

6. Hong Kong's innovation system in transition: challenges of regional integration and promotion of high technology

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INTRODUCTION

In recent years Hong Kong has regained its traditional position as the key transit point for the exchange of goods and services between China and the international economy. Sophisticated and reliable intermediary services occupy a key role in maintaining this status, so Hong Kong's future seemingly depends on the capacity of its intermediary firms to maintain a considerable share of business in Asian markets and the global economy (Meyer, 2000, p. 247).

Hitherto, however, technological innovation in Hong Kong has been undervalued as an element in Hong Kong's developmental experience and the few studies to have addressed the issue have emphasized the laissez-faire policies that shaped the process of industrialization in Hong Kong (for example Hobday, 1995). Hong Kong's entrepreneurs have skillfully exploited technology available on the international market, but they have not generally carried out research and development for the purposes of creating proprietary technology (Davies, 1999). Technological innovation has therefore only recently begun to attract serious attention in Hong Kong, where the Government in 1998 launched a new strategy in pursuit of knowledge-intensive economic growth.

Our point of departure for this chapter is the proposition that a system of innovation has been emerging in Hong Kong for at least the past century, conditioned by major economic and political upheavals at the global level accompanied by gradual institutional change at the local level. This transition in innovation has accelerated lately, as influential economic and political forces have reasserted themselves with the return of Hong Kong to Chinese sovereignty and the Asian financial crisis of the late 1990s. Hong Kong has of course passed through several stages of development; the

latest transition represents elements of continued growth and expansion as well as important breaks with the past. Simultaneously with important changes in the economy that we shall briefly describe below, a growing trend towards policy change has provided new frameworks for innovative activities in Hong Kong. Some of these policy initiatives have been designed to advance the pace and direction of technological change directly, while others have influenced the process indirectly. Finally, geopolitical events, especially Chinese political and economic developments, have significantly shaped the conditions for innovation in Hong Kong.

CONCEPTUAL AND METHODOLOGICAL ISSUES

We shall analyse the emergence and transition of Hong Kong's innovation system through two complementary perspectives: the historical and the spatial. If the analysis of innovation systems is based on evolutionary and history-friendly approaches to theorizing, as we think it should be, it is important to include dynamic concepts pertaining to tensions between continuity and change, as well as critical trends or events, in the conceptual toolbox.

Viewing Hong Kong's innovation system along the historical dimension, we seek to identify important stages in its development that are characterized by cultural, social or institutional landmarks. We note periods surrounding critical events that have challenged the established trajectory of a previous stage and brought about a transition to the next. The dynamism that we explore in this perspective feeds off the tension between, on the one hand, continuities and trajectories that are shaped by the accumulation of cultural or social institutions and, on the other hand, perturbing factors and events that would require adaptation and reform in the system – whether such factors are endogenous to the system or elements of the external environment.

The second dimension – the spatial – is based on our conviction that the impact reflected in Hong Kong's constantly shifting position in the global and regional political and economic landscape must be taken into account in the conceptualization of significant factors influencing its innovation system. These factors are situated in political environments that frequently reach beyond the purely 'national' scale: the financial power of global networks has often directly affected the regional level, accentuating the need for local/regional development. Although Hong Kong's government has been relatively autonomous during both colonial rule and since the return to China – exercising a level of authority much akin to that of a national government – the international context and indeed the ideology of the

government itself (which has generally espoused a hands-off or laissez-faire economic policy) have left much of the regulation of business in Hong Kong to market forces. The result is that most aspects of the development of Hong Kong's innovation system are co-determined at three important spatial levels, namely 'national', regional and global. In other words, what we observe in our analysis of the innovation system reflects causal relationships that transcend the national scale. There is then a need to adopt a multiscale analytical framework to capture the transitions that the Hong Kong innovation system has experienced during the post-war period.

