1. Introduction

Recognize that the only resource you have is your people, their brains, and their skills.

E.J. Mayer, former director of the Industrial Planning Department
of Israel's Ministry of Commerce and Industry

The quality of a people determines the outcome of a nation.

Lee Kuan Yew, Senior Minister of Singapore

According to one prominent development economist, economic development has been an 'elusive quest' (Easterly, 2001). But while this is true in many regions of the world, there is one region where at least five countries – Indonesia, Malaysia, the Philippines, Singapore and Thailand – have *averaged* over 6 percent growth since 1970 (World Bank, 2005) and one country, Singapore, is achieving levels of technological capacity found in developed countries. In all five countries the manufacturing sector has expanded, a broadening and diversified range of goods is produced and exported, and a growing emphasis has been placed on technology products. Such diversification or 'structural change' is a significant achievement. In fact, the World Bank (1993) was so impressed by this diversification that it suggested that Southeast Asia was an example other developing countries should emulate.

But diversification may no longer be enough for sustainable development. This is not to argue that diversification or even large infrastructure and other heavy industrial developments are not evidence of economic progress. But although second-generation development projects typically have high capital and management requirements, their technology requirements are well known and can often be acquired and used 'off the shelf' even if only contracting outside consultants. By comparison, 'new economy' initiatives to move into higher-value-added products at high levels of efficiency with local inputs requires far more tacit, sophisticated and often unknown skills, knowledge and technologies than before.¹

Why is sustainable upgrading necessary for economic prosperity? Firms are producing products or providing services in ever-more sophisticated ways and more quickly and efficiently than ever before. Product cycles that used to be measured in years, sometimes decades, are now measured

in months despite an exponential rise in product and process complexity. Global supply, product, value and, increasingly, innovation chains are expanding rapidly. These observations apply across industries such as microelectronics, software, chemicals, life sciences, bio products (including energy), logistics and telecommunications. One software industry executive observed, 'Competition in this industry is with yourself. If you are not the source of your own product's obsolescence, you are behind the curve.'² IDEMA, the hard disk drive industry association, likens the task of positioning read/write heads accurately over magnetic disks spinning at thousands of RPMs to maintaining the flight of a Boeing 747 17 cm off the ground while staying perfectly centered over the dividing stripe of a road.³ While these are clearly extreme examples, there are few industries free of these pressures, even if comparatively less severe.

Industry pressures spawn new incentives at the national level to develop technical capacity. Prior economic transitions from agriculture to first-stage, labor-intensive manufacturing require policy capacity to create a stable macroeconomic policy environment that encourages investment. By comparison, later shifts from first-stage manufacturing to second-stage industrialization require that local firms be able to adopt and integrate existing technologies and then, ultimately, innovate and create new technologies. Transitioning to a third-stage innovation-intensive economy puts the emphasis squarely on new knowledge creation, especially tacit knowledge. Sustainability comes from mastering new tasks associated with knowledge creation, dissemination and assimilation. As David Landes put it, 'It is not want of money that holds back development. The biggest impediment is social, cultural, and technological unreadiness – want of knowledge and knowhow' (1999: 269).

The problem is that the closer an economy gets to the technological frontier, the less knowledge is available from other sources about how to move forward. To the extent that industries experience rising wages without concomitant rises in quality and productivity, or in other words, innovation, they must retreat from the technological frontier and increasingly compete on price, which forces a 'hollowing out' as industries move to chase the lowest wage costs. This leaves a large pool of under-educated people unemployed. If new, more technologically advanced firms begin to form or set up operations, they often cannot find sufficient qualified workers. Mismatches between labor capacity and business needs results in a labor shortage amidst high unemployment.⁴

Thus, upgrading by maintaining robust innovation trajectories at the technological frontier requires increasing the technical brainpower, or what I call technical intellectual capital (TIC),⁵ of the population.⁶ Hence, educating and training the labor force *in technical skills* becomes a critical

component for economic upgrading (Felker, 1999; Mowery and Oxley, 1995; Nelson, 1993; Booth and Snower, 1999).

