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**Political Preferences and Increasing Returns:
The Boon and Bane of Technological
Development in Southeast Asia**

Bryan K. Ritchie

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About the Author

Bryan Ritchie is currently a Fulbright-Hays/Social Science Research Council fellow and visiting researcher at the Thailand Development Research Institute. His dissertation focuses on the political economy of technical intellectual capital formation, with a focus on Southeast Asia. His most recent publications include "Innovation Systems, Collective Dilemmas, and the Formation of Technical Intellectual Capital in Malaysia, Singapore, and Thailand" (Center for Innovation and Technopreneurship at the National University of Singapore working paper series, September 2000) and "Economic Crisis and Technological Trajectories: Hard Disk Drive Production in Southeast Asia" (with Richard F. Doner, forthcoming in 2001 in an edited volume from the Japan Program at the Massachusetts Institute of Technology). Before beginning his graduate work at Emory University, Ritchie received an MBA from Brigham Young University. He also has extensive experience in the computer industry including management and consulting roles for firms such as Novell, Iomega, 3Com, USRobotics, and Megahertz.

Abstract

New growth economics posits that increasing returns, primarily from education and training as well as research and development, drive endogenous growth. At the same time, it is becoming increasingly obvious that these activities are also subject to increasing returns of a political nature. While path-dependency is an important component of increasing political returns, it extends beyond this to include vested interests that grow over time. Thus, it is not simply that one decision leads to another, but that once a decision is made, subsequent decisions made in the same direction are easier while reversing the decision trend grows harder with each subsequent decision. Hence, increasing returns. In this paper I explore the ramifications of increasing returns, both political and economic, on education and training in Southeast Asia. In particular I examine the initial conditions that drive coalitional politics in Malaysia, Singapore, and Thailand and trace the impact of key decisions on future micro economic outcomes. I find that decisions made at critical junctures surrounding languages, bureaucratic structure, the focus of the education and training system, and the involvement of labor in education and training have far-reaching effects on a country's future technological capacity.

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B.K. Ritchie
November 2001

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1. Introduction

The meteoric economic growth and development of the countries of Southeast Asia has been well documented. Before the crisis of 1997 many were suggesting that Thailand, Malaysia, and even Indonesia and the Philippines were poised to follow their Northeast Asian neighbors into the realms of developed status in the near future.

Although often portrayed as emulating the growth strategies of the newly industrializing countries of Northeast Asia (most notably S. Korea and Taiwan), in reality the countries of Southeast Asia have pursued very different development strategies than their northern predecessors. Whereas Korea and Taiwan implemented Listian “hot-house”¹ modes of technological development closely based on Japan’s example, industrializing countries in Southeast Asia have implemented more globalist development strategies with foreign direct investment (FDI) playing a primary role, albeit to differing levels.

As much as domestic variables have shaped choices regarding economic strategies, it may be that escalating economic liberalization and rates of world-wide technological progress are increasingly rendering these “hot-house” strategies obsolete (Doner and Ritchie, forthcoming). If so, to meet technonationalist economic goals² countries may have to leverage productive niches within global production networks anchored by large, multi-national corporations (MNCs).³ Achieving technonationalist ends using technoglobalist means, however, is an institutionally challenging prospect. For “early” late developers, Gerschenkron (1962) explains that the critical institutional variable influencing economic development is the state. Because late developers must develop both in absolute terms and in relation to developed nations, a strong state is necessary to quickly resolve collective dilemmas surrounding critical market failures, especially capital accumulation and risk aversion. Without such intervention collective dilemmas take much longer to resolve if they

provide empirical evidence in support of this theory by showing that state-led industrialization in both Taiwan and Korea resulted in dramatic industrial transformation in a short period of time.

Nevertheless, inasmuch as fewer policy instruments are available for direct state intervention in the process of industrial upgrading, one-sided state strength may be increasingly insufficient to meet the demands of innovation and technological development prescribed by the new world economy. As Evans (1994) notes, developmental states must be embedded within the country’s social context. But perhaps even more importantly, as Doner and Hawes (1995) observe, private economic actors, particularly firms and labor, must play a participatory role in policy creation and implementation. It is the nature of these public-private coalitions that most influences the direction and sustainability, or trajectory, of technological development (Ritchie 2000). Just as public-private coalitions might become distributionary in nature with economically debilitating consequences (Olsen 1982), they can also have developmental consequences. Put simply, rather than creating a developmental state, “late” late developing countries must create public-private linkages that can support a developmental society.

Although much has been written about the effects of coalitions on economic development, much less has been written about the origins of these coalitions within an existing institutional structure, the institutional change and development they spawn, and how a country’s coalitional and institutional structure is subject to increasing returns over time, both economic and political. One purpose of this paper is to briefly describe the initial conditions in Southeast Asian countries and their influence on the formation of coalitions and institutions. Here I argue that differences in initial conditions between Northeast and Southeast Asia have resulted in different preferences for institutional and coalitional structure. A second, and larger purpose is to identify how existing institutional and coalitional structures shape institutional design at critical junctures and how the resulting institutions in turn influence micro-economic outcomes in path-dependent ways. Where preferences exist for broad and extensive public-private coalitional relationships

of technological development and innovation are possible. On the other hand, where the coalitional and institutional structure supports narrow, fragmented, and disconnected public-private linkages, developmental trajectories that intersect the technological frontier are much less likely.

Methodologically I propose to evaluate these hypotheses by comparing the development of technical capacity in the education and training systems (which I will refer to in the rest of this paper as just the education system) in Malaysia, Singapore, and Thailand. Although many different processes contribute to economic development, processes of technological learning are especially important (Felker 1999; Nelson 1993; Romer 1994). The capacity of the education system to produce technically trained and educated human resources, or technical intellectual capital - the number of scientists, engineers, and high-level technicians in the society - underlies any country's ability to participate in processes of technological learning. Exposure to the international economy and increasing technical sophistication, however, require that dense and participatory linkages exist among academia, government, business, and labor if society is to develop this capital. I have therefore chosen to evaluate the influence of coalitions, institutions, and increasing returns on the education system and its ability to foster these coalitional linkages. By focusing on the influence public-private linkages have on the high-end output of education systems, I do not suggest that more mundane issues surrounding education such as literacy, enrolment rates, infrastructure development, and basic job skills, are not important. Indeed, to achieve any level of success in producing technical intellectual capital, these initial factors must be in place. Yet, I do suggest that while education systems can often provide basic education and training goods without broad and dense public-private linkages, such linkages are necessary to develop the high-end intellectual capital needed if a country is to compete on the technological frontier.

I contend that the initial formation (or reformation in the case of previously colonized countries) of a modern education and training system is a critical juncture. It is at this juncture that countries make decisions that affect the structure of the education system and hence

deterministic, they do constrain future policies and institutions, which influence the frequency and depth of public-private linkages within the education system. Moreover, the effects of these decisions are subject to increasing returns and continue, in a path dependent way, until future reforms alter or reverse their course.

Testing my hypotheses on observations from countries in the same region makes it easier to hold regional and international variables constant. In addition, these countries, and to a lesser degree the Philippines and Indonesia are major export bases for technology-rich MNCs. The cases also vary strategically on the independent as well as many control variables. By comparing developmental processes cross-nationally, I can implement a certain amount of comparative control using Mill's methods. At the same time, however, carefully tracing these processes over time within each country makes it possible to retain the contextual detail necessary if one is to make causal claims in the face of probabilistic outcomes and multiple-causation.⁴

The remainder of this paper will proceed as follows. First, in section 2, I explore briefly how initial conditions influence preferences for coalitional structure and institutional design. Next, in section 3, I describe how preexisting coalitional and institutional configurations generate preferences for ongoing education and training policy and institutional formation during the critical juncture. Section 4 contains a review of economic and political theory on increasing returns and shows how policies and institutions created during the formation (or reformation) of the education system continue to influence public-private coalitional relationships long into the future. Finally, I end with a summary of my conclusions and observations.

2. Initial Conditions and Preferences for Coalitional Structure

In his groundbreaking work on new institutional economics, North (1990) argues that economic actors create institutions to mitigate information asymmetries, reduce transaction costs, and otherwise complete market transactions where the market left to itself would be unable to do so. In this view institutions are largely apolitical and the goods they provide are largely public in nature. Whether actors can

depends on path-dependent factors. Knight (1993), however, argues that institutional formation and change is not apolitical. Rather, social actors seek to define the economic environment in ways that will redound with long-term, private, benefits. Therefore, bargaining over institutional formation and change reflects existing asymmetries of power and influence. That is, institutional formation and change takes place within an existing institutional structure that confers wealth, power, and status on some while withholding the same from others. Although exogenous influences can rapidly and dramatically alter the rules of the game, the process is often more gradual. Nevertheless, endogenous institutional creation and change can also have unforeseen consequences leading to dramatic shifts in power and influence among social actors.

