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EAST ASIAN FINANCIAL SYSTEMS AND THE TRANSITION FROM INVESTMENT-DRIVEN TO INNOVATION-DRIVEN ECONOMIC DEVELOPMENT

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Many of today's high growth and high value-added businesses are concentrated in the knowledge- and innovation-based industries of information technology, telecommunications, biotechnology, media, software and entertainment. Though the governments of Hong Kong, Singapore & Taiwan (Asian NIEs) have invested heavily in promoting these sectors, they have largely failed to produce internationally competitive firms. We argue that government-led initiatives that were appropriate for economies in the investment-driven stage of industrialisation need to be reformed. As some economic sectors approach the technology frontier, diverse financing arrangements are needed to direct capital to high technology start-ups. To complement existing government-related technology initiatives, a more varied financial infrastructure must be developed.

Keywords: corporate finance, organisation learning, newly industrialising economies, East Asia

Firm-Level Technology Learning and Economic Development

The acquisition of technology by domestic firms is a key element of the economic development process. In newly industrialising economies (NIEs) that are driven by investment or factor cost advantages, technology is generally not created locally but secured from other nations (Porter, 1990). In the early stages of industrialisation, local firms may utilise several means to acquire technology, including licensing, imitation, or through OEM contracting. However, because purely market-based technology acquisition efforts are subject to market failures, there is a strong argument for government assistance. The contrasting technology acquisition policies of three Asian NIEs, Hong Kong, Singapore, and Taiwan, represent valuable lessons about the changing nature of industrial policy towards firm-level technology learning.

A common ingredient among the high performing economies of East and Southeast Asia is government attention to the development of technological competencies of export-oriented firms (Hobday, 1995; World Bank, 1993). In different ways, each of the Asian NIE governments of Hong Kong, Singapore and Taiwan stimulated the process of firm-level technological learning in an effort to catch up with more technologically advanced market economies. In Hong Kong, the state initially adopted a *laissez faire* position and refrained from direct involvement in high technology development (Yeh & Ng, 1994). However, Hong Kong has recently become more active by endeavouring to ensure that local firms have access to the latest productivity-enhancing technologies (Berger & Lester, 1997; Carney, 1997).

Hobday (2000) characterises the policy differences between Singapore and Taiwan as transnational corporation (TNC)- and OEM-led systems of innovation. Singapore has historically sought to attract foreign direct investment from TNCs and then to promote the transfer of their know-how to local firms by providing financial support via state-owned holding companies (Hobday, 1995; Schein, 1996). Taiwan sought to promote the growth of local firms by establishing state-owned and state-linked enterprises and has gone as far as establishing bridging institutions to assist in technology transfer (Noble, 1998; Wade, 1990).

Hitherto, Asian models of government involvement in the technology acquisition process were widely commended. Lall (1990) suggests that because markets for technology and labour are subject to failure, they will be under-supplied and as a consequence, state intervention is often required. Latecomer firms that lack the stimulation from sophisticated local demand and that are located far from the main sources of innovation (Hobday, 1995) may rapidly learn and catch up with advanced firms if the state is willing to invest in the technology

transfer process. While a range of policy options and firm strategies are available to accomplish technology acquisition goals, each requires the state to override strictly economic criteria in their investment decisions (IMF, 1998; Rajan & Zingales, 1998).

However, the 1997 financial crisis threw into question some of the basic tenets of the Asian model of government-led industrialisation (Goldstein, 1998; Krueger, 1999). Even before 1997, several analysts questioned the sustainability of state-influenced investments that did not generate positive economic returns (Clark, 1994; Clifford, 1994; Krugman, 1994). Problems related to the suppression of market forces by government policy-makers and the relative absence of non-bank financing and equity capital have been the focus of many recent calls for financial system reform (Goldstein, 1998; Henderson, 1998; IMF, 1998). However, few analysts have addressed the implications of these problem areas regarding the acquisition of technological competencies among domestic firms.

In this paper, we examine the relationship between capital markets in Hong Kong, Singapore and Taiwan and their capacity to respond to the needs of local technology-intensive firms. We propose that the methods of financing firm growth prevailing in these NIEs are well adapted to the investment-driven (Porter, 1990) stage of economic development when technology was primarily acquired from foreign sources. We also propose that as some domestic firms move towards the technological frontier, competitive advantage must increasingly come from the creation and commercialisation of locally created proprietary assets. In an innovation-driven stage of development, a more diverse set of financial vehicles is required in order to support the needs of firms which develop their own technologies rather than exploit technologies developed elsewhere.

The benefits of diversity in a nation's corporate financial systems can be understood from a systems theory perspective as an application of the general principle of requisite variety. Requisite variety demands that the complexity of the control system matches the complexity in the governed system (Ashby, 1956). Absent variety from the controlling mechanism and the governed system will tend to suffer either from under- or over-reaction to feedback. In this sense, what we describe as the corporate financial system is the governing mechanism that regulates the flow of capital to the productive sector. We suggest that economic growth in the Asian NIEs has created greater system complexity in the productive sector that so far has not been matched by a corresponding elaboration in the financial sector. The widely observed consequence is over-investment in some sectors but also, less well recognised, under-investment in others. If a nation aspires to develop an advanced economy that is diversified across a range of mature and growing industries, the principle of requisite variety suggests that it must devise governance mechanisms equal in their diversity.