In the presentation of Hong Kong's history and the evolution of its innovation system we shall therefore discuss the ramifications of various influences and consequences of economic, institutional or political changes on several scales, according to whether these appear most appropriately analysed at a national, regional or global level – or at all three of those levels simultaneously. For example the economic integration of Hong Kong with South China has been driven by 'open door' politics in China at the regional level, together with the intensification of global production chains and the structural transformation of businesses shifting to higher value-added activities in Hong Kong. To discuss the transformation of innovation processes in Hong Kong associated with the economic integration taking place in South China with reference only to its regional aspects would be to disregard vital international aspects of the process. Similarly, it would be dangerous to assume the direct and unilateral influence of global forces since local contexts are often intermeshed with the wider global system, as portrayed in the concept of 'glocalization' (Swyngedouw, 1997).

In Table 6.1, we have tried to illustrate the intersections of these two dimensions. On the one hand, we shall roughly distinguish four historical stages in the development of Hong Kong's innovation system. These stages are of various durations, and it is of course possible to suggest sub-stages for each of the four. We have then tried to situate a range of key trends and events within the framework of the three above-mentioned spatial dimensions.

In the following sections, we will use this historical/spatial framework to explore the twists and turns in the evolution of Hong Kong's innovation system. Within the limited space at our disposal, we shall try to illustrate the influence of most of the factors and characteristics outlined in the table, but we will be unable to do justice to some of the complexities and deep-seated features of Hong Kong's innovation system.

Ultimately it is our ambition to identify some strengths and weaknesses that characterize innovation processes in Hong Kong and to discuss the suitability of recent initiatives to accelerate the pace of innovation in the

Table 6.1 Factors shaping the development of Hong Kong's innovation system

Development stage	Spatial dimension		
	National	Regional	Global
1. Early 20th Century/Pre-World War II	<ul style="list-style-type: none"> • Trade hub • Small-scale industrialization • Expansion in South-East Asia 	<ul style="list-style-type: none"> • Migration and links with South China provinces • Center of overseas Chinese capitalism 	<ul style="list-style-type: none"> • Strong trading links to China and Europe/US
2. Cold War Period: 1950s to 1970s	<ul style="list-style-type: none"> • Migrants • Large-scale Shanghai industrialists 	<ul style="list-style-type: none"> • Loss of the China market in East Asia • Expansion of OEM networks 	<ul style="list-style-type: none"> • Boycott of China • Hong Kong strategic center
3. Opening of China: 1980s and 1990s	<ul style="list-style-type: none"> • Structural change: from manufacturing to services • Expansion of financial center 	<ul style="list-style-type: none"> • Movement of production to Guangdong 	<ul style="list-style-type: none"> • Production-chain linkages and management
4. Return to Chinese Sovereignty and Post-1997	<ul style="list-style-type: none"> • Government initiatives to promote knowledge-based economy 	<ul style="list-style-type: none"> • Pearl River Delta integration efforts • Closer Economic Partnership Agreement 	<ul style="list-style-type: none"> • Asian financial crisis • China joins WTO

territory. We shall outline a few arguments in that direction in our concluding section.

A BRIEF HISTORICAL BACKGROUND TO HONG KONG'S DEVELOPMENT

The Hong Kong story makes a fascinating tale of how what was a barren rock a little more than 150 years ago has emerged as a dynamic and vibrant international city.¹ In reality, the phenomenon of Hong Kong's economic growth has transpired over a shorter period covering the last four or five decades. Nevertheless, the foundation was laid over a longer period of time and it is worthwhile exploring the development of its innovation system over the past century.

Early Twentieth Century

Studies of Hong Kong's economic development in the early part of the twentieth century identify a variety of informal institutions and state initiatives that have supported industrialization, relying primarily on small-scale manufacturers linked in familial or ethnic networks and connected with expanding markets for relatively low technology products in China, South East Asia and Europe/US (Clayton, 2000).

