward capacities, proactive support for the local firms helped tap the spinoff potential that has emerged from growing flexibilization of production in electronics multinationals. Local machine tool sourcing received a boost when the federal government introduced incentives for firms meeting a 30 percent local sourcing condition in 1991. A further stimulus came when big *Bumiputera* enterprises began to capitalize successful Chinese firms involved in supplying electronics multinationals, and support of the state government helped three of Penang's local machine tool firms to attain tax benefits in the period 1989–98.

Like Penang, Kelang Valley had been a major center for colonial economic activities. Unlike Penang, however, its importance rose following independence. Kuala Lumpur remained the administrative and commercial capital of Malaysia. Port Klang replaced Penang as its chief port, and Subang became the site of its biggest international airport. In addition, like the ministries, Malaysia's prime industrial promotion agency, the Malaysian Industrial Development Auhority (MIDA) and other industrial parastatals, are also mainly located in the Kelang Valley. The synergies associated with good infrastructure and administrative and commercial centers obviously attracted many multinationals. Unlike Penang, however, Kelang Valley's socio-political structure offered little active support to start and strengthen machine tool subcontracting with microelectronics multinationals. The state not only did little to increase information about local suppliers engaged in machine tool activities, they also did little to attract the trust of local machine tool firms. The microelectronics multinationals often linked well with federal institutions to maintain customs and administrative coordination. Two managing directors of U.S. firms located in Ulu Kelang and Sungai Way in Kelang Valley reported meeting MIDA and MITI officials to help identify and coordinate the development of effective suppliers, but the meeting was not a success. Hence, weak network bonds in the Kelang Valley blocked the emergence of effective coordination mechanisms to solve collective action problems.

Politically, federal ethnic power relations has been reproduced at the level of the local state. *Bumiputera*-dominated UMNO has ruled Selangor since Malaysia's independence. The ethnic Chinese-dominated DAP has dominated only in Chinese-dominated urban constituencies. Given the proximity of federal institutions, multinationals generally coordinated their security, infrastructure support, and labor relations operations with federal institutions. The local state institutions have generally been bypassed by the microelectronics multinationals as a consequence. Dominated by *Bumiputera* employees, the SEDC has hardly enjoyed ethnic-based networking potential with multinationals as the purchasing officers in the latter have generally been ethnic Chinese. The Selangor State Economic Development Corporation's (SEDC) role has been limited to infrastructure development and the leasing of industrial land. In fact, its function stops once the

land is leased to the firms. The SEDC has played no formal role in the promotion of local sourcing. Given the political and economic congruence of ethnic interests both at the national and state levels, there has been no political pressure on the local state to assume a direct role in promoting local sourcing involving non-*Bumiputera* firms.

Under such circumstances, the small- and medium-scale firms that have had a long entrepreneurial experience and show potential linkage development effects – dominated by ethnic Chinese ownership – have enjoyed little state support. The lack of state support has left these firms facing severe market failure problems, though ethnic congruence with the generally ethnic Chinese purchasing officers in the multinationals have encouraged some amount of local sourcing. Not only are microelectronics multinationals badly positioned to identify small- and medium-scale firms' potential capabilities, requiring detailed scrutiny and monitoring, they themselves have received little encouragement to participate in such risky and uncertain developments. Hence, both the microelectronics multinationals and have been reluctant to engage actively in upgrading the technological capabilities of the local machine tool firms. Local machine tool firms not only face finance problems, including accessing subsidized loans and technical assistance from the credit guarantee schemes and the industrial technical assistance fund (ITAF), but are also hardly prominent to attract the attention of potential multinational clients. Indeed, interviews show that the list of small- and medium-scale firms promoted by the government include relatively few machine tool firms operating in the Kelang Valley. Where it has involved active state promotion, such as those by the *Bumiputera* venture trust, Permodalan Usahawan Nasional Berhad (PUNB) stringent ethnic-based conditions apply.

The lack of political support has restricted the establishment and strengthening of sourcing relationships between microelectronics multinationals and local machine tool firms in the Kelang Valley. The intermediary coordination role played by the PDC in Penang has been missing in the Kelang Valley. Lacking state efforts through institutionalization of risks and other support services, microelectronics multinationals in the Kelang Valley reported lacking motivation to develop local machine tool capabilities. Unlike in Penang, where a proactive state leadership has played a critical role in stimulating links between local firms and microelectronics multinationals, state leadership in the Kelang Valley has generally avoided such a role (see Rasiah, 1996b). Since the federal state, *de facto*, has generally been the active governance agent in the Kelang Valley, national considerations embedded in the NEP and its successor, the New Development Plan (NDP), have dictated the promotion of local sourcing. *Inter alia*, ethno-class differences has restricted the effectiveness of the nationally coordinated SEP. Its success in stimulating subcontract relations between ethnic Chinese firms and microelectronics multinationals have been modest even after the enactment of the 30 percent local sourcing condition in 1991 for firms applying to enjoy financial incentives. Yet, 2,763 firms had registered under the SEP by 1993 (Ministry of International Trade and Industry, 1994, p. 260).