Although I do not reject the argument that institutions are created to facilitate market transactions, they are not done so evenly, but rather in a way that serves the interests of the more powerful. Even when the desired outcome is economic, the process is always political. Whether institutions confer broad public goods or narrow private goods depends critically on the nature of social coalitions and the bargaining processes that take place within and between them. In particular, when bargaining takes place within an existing institutional structure that encourages political and economic equality among a large number of social actors, both public and private, broad coalitions emerge that create or alter institutions to provide goods that are at least collective and often public in nature. In contrast, large asymmetries of power among actors, especially when political and economic power is concentrated in the hands of a small political and economic elite, will often cause institutions to be created or altered to provide private goods that accrue to a narrow stratum of society (Olson 1982).

Thus, whether at the critical juncture a country's existing coalitional and institutional systems promote equality and broad-based social cooperation and participation on the one end of the spectrum, or inequality and narrow-based redistributionary collusion on the other end (or some point in between) depends, at least in some small way, on preexisting conditions. These conditions shape the bargaining process by generating preferences for the initial "rules of the game."

Rodrik (1995) suggests that a weak landed aristocracy and unusually high levels of both income equality and educational attainment have positively impacted economic development in East Asia. Many of these features can be traced to poor resource endowments and relatively homogeneous populations. Limited arable land and a lack of concentrated mineral or oil deposits in these countries reduced the likelihood that powerful landowners or resource-based elites would control political power. Moreover, without an easy source of foreign exchange, survival required that society invest in education and development.

Nevertheless, as Booth (1999) points out, significant regional differences exist between Northeast and Southeast Asia. For example, Auty (1994) observes that resource scarcity encouraged Japan, Korea, and Taiwan to adopt export-oriented growth strategies. Such strategies put pressure on firms to upgrade technologically to be able to compete in the world market. Abundant natural resources in Indonesia and other Southeast Asian countries, on the other hand, made import substitution policies and strategies more likely. Also, whereas social homogeneity in East Asia is commonly thought to facilitate cooperative social networks and linkages, Jesudason (1989) observes that deep ethnic cleavages in Malaysia have led to preferences for political and economic fragmentation. These differences have influenced the preferences social actors have for particular institutional configurations. Different institutional systems among the countries of both regions, in turn, provide a framework of incentives and constraints that impact, in a path dependent fashion, the capacity to develop the broad coalitional linkages that undergird a developmental society.

Even as structural conditions differ between Northeast and Southeast Asia, they also vary within Southeast Asia. Malaysia has been endowed with mineral, oil, and agricultural resources. Prior to independence, the British encouraged large-scale immigration to ensure sufficient quantities of labor to work in the resource-based industries. Whereas Chinese workers were recruited to work the tin mines, Indian labor was recruited to work the rubber plantations (Redington 1978). Upon independence Malaysia was both resource

the hands of the Malay political elite, qualified Chinese and Indian managers were retained to run the mines and plantations. In spite of efforts to create a broad-based political coalition among the races, a narrow, elite-based coalition developed between the Malay political leaders and largely Chinese economic actors.

In Thailand, a narrow coalition of Bangkok-based bankers, politicians, and rice traders were able to institutionalize a trade regime that enabled them to capture rents accruing from rice export quotas and taxes. The trade regime, in turn, had two further consequences. First, very little technology or innovation was required to maintain agriculture-generated rents (Christensen 1992). But second, the system created several important fissures within the government and society. Within the bureaucracy both the Ministry of Commerce and the Ministry of Finance competed for a portion of the export taxes (Christensen 1992). These two ministries in turn competed with the ministry of agriculture over the strategic policy direction of the agriculture industry (Feeny 1988). At the same time, the trade regime served to depress local rice prices below international levels affecting a large transfer of capital from the rural rice-producing population to the urban, industrializing population (Feeny 1988; Christensen 1992). Urban-rural cleavages became important for both economics and politics.

Singapore's resource endowments and social composition more closely approximate Northeast Asia than her Southeast Asian neighbors. Singapore has virtually no natural resources and is relatively ethnically homogeneous. The absence of a landed or resource-based aristocracy elevated the importance of both labor and the bureaucracy as sources of political support. It was therefore vital that competing political factions be able to develop broad coalitions between these two groups if they were to secure political power. Although initial preferences for a broad coalitional structure were driven primarily by political competition, on-going preferences have been driven by the exigencies of economic development in the face of resource scarcity.⁵ These coalitions became increasingly important after 1965 when Singapore was expelled from the newly formed Malaysian Federation and forced to survive economically and militarily on its own

In each country these preexisting conditions influenced the institutional and coalitional structure in which modern education systems were conceived of and built. In the next section I compare the response of each country to varied pressures for educational reform.

3. Reforming the Education and Training System

Critical junctures can be thought of as a point along a trajectory where the slope of that trajectory changes significantly from its previous angle. According to Collier and Collier (1991), a critical juncture must have three components: one, it must identify a significant change occurring within each case; two, the change must take place in distinct ways in different cases; and three, there must be an explanatory hypothesis about its consequences. In addition, effectively assessing the relative influence of the critical juncture as well as its legacy requires consideration of several other factors. First, one must provide a clear explanation of the preexisting trajectory, or base line, by which the new trajectory can be compared. Second, how does the current trajectory result in crisis or cleavage spawning the critical juncture? Third, how is the legacy produced, what are the mechanisms of its reproduction, how stable are the primary characteristics of the legacy, and how does the legacy end (as it must inevitably do) at some point in the future. And finally, one must evaluate alternative explanations that are also consistent across time.

Once it can be determined that a critical juncture has indeed occurred, one must be able to demonstrate that the similar but distinct events occurring in other cases are comparable. That is, did the critical junctures have an equal impact across the cases and can it be reasonably argued that the legacies were comparable?

Reforming the education and training systems across my three cases meets most of these standards fairly well. First, in each country changing political and economic circumstances necessitated dramatic institutional reform and creation. Nevertheless, each country responded to different requirements in different ways. Third, the legacies produced by the critical juncture have been pronounced and far-reaching. Finally, the legacies continue to exert an influence on

Yet the effects of the legacy have in all cases been modified, in some cases lessened, but have yet to be reversed in any of the cases.

The biggest problem, and indeed a significant problem for any comparison of critical junctures, is whether the events are comparable. In Malaysia and Singapore the events are closely related in time and duration. Both countries rapidly reformed their education systems to meet political and economic objectives soon after separation in 1965. Thailand, however, reformed its education system much earlier, much more slowly, and under different economic conditions. One might argue that Thailand faced completely different constraints in modifying its educational system. While this is clearly true, it does not by itself make the event not comparable with the other countries. What remains important is whether the event had a lasting impact on Thailand's technological trajectory over time. The fact that Thailand has not performed a comprehensive, system-wide reform of its education system suggests that earlier changes continue to influence public-private linkages. Nevertheless, incremental change to the Thai education system has altered the legacy of the critical juncture, just as similar incremental changes have done in Malaysia and Singapore.

The Crises

Upon independence in 1957, Malaysia inherited a fragmented education system from the British that provided education and training in distinct ethnic "streams." Under the British, a small, multi-ethnic upper-class, primarily those destined for the civil service, received an English-medium education while the rest of the population received a vernacular education provided by Chinese and Tamil community schools or Islamic-based Malay schools. After independence, the government immediately began to expand education. But, although the post-independence coalitional structure was relatively stable at the elite level, the underlying ethnic groups were fragmented, isolated, and suspicious. Ethnic cleavages were sufficiently deep to cause the ruling party to implement all policy, including education, on a communal basis (Crouch 1996).

current educational system perpetuated a fragmented, suspicious, and, as the riots revealed, hostile ethnic environment, the government undertook substantial education and training reform focused ostensibly on nation building and ethnic rapprochement. By 1971 the Malay government consolidated the four ethnic educational streams into one at the secondary level and above and designated Malay as the official medium of educational instruction. The government claimed the move was designed to unify the country (Francis and Ee 1971; Aziz and Chew 1980), but because ethnic minorities saw the move as an effort to further consolidate the Malay's hold on political power, the policy increasingly alienated non-Malay groups (Loh 1975).