Yet although developing countries are realizing that the primary developmental task has shifted from diversification to upgrading, only a few have been successful. To be fair, many have not yet even made the transition to economic diversification, let alone upgrading. On the other hand, very large economies, like China and India, have already moved significantly toward upgrading, driven in large part by huge markets and vast human capital, much of it educated abroad. There are in the middle, however, a fair number of 'intermediate' states that have made the initial transition to a diversified economy, but are now feeling increasing pressure to upgrade. These states find themselves in an ever-tightening economic vice, neither wage cost competitive with China or India, nor technologically competitive with Japan, Europe and the USA.

Nowhere are these pressures more evident than in Southeast Asia. Yet despite similar pressures for change, close examination reveals large differences among the various countries of this region in their levels of technological upgrading in general and skills development in particular. At the high end, Singapore has been able to create technological capacity that approaches that of the developed countries. Malaysia and Thailand exhibit vexingly mixed results, with some industries making more progress than others, but where in the aggregate technological capacity lags based on what other indicators of development would predict (see Table 1.1). What accounts for these differences?

Groundbreaking research by Peter Evans (1995) and Richard Doner (1992) explained that different kinds of growth depended on different kinds of interaction between the government and the private sector. Countries with tight linkages between government and businesses characterized by 'embedded autonomy' were more likely to succeed in the long term than places that lacked such relationships. While necessary as a first step in understanding what separated the successful from the unsuccessful, identifying the institutional capacity behind embedded autonomy pushed the question further back, prompting one to ask: where do these relationships come from? In earlier work I have argued with Richard Doner and Dan Slater that institutions that promote economic upgrading are the product of 'systemic vulnerability,' which is made up of three variables: resource scarcity, external security vulnerability and domestic coalitional breadth (Doner et al., 2005).

In this earlier argument, resource endowments interacted with security threats and coalitional structures to create incentives for institutional design. This book extends that early argument by unraveling the relationship between structural conditions, coalitional politics and microeconomic

Table 1.1 Comparative technology indicators for Asia

	Indonesia	Japan	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand
IMD world competitiveness ranking (2008)	51	22	31	19	40	2	13	27
R&D exp. (% of GDP, 2000–2005)	0.0533	3.145	2.643	0.6915	0.1117	2.25	N/A	0.2614
S&T human resources (per million capita)	215 (2000)	5719 (2005)	2770 (2005)	319 (2005)	N/A	4479 (2000)	2980 (1995)	159 (1995)
High-tech exports % of man nf. exports (2005)	16	22	32	55	71	57	N/A	27
Internet hosts per million capita (2005)	0.001212	258	20	15	3	271	N/A	5
Internet users per 1000 capita (2005)	73	668	684	435	20 (2000)	324 (2000)	N/A	110

Sources: World Bank, *World Development Indicators*, various years. Business International Indices of Corruption and Institutional Efficiency and are measured from 1980 to 1983. Transparency International Corruption Perception Index. Malaysian Science and Technology Information Centre, *National Science and Technology Database*, 1998; Singapore National Science and Technology Board, *National Survey of R&D*.

outcomes. The important change in the argument is to move coalitional politics into an intervening position between structural conditions and microeconomic outcomes.

Treating coalitional structure as an intervening variable suggests tantalizing possibilities about how structural, exogenous conditions, such as the resource curse, might operate through political preferences and incentives to shape economic institutions. It also shows that selecting and implementing appropriate economic policy is not simply a matter of determining what to do, but instead is the product of complicated and heavily vested interactions among political entities who just as often have as a goal the acquisition of political power as a means to generate economic returns. Finally, a coalitional approach might provide leverage on the question of democracy and upgrading. To the extent that productive linkages between government and industry are best maintained through broad and participative linkages, then politics that encourage broad participation will be most effective at producing economic upgrading, whether or not they use democratic means to do so.