The federal state has only been slightly more successful than SEP in its promotion of the VDP involving the electric/electronics industry. Anchor companies began to support small and medium firms with an equity of not less than RM100 thousand that show *Bumiputera* participation in equity and employment of 70 percent and 55 percent, respectively. Participation in this program within the electronics industry has so far largely involved consumer and industrial electronics firms. Few of them, however, have established links with microelectronics firms. Sapura and Sharp were the initial anchor firms. This program has helped create *Bumiputera*-controlled suppliers from scratch within a short time in the electronics industry. The government planned to create 80 new vendors over the sixth and seventh Malaysia plans (Letchumy, 1993, p. 14). Subsidized loans and technical assistance offered through ITAF and venture companies such as PUNB have been critical in their development. Information asymmetry and other imperfections have combined to hamper local machine tool suppliers access to such productive rents in the Kelang Valley.

Socio-political divergence in the Kelang Valley – between the small and medium business community and UMNO-dominated political leadership

both at the state and federal levels – stifled the development of complementary institutions to support the growth of ethnic Chinese-controlled small- and medium-scale businesses. With weak interethnic relations at the small- and medium-scale level, the Chinese business community involved in metal, tooling, foundry, rubber, and plastic works enjoyed little support to access microelectronics multinationals. Federal financial incentives associated with local sourcing also failed to generate local sourcing levels comparable to Penang. Hence, much of the domestic machine tool sourcing in the Kelang Valley has been met by foreign subsidiaries attracted to Malaysia. Kelang Valley microelectronics multinationals have also established supply links with Penang's machine tool firms. In addition, three Penang firms dropped plans to extend subsidiary operations in the Kelang Valley owing to a lack of complementary support from local state officials. These firms reportedly had considered opening subsidiaries in the Kelang Valley following encouragement from two U.S. multinationals located there.

4. SMI performance: growth and technological deepening

For the purpose of a more detailed study, we use 17 machine tool firms from Penang (13) and the Kelang Valley (four) to examine their growth and subcontracting experience with microelectronics multinationals. Data limitations prevented a detailed study of more firms. Given their small size and lack of information, these firms were selected from information provided by microelectronics multinationals operating in the two locations. Eight microelectronics multinationals were chosen for that purpose (see Table III). All firms in the sample have introduced flexible production techniques in production. The tracing procedure yielded 25 machine tool firms in Penang and nine machine tool firms in Kelang Valley. The interview response rate was 72.0 percent for Penang and 44.[4] percent for Kelang Valley.[5] Although the Japanese firm in the sample had begun using just-in-time (JIT) principles through its minimum stock turnaround technique from 1975, JIT did not lead to the development of local suppliers. The opaque control structures in Japanese firms precluded the potential for proactive participation in the development of local machine tool firms. Also, Japanese firms' extensive vertical integration and product diversification, including in machinery development, reduced the need for sourcing them locally, especially when local capacities had to be newly developed.

Much of production involving microelectronics multinationals in the 1970s in Malaysia expanded truncatedly. Located in free trade zones, multinational firms were neither required to nor enjoyed supporting capabilities to source locally. Both external and internal developments did not offer the stimulus for the development of local supply capacity. Not only were local firms little developed to participate in machine tool subcontracting relationships, microelectronics multinationals' offshore strategies emphasized little links domestically. These firms accessed primarily tax benefits (that stimulated transfer price potential), market

TABLE III
Microelectronics multinationals

Firms	Inception year	Equity (%)	Location	Flexibilization efforts	Substantial flexibilization
AA	1972	U.S. (100)	Kelang Valley	1983	1988
AB	1973	U.S. (100)	Kelang Valley	1982	1989
AC	1980	U.S. (100)	Kelang Valley	1984	1990
AD	1972	U.S. (100)	Penang	1982	1989
AE	1973	U.S. (100)	Penang	1980	1984
AF	1973	U.S. (100)	Penang	1983	1989
AG	1973	U.S. (100)	Penang	1984	1989
AH	1973	Japan (90); Malaysia (10)	Penang	1975	1978

Source: Author interviews (1993–98).