Official British colonial history has tended to neglect the growth of such industries in the territory of Hong Kong, partly on account of the influence of the perspective of the Major British 'Hong' – trading houses – which had little commercial interest in manufacturing and instead emphasized the promotion of the entrepôt trade (Loh, 2002).² It is nevertheless important to recognize the existence of this 'undergrowth' sector of small-scale industrial firms in Hong Kong for two reasons: first it provided opportunities for Chinese entrepreneurs to accumulate technical and managerial skills that could be successfully deployed in subsequent stages of development; second it gave Chinese firms opportunities to practice organizational modes that supported networking, subcontracting relationships, and the international search for markets. These opportunities in effect 'rehearsed' critical features of subsequent industrialization in Hong Kong that prevail to this day.

Cold War Period: 1950s to 1970s

The overthrow of the Kuomintang (KMT) regime of General Chiang Kai Shek in 1949 by the current government of the People's Republic of China remains one of the most significant events in Hong Kong's history. The overthrow caused an exodus of about one million mainland Chinese to Hong Kong. The people of Hong Kong, including its migrants, grew up and developed in a community that had Chinese roots but were under British administration. These migrants in turn made a huge contribution to Hong Kong's economic explosion by escalating the establishment and size of manufacturing industries, further expanding the role that Hong Kong had played hitherto as an entrepôt. In the face of the declining power of the KMT, Shanghai textile barons in particular transferred enormous amounts of capital and managerial expertise in textile manufacturing to the colony (Wong, 1988). The international blockade of China, declared by the United Nations in 1950 (which remained until 1953), combined with the US imposition of an embargo on all goods of Chinese origin, cut Hong Kong off from its natural hinterland in Southern China and sapped the entrepôt trade that sustained its economy.³ Lacking the trading networks

necessary for export purposes and because the mainland market was closed to them, these Shanghai industrialists turned to the British trading houses in Hong Kong, which were experienced in the entrepôt trade and had established links with the British and other international export markets (Tsui-Auch, 1998, p. 59). At the same time they set about building export-oriented, transnational production operations across Southeast Asia, further developing the management of the dispersed manufacturing capabilities that are distinctive of Hong Kong to this day (Enright et al., 1997, p. 5).

The late 1950s brought the beginning of industrial diversification into the manufacture of plastics commodities and electronics products. By 1959 the value of manufactured exports had surpassed that of the entrepôt trade; by the early 1960s Hong Kong was among the largest manufactured product suppliers in the developing world (Hong Kong, 1961). In the 1960s and 1970s an increasing number of foreign and overseas Chinese industrialists invested in industry, trade, finance and tourism in Hong Kong, which was a free trade port with no control over foreign exchange (Tsui-Auch, 1998, p. 60). Increasing global trade, particularly in the West, and liberal international trade relations benefited Hong Kong's export-oriented production. All the while continued turmoil in the region during this period triggered periodic surges of migration both into and out of Hong Kong. Today it is estimated that more than half of Hong Kong's more than 7 million citizens are descendants of post-1949 migrants.

Hong Kong's government can be characterized as embracing an economic policy of minimum intervention in the belief that free markets allocate resources most effectively. This tradition began to change with the establishment of important institutional frameworks and organizations in Hong Kong around the late 1960s, early 1970s and beyond. These institutions both *supported* innovative activity in Hong Kong and *intervened* in it to varying degrees. Primary among them was the Hong Kong Productivity Council (HKPC), initially conceived by the Working Committee on Productivity in 1963, which was created in 1967. Ferguson (2001, p. 2) states that the HKPC has 'concerned itself with technological upgrading through consultancy and vocational training with most of its efforts to diffuse off-the-shelf best practice technology rather than create new techniques'. Another move in this direction was the Advisory Committee on Diversification, authorized in 1977, which recommended a more active role for the government and greater support for the provision of technological infrastructure (Ferguson, 2001, p. 2).

This period also witnessed the development and operation of infrastructure services and facilities that contributed significantly to the growth-enabling environment, including monopolies in utilities that since the 1970s

have been governed by schemes-of-control. Investment in infrastructure in Hong Kong during the post-war period has been very high compared with that in many other developing countries (Mody, 1997, pp. xii–xiv). Consequently the supply of reliable electric power, telecommunications and transport services in Hong Kong has occurred on a scale that has enabled rapid economic growth. The transition to a service economy in Hong Kong has further underscored the importance of government policies that can support competition and raise efficiency in sectors such as telecommunications and professional business services (Cheng and Wu, 1998).