Singapore gained its independence two years following Malaysia. However, to ensure a large and captive domestic market for its import substitution industrialization (ISI) economic strategy, Singapore joined the new Malaysian Federation in 1963 (Rodan 1989). As part of the integration Singapore and Malaysia merged their educational systems.⁶ In an effort to impart, as Bedlington (1978) puts it, a veneer of "Malayness," Singapore adopted for its official education system the objectives and language of the Malay stream.

In 1965, however, Singapore was expelled from the federation. In addition, from 1960 and 1970 the British withdrew its military forces from Singapore, which had accounted for over 30% of the economy (Schein 1996). Suddenly Singapore was extremely vulnerable,⁷ both economically and politically. Without Malaysia's hinterland as a domestic market, ISI strategies were no longer practical. And without the income from the British military bases, survival demanded an extremely rapid economic transition. Finally, without the British military presence, Singapore was vulnerable to Indonesian "konfrontasi" and Malaysian political hostility. In response the government made it a priority to reform the education system to facilitate a rapid transformation to export-oriented industrialization.

Unlike Malaysia and Singapore, Thailand was never colonized. Thus, the Thai education system was free to develop organically without the imposition of foreign institutions or control. Initial results were promising. Thailand was the second country in Asia after Japan

country had established a vibrant and thriving university in the capital. Yet by the end of the decade it became apparent that political crisis was imminent. In 1932 a small cadre of elite-level politicians and academics overthrew the absolute monarchy in a bloodless coup and instituted in its place a parliamentary democracy. As part of this dramatic political transformation the government revamped the education and training system to foster nationalism and political socialization (Cleesuntorn 1988). High demand for political socialization and manipulation combined to create education and training institutions that furthered political and not economic ends.

The Decisions

In each case, social actors operating within a unique institutional and coalitional structure responded to a unique crisis by initiating institutional reform. The resulting policies and institutions in each country addressed (or failed to address) four issues that have proven critical to developing productive public-private linkages. These issue areas are language, bureaucratic structure, the relative focus on resource-based technology, and the role of labor in development strategies. I shall address each in turn.

Language is only important as it contributes or detracts from a chosen developmental strategy. In countries like Japan and Korea, which chose to pursue "technonationalist," internal development strategies, language has not been a barrier to public-private linkages. Technological capacity in these countries developed first within indigenous firms (with government assistance) after which government policies and institutions facilitated transmission and adoption throughout the economy. Thus, there were no language barriers to hinder technological diffusion from firms to institutions of higher learning and training facilities and back again. Even when firms received technology from other countries, it was quickly indigenized and then absorbed and transferred.

The countries of Southeast Asia, due at least in part to the changing international environment, have chosen to rely on MNCs for technology and innovation. In most cases these firms are American

firms exists largely in the native languages of the MNCs: English, Japanese, and German. Transferring technologies across languages is much more difficult than within the same language. Language barriers to technological transfer, absorption, and diffusion have lessened insofar as local scientists and engineers have learned the foreign language and can translate technology into the local vernacular. This "chicken-egg" problem, however, continues to plague most of the countries of Southeast Asia, although again to differing degrees.

As I noted above, a significant component of educational reform in Malaysia was to centralize education around the Malay stream with Malay as the language of instruction. Soon afterwards, Malaysia began aggressively soliciting FDI as a development strategy. Although successful with many high-technology firms, especially in semi-conductors and hard disk drives, language barriers between the firms and the public components of the education and training infrastructure made linkages between the two difficult. For example, the education system, to the extent it was initially concerned about technological development (more on this below), had to rely on Malay speaking teachers and trainers, of which there were (and still are) very few. Utilizing private sector technologists as teachers and trainers was initially virtually impossible as most were foreigners and did not speak Malay.⁷

Language has been a similar barrier in Thailand. Although as early as 1950 the government created joint research and training institutions with the Germans and Japanese, diffusion of technology from these institutes to the general population was difficult. Eventually foreign government support for these institutes was dropped and they were merged into the King Mongkut Institute of Technology. Like Malaysia, Thailand has been able to transfer and absorb foreign technologies only to the extent it can train local engineers who are fluent in English. Even then, however, the process of translation before diffusion is time consuming and difficult. Malaysia's superior command of the English language (on average) makes these processes easier in Malaysia than in Thailand.

Singapore chose to reform its education system in an entirely

a broad developmental coalition between the state, labor, and foreign MNCs provided a base of support to reform the education system around English (Schein 1996), even though the numerically dominant labor faction of the coalition would have preferred Chinese. The decision had immediate consequences. Whereas linkages between foreign capital and the education system in Malaysia and Thailand were very weak, Singapore was able to create a number of training institutes with the direct participation of MNCs (Ritchie 2000). Those people trained in these institutes were not only qualified to work in Singaporean industry, but also to participate in the education system as teachers and trainers. By choosing the English stream, the government also diffused potential ethnic tensions by focusing education around business and technology rather than supporting the dominant social group (Thomas, et. al. 1980).

The level of fragmentation existing within the bureaucracy at the time of reform, as well as the level of fragmentation remaining in the system after reformation also influenced the system's capacity for coordination and linkage. Responsibility for education and training in Singapore was initially divided between the Ministry of Trade and Industry and the Ministry of Education. The economic development board (EDB), a statutory board created in 1961 under the Ministry of Trade and Industry to solicit FDI, was given primary control to coordinate manpower development with the needs of potential and actual foreign investors. In this broad overarching role, the EDB was able to coordinate education and training activities for the entire Singapore education system (see Figure 1), including budgets, curricula, and forecasting. But perhaps most importantly, the EDB was able to link these organizations with private MNCs.

In Malaysia reform of the education and training system took place almost simultaneously with dramatic economic and social policy restructuring. In 1971 the Malaysian government introduced the New Economic Policy (NEP), an aggressive majority affirmative action program designed to transfer wealth from the non-Malay population to the Bumiputras, or "Sons of the Soil," the name given to indigenous Malays.⁸ Responsibility for education was initially given to the Ministry of Education while training responsibility was given to the