access to third countries (especially the generalized system of preferences), and cheap unorganized labor that allowed easy hiring and firing (see Lim, 1978; Rasiah, 1993). Production merely comprised the assembly of imported inputs for export. All exports went back to parent firms before being sold to wholesalers and retailers. Work organization typified neo-Taylorism, referred to as casualization by Sabel (1986) or low road to industrial restructuring by Sengenberger and Pyke (1991) and Hirst and Zeitlin (1991). Under such circumstances, microelectronics multinationals were not only little interested in deepening skills and training facilities in Malaysia (see Rasiah, 1996b), but also hardly saw a need to broaden proximate machine tool supply capacities. Malaysia is essentially a primary economy and hardly offered internally generated productive capacities. The country lacked a dynamic industrial policy to facilitate the creation and management of institutions to support industrial deepening and widening (see Rasiah, 1997). Manpower development institutions were relatively weak. The labor force was composed primarily of those who left school at an early age, though the relatively high literacy rates and fluency in English made those people easily trainable.

The general work organization began to change strongly from the 1980s as a consequence of competition and the volatility of demand. Especially in semiconductor production, where product cycles have become increasingly shorter and prices have fallen sharply, firms began to introduce rapid changes in work organization. Most high technology firms began to introduce flexible production systems, superimposing cellular manufacturing onto state-of-the-art human resource techniques such as total quality management (TQM) (Rasiah, 1993, 1994). Although the single Japanese microelectronics firm in the sample had began introducing JIT in 1975, Japanese style control structures had restricted the participation of local personnel in decision making. Japanese employees have continued to retain key technical and managerial positions in the firm. Indeed, the firm that used minimum stock turnaround (MST) techniques and small group activities used both flexible and Taylorist work organizations in the 1970s and early 1980s. From the 1980s, all firms irrespective of ownership began introducing flexible production techniques, integrating innovative capacity with execution throughout the division of labor and thereby reducing hierarchies and making job opportunities interlock in the process. The Japanese multinational, however, despite leading in technical expertise in flexible production systems, offered less stimulus for local machine tool sourcing. Key managerial positions were still controlled by Japanese employees and their own interfirm and intra-holding company sourcing links. The sharp fall in labor reserves from the late 1980s left even industrial and consumer electronics firms – particularly those located in the major industrial centers of West Peninsular Malaysia – introducing flexible production strategies (Rasiah, 1995, 1996a).

Offshore production involving microelectronic multinationals in Malaysia had transformed from a mobile activity (Lim, 1978; Rasiah, 1988) to a deep-rooted regional operation (Rasiah 1988, 1993). The growth of product and process customization within the rapidly growing Asia Pacific market enhanced such a development further. These developments, particularly to enable productive flexible specialization, has encouraged a strong impetus for proximate local machine tool sourcing and the intensification of employee training in-house and externally. Currency fluctuations too were important, but as Rasiah (1994) has argued, they accompanied rather than initiated such developments. Some elements of research and development in the redesigning of mature products such as the 80386 and 80486 microprocessors and EPROM chips has also emerged to tap the direct externalities generated out of the development of local labor's innovative faculties and changes in financial incentives (Rasiah, 1996a). Interestingly the appreciation of the ringgit after 1992 reversed the exchange rate advantage. The currency crash of 1997 did not help the firms ameliorate the problem until 1999 owing to a credit squeeze that has harmed access to loans. Interests rates have from early 1999 began to fall sharply, thereby reversing credit flows in the Malaysian economy.

Direct and indirect (cutting edge process techniques) proxies, such as quality control circles (QCCs), small group activities, JIT, quick changeovers and multi-product lines, TQM, total preventive maintenance (TPM), and statistical

process control (SPC), were used to trace the timing of application of flexibilization of production in the firms. A detailed longitudinal presentation of the absorption of flexible production techniques is undertaken in Rasiah (1994, Figure 2). As shown in Table III, the only Japanese microelectronic multinational in the sample began introducing flexible production techniques in 1975, achieving substantial application by 1978. The majority of firms, owned by U.S. capital, began absorbing flexible production techniques in 1980–84, achieving substantial application in 1984–90. Although company AE enjoyed substantial use of flexible production techniques by 1984, the remaining U.S. firms only achieved significant levels during 1988–90. Between the remaining firms, the absorption period has been similar.