Opening of China: 1980s and 1990s

Under the umbrella conditions described above, industries in Hong Kong such as electronics evolved into competent companies exporting around US\$7.5 billion worth of electronics products in 1991, equivalent to 60 per cent of the total exported by Taiwan at the time. Many overseas electronics firms first selected Hong Kong as a manufacturing base in Asia, and the electronics industries thrived on original-equipment-manufacture (OEM) subcontracting arrangements (Henderson, 1989; Hobday, 1995). The migration of electronics manufacturing to the Chinese mainland in the 1980s did not necessarily impede export-led technological learning, but an emphasis on low-cost production among Hong Kong networks in South China made more likely the capture of industries in OEM patterns that had been successfully employed earlier (Chiu and Wong, 2001). In fact some of the most important industry clusters competing from a base in Hong Kong were created in the wave of expanding manufacturing and services businesses in the decades of the 1970s and 1980s. These clusters include light manufacturing, transportation, tourism, financial and business services, and communication and media industries (Enright et al., 1997).

As part of its industrial policy the government sought at the time to facilitate the growth of industrial manufacturing through investments in infrastructure and human capital, while simultaneously upgrading institutions that served to enhance industrial production and penetration of overseas markets. Investments in infrastructure centered on the creation of industrial estates that enabled firms to build or rent manufacturing facilities without having to commit high levels of capital to physical infrastructure in the context of high land prices. Vocational training became another area of active policy initiative, as the government sought to meet the increasing demand for skilled labor. In many ways these actions reflected the persistence of an approach to industrial policy that emphasized a reluctance to target support to specific sectors or firms.

Given Hong Kong's singular position as a British Crown Colony on the doorstep of the most populous country in the world, political matters naturally served to shape its innovation system significantly. In this respect there is little doubt that the two most significant events affecting Hong Kong's innovation system in this period were (1) the modernization program that the late Chinese leader Deng Xiaoping promulgated in 1978 and (2) discussions between the Chinese and British governments that opened in 1982 over Hong Kong's sovereignty. The latter negotiations ended in 1984 with the signing and ratification of the Sino-British Joint Declaration, which stated that Hong Kong (HK) would become a Special Administrative Region (SAR) of the People's Republic of China and that Hong Kong's capitalist system and 'way of life' would be preserved for 50 years. The 'one country–two systems' framework under which Hong Kong is presently governed was enshrined in the 'Basic Law', the present constitution for the HKSAR. Coupled with the opening-up process these two events catalysed the transformation of Hong Kong's innovation system. In many ways, the opening of China precipitated and accelerated the Hong Kong people's learning curve, which ultimately proved helpful not just economically but also in accepting that their fate and future lay with that of Mainland China.

The most striking change in Hong Kong's innovative landscape that was triggered by the opening of the mainland in 1979 was the decreasing role of manufacturing in Hong Kong and the simultaneous rise in the services sector (Table 6.2). At its peak in the mid-1980s, the manufacturing sector in Hong Kong employed 41.7 per cent of the active labor force but by 1995 it employed only 15.3 per cent (Berger and Lester, 1997, p. 9).

Table 6.2 Percentage contribution to GDP by economic activity

Economic Activity/Year	Agriculture, Fishing, Mining, Electricity, Gas and Water	Construction	Manufacturing	Services
1980	2.5	6.6	23.6	67.3
1985	3.5	5.0	22.0	69.5
1990	2.8	5.4	17.5	74.4
1995	2.6	5.3	8.3	83.7
2000	3.3	5.2	5.8	85.7
2002*	3.5	4.4	4.6	87.4

Note: * Figures are preliminary and subject to revision.

Source: Census and Statistics Department, Hong Kong SAR.