Our analysis begins with a review of firm-level technology learning in Asian NIEs. Next, we examine the corporate financial systems of these NIEs and evaluate their strengths and weaknesses with respect to promoting technological learning. Third, we identify some obstacles confronting new and small technology-based firms in the region. We conclude with a review of recent capital market reforms and a discussion of emerging trends in the region's corporate financial systems.

Firm-Level Technology Learning in Asia's NIEs

Several analysts suggest that the Asian NIEs have already made the transition from developing to advanced economy status. Instrumental in this transition is the emergence of advanced technology industrial sectors. Enright and Dodwell (1997) argue that Hong Kong's open economy and its role as a gateway to China have helped it make a transition to a knowledge-based economy. Taiwan is sometimes described as a Silicon Valley of the East (Mathews, 1997) and Singapore, a Silicon Island of the East (Mathews, 1999). In many respects, the Asian NIEs show excellent progress on several indicators of technological advancement. These are modern, affluent economies with per capita incomes of US$25,100 (Hong Kong) and US$26,300 (Singapore). These two Asian NIEs surpass those of many OECD countries such as Canada ($22,400), the United Kingdom ($21,200), France ($22,600) and Germany ($22,100).[1] Each economy possesses an efficient high-technology manufacturing sector. One also finds high literacy rates and the full panoply of technology-enhancing institutions such as technological universities, science parks and many governmental development programmes.

In each economy, much routine manufacturing has been exported to lower cost locations. Over the past 20 years, Singaporean electronics firms relocated to neighbouring Johor province in Malaysia, and Batam Island in Indonesia (Hobday, 1994a) and Taiwanese and Hong Kong-based firms relocated to south China (Hsing, 1996). Some of this progress may be attributed to state policies aimed at promoting the incremental development of technological competencies among its domestic firms.

Despite clear evidence of technological catch-up (Hobday, 1995), there is some doubt about the sustainability of technology-based enterprise in the Asian NIEs. Redding (1990) notes that Hong Kong's family business groups have failed

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[1]GDP per capita: purchasing power parity (1998 est.) Though significantly below than the other Asian NIEs, Taiwan's ($16,500) per capita GDP puts it on a level comparable to that of Spain ($16,500) and ahead of Portugal ($14,600) and Greece ($13,400). Source: *The CIA World Factbook*. Washington: The Central Intelligence Agency. Available at http://www.odci.gov/cia/publications/factbook/.

to master the skills needed for entry into capital intensive industries or businesses that require coordination of complex functional areas. In industries such as watchmaking, Hong Kong firms have remained dependent upon Japanese firms for technological innovations and for high-value components (Glasmeier, 1994). While Hong Kong's trading, banking and retailing sectors have readily absorbed information technology and adopted organisational practices that foster productivity, few manufacturing firms have developed proprietary assets or firm-specific competencies (Carney, 1998). Indeed, Lui and Chiu (1994) suggest that the relocation of manufacturing to lower cost sites represents evidence not of technical upgrading but the continuation of labour-intensive low-cost production strategies. In a review of innovation in Hong Kong's manufacturing sector, Leung and Wu (1995) find little evidence of domestic R&D activity or of firms developing linkages with technology-based firms.

In Singapore, technological learning has occurred in the electronics sector, but progress remains focused upon low-cost high-quality production engineering rather than information-based software skills or R&D. Hobday concludes that "Singapore's domestic capacity in software and advanced technology remain conspicuously weak" (1994: 854). Although Singapore's economic development plans have targeted the development of information-based industries for over a decade, policy-makers concede that technology transfer and other technology goals have not been fully accomplished (Schein, 1996).

While Singapore promoted technology transfer from TNCs, Taiwan's technology policy focused on developing its domestic enterprises. Wade (1990) argues that Taiwan's government-led industrialisation was especially effective in mid-range technologies. State industrial policy is often credited with the creation of Taiwan's large PC industry (Mathews, 1997). However, Chu (1994) notes that Taiwan's vital small-business sector has not been responsive to state incentives aimed at upgrading technology activities. The preferred strategy in the small-firm sector, in defiance of state policy goals, has been the relocation to mainland China (Chu, 1994). Notwithstanding success with reverse engineering and technology transfer, state-led initiatives are often less successful in promoting original initiatives. For example, Noble (1998: 146) describes Taiwanese development agencies as "inept" and "hapless" in their attempts to create new Chinese language software and in generating common standards for network computing. Hobday (2000) argues that despite their achievements, Taiwanese firms continue to suffer from structural weaknesses and lack deep technological roots. A large proportion of output remains in low-priced sub-components, firms continue to be weak in R&D, new product design and continue to rely on a repeated cycle of catch-up, imitation-based growth.

Few could deny the magnitude of technology capacity building and pace of the "catch-up" accomplished in these three economies. Domestic firms in Asian NIEs entered into mature technologies and, by developing absorptive capacity quickly, moved down the product life cycle towards the initiation stage. However, none of Hong Kong's *laissez faire*-, Singapore's TNC-, or Taiwan's OEM-led systems of innovation have produced evidence of sustained initiating and commercialising capacities (Hobday, 2000). Significant problems remain as important sectors in these three economies stand on the cusp of a fundamental transition from development that was based upon investment in physical infrastructure to development that is based upon technological initiation.