COOPERATION AND SKILLS DEVELOPMENT

Creating technical intellectual capital is more complex than simply organizing and applying existing resources. Although large stores of knowledge are explicit and available ‘off the shelf,’⁷ there is an equal amount of knowledge that is internal, individual, and must be learned ‘on the job,’ or through direct experience.⁸ This implicit or tacit knowledge is critical for innovation and must be endogenously created.⁹ But as Merilee Grindle (2004) notes, tasks associated with educating and training demand greater information flows, monitoring and enforcement, as well as the ability to reconcile distributional allocations and manage complex outcomes with long time-to-payoffs. Each gives rise to new and complex collective dilemmas that resist easy resolution.

Three tasks with respect to education and training are particularly bedeviled by these collective dilemmas. First, creating an education and training infrastructure to provide *general* skills and talents must overcome large investment costs and slow time-to-payoff hurdles. These challenges are usually met through government financing of general, public education and training.¹⁰

Second, *specialized* skills are created by firms as they educate and train scientists, engineers and technicians in firm- and industry-specific processes and products. Yet in an environment of high labor mobility, trained labor is easily ‘poached’ by competing firms (Pigou, 1912). This, in the

parlance of the economist, is a classic problem of positive externalities. If all firms were to train without regard to investment appropriation, a substantial pool of skilled labor would exist from which all firms could draw. But precisely because positive externalities mean that someone is paying for something they are not getting (or getting what they are not paying for), firms are dissuaded from training and are instead motivated to 'free-ride' on the training efforts of others, leading to a socially suboptimal, low-skill equilibrium (Soskice, 1991).

In his seminal work on human capital development, Becker (1962) argued that in fact there was no skills-development externality. If training could be disaggregated into general and specific components, then in a competitive labor market the individual would find it in her best interest to invest in acquiring general skills, and both the firm and the individual would find it in their interest to share the cost of acquiring specific skills. All that would remain is for the individual and the firm to negotiate over the portion each would provide.

Recent work, however, argues that Becker's theory is based on a set of untenable assumptions. First, as Stevens (1999) points out, differentiating between general and specific skills may be virtually impossible.¹¹ But second, Streeck (1989: 97) argues that even if skills can be disaggregated, a technologically demanding international economy may actually require firms to provide fewer specific skills and more 'generally polyvalent skills that can be put to a variety of as *yet unknown* future uses' in order to maintain or enhance competitive advantage (*italics in original*). Streeck also points out that beyond the vagaries of skill specificity is the problem of uncertainty. Becker's model, like all neoclassical economic models, assumes perfect information. Since individuals cannot know perfectly what skills will be in demand and since firms cannot know perfectly what skills will maximize their return, both face powerful disincentives to invest in training. As rates of technological change accelerate, or as the time to acquire education or training lengthens, uncertainty increases and education and training decreases. Third, it is essential that economic actors, especially firms, demand high-level technical talent. Institutions, policies, or private information designed to facilitate cooperation for education and training will have little impact if there is no demand for the skills once they are created. Demand is best fostered when firms conduct innovation (Booth and Snower, 1999; World Bank, 1997; Zeufack, 1999). Firms are more likely to invest in innovation when full investment appropriation is assured and monopolies are controlled (Metcalf, 1995).

What all of this means is that creating new skills and knowledge is not easy. To sum it up, the appropriate supply and demand of technical intellectual capital is contingent upon society's ability to provide

necessary public goods, promote positive externalities and stimulate demand without fostering uncompetitive behavior. How do we get all three conditions?

Although the market knows what training it needs, it does not always provide appropriate incentives that result in an optimal supply of skills. Some scholars argue that strong states capable of functioning autonomously from the demands of special interest groups can overcome the market's failures.¹² But government solutions to these market failures are usually not very effective. Governments often fail for reasons of moral hazard, distance from and unfamiliarity with market signals, and the tendency to subordinate economic necessities to political maneuverings. One certainly doesn't need to look far to find examples of government policies making a mess of the economy, including the current financial crisis in the USA.