Figure 1 : Singapore's Technical Education and Training System

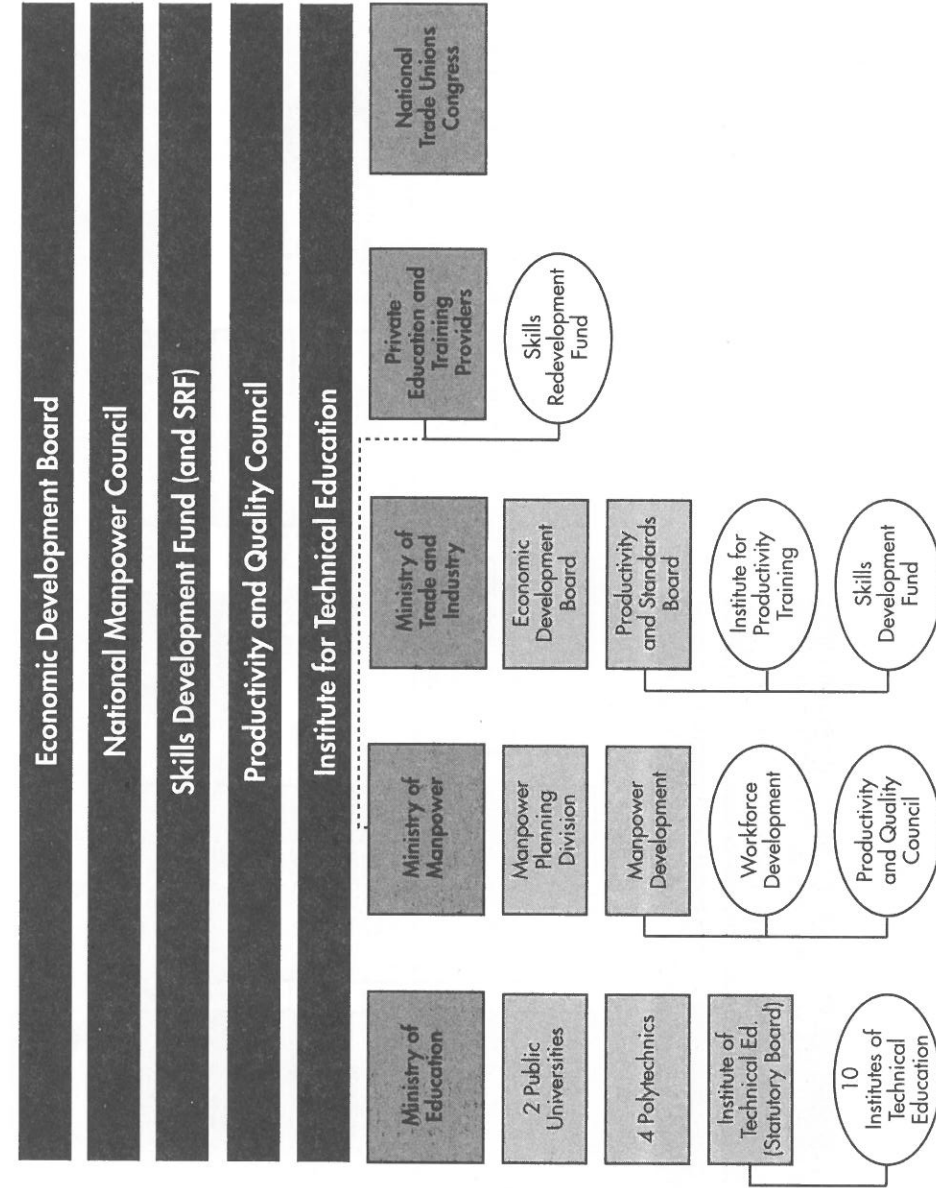
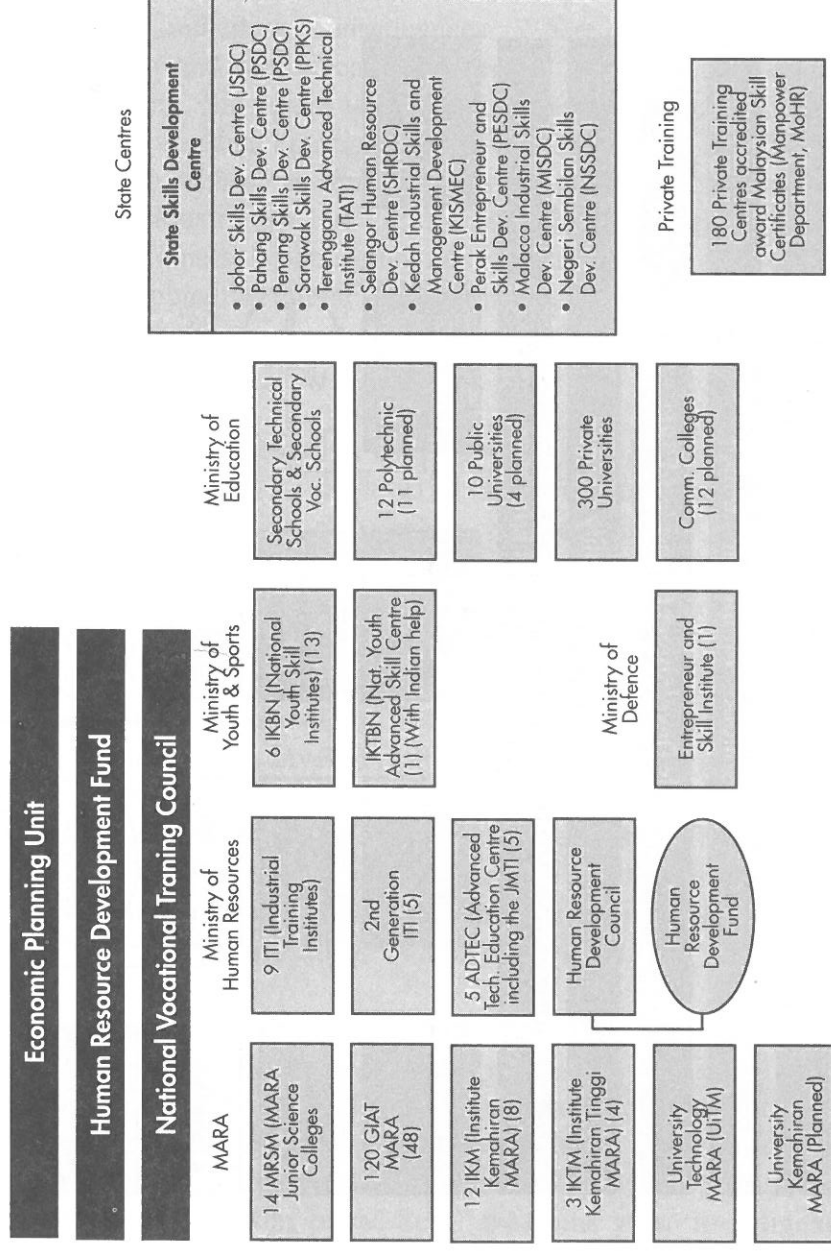
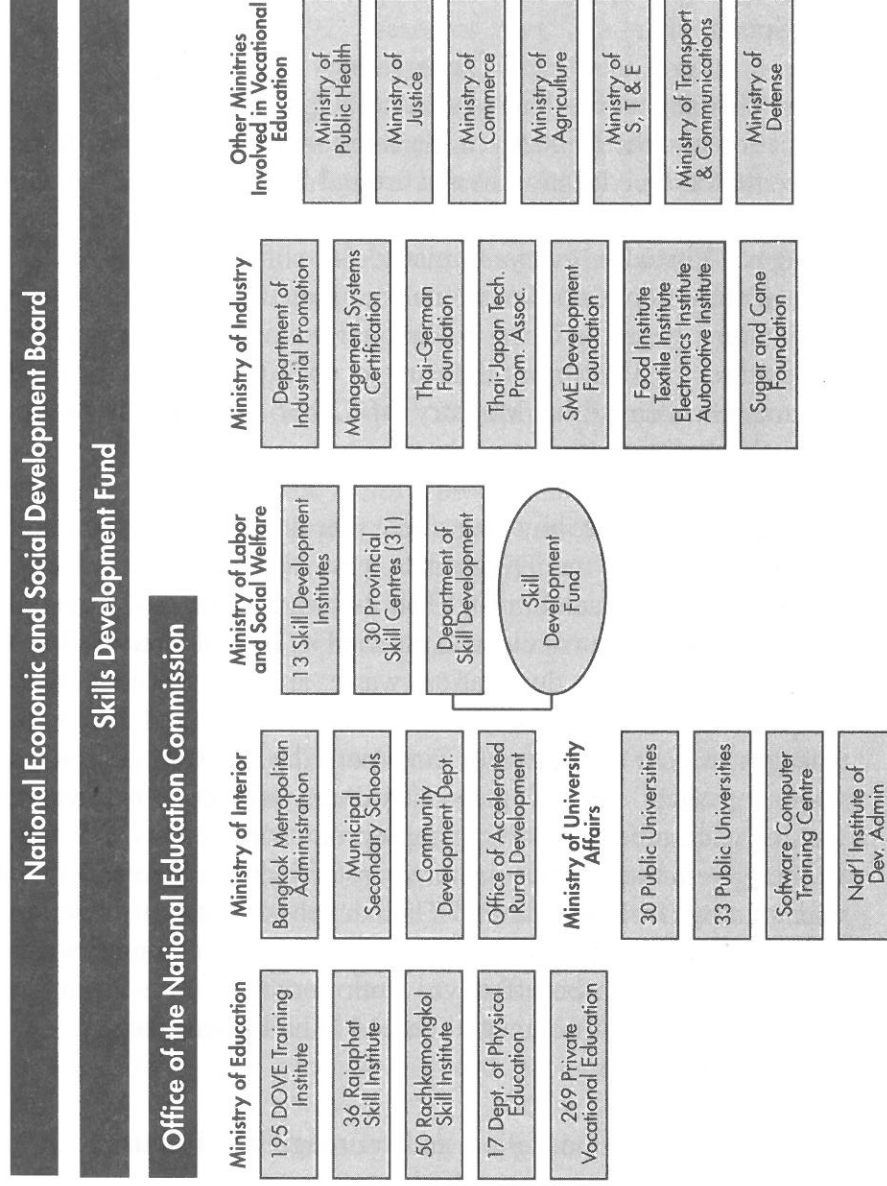


Figure 2 : Malaysia's Technical Education and Training System



Public Services Department oversees all public sector training
Number in parentheses indicate total under construction/planning

Figure 3 : Thailand Education and Training System



But in an effort to tie education and training with the new affirmative action economic policies, two additional ministries were given responsibility for both education and training for Bumiputras: the Majlis Amanah Rakyat (MARA), which later was incorporated into the Ministry of Entrepreneurial Development; and the Ministry of Youth and Sports.

In Thailand education was initially parceled to the Ministry of Education and the Ministry of the Interior. The Ministry of Education concentrated on education in and around Bangkok while the Ministry of the Interior developed a separate education infrastructure in the rural villages. Virtually every ministry, in some fashion or another, immediately took up vocational training. Thus, the Ministry of Agriculture began offering vocational training in areas relating to agriculture, the Ministry of Industry set up industrial training programs for manufacturing, the Ministry of Labor and Social Welfare for general vocational studies, and so forth.