Just prior to 1997 important changes occurred whereby the Hong Kong Government participated more actively in the transformation of Hong Kong's innovation system, a move that began during the Cold War period. Although little was done in response to specific 1979 recommendations by the Advisory Committee on Diversification (which called for greater support for technological deepening), the late 1980s saw the government establishing industrial estates in Tai Po, Yuen Long and Tseung Kwan O for companies engaged in technology-intensive techniques. Furthermore Hong Kong's third major university devoted to scientific and technological research – The Hong Kong University of Science and Technology – was also founded in the late 1980s.

These policy changes were triggered because Hong Kong had hitherto been primarily a low-cost producer. In the prelude to its return to China in 1997, it found its competitive advantage being eroded by rising wage and land-rental rates as well as the emergence of other developing economies in the region.

From Crown Colony to Special Administrative Region: Run-up to 1997 and Beyond

The role that Hong Kong came to occupy in Asia has been fundamentally shaped by its geographical and political position. Hamilton (1999) argues however that it has also been the organizing center of Chinese-led capitalism: 'Because Chinese modes of capitalist acquisition are based on bottom-up individual and family-based strategies of seizing opportunities wherever they exist, rather than on top-down corporatist strategies of linking state administrative capabilities with elite economic opportunities, Chinese capitalism is integral to world capitalism itself' (Hamilton, 1999, p. 16). The organization of Chinese family businesses involved firms of many sizes, a paternalistic management model, and perhaps most importantly a network of social and economic relationships from the outset (Redding, 1990). These networks were crucial for the rapid expansion of subcontracting networks and long commodity supply links serving the US and European markets during the 1960s and 1970s. The management of vertically disintegrated supply chains and networks remains a notable strength of Hong Kong entrepreneurship.

These events meant that as Hong Kong approached its return to China in 1997, it was proudly boasting that no other society had more experience in investing and producing in China. Ever since the mid-1980s, Hong Kong has been the largest source of foreign direct investment in China. Although the exact figures are impossible to determine, various statistical sources estimate that Hong Kong's contribution to realized foreign investment in

China comprised about two-thirds of the total by 1994 (Berger and Lester, 1997, p. 5). It is on this basis that Enright et al. (1997, p. 7) accurately describe how Hong Kong's historical role as a city of departure from China has laid the foundation for a reverse flow of business investments during the 1990s not only back to Hong Kong, but to mainland China through Hong Kong. They claim that this has 'helped Hong Kong become the de facto capital of the 50 million or more overseas Chinese who today play such an important role in the economic modernization of the Asian region and in the reconstruction of China's market economy' (Enright et al., 1997, p. 7). The economic impact is considerable, since overseas Chinese investors – often Hong Kong companies or investors operating out of Hong Kong – now employ at least 14–15 million people in China. It is also crucial to understand that the migration of production facilities to the Pearl River Delta (the PRD) in many ways represented growth, rather than decline, of Hong Kong's engagement in manufacturing. For political reasons such growth was, however, categorized as outside the territory, even if it was, from a historical perspective, a reintegration into Chinese markets. The effects on service industries must also be seen as beneficial in the sense that most of the migration spurred further growth and increased sophistication of producer business services (Tao and Wong, 2002).

In establishing and upgrading these networks Hong Kong firms have exploited their traditional strategies of imitation and followership, while emphasizing the development of organizational know-how rather than formal research and development for new products.⁴ The bulk of R&D expenditure by private firms in Hong Kong is devoted to redesigning and improving products as well as making them easier and cheaper to produce. In other words process innovation has often taken precedence over product innovation in Hong Kong industries, and the support of bridging institutions such as the Hong Kong Productivity Council has often served to underscore these efforts to improve production efficiency. While learning extensively from OEM contacts overseas, Hong Kong firms have been instrumental in setting up and improving production facilities in Mainland China – transferring innovative production technology and management organization rather than product innovations.