But even if governments have the capacity and focus to create and implement the right policies, experience teaches us that few if any governments have the knowledge to address increasingly complex development problems without the input of the private sector.¹³ Furthermore, there is no good explanation why some states might be capable of finding and implementing the precise mechanisms through which government capacity is translated into specific outcomes or encouraging and applying private sector preferences and capacity to support major policy initiatives while others are not (Wade, 1990).

That markets and governments by themselves are not sufficient to foster the required amount of education and training suggests that institutions capable of facilitating the cooperation necessary for education and training might reside between the two, or be a combination of both. Different combinations of market and government institutions have generated similar capacities for skills upgrading. *Handwerk* apprenticeship guilds in Germany and institutions restricting labor mobility in Japan have been able to resolve collective dilemmas hindering firm-level training (Thelen and Kume, 1999).¹⁴ In France and Eastern Germany, similar apprenticeship institutions have emerged through the information activities of private business associations. Private information, usually supplied by business associations, can provide the impetus for firms to expect that other firms will also train, thus overcoming the lack of trust that can restrict cooperation (Culpepper, 2003). In Europe the widespread practice of financing business through non-equity sources of capitalization can extend a firm's decision-making horizon, allowing it to adopt a long-term perspective toward investments made in skills development (Finegold, 1991). Strong labor unions in Germany regulate firms to fulfill their social obligation as a 'place of learning' as much as a 'place of production' (Streek, 1989). And

finally, government research funding coupled with student loan programs in the USA has encouraged widespread access to higher education.

Clearly a wide variety of institutional structures might provide the capacity needed to overcome market and government failures that can block upgrading,¹⁵ and, moreover, these institutional structures are changing over place and time. For example, developmental state theorists have argued that a strong, autonomous and embedded state was able to create patterns of reciprocity between government and business that fostered key institutions for upgrading.¹⁶ This policy strategy, however, might only have been possible due to prevailing geopolitical conditions. In an attempt to corral the expansion of communism, the USA and other Western powers were willing to maintain a global economy that tolerated domestic trade restrictions on imports into the Northeast Asian countries while welcoming their exports (Cumings, 1984). Using this 'technonationalist' approach, Korea and Taiwan were able to implement Listian 'greenhouse' modes of technological development based closely on Japan's example (Keller and Samuels, 2003).

This explanation, however, cannot account for Singapore's success. In contrast to the Northeast Asian countries, the countries of Southeast Asia pursued a very different developmental track.¹⁷ With growth occurring toward the end of the cold war, the global economy was much less tolerant of 'technonationalist' development strategies. Instead, these countries pursued more globalist development strategies, in which foreign direct investment (FDI) played a primary role, albeit to differing levels (Doner and Ritchie, 2003).

We can see, then, that it is not the particular institutions that matter, but rather their functionality and capacity as demanded by the requirements of a particular time. If countries are to upgrade their skills in the current global economic environment, they must create the capacity to overcome the investment appropriation dilemmas associated with education and training, and encourage foreign-owned firms to transfer core technologies to local firms. Because both challenges are hindered by market failures, countries must figure out how to simultaneously coordinate the development efforts of key actors in firms, business associations, unions and universities without providing incentives for government policy failure. Taken together, these tasks require the capacity of society to create institutions that reduce barriers to information flow and collection, improve transparency within corporations and government, encourage more and broader participation from economic actors, resolve sticky distributional conflicts, create short-term incentives to compensate for long-term payoffs, monitor performance including resource allocation and usage, and impartially enforce sanctions for infractions of development policy, regardless of how

politically connected the offending group might be. Anything less will constrain the creation, acquisition, assimilation and dissemination of ever-more sophisticated knowledge and skills necessary for upgrading.

This book argues that the cooperation needed to accomplish these tasks is shaped significantly by coalitional politics. The nature of the interaction between political elites and mass actors shapes incentives for policy choices, which over time are regularized into institutional forms, which have long-lasting impacts on performance outcomes.