The accumulated physical infrastructure, consisting of a productive capacity in factories, science parks, research and technical training institutes, fuelled the high growth rates of the past 20 years. This infrastructure is the product of a corporate financial system that was systematically biased toward its creation. However, this corporate financial system is now showing deficiencies related to over-borrowing (McKinnon & Pill, 1998) and misdirected investment (Goldstein, 1998). Recent research suggests that many Asian financial systems often fail to efficiently allocate capital (Young, 1995). One such inefficiency is a bias toward investment in physical and tangible assets (International Monetary Fund, 1998). The corollary of this bias, and one that is explored in this paper, is that many firms do not have access to needed investment capital for developing intangible assets such as research, patents, copyrights as well as organisational innovations that promote learning (Hall, 1992).

As latecomer industrialisers, this bias yielded successful results by fostering the creation of a physical infrastructure and an efficient, high-quality scale-based electronics manufacturing sector. However, development and growth imply change and the bias favouring physical assets that worked so well in the take-off stage of industrialisation may now have run its course and, if left unchanged, may well produce ever diminishing returns. The question that arises is: What kind of corporate financial arrangements are needed to facilitate the birth and growth of firms that operate at the initiating phase of the product life cycle?

The Financing Needs of High Technology Firms

At the initiating phase of the product life cycle, firms need access to a blend of co-specific assets (Teece, 1998). Often, these assets are proprietary, firm-specific intangibles that are embodied in firms' processes and routines (Nelson & Winter, 1982). Corporate financial arrangements that support the creation, utilisation, maintenance and transfer of intangible proprietary assets are more specialised and complex than those for tangible assets (Nakamura, 1999; Prowse,

1996). At the firm level, specialised governance structures are required to support the effective deployment of intangibles (Teece, 1998; Williamson, 1985).

Due to inherent measurement and valuation difficulties, the financing of intangibles has been problematic for firms regardless of context (Megna & Klock, 1993; Nakamura, 1999). Expenditures on intangibles have traditionally been accounted for as short-term expenses and are not capitalised or counted as long-term assets. However, the recognition that technological competence is cumulative suggests that intangible assets should indeed be considered capital investments and subject to accounting rules that appraise their true value. The problem of under-valuation matters little if intangibles are a minor component of a firm's overall asset mix (Rappaport, 1986). However, the valuation issue becomes more important if intangibles constitute a significant portion of the firm's total asset mix. For firms that rely upon intangible assets and are dependent upon external sources of funds, the existence of adequate capital market institutions that can assess the potential value of such assets is central to a firm's ability to attract growth capital.

In Asian NIEs, the problems of crafting specialised organisational structures, accounting practices, governance mechanisms and creating specialised financial intermediaries that finance intangible asset are novel. Khanna and Palepu (1999) suggest that emerging markets frequently lack the *soft-market infrastructure* of financial and regulatory institutions that are taken for granted in economies that are characterised by innovation-driven investment.

Theories of corporate finance suggest that different forms of capital are needed to support different types of asset (Williamson, 1985) and that efficient forms of financial intermediation vary with firm size (Prowse, 1996). The efficient and effective supply of capital requires two basic functions: (i) ensuring that capital is directed to its most productive uses, and (ii) ensuring a reasonable return is earned by suppliers of that capital. Clearly, the effectiveness of (i) depends on (ii). Investors won't invest if they cannot get their return. Therefore, financial intermediaries need to develop mechanisms to monitor the use of their capital and the means to intervene if they discern problems. However, there are important differences in national corporate financial systems that influence the kinds of firms which can successfully seek external funding and also the kinds of assets that will be funded (Prowse, 1996; UNCTAD, 1998). There is growing evidence that national corporate financial systems differ in the degree to which they effectively and efficiently allocate capital to the most promising high-technology firms (Maher & Andersson, 1999; Murray, 1998).

Financial intermediaries specialise by developing capital instruments to meet differences in suppliers, and supplier and user preferences for growth, income, risk and liquidity. Intermediaries that specialise in linking suppliers seeking high

risk, long-term capital growth with such projects possess particular incentive structures and develop appropriate monitoring and intervention capabilities. Specialists in low-risk short-term capital possess different characteristics. The corporate financial systems of advanced market economies typically possess both a blend of firms and productive assets and a diverse range of financial intermediaries. Economies possessing a narrow range of financial intermediaries will be either unable to meet the demand for funding of certain categories of assets or will put stress on those intermediaries by requiring them to fund assets which they are ill-equipped to fund (Miller, 1998; UNCTAD, 1998).

Of particular relevance to this analysis are the differential informational qualities of tangible and intangible assets because the latter present distinct problems to the corporate financial system (Nakamura, 1998). Informational differences determine the kind of financial intermediary that can effectively provide capital on terms that are acceptable to both firms and investors. Firms with heavy investments in physical or tangible assets pose less severe information problems to investors because firms may offer their physical assets as collateral. The capacity of investors to monitor the quality and the residual value of collateralised physical assets also reduces their risk (Prowse, 1996). In contrast, firms that focus upon intangible assets, such as knowledge or technical capability, pose greater informational problems to investors. Intangible assets cannot be collateralised nor can their utilisation and maintenance be easily monitored. Accurately assessing the risk of, for example, a research and development programme is quite difficult for outside investors. Moreover, the residual value of a failed research programme is typically much lower than that of a tangible asset such as a piece of commercial real estate.