Unlike Singapore, however, there was no initial coordinating body in either Malaysia or Thailand to play the role of the EDB (See Figures 2 and 3). Each ministry had its own budget, developed its own infrastructure and curricula, and pursued its own objectives. The result has been tremendous duplication, waste, and lost advantages of scale and coordination. Fragmentation has also hindered public-private linkages in both countries. In Singapore the EDB initially acted as a "one-stop shop" becoming the linkage nexus between private firms and the government, involving appropriate departments and ministries in the government as necessary to foster industry relevant education and training. In Malaysia and Thailand these links, at least initially, were unilateral and needed to be established in complex ways with multiple players to be effective. Both countries have taken steps to address the issue of fragmentation and I shall assess their effectiveness below.

Resource-based education and training, like language, is only a problem if it does not match the needs of the capital base. Both Thailand and Malaysia invested early and heavily in education and training for their respective resource-based sectors becoming over

Palm Oil Research Institute are conducting R&D on the technological frontiers of their respective industries. Nevertheless, both rubber and palm oil are declining industries. Neither contributes to the GNP of Malaysia as it once did. The demand for technologists is now heavily concentrated in electronics and other manufacturing industries. Likewise, Christensen (1992) observes that Thailand successfully developed technologically leading-edge, high-yield strains of rice. Nevertheless, since the late 1950s productivity in the rice industry has not improved but has actually declined. Like Malaysia's resource industries, Thailand's rice industry has consistently declined as a percent of overall GNP as manufacturing and industry have grown to take its place. But, also like Malaysia, Thailand has found it difficult to develop the technical intellectual capital needed to consistently upgrade these new industries.

Without a natural resource base, Singapore concentrated its early skills development around precision engineering, electrical assembly, welding, and other industrial skills. These skills not only matched the needs of the MNCs investing in Singapore's economy, but they were also particularly useful for local firms supplying the MNCs locating in Singapore. Thus, Singaporean-owned firms were able to embed themselves into the MNC's production networks in a relatively short period of time.

Finally, the decision to include or exclude labor in the education system dramatically influenced worker participation in training programs. Labor in most countries recognizes the importance of training. Nevertheless, without government support and recognition, it is difficult for labor to be involved. If labor is not involved, training tends to be focused on the upper end of the work force, especially management training for executives. This has been a significant problem in both Singapore and Malaysia, but one which Singapore has effectively addressed by working with and through organized labor.⁹

In Malaysia, labor has been actively suppressed. Without financial resources and government support, efforts to train have been minimal (Jomo and Todd 1994). Thailand has also taken a strong anti-labor stance. Dore (1990) argues that labor in Singapore has been

plays an important political role. While the government can manipulate labor to a certain extent for development purposes, it can only go so far before it loses labor's political support. Thus, at the same time the government extracts concessions from labor, it also provides side-payments and benefits. One of these benefits is a place at the policy-making table, which allows labor to actively participate in forming and implementing development policy, especially when it has to do with training. Thus, while labor has been unable to effectively lobby for control over wages and benefits, they have successfully extracted concessions from both management and the government over training and education programs.¹⁰

Each of these four areas have continued to influence education and training in these countries. Moreover, decisions surrounding these early critical areas have influenced later decisions. In the following section I examine these longer-term influences as well as forces changing the trajectory of these decisions. First, however, I review the theory on increasing returns.

4. Institutions and TIC Formation: past decisions and current performance

The central point of this paper is that history matters: outcomes turn on decisions and choices, which often seem small and insignificant at the time, and which are made temporally prior, often long before, the observed outcome. Particular outcomes can be seen as arising from certain choices where, as David puts it, "one damn thing follows another" (quoted in Collier and Collier 1991:27). This path dependency is a pattern of change where the outcomes of crucial transitions establish distinct trajectories within which one event follows another (Collier and Collier 1991).

This definition of path dependence, however, is overly broad and simply "refers to the causal relevance of preceding stages in a temporal sequence" (Pierson 2000:252). Instead, I adopt for a framework of path dependence a narrow definition explained by Pierson (2000)¹¹ in which path dependence is accompanied by increasing returns. That is, prior events do not simply lead to particular outcomes with the option of changing paths at any time,

the same direction. Thus, there is a feedback process. As one moves along a certain path the relative benefits of remaining on that path increase compared to other options. Adopting this narrower version encourages increased analytical clarity and helps to systematically parse out the individual effects of prior events.

Education and training processes are subject to both economic and political increasing returns. Economists describe increasing returns as virtuous cycles of increasing capacity and endogenous growth (Buchanan, 1994). Increasing political returns, on the other hand, can be accurately depicted as increasingly "vested" interests (Pierson, 2000). First I will examine the influence of increasing economic returns on education systems, after which I will change my focus to increasing political returns.

Economics and Increasing Returns

Decreasing returns have long been utilized in economics to search for unique equilibria. If one can determine existing factor endowments and preferences, a single, optimum outcome, or equilibria, can be determined. Decreasing returns generate negative feedback making each step away from the equilibrium harder than the last. New economic research, however, is increasingly focusing on path dependence and increasing returns. Particularly important for this research has been the work of Romer (1994), Grossman and Helpman (1991), and others who argue that economic growth is endogenously driven. Increasing returns are especially evident in intangible investment, particularly in research and development and education and training. These "knowledge intensive" activities generate positive rather than negative feedback. Feedback effects are particularly evident when set-up and fixed costs are large and where there are significant learning effects, coordination effects, and adaptive expectations. Education and training exhibits each of these tendencies.

Large set-up or fixed costs. Education systems require a tremendous amount of fixed costs. Buildings, libraries, phones, computers, teacher training, and so forth require significant resources. In 1998 Malaysia spent 19.51% of its total government

5% of total GNP on education (Malaysian Ministry of Education, 2000). The OECD mean for education expense is 5.9% of GNP. Singapore spends 3% of GNP on education but 28% of per capita GNP on tertiary education alone (World Bank 2000). Large set-up costs and long and often uncertain investment maturities virtually require that governments be involved in the initial creation of the education system.

Learning effects. Those involved in maintaining education systems learn by doing. As the system begins to educate and train people in priority fields of study, innovations, expertise, and advancements are made in these areas. Expertise, innovations, and advancements then feed back on the system improving capacity in certain areas while diminishing it in others.

In Thailand the education and training system was oriented around proper citizenship, democratic participation, and traditional economic activities, primarily rice agriculture and handicrafts (Muscat 1994; Cleesuntorn 1988). Those educated in the system were those available to become new trainers. Thus, Thailand was able to develop respectable agricultural scientists, but lacked the expertise to quickly develop precision or electrical engineers when new MNCs required them.

Malaysia's education system, like Thailand's, was initially concerned primarily with political issues. In this case ethnic considerations were most pressing. Also, because of the early prominence of rubber, tin, and later palm oil in the economy, and because the bulk of the economically disadvantaged Bumiputra population lived in the rural countryside, technical education and training focused primarily on resource-based industries. The result was a low focus on technical subjects. The trend continues today. As of 1997/1998 only 39.8% of first-degree enrolment at private institutions and 41% of first-degree enrolment in public institutions are studying technical subjects. Graduation figures are similar. 63.7% of first-degree graduates in 1997/1998 are in the humanities and social sciences. Master and doctoral degree enrolments favor humanities and social sciences by 62.6% and 54.5% respectively.¹² A recent study by the Ministry of

Unlike Thailand and Malaysia, Singapore's system has been built to create industrial skills and technical capacity. Here, 61.4% of first-degree enrolment is pursuing technical subjects. Likewise, 51.5% of first degree graduates graduate with a technical degree (Singapore Ministry of Education 2000).

Coordination effects. The benefits of a chosen path are enhanced when individual or organizational activities are integrated with those of other individuals or organizations. Increasing integration amplifies feedback effects of the initial institutional and policy choices. This has been especially true for education and training and can be seen clearly in the linkages and activities between the education system and public initiatives in research and development. In particular, public research initiatives are constrained by the capacity developed in the education system. Public sector research and development initiatives then feed back on the education system. Although private sector initiatives are also constrained by the research capacity developed by the education system, they are much more responsive to the market. Furthermore, capacity and talent for private sector initiatives can often be sourced from outside the domestic economy much more easily than for public sector initiatives.