COALITIONS AND COOPERATION

The structure of coalitions influences the ability of social groups to cooperate to overcome collective dilemmas. A growing consensus among scholars is that broad coalitions facilitate the provision of public goods.¹⁸ Active participation in the policy process by a broad cross-section of coalition members improves policy credibility by ‘tying the hands’ of the ruling elite. Broad participation, the active involvement of economic actors in policy design and implementation, holds all actors accountable for outcomes, which allows ruling elites to maintain sufficient autonomy from any one interest group, making cooperation possible to resolve completely the collective dilemmas that bedevil third-stage upgrading initiatives.

Broad and participative coalitions shape political interactions for the acquisition and distribution of resources. If we accept, as Knight (1992) argues, that those in power will create institutions that maintain their power,¹⁹ then the breadth of the support base upon which rulers depend for power will shape institutional formation and change. When political elites depend on a broad coalition of support to stay in power, they must provide side payments to a wide cross-section of society (Doner et al., 2005). This is done most efficiently through the provision of public goods (Bueno de Mesquita et al., 2003). Public goods such as education and training infrastructure, public housing and welfare redistribute and reallocate resources in ways that improve equality and access to power.

Even so, it is not enough simply to provide public goods. In order to ensure that public goods lead to technology-enhancing institutions, coalition members must also be involved in the policy-making process. Involvement ensures access to policy and institutional creation, which enhances distributional equality.²⁰ Once governments are committed to supplying public goods, they apply the full complement of brainpower in a society to the problems of innovation and upgrading. Broad participation is the only way the necessarily massive bi-directional information flows can be created to ensure the accumulation and dissemination of technical

information *and* the necessary input to resolve the distributional and coordination conflicts that arise as a result, especially with respect to monitoring and enforcing compliance. To coordinate participation of a broad coalition while simultaneously checking rent-seeking, governments must create and maintain cooperative public–private linkages among government, business, labor, academia and other relevant social actors that hold actors accountable to one another. In other words, broad and participative coalitions are the force behind the institutions that encourage embedded and autonomous relationships between government and the private sector.

Explaining the origins of developmentally friendly coalitional structures is tricky. Much of the political-economy literature points to domestic conflict, either among elites or between elites and the masses, as the primary factor behind coalitional formation (Waldner, 1999). Excellent studies also exist that connect resource endowments and domestic divisions, primarily ethnic fragmentation, to the probability of growth and the provision of public goods (Sachs and Warner, 1997; Easterly and Levine, 1997), but there is little if any explanation of the causal mechanisms between structural conditions and economic outcomes.²¹ This book focuses on the influence of coalitional politics as the mechanism through which structural conditions influence microeconomic outcomes.

‘Systemic vulnerability’ shapes preferences of ruling elites for particular coalitional structures.²² Scarce resources expand coalitional breadth by forcing governments to generate revenues from a broad cross-section of groups and people in society, usually through taxation.²³ As mentioned above, in return for taxes paid, government must supply goods, which for efficiency purposes are usually public in nature, which also encourages an expansion of the coalition in a virtuous cycle. Plentiful resources, on the other hand, provide options to generate income from a narrow cross-section of society. Side payments given in return can be private in nature and targeted to these few individuals or groups. Military vulnerability increases pressures on limited resources. Domestic fragmentation, especially when it manifests itself through conflict, makes cross-class coalitions more difficult by encouraging confrontation rather than cooperation in the use of available resources.