Because of differences in the way financial intermediaries allocate capital, monitor performance and intervene to correct problems, they also specialise in the size of enterprise they can efficiently serve. The provision of external finance to small firms is a universal problem because of their low survival rates and associated risks (Murray, 1998). Neither banks nor traditional equity markets are well equipped to supply external finance to small business (more on this below), yet a high rate of new business formation is critical to an innovation-driven economy (Porter, 1990). The timely provision of external funding is especially important to opportunity-rich but cash-poor small firms in high growth sectors because such firms are rarely self-financing (Arthur, 1996).

Asian NIEs and High-Technology Firms

Relative to many Asian economies, the NIEs possess large and well-capitalised financial sectors. Indeed, there is a long running rivalry between Singapore and

Hong Kong (with Tokyo) for status as Asia's leading financial centre. However, in their own way, each of their financial sectors is weak in meeting the financing needs of small high-technology firms. The primary problem lies in the lack of diversity among financial intermediaries. Large banks dominate their corporate financial systems (Huang & Xu, 1999; Rajan & Zingales, 1998). Hong Kong's financial system is dominated by two banks, but it has hundreds of smaller banks that are each closely affiliated to family business groups. Three large banks (that are heavily regulated by the central monetary authority) dominate in Singapore. Taiwanese banks are for the most part state-owned or directed. Banking's dominant role is partly a legacy of Asia's rapid industrialisation. In the early phases of the region's post WWII growth period, infrastructure building and support for export-led manufacturing were fuelled by capital from internal aid organisations and development banks (World Bank, 1993). State-owned banks, in particular, were oriented toward funding developmental and infrastructural projects (Singh, 1998). As these economies grew rapidly, banks consolidated their dominant position as the major form of financial intermediary.

Banks in general do certain forms of financial intermediation well, but are weak in two regards. They are not particularly well equipped to lend to small firms nor do they typically lend against intangible or uncollateralised assets (Appel, 1986). Bank "aversion" to small firms and uncollateralised assets is a structural condition. Because a bank's liabilities consist of deposits that are on-call at very short notice while their assets are typically less liquid, there is a structural inequality between assets and liabilities that render banks liable to irrational "crowd" behaviour. Irrationality may be manifested in "runs" on the bank or periodic liquidity crises in the financial sector that have wide ranging consequences for the economy as a whole, such as depressions and economic stagnation (Miller, 1998; Radelet & Sachs, 1998). Bank involvement in risky and failed projects, even relatively minor failures, may stimulate such crises. The need for bank prudence is reinforced by the absence of incentive.

Banks have little incentive to fund high-risk projects. The nature of debt contracts limit their upside to the repayment of the principal and an agreed-upon interest payment. On the other hand, if the project fails, they lose their investment. Since banks cannot profit from the upside return of highly successful projects but bear the full costs of failed projects, bank debt is structurally unsuited to the high-risk uncertainties of lending to start-up firms and to projects at the initial stages of a product life cycle (Prowse, 1996).

An exception to the prudential lending rule occurs when governments, either implicitly or explicitly, offer loan guarantees. However, such guarantees introduce a potentially dangerous moral hazard problem into bank lending. That is, investments may be placed under a moral hazard when financial intermediaries whose liabilities

are explicitly or implicitly guaranteed by the government have a reduced incentive to exercise prudence in assessing either the merits or credit worthiness of projects they choose to underwrite. If projects succeed, the creditor profits from the investment, and if projects fail, government guarantees cover the loss. This sort of moral hazard problem is particularly relevant in the case of state-owned banks or funding agencies which may be willing to fund risky projects, but because of the moral hazard problem, are not well positioned to discriminate between good and bad risks (Goldstein, 1998). Consequently, the principle of prudential lending as well as the moral hazard problems associated with government loan guarantees indicate that neither state nor commercial banks are natural sources of long-term risk capital.

Other forms of corporate financing can more effectively provide long-term risk capital than banks. Public bonds are issued for periods of 10 to 30 years, publicly traded equity is issued in perpetuity (or until bought back) and private equity (venture capital) is locked in until a buyer can be found. Bank debt in contrast must be loaned for a specific and finite time horizon. Bank debt can be periodically rolled over, but it is not patient to the same degree as public bonds, equities and venture capital. Banks can lend for the long term only against specific, earmarked assets that have a predictable residual market value because prudential lending requires that loans must be collateralised against physical property or other marketable assets (Copeland, 1986). For this reason, banks are also not well equipped to lend against specialised firm-specific assets which have low salvage value (Williamson, 1985). Even more serious difficulties exist when banks consider making loans for investments in intangible assets.

Compared to their banking sectors, the security markets of Asian NIEs are relatively weak and underdeveloped. Though trading in secondary security markets often appears robust, few firms actually rely on equities as a major source of capital (Berger & Lester, 1997; Redding, 1990). In fact, most firms are closely held by owners and the float (the proportion of shares that are actually traded) is very small — rarely more than 60% (Claessens *et al*., 1999).