The absorption of flexible production techniques from the 1980s and shortening product cycles has intensified layout reorganizations and machinery modifications. While the lone Japanese firm in enjoyed a flexible production organization from the 1970s, the seven U.S. firms, irrespective of location, have experienced substantial process reorganization and machinery modification since the 1980s. Modifications have often required improvements without complete machinery replacement. All microelectronics multinationals have as a consequence started a machinery support division to coordinate such service activities. Given higher transaction costs involved with enlarging hierarchies into dissimilar activities, the potential for out-sourcing of a significant share of these services began to grow in Malaysia. While latent demand grew strongly in all locations of microelectronics multinationals, the share of machinery out-sourcing and related services locally has tended to show a distinct variance between Penang and Kelang Valley. Local machine tool suppliers in the two regions also demonstrate substantial differences in productive capability.

Interviews with the eight firms show that all of them have experienced rapid reorganization, especially in layouts, machinery, and manpower. As shown in Table IV, Penang's machine tool firms are not only greater in number, they show a wider and more sophisticated range of products. The technological depth of Penang's machine tool suppliers, as measured by precision and human capital indices is clearly superior to Kelang Valley's suppliers (see Tables IV and V). Of the 17 firms studied in detail, 14 Penang firms performed high precision engineering and three assembled automated machinery compared to none in the Kelang Valley (see Table IV). Six Penang firms had engineers in their employment compared to none in the Kelang Valley firms (see Table V). The share of technicians and machinists in total employment among Penang firms exceeded 26.7 percent. Only one firm in the Kelang Valley managed to fall among Penang firms. The precision production machinery and precision testing machinery indices of Penang firms were generally far higher than that of Kelang Valley firms. It should be noted that Penang firms showed similar productive capacity as Kelang Valley firms in the late 1970s, none engaging in high precision engineering, working without scientific process control techniques, and none producing automated machinery. Also, all of Penang's suppliers interviewed regarded microelectronics multinationals as key to their development. Substantial inflow of technology involving U.S. microelectronics multinationals, and gradual two-way interfacing with software and hardware has helped upgrade local firms technological capabilities. Only BO among the four Kelang Valley supplier firms considered microelectronics multinationals as an important agent for its growth.

The technology trajectory of local machine tool firms in Malaysia has involved five stages of development. Stage one has typically characterized production of simple crude parts that have been fabricated into final components by more developed suppliers or the microelectronics multinationals themselves in-house.

The second stage has involved the manufacture of jigs, fixtures, moulds, and dies with low precision levels. Stage three is characterized by high precision engineering of small batch components. Stage four either involves the production of small batches with high precision requirements or the manufacture of semi-automated machinery, or both. The former has involved a range of products using similar horizontal technologies, while the latter has generally involved the microelectonics industry. Although microelectronics multinationals have been the main initiators, consumer electronics and disk drive firms have started acquiring

TABLE IV
Local machine tool firms, Penang and the Kelang Valley, 1993

Firm	Ownership (equity %)	Location	Inception year	Process techniques	Employ-ment	Sales (RM million)	Products
BA	L_C(100)	Penang	1979	TMS, JIT, QCC	45	2.5	Precision components
BB	L_C(100)	Penang	1983	TMS, JIT, TQM QCC, SPC	22	1.4	Precision parts, automated machinery
BC	L_B(60) L_C(40)	Penang	1988	TMS, Codified instructions	15	0.3	Precision fabrication
BD	L_C(100)	Penang	1987	QCC and SPC	34	1.5	Precision parts, automated machinery
BE	L_C(100)	Penang	1991	TMS, Codified instructions	17	0.3	Precision parts
BF	L_C(100)	Penang	1976	JIT, TQM, TMS, TPM, QCC, SPC	200	20.0	Precision components, automated machinery
BG	L_I(100)	Penang	1978	Codified instructions	22	2.6	Precision parts, moulds, and dies
BH	L_C(100)	Penang	1984	JIT, SPC, QCC	85	10.0	Precision components
BI	L_C(100)	Penang	1980	JIT, TPM, QCC, TMS	68	15.0	Precision parts, automated machinery
BJ	L_C(100)	Penang	1984	JIT, TPM, QCC, TMS	40	2.5	Precision parts
BK	L_C(100)	Penang	1950	JIT, TQM, TPM, QCC, TMS	120	10.0	Precision parts, automated machinery
BL	L_C(100)	Penang	1980	JIT, TQM, TPM, QCC, SPC	40	1.7	Automated machinery
BM	L_C(100)	Penang	1982	JIT, TQM, TPM, QCC, SPC	128	12.0	Simple parts fabrication, jigs, fixtures, moulds, and dies
BN	L_C(100)	Kelang Valley	1988	Codified instructions	18	0.15	Moulds, dies, jigs, and fixtures
BO	L_C(100)	Kelang Valley	1988	Codified instructions	14	0.36	Jigs, fixtures, moulds, and dies
BP	L_C(100)	Kelang Valley	1984	Codified instructions, QCCs	32	0.56	Simple parts fabrication, moulds, dies, jigs, and fixtures
BQ	L_C(100)	Kelang Valley	1975	TQM, QCC	69	2.5	Parts fabrication, jigs, fixtures, moulds, and dies