Coalitional structure in turn shapes social bargaining around key decisions, which over time result in institutions, both formal and informal. At key junctures in time, society is faced with critical choices over which they must bargain and that have long-lasting effects. Decisions made or not made at these junctures are shaped by preferences of political and economic elites. Such choices are especially evident either during periods of state-building or at critical junctures when crises, conflicts or other events ‘open’ the institutional structure for change. During transitions to

independence in Malaysia and Singapore, and to a constitutional monarchy in Thailand, key decisions were made or not made that shaped, in a path-dependent way, important outcomes in the education and training institutional infrastructure in each country. As I detail in Chapter 5, decisions surrounding language of instruction, the degree of bureaucratic fragmentation allowed, the extent to which labor is involved, and the level of focus on technology and science influenced the focus and performance of education and training systems for sustainable economic upgrading by facilitating or hindering close interconnections between business, government and academia. These interconnections are the necessary ‘touch points’ that foster cooperation to resolve the collective dilemmas surrounding education and training.

This book focuses on the origins of institutions that facilitate the capacities needed for improving technical intellectual capital. It argues that these institutions are significantly shaped by coalitional politics – the aggregations of raw political preferences, whether formally incorporated into the political structure or not,²⁴ behind policy choices.²⁵ Preferences for both upgrading and the nature of coalitional politics are influenced heavily by levels of systemic vulnerability, the influence of which is highest at points of new institutional creation, such as state formation.

The entire argument is graphically depicted in Figure 1.1: systemic vulnerability (the independent variable) is a sufficient cause of coalitional structure (the first intervening variable), which in turn is at least a necessary input, and perhaps also sufficient, for institutionalized public–private linkages (second intervening variable), which then determines the level of technical intellectual capital creation that is possible (the dependent variable).

Chapter 2 explains the theory in more detail. Chapter 3 then tests these ideas to establish plausibility and generalizability. As in all quantitative analyses, there is little ability to do more than guess at causal mechanisms. Nevertheless, the findings reveal a strong correlative relationship between systemic vulnerability, coalitions and skills upgrading, as well as interactive relationships between resource endowments and ethnic fragmentation and conflict.

Figure 1.1 Argument outline

The book seeks to establish causality by examining three cases – Malaysia, Singapore and Thailand. These three cases provide strong quasi-experimental control on a number of variables, including, among others, religion, development strategy, regional considerations, culture and processes of industrialization. In addition, the comparative control extends to both cross-sectional and longitudinal analysis, allowing the analysis to move beyond assuming predictive outcomes to entertaining the possibility of conjunctural causation.²⁶

Chapter 4 begins the process-tracing analysis by examining the historical processes through which systemic vulnerability has influenced and continues to influence coalitional form and function in the three Southeast Asian cases. The second part of this analysis identifies how these structural conditions influence preferences coalitional actors have for (1) prioritizing economic redistribution relative to overall economic expansion and (2) fostering innovation and technological development.²⁷

Chapter 5 shows how coalitional preferences influenced the four key policy and institutional choices made during the process of forming an education and training system as part of larger state-building processes. This is the key critical juncture when policy decisions among the cases diverge.²⁸ Chapter 6 examines the legacies of these initial choices on past and present policy decisions.

Chapter 7 then evaluates the mechanisms by which policy regimes result in institutional systems and the ways these institutional systems foster public–private linkages. In particular, the chapter examines the ways these linkages operate to facilitate the formation of technical intellectual capital in several technology-intensive industries. Since a significant advantage of process tracing is the ability to incorporate additional observations at different levels of analysis, the analysis refocuses the explanatory lens on government-led initiatives to create technological capacity in general and technical intellectual capital in particular *within* each of the three cases, thereby increasing the overall number of observations in the sample.²⁹ The initiatives include the creation and operation of a ‘skills development fund,’ incentives to promote higher-technology FDI, and incentives to connect public research institutions to private actors.

Finally, Chapter 8 explores the question of whether systemic vulnerability and coalitional politics influence policy change and implementation only during times of relative institutional vacuums, such as periods of state-building. In other words, is it possible that major crises or other causes of institutional upheaval alter decision calculi and create windows of time during which discontinuous change of significant policy and subsequent institutional formation can take place? To answer this question I

evaluate the impact of the Asian financial crisis as a potential subsequent critical juncture.