The absence of investor safeguards, such as minority rights, standard auditing and accounting procedures, and full disclosure, make equity markets unattractive to potential investors. Consequently, the institutional investor base in Southeast Asia is very thin. Importantly, the absence of a large base of institutional investment in Southeast Asia deprives younger firms of an important source of capital.

Singapore has been open to FDI but has suffered from shortcomings related to the development of its capital market. Private saving through mutual funds and institutional investors is minimal and most domestic savings are channelled through a state-controlled central provident (pension) fund. Banks dominate equity trading and are focused mainly upon commercial real estate (Liow, 1998). Taiwan's

system has similar limitations. Additionally, the Taiwanese government tightly controls direct foreign ownership of shares listed on the Taipei Stock Exchange. Hong Kong, which boasts the most sophisticated of the region's capital markets, is also the most hostile to start-ups. For example, among other listing requirements is the demand that firms show three consecutive profitable years and audited profits of at least HK$50 million prior to listing on the Hong Kong Stock Exchange. Since many technology firms show no profits in their early stages, these requirements disqualify many promising new economy firms from equity capital. Berger and Lester (1997) suggest that the absence of equity capital in Hong Kong encourage high-tech firms to engage in contract manufacturing as a source of cash flow. Indeed, much venture capital in the region is aimed at funding manufacturing (Leinbach, 1991).

Other forms of corporate financing are also weak. The market for long-term domestic debt (i.e. bonds) is practically non-existent (Henderson, 1998). Indeed, Southeast Asian corporations have become very dependent upon foreign bond issues due to the absence of local supply. In sum, the corporate financial systems of Asian NIEs are bank dominated with a corresponding weakness in other sources of capital. In particular, there is limited equity capital, especially private or venture capital, and there are difficulties in becoming listed on equity markets. Moreover, banks continue to employ a relational approach to lending which was well suited for traditional patterns of post WWII industrialisation based upon investment in tangible assets. Consequently, corporate financial systems are not well equipped to meet the needs of high-tech firms that have capital structures weighted towards intangible assets. However, the situation is dynamic. The Asian financial crisis motivated a range of reforms in the financial sector. We now turn to these developments to examine the emerging prospects for high-tech firms seeking risk capital.

The Emerging Role of Venture Capital

In technologically dynamic regions, private equity partnerships or venture capitalists that specialise in funding small high-technology firms have emerged (Florida & Kenny, 1988). Venture capitalists are specialist financial intermediaries that monitor and intervene in ways that differ from banks and from public equity and bond markets. Venture capital is a bundle of services and incentives so structured to simultaneously fund promising ventures and ensure a return to investors. In addition to capital, venture capitalists provide a variety of inputs to the firms in which they invest. Such inputs include operational expertise, management control, general business knowledge, access to networks and moral support (Sapienza, 1992). In this capacity, venture capitalists are well positioned

to monitor and intervene. This close positioning is a vital source of advantage when capital is applied to the development of intangible assets.

Venture capitalists profit from their efforts when they capitalise their investments through an initial public offering (IPO) or through the sale of their equity holdings. Because venture capitalists profit only when they "cash out" or exit a venture, they play a vital role in monitoring and influencing managers' behaviour and have a strong incentive to ensure that capital is used effectively. While well positioned to supply capital to small firms, venture capitalists are less able (and are unneeded) to meet the needs of very large enterprises.

For venture capital markets to function effectively, there is a corresponding requirement for effective public equity markets that can provide private investors with a means to cash out. The relationship between private and public equity markets is therefore symbiotic. Once a firm graduates to public market status, there are numerous monitoring mechanisms, such as stock and bond rating services, and other advisers that analyse the decisions, operations and reports of larger firms and are able to form opinions on a firm's investment needs and worthiness. Unlike smaller firms, the actions of very large and better established public firms do not require the internal monitoring and intervention offered by private venture capital investors. On the whole, institutional investors through arms-length means can efficiently monitor larger firms. In short, firms whose core assets are intangibles need different and distinct types of financial intermediaries at different points in their life cycle.

Prior to the Asian crisis, the region's NIEs had virtually no autonomous venture capital sector (Berger & Lester, 1997; Leinbach, 1991). Since the crisis, the need for venture capital has been widely recognised and there has been a surge in its supply (Folta, 1999; Zutshi *et al*., 1999). The development of such alternative sources of capital is a welcome sign, but there are some grounds for caution. In Taiwan, venture capital is state-directed through the banking system (Jones, 1998), and is heavily subsidised and directed to state-preferred sectors through a system of targeted tax credits. In Singapore too, much of the new venture capital is government-directed with capital concentrated in the hands of government-linked holding companies.

In Hong Kong, the main suppliers of venture capital are funds created by the large family-owned and cash-rich conglomerates. Khanna and Palepu (1999) suggest that conglomerates and holding companies fill institutional voids in emerging markets: one such void is that of venture capitalists. Nevertheless, the recent history of these family business groups is that they have excelled at structuring deals, not at building enterprises (Chu & MacMurray, 1993). We discuss below the reasons why family firms tend to be poor providers of risk capital. Generally, research on Asia's family conglomerates support the view that they tend to be

risk averse (Kao, 1993), favouring investments in generic rather than specialised assets (Redding, 1994), and to prefer projects with short payback periods (Limligan, 1986).