Public research and development initiatives and expenditures in Malaysia closely match the output of the education system. In 1998, 77.8% (4,072) of public sector R&D personnel were involved in primary commodity research. By comparison, only 11.4% (475) of R&D personnel in the private sector were similarly involved in primary commodity research. Investment in R&D broken out by public and private sector tells a related story (see Table 1).

These numbers suggest that government expenditures on R&D do not closely match private industries' needs. Comparing the private sector's 81.59% of total investment in manufacturing, science, and technology compared to the public sector's 49.19% puts this disparity in sharp relief. Indeed, the numbers for 1994 and 1996 paint an even starker picture. For example, in 1996 the Malaysian Institute for Microelectronic Systems (MIMOS) had 21 R&D personnel and spent just over RM 4 million on R&D. To Malaysia's credit in 1998 it

Table 1 : Research and Development Expenditures - Malaysia

R&D Objective	Total Expenditure (millions of RM)							
	GRI*		IHL*		TOTAL SECTOR		PUBLIC/PRIVATE	
	RM	% of total	RM	% of total	RM	% of total	RM	% of total
Agriculture	75.20	30.00	29.90	22.30	105.10	27.58	30.90	4.100
Animal Prod.	6.40	2.00	2.50	1.80	8.90	2.30	.00	.000
Mineral Resources	.30	.12	.36	.26	.66	.17	.05	.006
Energy Resources	.42	.16	1.14	.85	1.56	.40	76.00	10.100
Other Nat. Resources	7.30	2.90	1.80	1.30	9.10	2.38	.04	.005
TOTAL PRIMARY PRODUCTS	89.62	36.20	35.70	26.71	125.32	32.89	106.99	14.300
Manufacturing	28.80	11.64	48.80	36.51	77.60	20.37	506.00	67.820
Infocomm	92.00	37.20	4.40	3.30	96.40	25.30	83.00	11.120
Natural Sci, Tech, Eng	4.90	1.90	8.50	6.30	13.40	3.50	19.70	2.600
TOTAL MFG, TECH, AND SCI	125.70	50.82	61.70	46.71	187.40	49.19	608.70	81.590

Source: 1998 Malaysian Science and Technology Indicators Report, MASTIC

*GRI = government research institute; IHL = institute of higher learning (public)

personnel to 216. Nevertheless, there is still some way to go before matching the 1,793 researchers at the Malaysian Agricultural Research Institute.¹⁴ Also, there are still few if any formal linkages between public research institutes and the education system.

In Singapore, public research institutes, institutes of higher learning, and the private sector are closely integrated and coordinated in their development activities. Instead of functioning as stand alone research facilities, the government designed public research institutes to operate in conjunction with institutes for higher learning and the private sector. Between 1992 and 1998 the National Science and Technology Board (NSTB) created 13 public research institutes. Because the universities were already developing the human resources in areas needed by these institutes, logistically it made sense to locate these institutes on or nearby the university campuses. To ensure tight linkages between the institutes and the universities, researchers at the universities, primarily university professors, were assigned to the research institutes. Then, although the government initially funded the public institutes, private firms were offered "memberships" to participate in the research activities. Membership dues and joint development projects formed the foundation for ongoing revenues.

Students doing research in the areas covered by these institutes are assigned to the appropriate institute for their junior and senior year projects. Through the institutes these students are then placed at member companies for internships. As officials at Seagate Singapore explained, when the students finish their projects they present them to upper management. The company then hires the best and brightest. It is not unusual for these new employees to find themselves back at the research institute on a regular basis working on joint projects.¹⁵ These intertwining relationships reinforce the technological trajectory that is shaped by complex interactions between public and private actors.

Adaptive expectations. Where education and training systems are fragmented and not well coordinated, actors may feel the need to "pick the right horse."¹⁶ Training in Thailand and Malaysia is a case in point. In Malaysia training opportunities have mushroomed in the last few years. Over 600 private education and training institutions are now

especially if he/she is Bumiputra, opt for training at MARA's advanced government to government training institutes,¹⁷ the Ministry of Human Resources' Advanced Technical Training Centers, the Ministry of Youth and Sport's IKTBN (national sports higher skills training institute), or the Ministry of Education's planned community colleges or polytechnics. Although MARA, the Ministry of Youth and Sports and the Ministry of Human Resources all subscribe to the standards set by the National Vocational Training Council, the Ministry of Education does not. Furthermore, all are either awarding tertiary level degrees, or plan to do so in the next year or two. The point is that the standards of these education and training programs vary and the private sector is often confused about the relative worth of the various certificates, diplomas, and degrees.

Singapore has a single, well-integrated education and training system that starts with the Institute of Technical Education (ITE) and moves through the polytechnics and then to the university. For those already in the work force, the NTUC, Productivity and Standards Board (PSB), and private corporations are the primary providers of training. Nevertheless, these organizations primarily rely on the ITEs and the polytechnics to actually do the training. All of the certificates, diplomas, and degrees are standardized throughout the system.

As North (1990) notes, economic increasing returns like those outlined above are reinforced by institutional structures. As I have endeavored to show, creating institutions involved with education and training have high start-up and fixed costs and are characterized by extensive learning effects, coordination effects, and adaptive expectations. Once established, these institutions create powerful incentives for stability and further development leading to the creation of complementary institutions and organizations. This system of institutions functions to reinforce massive increasing returns at the macro-level. Above I showed how this is true between education and training and public R&D. But the same principles hold for institutions and organizations involved in finance, transportation, law, and so forth. Together these institutions form the basis of a country's national innovation system (Rasiah 1999, Nelson 1993). Clearly this matrix of institutions and policies also interacts to direct each other's

and indeed its entire innovation system, is subject to increasing returns of a political nature, often exhibited in "vested interests." It is to this topic that I turn to next.

Politics and Increasing Returns

Four areas render education and training especially vulnerable to increasing returns of a political nature. They are, the collective nature of politics, its institutional density, political authority and power asymmetries, and the complexity and opacity of politics. Unlike economics, these conditions make it difficult to find a single equilibrium outcome. Instead, many outcomes are possible.

The collective nature of education and training policies and institutions. The preferred outcomes of government policy are very often collective, if not public, goods. Although all education and training policy demand some level of collective action, initiatives to develop technical talent are especially demanding since to succeed they require the active participation of groups outside of government, especially business, academia, and labor. When nationalization, ethnic harmony, or citizenship are the focus of education systems, fewer formal and informal linkages are required with groups outside of government. Therefore, societies that prefer educational systems to be organized around economic development choose to create institutions that foster dense institutional linkages between educational and training institutions, private business, academia, labor, and the government. Such has been the case in Japan, Taiwan, and Singapore, although the organization of these linkages in each country varies dramatically. On the other hand, those that organize education around political priorities need fewer such linkages. Without a collective effort to rationalize the institutional structure, it tends to develop in fragmented and disconnected ways that inhibit future collective action when it becomes needed to enhance the provision of public goods associated with technological development. This pattern, for example, is evident in Malaysia, Thailand, and Indonesia.¹⁸

The institutional density of education and training

collective action such as capital accumulation, risk aversion, and free-riding. Second, education is one of the great social equalizers and has ramifications for social hierarchies. Both those interested in equality as well as those who desire status quo or increasing inequality must manipulate the education system through policies and institutions to achieve their ends. Finally, to function effectively, education systems must be able to coordinate the activities of diverse public and private groups.

Once created, either intentionally or by default, political policies and institutional structures are incredibly durable. As Pierson states, “policies, grounded in law and backed by the coercive power of the state, signal to actors what has to be done and what cannot be done, and they establish many of the rewards and penalties associated with particular activities.” Moreover, he goes on to explain that institutions “[discipline] expectations about the behavior of others” making them increasingly prone to feedback and path dependency (Pierson 2000:259). But perhaps the most important cause of path dependency among political policies and institutions is that they are created to be resistant to change resulting in a strong bias for the status quo.

For example, in Thailand the entire education system was initially constructed as part of the civil service. Kindergarten teachers up through university professors are considered career bureaucrats. As such, they are extremely difficult to remove when they underperform. Indeed, until recently there was no performance system attached to promotion within the Thai university system. Once hired, professors were considered to have immediate tenure. Persisting vested interests can be seen in efforts to reform the system. When the Asian Development Bank and the Ministry of University Affairs attempted to hive off the universities from the civil service and make them “autonomous,” university professors desiring to remain part of the civil service as well as intense bureaucratic turf battles between the Ministry of Education and the Ministry of University Affairs scuttled the attempt.¹⁹

Education and training as part of the Thai bureaucracy also disciplines the behavior of public and private actors. Private

and inefficiencies in public-private relationship. Moreover, the system provides very few incentives, financial or otherwise, for education and training organizations, public or private, to pursue linkages with private firms. Both group’s expectations feedback and strengthen the barriers between them. Thus, efforts by the government to link education and training to the private sector through incentives such as tax deductions have been largely ineffective (World Bank, 2000). The World Bank also reports that only 3-5% of industrial firms have used the services of any of a range of government science and technology programs. In one case, the Ministry of Labor and Social Welfare spent \$153 million to overhaul its system of industrial training centers and make them more technologically advanced. Nonetheless, the largest technology employer in the country, Seagate, reported never having hired a single graduate of any of the revamped computer courses (Bangkok Post, 1998).