Notes: L_C – Local Chinese; L_B – Local *Bumiputera*; L_I – Local Indian; T – Taiwanese.
Source: Author interviews (1993).

high precision parts from machine tool firms. In stage five, firms either undertake large volume precision engineering of components or small batch fully automated machinery, or both. Disk drive multinationals have become major purchasers of large batch parts from selected machine tool firms. Firms in stage five generally enjoy original equipment manufacturing (OEM) capability (i.e., they enjoy the capacity to supply orders by using their own production capabilities). Given the cumulative and complementary nature of these stages, firms specializing in the higher stages in the technology trajectory also often perform the lower operations. It is only when firms pass through stage five that original design manufacturing (ODM) and original brand manufacturing (OBM) stages emerge. The transition through these stages is not discrete as firms that have OBM

TABLE V
Capital deepening indices, local machine tool suppliers, Penang and the Kelang Valley, 1993

Firm	Engineer index[a]	Technician/ machinist index[b]	Precision production machinery index[c]	Precision testing machinery index[d]	Precision tolerance level (± inches)		
					Grinding	Milling	Stamping
BA	0.0	26.7	27.6	33.3	0.00005	0.00005	0.001
BB	0.0	68.2	21.1	23.1	0.0001	0.0005	n.a.
BC	0.0	40.0	15.0	30.0	0.0002	0.0005	n.a.
BD	0.0	60.0	11.8	40.0	0.0002	0.0002	n.a.
BE	0.0	45.2	45.2	26.5	0.0001	0.0002	n.a.
BF	2.0	47.0	34.3	78.9	0.00005	0.00005	0.001
BG	0.0	40.9	38.9	33.3	0.0002	0.0002	n.a.
BH	0.0	42.4	47.2	29.4	0.0001	0.0005	n.a.
BI	1.5	44.1	55.1	71.4	0.0001	0.0001	0.002
BJ	2.5	50.0	25.0	60.0	0.0001	0.0002	n.a.
BK	1.7	41.7	38.9	33.3	0.0001	0.0005	0.002
BL	2.5	52.5	33.3	60.0	0.0001	0.0001	n.a.
BM	1.7	49.2	29.2	73.3	0.00005	0.00005	0.001
BN	0.0	22.3	5.6	6.7	0.001	0.001	n.a.
BO	0.0	20.6	6.8	10.8	0.0002	0.0005	n.a.
BP	0.0	27.6	12.2	11.7	0.001	0.001	n.a.
BQ	0.0	35.4	6.2	21.5	0.001	0.001	0.02

[a] Refers to percentage shares in total employment.
[b] Refers to percentage shares in total employment.
[c] Refers to their intensity in total production machinery.
[d] Refer to their intensity in testing machinery, respectively.
Source: Author interviews (1993).

facilities that also manufacture the lower production stages.

None of the local machine tool firms studied here has participated in ODM and OBM activities, though six firms in Penang reported having designing capabilities. The prime cutting edge machinery used in production is still imported by the microelectronics firms in the sample, because none of the local supplier firms has managed to move up to ODM and OBM activities. Nevertheless, within the limited range of machinery and component markets entered by local firms, suppliers in Penang tend to have production capabilities superior to supplier firms in the Kelang Valley. Penang firms using the proxies – share of precision production and testing machinery indices, engineer and technician/ machinist indices, and level of precision tolerance – tend to show higher productive capabilities. Also, BF from Penang has started plans to locate a machine tool plant in China to service microelectronics and disk drive firms.

Penang and Kelang Valley machine tool firms also demonstrate considerable differences in their technological relationships involving microelectronics multinationals. Machine tool firms in both Penang and the Kelang Valley were backward in the 1970s. From simple fabrication, several of Penang's local machine tool firms have gradually moved up the technology trajectory while those of Kelang Valley have generally remained entrenched in stages one and two activities. Technological deepening in Penang has involved substantial technology transfer from microelectronics multinationals. In addition to upfront capital and guaranteed markets, microelectronics firms have also developed prototypes and subcontracted them out to local machine tool firms. Process and product knowledge was transferred, and the development of local firms was monitored by the principal buyers. As the local firms participated actively in the quantitative and qualitative needs of the microelectronics multinationals, the multinationals' own self-expansion efforts saw swift technological deepening in the local machine tool firms in Penang (Rasiah, 1994). As the local firms passed

through the learning cycle, the relationships changed to involve increasing in-house participation in technology development. BF, BI, BK, and BM subsequently managed to gain sufficient synergies to participate actively in the development of their own capabilities. Increased in-house development capabilities enabled BF and BK to attain relative freedom from their foster multinationals in the 1990s. Local machine tool firms hardly had similar technology transfer from microelectronics multinationals in the Kelang Valley despite the dominance of U.S. ownership. Relying strongly on in-house technology development both in the 1970s and the 1980s, local machine tool firms in the Kelang Valley failed to achieve similar levels of technological deepening.