In summary, the growing availability of venture capital is promising, but these sources of capital need to be better conditioned by the types of management skills and incentive attributes characteristic of venture capitalists in other regions of the world. Part of the difficulty in establishing private equity markets with these characteristics is the under-development of public equity markets which are necessary for venture capitalists to cash out.

Asian Equity Markets and the Family Firm

According to Say's law, demand creates its own supply. So, why haven't Asian financial markets adjusted to diversify their range of financing options in order to meet the needs of high-technology firms? In one view, high-technology firms are comparatively new in the region and are the victims of the region's institutional path dependencies (McVey, 1992). That is, diverse financial intermediaries did not develop because they were not needed in the past. Very high levels of retained earnings supplied much of the financing needed for operations in low-technology and mature market lines of business (Akyuz & Gore, 1996). Secondly, very high levels of personal savings characterised Asian NIEs between 1956–90 (Singh, 1998). The vast majority of these funds were channelled through large banks and state-controlled savings banks, which preferred lending against capital-intensive projects or to labour-intensive exports oriented factories with rapid paybacks. Thirdly, the generation of firms founded since WWII have preferred to stay family run and closely held. Many firms were unwilling to open themselves up to the standards of transparency required for efficient public bond and equity markets. In other words, public bond and equity markets were both unneeded and unwanted by tightly controlled family firms that dominated the corporate landscape during the investment-driven stage of the Asian economic miracle.

The result of government technology development strategies is that many firms have a foot on the lower rungs of the high-tech ladder. However, most technology-intensive firms in the Asian NIEs are relatively small manufacturers that are closely held by founding entrepreneurs or their families.

These entrepreneurs have developed a reputation for cost efficiency, responsiveness and flexibility as OEM manufacturers. Family firms are especially well suited to networked production and to industrial settings where their low managerial overhead and their ability to efficiently organise low-cost labour in non-complex technologies is a key competitive advantage (Carney, 1998; Lui & Chui, 1994; Redding; 1994). Because owner/managers have a direct claim

on their firm's profit stream, owner/managers have a strong incentive to ensure that their capital is deployed sparingly, used efficiently and that indirect production costs are tightly managed. The incentive effects of direct ownership also reduce the need for third-party monitoring and supervision (Brickley & Dark, 1987). Indeed, concentrating ownership and control solves many agency problems that are endemic in professionally managed firms. When family firms are compared with enterprises operated by professional managers characterised by high managerial overheads and weaker incentives with respect to direct cost control, the owner-managed firm appears to be designed for frugality.

On the other hand, family firms' risk-bearing properties limit their scope for growth in high-risk markets (Fama & Jensen, 1983). That is, since a high proportion of their wealth is tied up in the business, family-owned firms tend to diversify capital as soon as the opportunity arises. As such, owner/managers tightly ration capital and/or invest in generic assets that can be re-allocated to other lines of business as a means of reducing their exposure to risk. In short, the ownership structure of family firms ill-equips them for assuming the risks involved in high-technology sectors. As such, these firms are starved of risk capital and either because of their small size or due to the family's preferences for tight control, these firms have been unable or have chosen not to access Asia's public equity or bond markets. These firms are unlikely sources of sustained innovation since they have the tendency to use their positive cash flow to diversify their family's risk exposure rather than reinvesting it in an attempt to build technology-related competencies.

Few would contest the importance of a vital small firm sector to the development of an innovation-led economy. Nevertheless, small firms or networks of small firms alone are rarely sufficient to assure competitive success over long periods (Storper & Harrison, 1990). Firms most able to profit from innovation are those with access to patient capital (Hansen & Hill, 1991) and the necessary complementary assets to commercialise and distribute products on global markets (Harrison, 1994; Hobday, 1994b; Teece, 1998). As technologies mature and mass markets emerge, large companies with superior process technology, manufacturing capabilities, financial leverage and global distribution channels displace small start-ups (Harrison, 1994). At this stage, dynamic capabilities, the capacity to sense new opportunities and reconfigure core and complementary assets (Teece, 1998), become the keys to profiting from investments in high-technology assets.

Because intangible assets are subject to increasing returns (Arthur, 1996), firms must establish themselves and grow very quickly if they are to survive the early stages of the product life cycle (Day, 1997). In this regard, technological competence is a necessary but not sufficient condition for firm growth. In addition, profitable growth requires timely access to financial resources. To fund up-front

development costs, to build an international distribution and service presence, and to establish a global brand name requires a careful shepherding of resources. In slower-growth mature industries, expansion can often be funded from internal sources. In the take-off stage of industrialisation, Asian family firms were largely funded from internal sources. In contrast, in high-growth industries, opportunity-rich enterprises can rarely meet their financing needs from internal sources. Simply put, high-tech firms need external funding in the form of patient capital if they are to achieve sufficient size and scope to become technology leaders.

In truth, there really are numerous entrepreneurial high-tech start-ups in the Asian NIEs. However, few grow up to reach full maturity. While many firms with the potential for creating valuable knowledge-based and other intangible assets are founded, very few succeed. Most remain relatively small and dependent upon firms from outside the region for access to expertise and/or access to global markets. Few high-tech start-ups enter foreign markets on their own account and even fewer have the capacity to both discover and commercialise innovative products and services.