Policies surrounding the New Economic Policy in Malaysia have similarly conditioned public-private linkages. While it is clear that the NEP has not achieved what was initially hoped for (both in general economic terms as well as in education and training), it has influenced development outcomes both positively and negatively. First, it is difficult to deny that the education and skill levels of the majority Bumiputra population have not risen dramatically. Second, even though Bumiputras do not own 30% of economic assets as originally targeted, the 20% they do own is a far cry from the 2% they began with in the early¹⁹ 1970s.

Many within and without the system, however, report that the ethnic majority feels entitled to the assistance they receive and do not perform as they might otherwise if the funds expended were their own. Analyzing teacher credentials, for example, begs the “half full, half empty” comparison. After 30 years of NEP policies, half of the faculty in the National University’s faculty of social sciences and humanities have a doctorate.²⁰

The institutional structure also influences the behavior of non-Bumiputras. In many cases quotas for faculty and student positions have forced qualified non-Bumiputras to apply to

in the faculties of the National University of Singapore, often performing important academic and administrative functions.²¹

Like Thailand, the institutional structure in Malaysia influences the relationship between the education system and private enterprise. Many private enterprises in Malaysia are run by ethnic Chinese families (although the ratio is less now than in the past). These family-run businesses have been conditioned through NEP policies to “keep their heads down” and eschew connections with the government, which is seen as primarily interested in redistributing their assets. This may be one reason why only 5,001 of over 100,000 small and medium industries (SMEs), and only 300 of the more than 16,000 SMEs with less than RM2.5 million paid up capital participate in the Human Resource Development Fund scheme.²² By comparison, 100% of the SMEs with over 10 employees participate in Singapore’s Skills Development Fund. Of those firms with less than 10 employees, 33% participate (SDF Annual Report 1999).

These data point to an interesting potential conclusion: the current institutional system in Malaysia, of which the education system is an integral component, develops and perpetuates economic mediocrity. Policies to elevate the Bumiputra have led to dramatic, but perhaps now decreasing returns. Simultaneously, these same policies have marginalized the social talent and capacity of non-Bumiputras, or at least reduced it significantly.

Singapore’s education system is also institutionally dense. At first glance it even appears to be somewhat fragmented. Three ministries have responsibility for education and training, the Ministry of Trade and Industry, the Ministry of Education, and the Ministry of Manpower. Nevertheless, the density of institutional linkages acts to coordinate and complement the activities of each ministry while encouraging participation from the private sector (Ritchie, 2000). Particularly important is the coordinating role played by the EDB and the Ministry of Trade and Industry. The EDB identifies critical technological needs in society and then works within the formal education system and with private actors to ensure the supply of skills to meet these needs. Intra-governmental linkages are also encouraged

facilitate cooperation on a training project jointly managed and operated by the PSB, the NTUC, and the Ministry of Manpower’s Human Resource Development department, the PSB sent a senior director to work for the HR Development department for a period of two years, after which he will return to the PSB.²³

Political authority and power asymmetries in education. Feedback from dense institutional systems magnifies power asymmetries while at the same time rendering these relationships less visible (Peirson 2000). The nature of the education system in all three countries allocates power to certain actors and then reinforces that power in a self-perpetuating way.

Education systems are a source of power for a number of reasons. First, educational systems are useful for disseminating political and social ideology. In other words, education is a tool for maintaining political power and social identity and can be the battlefield on which groups vie for influence. This conflict can be seen clearly in Malaysia where the Malay dominated Education Ministry is pushing for ethnic assimilation and control while at the same time Malaysian Chinese, and to a lesser extent Indian, education leaders push for autonomy and distance from the government. On the other hand, since the Singapore government derives its legitimacy primarily from economic expansion, education is designed to further political power through economic development. Thus, it is not that education in Singapore is apolitical, but rather that political aspirations coincide with economic development, which aspirations are broadly shared by both public and private actors. Indicative of this prioritization is the aegis over the education system provided by the Ministry of Trade and Industry.

Second, because of the pervasive influence education has on the lives of a country’s inhabitants, leadership positions within the education system carry significant power and influence. Due to its prominent position within the civil bureaucracy, the Ministry of Education is seen as a favored reward for political loyalty and service in Thailand.²⁴ In Malaysia, rising political stars often orbit through the Ministry of Education first. The current and former prime minister and the current and former

representation among the respective ethnic groups. In an example of formal and informal rules, MARA provides pre and post employment training and formal education for Bumiputras. The Ministry of Youth and Sports concentrates on training youth, but because of its strong Islamic foundation also focuses primarily on the Bumiputra. Control of the two main ministries, the Ministry of Education and the Ministry of Human Resources is shared between the Malays and Chinese. In a tacit agreement between the two, the minister of education will always be Malay while one deputy will be Chinese and the other Malay. The minister of human resource, however, will be Chinese and the deputy will be Malay.²⁵ The necessity of sharing power among these ministries speaks to their social and political power and influence.

Finally, since education systems redistribute both economic and political power, vested interests are high and change is difficult. When Suqiu, the Malaysian Chinese Organizations Election Appeals Committee, suggested that current affirmative action policies, including those for education and training, be changed to apply on a per need basis, dramatic opposition erupted, especially from Malay students. Nevertheless, high government officials privately admit that to be competitive in a global, knowledge-intensive economy, the educational system must be reformed away from ethnic imperatives.²⁶ Yet, rather than implement reform from the ground up, they have found it is easier to create new systems on top of old, which have further exacerbated fragmentation. In one example, the flagship university around which the Malaysian Multimedia Super Corridor (MSC) was initially conceived and developed was not a government public university, but rather a private university. A private university was chosen, I am told, because they are not subject to the affirmative action policies of the NEP. To ensure control of the university, the government had Telekom Malaysia, a corporation 70% owned by the government, build and run it. This way the government can exercise direct control for economic purposes without being beholden to (or seen as betraying) the very policies and institutions it created for other political purposes.²⁷ Reform, in this sense, is ad hoc and patchwork and does not address the underlying issues that are hindering further economic progress in other sectors.

dilemmas, institutional density, and political authority and power asymmetries necessarily increase transaction costs and make education systems complex and opaque. Much of this complexity and murkiness arises because performance of the education system is difficult to measure. Although numbers of degrees and certificates indicate raw quantities of those educated and trained, the quality of that training, or changes in quality, is difficult to immediately ascertain. Further complicating issues of measurement is the relatively long lag time between acquiring skills and their actual use in the market place. Finally, it is not often clear what metric society prefers to use when judging its education system. Since politicians, and indeed even firms, come and go in the interim, learning effects are often minimal and status quo biases are strong. But perhaps even more important, because outside checks and balances are minimal, vested interests in the existing system can easily develop.

Insofar as both domestic and international actors scrutinize macro-economic policies and procedures, when corruption does occur it is usually discovered, albeit often in grand and spectacular scandal. On the other hand, education and training systems offer myriad ways to channel resources from one group to another in ways that are difficult to detect. Large budgets for property development, building construction, school maintenance, and ongoing equipment and materials purchasing requirements provide opportunities for kickbacks, favoritism, and other forms of corruption. Pasuk and Sungsidh (1994) estimate that in 1990 the Ministry of Education in Thailand was the third most corrupt ministry in the bureaucracy squandering over 8 billion baht (\$320 million at the then exchange rate of around 25 baht to the dollar). In one example, the Counter Corruption Commission of Thailand found that 150 officers responsible for checking the quality of furnishings and materials for all of the country's elementary schools colluded to accept sub-standard tables and chairs, cheating the government out of almost 4 million baht (ibid: 35).