The lack of consequent development in supplier networks has resulted in increased in-house workshop machine tool production in Kelang Valley microelectronics multinationals. Some microelectronics multinationals in addition have also began purchasing machinery from Penang's machine tool firms. For example, AC bought four automated wire bonders from BF. AA acquired six wire bonders from BK in Penang in 1990, while its subsidiary in Seremban acquired eight wire bonders from BK in 1992. The growing reputation of Penang firms led to microelectronics firms in the Kelang Valley to encourage them to start subsidiary operations in the Kelang Valley. As a result, BF, BI, and BK considered starting subsidiary plants in the Kelang Valley in 1996.[6] Such plans were, however, abandoned after a careful study owing to a lack of state support, rising costs of production resulting from rising wages from the late 1980s, intermediate inputs, utilities, and an appreciating exchange rate until the financial crash of 1997.

Overall, backward sourcing by microelectronics multinationals in Malaysia has been very small owing largely to the overwhelming composition of imported wafers. The share of local production inputs in microelectronics multinationals in 1993 ranged from 0.5 percent in AC to 7.5 percent in AE.[7] Although the pecuniary share of machine tool inputs sourced by most microelectronics firms has been relatively small, ranging from 2.5 percent by AC to 33.7 percent by AE in 1993, it has risen steadily in Penang firms. The average share over the period 1988–93 ranged from 1.2 percent in AC to 18.5 percent in AE.[8] When AE is excluded, the next best figures come from AG, which sourced 8.3 percent of its machine tools from local firms on average over the same period. As was noted earlier, local machine tool firms have yet to break into ODM and OBM activities. Total sales of local machine tool firms linked to microelectronics multinationals have, however, expanded considerably. From virtually scratch operations at inception, local machine tool sales rose to millions of ringgits in 1993. BF recorded gross sales of RM20 million in 1993 (see Table III). Here again, Penang firms show a superior performance record over Kelang Valley firms. All five firms that achieved gross sales figures of at least RM10 million in 1993 are located in Penang.

Whatever the classifications used, it can be seen that Penang's local machine tool suppliers generally show higher growth and technological deepening than their counterparts in the Kelang Valley. Yet local firms in both regions had similar productive capabilities in the 1970s. Both sets of microelectronics firms have been dominated by U.S. ownership, and local firms have been dominated by ethnic Chinese ownership. Given their similar initial capabilities and the latent demand generated by the microelectronics firms, this contrasting experience within the same national polity distinguishes the influence of local structural specificities on the development of institutional coordination.

5. Conclusion

This paper has looked at the nature of government-business coordination as a factor in the development of SMEs in Malaysia. It has shown that the better performance of small machine tool firms in Penang compared to those in Kelang Valley can be attributed to differences in the quality of government-business coordination. The different ethno-class specificities in Penang and the Kelang Valley have set structural constraints in the development of government-business coordination in the two locations.

Relatively complementary local socio-political structure helped enhance effective coordination between markets, institutions, and firms to enhance the development of small- and medium-scale machine tool firms in Penang. The specific

nature of local politics in Penang, and the local political leadership's relative autonomy over the federal government, helped the local state to support ethnic Chinese small- and medium-scale businesses more actively. The special intermediary role of the Penang Development Corporation has been instrumental in forging strong state-business-multinational coordination. Thus, markets, trust, and in-house command worked complementarily to coordinate the expansion and deepening of machine tool subcontracting firms in Penang.

Although similar machine tool demand also emerged in the Kelang Valley, constraints imposed by a stifling local socio-political structure restricted the expansion of similar machine tool relationships between microelectronics multinationals and local small- and medium-scale firms. The local state offered little proactive support to forge links between microelectronics multinationals and local small- and medium-scale machine tool firms in the Kelang Valley. Unlike its counterpart in Penang, the Selangor Economic Development Corporation has hardly played any coordinating role to link microelectronics multinationals with local firms in the Kelang Valley. The official vendor development programs promoted by the federal government have remained underutilized.