Imitating firms did not need equity markets but initiating firms do. Funding for discovering, commercialising and managing the internationalisation process requires external sources of capital. Moreover, there is no doubt that such capital is locally available. The problem is that traditional institutional arrangements prevent it from going to the most promising recipients. Asian NIEs have little experience funding new economy industries and have not yet developed the regulatory mechanisms and institutions suitable for performing effective financial intermediation to businesses whose core assets are intangible (Prowse, 1996). The system of relational financing that emerged during the post WWII period of rapid investment-driven development lies at the core of this issue.

Relational Financial Systems and High-Technology Investment

Capital market weaknesses in the NIEs are partly a matter of design. Non-bank sources of corporate financing in NIEs have suffered both active and passive suppression. Active suppression is the degree to which government regulation, discriminatory taxation, and cumbersome and restrictive issuance procedures hamper market development. Passive suppression refers to the neglect of regulations governing corporate disclosure, accounting standards and protection for minority stockholders (Prowse, 1996). The former restricts supplier and user access to markets. The latter interferes with the ability of participants to get reliable data about risk and return. Active and passive suppressions of non-bank sources of finance were an integral part of governmental-directed economic growth strategies (Krugman, 1994; Prowse, 1996). Consequently, financial systems developed a

distinctly relational character distinguished by enduring interpersonal networks of policy-makers, lenders, borrowers and intermediaries (Rajan & Zingales, 1998).

Corporate financial systems based upon relational contracting have a number of advantages. Deliberate suppression of market signals allows government to dictate or coordinate investment priorities. Under conditions of early industrialisation and market failure, it allowed the state to invest in human capital and rewarded export-oriented firms with preferential access to limited export quotas or other scarce resources. Relational contracting also permits inter-temporal cross-subsidisation. That is, subsidised investment in low-return projects in the near term may be made against the expectation of access to high-return projects in the future. On this *quid pro quo* basis, relational contracting promotes investment in projects that may possess low economic or private benefits, but have very high public or social benefits. Investing in high-public-, low-private-return projects is not new — governments frequently do so through the medium of the state-owned corporation. However, relational contracting in Asian NIEs is pervasive. Such an institutional arrangement was beneficial in some ways as Asian NIEs were building investment-driven economies. That is, by channelling investment towards projects with high public and social benefits, governments were able to boost the growth process in their emerging economies of the post WWII era and to practise inter-temporal and cross-product subsidisation of desired projects.

On the other hand, having successfully industrialised and now facing recalcitrant difficulties in negotiating the transition from investment- to innovation-driven development, the downside of relational financing have become apparent. The main disadvantage of relational contracting is the absence of a feedback mechanism, which reliably informs a firm when to stop investing or a bank to stop extending credit. For example, strong and enduring relations with a bank may permit a firm to continue investing when cash flows signal that strategies are not working and/or markets are declining. In this regard, rather than promoting long-term planning through inter-temporal cross-subsidisation, the suppression of market information may actually promote myopic investment practices resulting in industrial over-capacity and the funding of new projects on the basis of past partnerships rather than on the basis of future prospects. By continuing to invest in conditions of adversity and negative cash flow, firms may be destroying long-term value rather than creating or preserving it (Rajan & Zingales, 1998).

Government-Linked Enterprise and Technology Development

In Singapore and Taiwan, government-linked enterprises, often privately owned but enjoying close linkages with the state, have traditionally been the favoured instruments of industrial policy (Wade, 1990). Historically, the business focus

of most government-linked enterprises has been heavy industry such as chemicals, artificial fibres, oil refining and shipbuilding (Zutshi & Gibbons, 1998). In these settings, government-linked enterprises had a reputation for over-building capacity resulting in high levels of growth but low rates of return (Henderson, 1998; Young, 1995).

Despite their unsuitability for the role, government-linked enterprises are often the chosen instruments of Taiwan's and Singapore's high-technology development strategies and often with quite predictable results — over-investment, over-capacity and low returns. For example, production levels of Taiwanese (and South Korean) government-linked enterprise resulted in massive over-capacity in DRAMs and semi-conductors in the early 1990s. Currently, Taiwan seems poised to repeat the over-capacity scenario in the thin-film liquid crystal displays used in laptop PCs. At the urging of the Taiwanese government, at least five firms have signed licensing agreements with US and Japanese firms to build such a capacity (Far Eastern Economic Review, 1999b).

Such over-investment in manufacturing capacity stems in part from the fixed-asset bias of bank-led financing but such financing ultimately impedes the development of small high-tech firms since they cannot generate the returns needed to fund a sustained stream of investment necessary to build knowledge-based assets. In essence, most government-linked enterprises remain single-phase manufacturing firms with little upstream research and development capacity or downstream distribution and marketing capacity to access global markets (Zutshi & Gibbons, 1998). For these complementary upstream and downstream assets, government-linked enterprises remain dependent on alliances and joint venture partners. As such, while government-linked enterprises have been successful assimilators of mature technologies developed elsewhere, there is little evidence that government-linked enterprises can develop and commercialise assets based upon internally generated intellectual capital.