Although the value of the analysis in this book is primarily focused on Southeast Asia, its findings on causal mechanisms may be applicable to countries and regions outside of Southeast Asia, industries beyond information technology, and more general relationships between politics and economics. One of the surprising implications of the findings from the application of this research to bigger questions of politics and economics concerns the connection between democracy and economic development. If broad and participative coalitions are in fact necessary for economic upgrading, the right question is not whether democracy is good for development, but whether democracy does enough to create broad and participative coalitions. Scholarly findings that democracy increases the provision of public goods (Baum and Lake, 2003) makes sense when looked at through a coalitional lens: democracy encourages a broader social coalition, which encourages the provision of public goods, as Riker (1980) and Bueno de Mesquita et al. (2003) would predict. But democracy tells us nothing about whether the coalition will be participative enough to encourage the right kinds of public goods, sufficient information creation, or needed oversight and sanctions. Democracy, therefore, is probably neither necessary nor sufficient for development. But it could be a precursor to coalitional structures amenable to development if it is constructed appropriately.

NOTES

1. On upgrading, see, e.g., Gereffi et al. (2005). On the distinction between structural change and upgrading, see Montobbio and Ramp (2005); and especially Waldner (1999).
2. Novell company board meeting, Provo, Utah, 1996.
3. IDEMA stands for the International Disk Drive Equipment and Materials Association (IDEMA). See also McKendrick et al. (2000).
4. Ironically, this condition arises just as easily in developed as developing countries, for example in Michigan where declining automotive manufacturers are laying off less-skilled workers while new IT firms cannot find enough higher-skilled workers.
5. Throughout the rest of the book I use the term 'technical intellectual capital' to include both scientific and technical knowledge. I realize, however, that the two are not interchangeable. As Parayil (1999) rightly points out, technology is not simply applied science. Rather technology is, as the word suggests, techniques. Thus, technology can be used without the scientific understanding of the theories behind them. But more important, science and technology develop differently. As Kuhn (1962) observes, scientific progress is often conflictual and discontinuous. On the other hand, technology is best understood as an evolutionary and cumulative process. I do my best to distinguish between scientific progress and technological development. But if I have to privilege one over the other, appropriate techniques can be effectively applied, indeed even improved

upon, without a complete understanding of the scientific and theoretical principles behind them.