The relatively open nature of managerial control in U.S. firms has facilitated greater participation by local personnel in holding strategic positions to establish and strengthen links with local machine tool firms. In Penang, the common ethno-political background of owners of local machine tool firms, state leadership, important purchasing officers, and managing directors of microelectronics multinationals helped overcome problems of networking, thereby stimulating greater support for the development of local machine tool subcontracting. U.S. firms also dominate microelectronics manufacturing in the Kelang Valley, but the lack of similar state participation has restricted the development of complementary state-business links. The lone Japanese firm in the sample located in Penang did not initiate the development of local machine tool capabilities because of their restrictive managerial control structures. These findings have also been supported strongly by the statistical analysis reported in the paper.

Acknowledgements

Comments from Shujiro Urata, Hiroki Kawai, Farrukh Iqbal, Migara De Silva, Jeffrey Nugent, Paitoon Wiboonchutikula, Carl Liedholm and other participants of the World Bank Institute project on the Role of Small and Medium Enterprises in Development are gratefully acknowledged.

Notes

[1] This allowance was renamed the Investment Tax Allowance following the Promotion of Investment Act of 1986.

[2] A longer time series was not possible owing to the aggregation of the industry with other industries in the preceding years. The available industrial production index is that of all machinery industries, including electronics, which significantly distorts the actual growth of the industry.

[3] See Appendix 1 for the data used in the regressions.

[4] Interviews with PDC officials conducted by the author in 1986.

[5] The firms that did not respond claimed not to have information records or was too busy to meet datelines required.

[6] Interviews conducted in 1993 and 1998.

[7] These figures exclude building and service expenses.

[8] Among other things, the average figure takes into account large machinery purchases during major upgrading exercises.

Appendix 1. Machine tool suppliers reporting links with semiconductor multinationals, 1993

Firms	Sales RM mn	Value added RM mn	Employment	Fixed assets RM mn	Location dummy	Staff with experience working in micro component technology	Government-business coordination dummy
BA	2.5	0.55	45	2.8	1	0	1
BB	1.4	0.322	22	1.1	1	0	1
BC	0.3	0.045	15	0.8	1	0	0
BD	1.5	0.285	34	1.2	1	0	1
BE	0.3	0.042	17	1.5	1	0	0
BF	20	5	200	10	1	0	1
BG	2.6	0.6344	22	2.7	1	1	1
BH	10	2	85	6.8	1	0	1
BI	15	3.9	68	8.6	1	1	1
BJ	2.5	0.475	40	2.8	1	1	0
BK	10	2.12	120	6.3	1	0	1
BL	1.7	0.289	40	2.6	1	0	0
BM	12	2.64	128	8.8	1	0	1
BN	0.15	0.018	18	0.3	0	0	0
BO	0.36	0.0396	14	0.68	0	0	0
BP	0.56	0.0784	32	0.71	0	0	0
BQ	2.5	0.3375	69	3.6	0	0	0
BR	5.2	0.988	145	1	1	0	1
BS	8	1.44	290	1.5	1	0	1
BS	1.5	0.3315	45	0.4	1	0	1
BT	3.2	0.6144	25	1.3	1	0	1
BU	0.8	0.12	39	0.2	1	0	1
BV	2.3	0.4347	48	0.8	1	0	1
BW	0.6	0.1092	26	0.4	1	0	1
BX	0.9	0.1611	35	0.5	1	0	0
BY	2.4	0.5352	34	1.8	1	0	1
BZ	8	1.944	92	1.9	1	0	1
CA	1.9	0.4009	42	1.5	1	0	1
CB	10	2.33	135	2.2	1	1	1
CC	0.3	0.048	22	0.6	1	0	0
CD	0.9	0.1656	25	0.4	1	0	1
CE	1.2	0.2112	44	0.5	1	0	1

Source: Compiled by author (1993–98).

Appendix 2.
Likert scale results of firms responses to government business coordination (1–3 = 1; 4–7 = 0)

	Chamber of commerce with government support	Ministry of International Trade and Industry (located in Kelang Valley)	State officials (including development corporations) directly assisting	Support from private-public coordination councils (e.g., Penang industrial coordination council)	Overall government-business dummy
BA	1	0	0	0	1
BB	1	0	0	0	1
BC	0	0	0	0	0
BD	1	0	0	1	1
BE	0	0	0	0	0
BF	1	1	1	1	1
BG	1	0	1	0	1
BH	1	0	1	0	1