Needed Reforms

Many of the ingredients of national competitive advantage in high technology are in place in the Asian NIEs. Each economy, in different ways, has demonstrated the managerial expertise and absorptive capacity for foreign technology. Further, each has a vital small family firm sector that is widely acknowledged to be a deep reservoir of entrepreneurial acumen. There is also ample local and international capital searching for growth opportunities. What is lacking is an effective means of linking existing management, entrepreneurship and capital in a way that is suited for the risks and opportunities of the new economy and the innovation-driven stage of economic development.

The operating model of directed development and relational contracting in Asian financial systems has produced an unpropitious environment for high-technology firms. As a result, many ill-fated projects are funded on the belief that technological successes will follow if you simply put in place tangible investments. In Hong Kong and Taiwan, building real estate and infrastructural assets are seen as essential to success in high-technology sectors — but it is too often the property firms that benefit, not the start-ups.[2] Too many factories are built in Taiwan and Singapore to encourage investment and this results in industrial capacity that is often not needed. Consequently, markets get flooded and wholesale prices fall.

A real need in Asian NIEs is for the creation of an institutional environment comprising diverse and efficient capital markets. In this regard, capital market regulations in Asian NIEs need to be substantially strengthened and their rules enforced. Currently, capital markets in the region suffer from severe limitations. With little transparency and most importantly a lack of protection for minority shareholders, East Asian stock markets are viewed with well-justified caution by potential investors. Significantly, the resulting absence of a large base of institutional investment deprives young firms of an important source of capital.

Institutional investors will not increase their risk exposure to the region without more stringent safeguards on their investments. Transparency, disclosure and rigorous accounting standards assure institutional investors of the opportunity to examine the books before they invest, the capacity to monitor behaviour once they have placed their bets, and an expectation of being able to cash out on fair and equitable terms. In addition, such reforms will undoubtedly inhibit the ability of existing firms to cross-subsidise unprofitable operations, thereby facilitating the process of creative destruction.

Due to equity market imperfections, locally listed high-tech firms may be under-valued or burdened with equity which trades at a discount relative to firms which trade on more liquid and transparent capital markets. In this context, well-managed local firms which are prepared to withstand higher standards of public disclosure and scrutiny find that their own shares are worth more on foreign markets and many seek access to equity capital on US and European stock markets. One option in this regard is the American depository receipt (ADR), a form of foreign public listing. In the past five years, over 200 firms

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[2]Ellis, E. (1999) IT takes a village, *Time Magazine*, April, 5. Describes how Hong Kong high-tech entrepreneurs refer to that territory's Cyberport project as "Cyber Villas" because they consider it as "*just another property deal in a city whose business environment knows little else*". This US$1.7 billion project was awarded without competitive bidding to Pacific Regional Developments.

from East Asian NIEs have issued ADRs.[3] Another option for Asian high-tech firms is a direct listing on New York's NASDAQ exchange, which comprises leading high-technology firms. By listing either directly or through ADR in foreign capital markets, domestic firms have undoubtedly spurred local markets to adopt practices and regulations which have improved the efficiency of local markets (Khanna & Palepu, 1999).

To develop their high-technology industries, governments across Asia are creating local versions of NASDAQ. Hong Kong recently established the Growth Enterprise Market (GEM) and Singapore created a "SESDAQ". Taiwan recently unveiled new rules that make public listing easier for firms with few fixed assets, such as software firms. Like the growth of venture capital discussed above, these developments represent promising new sources of funding for technology-intensive firms and have positive implications regarding the requisite variety of financial intermediation needed to support a correspondingly diverse industrial structure. However, there is a yet wider array of financial markets and institutions such as bond markets, futures exchanges, derivatives and over-the-counter markets, which specialise in financing particular types of economic activities.

Variation in financial markets and the associated diversity of governance mechanisms have important implications for the development of firm technical capabilities. Because firm capabilities tend to reflect the governance system in which they are embedded, similarly governed firms tend to respond to their competitive environments in similar ways. As a result, firm competitive advantages also become undifferentiated. For example, bank-dominated financing and endemic moral hazard facilitated conglomerate expansion. The prevalence of small-scale contract manufacturing that competes on cost efficiency reflects the dominance of the self-financing family firm. Berger and Lester (1997) observe that Hong Kong software and high-technology firms must often resort to contract manufacturing as a source of cash due to the lack of private or public equity. The absence of alternative sources of capital can drive firms into similar financing and product market strategies.

Firm capabilities are valuable when they are proprietary, scarce and embodied in hard to emulate firm specific routines (Wernerfelt, 1984). If firms possess only generic undifferentiated capabilities, they will typically resort to "head-on" price or cost-based competition (Porter, 1985). Financial diversity promotes differentiation because accessibility to financing alternatives enables firms to create a blend of firm-specific assets funded by multiple sources.

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[3]As of May 21, 2000, the Bank of New York listed 107 Hong Kong, 27 Singaporean and 60 Taiwanese ADRs in the database of ADRs. *Source*: http://www.bankofny.com/adr

Unfortunately, the spontaneous and responsive growth of this sort of diversity is currently impeded by a corporate financial system that was created for the developmental problems of an earlier era and many issues concerning the relational character of East Asian financial systems remain to be addressed. Arms-length and objective scrutiny of investment proposals by appropriately specialised agents are necessary if financial capital is to be allocated on the basis of the merits of an investment proposal. At present, relational contracting between bankers, government-linked enterprises and established conglomerates dampen forces for creative destruction and deprive promising but less well-connected firms of capital.

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