Perhaps even more difficult to understand clearly, but probably more influential, has been the effect of the education system on each country's trade regime. First, low quantities of technical intellectual capital in Malaysia and Thailand have made it difficult for MNCs to upgrade

restricting their ability to compete in the global economy. To survive, local firms in both countries have had to secure on-going government protection in the form of trade tariffs and subsidies. Protecting local industry without requiring that it upgrade technologically in return has had at least three negative consequences. First, rents associated with trade policies lessen the pressure local firms feel to upgrade technologically. As technical capacity stagnates, local firms are less likely to forge productive relationships with technology-rich MNCs. Second, tariffs often increase the costs of product inputs for local firms. Thus, protection makes it difficult for local firms to compete on either cost or quality. Finally, as possibilities for productive linkages between local and multi-national firms dim, the gulf between them grows and local firms become ever more dependent on, and become more aggressive in seeking for government protection.

Politicians also benefit from tariffs and subsidies, especially where a narrow coalitional structure favors personal, crony-promoting relationships. First, protected firms can be counted on for political support. But perhaps less obvious, through patron-client relationships politicians can directly share in the economic rents generated by trade protection. Firms provide politicians with an economic annuity, usually in the form of a board or advisory position, in return for protection from foreign and domestic competition.²⁸ Ultimately, neither firms nor politicians have any incentive to change the system.²⁹

Although facing many of the same obstacles, outcomes in Singapore differ from those in Malaysia and Thailand. First, protecting the local market for indigenous firms was never a viable economic strategy, especially after separation from Malaysia. Instead, economic and political vulnerability put tremendous pressure on the education system to develop the technical intellectual capital necessary to compete in the global economy. Thus, the government took proactive steps to link themselves to the MNCs and the MNCs to local capital. Because of its unwillingness to protect local industry, the Singapore government was initially seen as hostile to local capital. In fact, however, the government took early and extensive measures to assist local firms, not through trade protection, but through technology

technological upgrading. Since there were no rents generated by the trade regime, politicians secured political legitimacy and economic actors profits by forming broad coalitions to develop public goods that would most efficiently expand the overall economic pie. Despite the fact that foreign capital was initially favored in these relationships, over the last two decades government has increasingly emphasized the development of indigenous firms.³⁰

5. Conclusion

Arguments based around a framework of increasing returns are easily criticized as being deterministic. Events, once set in motion, are impossible to stop. I do not make such an argument, and none of what I have argued should be construed as such. As difficult as change might be, it is always possible. As North (1990) observes, as mechanisms of reproduction erode or are swamped, new directions, often dramatic, are possible. I have tried to identify some of these changes now taking place in all three systems. The point is that this change is bounded, and institutionally dense systems, such as education, are prone to inertia.

The central finding of this paper is that political and economic exigencies led to critical junctures at which time countries made decisions about the institutional formation of their modern education system. These decisions, made within an existing institutional structure and influenced by preexisting conditions - especially levels of income equality, resource endowments, and ethnicity-influenced, in a path dependent way, the frequency and density of public-private linkages within each country's modern education system and in turn, the ability of that system to develop technical intellectual capital.

Singapore's decision to respond to early economic imperatives by building broad coalitions between labor, business, and government paved the way for productive linkages among these groups within the education system. Different initial economic conditions, primarily with respect to natural resource endowments and larger domestic markets encouraged Malaysia and Thailand to focus educational reform around differing political and social objectives. When foreign-led export economic strategies were adopted, challenges and

Both Malaysia and Thailand have taken steps to address their linkage problems, although to this point Malaysia has done much more than has Thailand. Edwards (1999) shows that the performance of the Malaysian Human Resource Development Fund, after a slow start, has been impressive. Although Thailand has done extensive research on implementing a similar fund, it has yet to be implemented. This and other evidence tentatively suggests that some of the legacies associated with historical education reform are beginning to fade. One encouraging data point is the self-reported rise in technical researchers in Malaysia from around 80 to more than 400 per million capita between 1994 and 1998. Even so, this figure still pales beside the more than 3,000 researchers per million capita in Singapore or the more than 6,000 in Japan. The bigger question for Malaysia is whether society has the collective will to sufficiently reform education policies and institutions to be competitive in a rapidly changing world economy, or whether ethnically-based considerations will perpetuate technical mediocrity. The current economic situation in Thailand may imply that imperatives facing Thailand are even more severe.

To conclude, it is appropriate to address alternative explanations. Although European colonizers are not often thought of as leaving strong educational legacies, strong differences between the outcomes in Singapore and Malaysia downplay the significance of initial colonial systems. In fact, Thailand, the country with arguably the weakest technological infrastructure, probably had the strongest education system early on. Second, the fact that all three countries pursued technological development through foreign direct investment, and yet education and training outcomes differed, downplays the importance of arguments invoking MNC-led development factors. Nevertheless, this variable is less easily disposed of than the first because one might still argue the difference is one of time or degree. Singapore has pursued MNC-led development the longest and most intensely and has benefited the most, Malaysia for less time and less intensely and recognizing fewer benefits, and Thailand the least with a commensurate amount of benefit. The fact, however, that at similar stages of development Singapore had a stronger technical infrastructure than the other two countries does provide some additional evidence against both the time and intensity explanations.

Notes

- 1 Greg Felker first used this term in an exchange with the author.
- 2 Technonationalist economic goals include facilitating technology transfer, diffusion, and creating and nurturing indigenous technology and firms, Samuels (1994) provides a lucid comparison of technonationalism and technoglobalism in the context of Japanese development.
- 3 McKendrick, et. al. (2000) show how Singapore has been more successful than either Malaysia or Thailand in finding a niche in the global production chain of hard disk drives.
- 4 Much has been written about the methodological flaws of using Mill's methods of comparison. Some of the more important include Ragin (1987), King, et al. (1994), and Waldner (1999).
- 5 Certainly the PAP had exhibited a past willingness to narrow the coalition. For example, soon after winning the government in 1959, it abrogated many of the significant perks enjoyed by the bureaucracy, arguably the group from which the PAP derived its strongest support at the time (Tremewan, 1994).
- 6 This was not as difficult as it first might appear as the British administered the same educational system for both countries.
- 7 This is not to say that foreign firms did not participate in the training of their Malaysian workers. In fact, there has been substantial training, especially between the state-run training centers, such as the Penang Skills Development Center, and private firms. Moreover, the English capacity of Malaysian workers is quite high. My point is only that language barriers hindered rather than promoted linkages between the foreign-dominated MNCs and the government-dominated education system. Where English was the medium of instruction, especially in private education and training centers, linkages with private industry were more likely.
- 8 The classification of Bumiputra was subsequently enlarged to include all "indigenous" peoples of Malaysia (everyone but those that had immigrated after British colonial control was established).
- 9 Author interview.
- 10 Author interview. The National Trade Union Congress, Singapore's corporatist representative for organized labor, recently developed a skills redevelopment program, which they implemented using training facilities in the EDB, Productivity and Standards Board (PSB), and local institutes of technical education. Although they did not control any direct funding, the program utilized funds from the Skills Development Fund as well as funds from the Ministry of Manpower earmarked for corporate training facilities.
- 11 This section is structured around and draws heavily from Paul Pierson's excellent theoretical treatise on increasing returns (2000).
- 12 Malaysian educational data comes from 1998 Malaysian Science and Technology

- 13 Author interview.
- 14 Malaysia is already spending significantly more per researcher at MIMOS than at the Malaysian Agricultural Research Center. All of these figures come from MASTIC's Malaysia Science and Technology Indicators Report for 1994, 1996, and 1998.
- 15 Author interview.
- 16 This is the phrase Pierson uses to describe the impulse to adapt to the option that appears most likely to succeed in the long term.
- 17 These include institutes that have been set up with help from the U.K., Germany, Spain, France, and the U.S.
- 18 It is not that these two options exist only in Asia, but rather that is the region with which I am most familiar. I am sure that similar examples, especially for the latter, could be found in Latin America, Africa, and the Middle East.
- 19 Author interview.
- 20 Author interview.
- 21 Author interview.
- 22 Author interview.
- 23 Author interview.
- 24 Author interview.
- 25 Author interview.
- 26 Author interview.
- 27 Author interview.
- 28 Doner (1997) has argued that if competition exists among patron/client groups, then monopoly rents can be avoided. Even so, there is no reason to expect that the groups will cooperate or that through competition broader productive linkages will emerge between government actors and local firms.
- 29 Becoming a member of the WTO, which was necessary to ensure that foreign markets remain open to Thai products, is putting external pressure on Thailand to reform its trade policies. Recently, the government lifted the requirement that carmakers source at least 54% of their products locally. Local parts manufacturers "don't have the technology or volume" to compete with international suppliers and are not likely to survive ("Out of the Driver's Seat." *Far Eastern Economic Review*, August 17, 2000, p. 46).
- 30 Author Interview

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