APPENDIX 2 *(Continued).*

	Chamber of commerce with government support	Ministry of International Trade and Industry (located in Kelang Valley)	State officials (including development corporations) directly assisting	Support from private-public coordination councils (e.g., Penang industrial coordination council)	Overall government-business dummy
BI	1	0	1	1	1
BJ	0	0	0	0	0
BK	1	1	1	1	1
BL	0	0	0	0	0
BM	1	0	1	1	1
BN	0	0	0	0	0
BO	0	0	0	0	0
BP	0	0	0	0	0
BQ	0	0	0	0	0
BR	1	0	1	0	1
BS	1	0	0	0	1
BT	1	0	1	0	1
BU	1	0	0	0	1
BV	1	0	0	0	1
BW	1	0	1	0	1
BX	0	0	0	0	0
BY	1	0	0	0	1
BZ	1	0	0	0	1
CA	1	0	0	0	1
CB	0	0	1	0	1
CC	0	0	0	0	0
CD	1	0	0	0	1
CE	0	0	1	0	1
CF	0	0	1	0	1

Note: Firms responding as extremely strong (1), very strong (2), strong (3), undecided (4), weak (5), very weak (6), nonexistent or negative (7).

References

Best, M., 1990, *The New Competition*, Cambridge, MA: Harvard University Press.

Chee, P. L., 1986, *Small and Medium Industries in Malaysia*, Kuala Lumpur: Forum Press.

Brusco, S., 1982, 'The Emilian Model: Productive Decentralization and Social Integration', *Cambridge Journal of Economics* **6**(2), 167–184.

Chee, P. L., D. Lee and R. T. Foo, 1981, 'The Case of Labour Intensive Industry in Malaysia', in R. Amjad (ed.), *The Development of Labour Intensive Industry in ASEAN Countries*, Bangkok: International Labour Organisation.

Hirst, P. and J. Zeitlin, 1991, *Reversing Industrial Decline? Industrial Structure and Policy in Britain and Her Competitors*, Oxford: Berg Publishers.

Khong, S. M., 1991, 'The Service Sector in Malaysia: Structure and Change', Unpublished Ph.D. thesis, Cambridge University, Cambridge.

Lim, L. Y. C., 1978, 'Multinational Firms and Manufacturing for Export in Less Developed Countries: The Case of the Electronics Industry in Malaysia and Singapore', Unpublished Ph.D. thesis, Michigan University, Ann Arbor.

Nathan, R. et al., 1969, 'The Penang Master Plan', paper submitted to Penang Government. Penang.

PDC, 1971, *Annual Report*, Penang: Penang Development Corporation.

Rasiah, R., 1988, 'The Semiconductor Industry in Penang: Implications for NIDL Theories', *Journal of Contemporary Asia* **18**(2), 24–46.

Rasiah R., 1992, 'Foreign Manufacturing Investment in Malaysia', *Economic Bulletin for Asia Pacific* **63**(1), 63–77.

Rasiah, R., 1993, *Pembahagian Kerja Antarabangsa: Industri Semikonduktor di Pulau Pinang*, Kuala Lumpur: Malaysian Social Science Association Press.

Rasiah, R., 1994, 'Flexible Production Systems and Local Machine Tool Subcontracting: Electronics Component Multinationals in Malaysia', *Cambridge Journal of Economics* **18**(3), 279–298.

Rasiah, R., 1995, *Foreign Capital and Industrialization in Malaysia*, New York: St. Martin's.

Rasiah, R., 1996a, 'Industrialization as Engine of Growth and Industrial Policy in Malaysia', *Managerial Finance* **9**(2), 79–102.

Rasiah, R., 1996b, 'Changing Organisation of Work in the

Electronics Industry in Malaysia', *Asia Pacific Viewpoint* **37**(1), 21–38.

Rasiah, R., 1997, 'Class, Ethnicity and Economic Development in Malaysia', in G. Rodan, K. Hewisen and R. Robison (eds.), *Political Economy of South-East Asia*, New York: Oxford University Press.

Rasiah, R., 1999, 'From a Backyard Workshop to a Modern Machine Tool Factory: Eng Hardware', in K. S. Jomo, G. Felker and R. Rasiah (eds.), *Industrial Technology Development in Malaysia: Firm and Industry Studies*, London: Routledge.

Sabel, C., 1986, 'Changing Models of Economic Efficiency and their Implications for Industrialization in the Third World', in C. F. D. Alejandro et al. (eds.), *Development, Democracy and the Art of Trespassing*, Notre Dame, IN.: Notre Dame University Press.

Saxenian, A. L., 1997, *The Regional Advantage*, Cambridge, MA: Harvard University Press.

Sengenberger, W. and F. Pyke, 1991, 'Small Firm Industrial Districts and Local Economic Regeneration: Research and Policy Issues', *Labour and Society* **16**(1).