6. Dunning argues that intellectual capital has emerged as the key wealth-creating asset in most industrial economies (1998: 47). Similarly, measuring the contribution of human capital by deducting both natural capital and produced capital from the total stock of wealth, the World Bank (1997) finds that human capital makes up more than two-thirds of per capita wealth in Organisation for Economic Co-operation and Development (OECD) countries and just under two-thirds of total wealth in most developing countries (cited in Auty, 1998).
7. Explicit technology is embodied in equipment, blueprints, schematics etc.
8. As early as 1957, Solow calculated that technological change accounted for over 87 percent of total economic growth, leaving less than 12 percent to be accounted for by the traditional factors of capital and labor. 'But for all practical purposes, Solow and other neoclassical economists conceptualize technology as an exogenous factor that is outside the production process (function)' (Parayil, 1999: 71). But knowledge also has a large tacit component. That is, insofar as equipment, blueprints, white papers and multimedia presentation can be transferred around the world, knowledge is explicit. But where equipment must be used and maintained, not to mention improved upon, and where blueprints, papers and presentations must be read (heard) and understood, and where processes must be learned by doing, knowledge is tacit.
9. See Romer (1986); Lucas (1988); and Grossman and Helpman (1991).
10. Baum and Lake (2003) argue that countries with higher levels of participation in the policy process (particularly democracies) are more likely to provide these public goods.
11. In all fairness to Becker, the ability to differentiate between general and specific skills is almost certainly much harder today than in the late 1950s when he was writing. In the twenty-first century the pace of technological change means that firms often cannot tell what skills they will need tomorrow. New, industry-specific skills rapidly become general skills in a very short period of time. In this environment negotiating over what portion of investment will be borne by the individual as opposed to the company is difficult at best, but perhaps impossible. Such would not have been the case in a more Fordist production operation of the mid-twentieth century.
12. See Ashton et al. (1999). Gerschenkron (1962) suggested that for 'late' developing countries, a strong state was necessary to overcome collective dilemmas of capital accumulation and risk aversion. Statist theory finds its strongest support in the literature on how the developmental states of Japan, Korea and Taiwan were able to steer private industries through the gauntlet of technological upgrading by implementing far-sighted industrial policy (Johnson, 1982; Amsden, 1989; Wade, 1990).
13. For more on this point, see Culpepper (2003).
14. In Germany, the *Handwerk* sector was given monopoly training rights whereas in Japan institutions restricting labor mobility allowed firms to fully recognize the return on their investment made in skills development. The USA and the UK, on the other hand, lack institutions that lead to this outcome.
15. This insight fits with recent research that shows that countries have unique systems of institutions that interact in complex ways to influence processes of innovation (Nelson, 1993; Dosi et al., 1988; Freeman and Soete, 1997; Rasiah, 1999b). Searching for a single configuration of policies and institutions, 'institutional monocropping' is probably not very useful (Rauch and Evans, 2000).
16. See Amsden (1989), Wade (1990), Johnson (1982), Woo (1991) for more on the developmental state.
17. See Booth (1999), Bernard and Ravenhill (1995), Dittmer (1992), and Cai (1999) for various perspectives on this debate.
18. On this point, see Doner et al. (2005); Root (1996); and Bueno de Mesquita et al. (2003). For a contrasting view, see Waldner (1999).
19. Knight argues that while the incentives behind institutional formation and evolution

may be economically driven, the process is primarily political. That is, no institution is created or altered in a vacuum, but within an existing institutional system. This existing system confers asymmetric power on the actors involved. Thus institutions are formed or altered through a complex bargaining process that reflects current power relationships.

20. Baum and Lake (2003) argue that democracies are better at producing public goods because of the participation of their citizens.
21. Of the few examples where authors link structural factors to policy outcomes, the best include Engerman and Sokoloff (2002) and Easterly and Levine (1997). Sokoloff and Engerman argue that natural resource scarcity created economic and political equality that enhances entrepreneurship and political participation. Easterly and Levine argue that ethnic divisions account for much of the poor growth record in newly developing countries.
22. In earlier writings I have thought of systemic vulnerability as including coalitional structure (see Doner et al., 2005). In this book I focus on the core elements of systemic vulnerability, to which I add ethnic structure and then examine the effects on coalitional structure, which now gets treated as an intervening variable.
23. See Shafer (1994) for a version of this argument.
24. For my purposes, coalition does not imply political incorporation. Coalitions of social interests can provide benefits and resources to, as well as receive benefits from, political elites whether or not they are incorporated into the formal political system. This observation leads to important insights when considering whether democracy is the ideal form of political structure to encourage coalitional structures beneficial to skills formation.
25. Analysis of coalitional politics has been largely ignored by political scientists. A key exception is the work of David Waldner (1999). Perhaps the reason, as Waldner notes, is that arguments invoking coalition-driven mechanisms often devolve into little more than descriptions of interplay between powerful actors while ignoring the independent role of the state (1999: 4). But if 'calculations of rulers and would-be rulers' motivate the formation of coalitions to pursue particular objectives, coalitional analysis becomes the heart of any politics of economic development (Wade, 1990: 309).
26. See Ragin (1987) for an interesting alternative to comparative methodologies based on Mill's methods as well as a discussion of conjunctural causation.
27. The data I use in this section are archival data and other secondary historical sources, combined with over 120 interviews I conducted in all three countries between 1998 and 2005.
28. See Collier and Collier (1991) for a further description of the usefulness of critical junctures in qualitative analysis.
29. See King et al. (1994) for a discussion on the appropriateness of expanding sample size in this manner.