Soon after 1997, however, the Asian Financial Crisis hit the entire region particularly hard and contributed to a dramatic bursting of the asset bubble that had bolstered much of Hong Kong's economy. Simultaneously economic reforms on the mainland were increasing in pace. These events, combined with China's accession into the World Trade Organization, put Hong Kong in a situation in which it could no longer rely as heavily on its traditional methods for accumulating wealth. The magnitude of these

changes cannot be overemphasized. Following a tradition of relatively high and stable levels of growth, Hong Kong society suddenly found itself facing quarter upon quarter of negative economic growth and rapidly mushrooming unemployment. This was the first time Hong Kong had ever experienced such deep-seated economic turmoil. At an individual level those who had invested in either the stock or property markets saw their asset values slashed, falling into a situation of 'negative equity' whereby the amount of outstanding loans payable on their assets exceeded the assets' market value. As such, society at large was palpably yearning for strong leadership and a new vision to pull Hong Kong out of its economic difficulties.

These sudden changes in the economic landscape forced the Hong Kong government to participate even more actively and rapidly in the transformation of Hong Kong's innovation system so that it could identify a new role for itself as well as a new engine for its continued economic growth. This search culminated in the appointment of a Commission on Innovation and Technology (CIT) in March 1998. The members of the Commission comprised mostly American-trained academics and professionals. In its first report (1998) the CIT noted in its vision statement that 'innovation and technology are vital to the future prosperity of Hong Kong', proposing such a vision in response to the challenges that Hong Kong was facing at the time (HKSAR, 1998, p. 13). The commission's second and final report made eight concrete recommendations (HKSAR, 1999, pp. 5–7) which identified measures to promote high technology innovation in order to haul Hong Kong out of its worst ever recession.

- Coordinate the government's policy functions
- Merge the Hong Kong Science Park, Hong Kong Industrial Estates Corporation and the Hong Kong Industrial Technology Center
- Invest in education
- Seek overseas talent
- Relax immigration restrictions on talent from the mainland
- Expand the government's incubator program
- Forge closer ties between academia and industry
- Explore the feasibility of a co-investment scheme providing government venture capital on a matching basis with private funds

We will analyze two cases to illustrate the new face of the Hong Kong government's official posture: its attempts to follow up and further promote the economic integration taking place in the PRD, and its policy initiatives aimed at promoting high technology innovation such as the Cyberport and the Science Park.

INTEGRATION WITH THE PEARL RIVER DELTA REGION

The Pearl River is considered one of China's three main waterways. Formed at Guangzhou, the Pearl River flows east and south to form a large estuary between Hong Kong and Macau. The river links Guangzhou to Hong Kong and the South China Sea and is one of China's most important waterways for trade. The PRD is found along the estuary of the Pearl River.

Although the territories of Hong Kong and Macau are geographically integrated parts of the PRD, the 'special' status of these two territories often sets them apart from the rest of the region; therefore in the literature and debate that has emerged in recent years the term 'Pearl River Delta' frequently serves as shorthand for the administrative zones, municipalities and districts of the PRD in mainland China (excluding both the Hong Kong and Macau SARs). Some reports use the term 'Greater PRD Economic Region' when they include Hong Kong and Macau (for example, Federation of Hong Kong Industries, 2003).

Guangdong's geographic position as a peripheral province on the southern coast meant that it was far from China's industrial heartland. Guangdong's scarce natural resources limited its ability to contribute to the development of heavy industries, which were the focal points of China's five-year plans in the 1950s, 1960s and 1970s. The lack of convenient transportation links with the rest of China also hindered Guangdong's development. As such, Guangdong was an economic laggard as compared with other Chinese provinces over the period 1949–1979. All of this, however, changed in 1979 when Guangdong Province was put at the forefront of China's reform program. It was chosen for special treatment due to its proximity to Hong Kong and Macau, its distance from the heartland of the Chinese mainland, and the fact that it was not advancing as quickly economically as the other coastal provinces.

As a consequence Guangdong Province was given greater political and economic autonomy than other jurisdictions in the Chinese mainland. The main areas over which it was granted greater autonomy were finance and fiscal matters, foreign trade and investment, commerce and distribution, allocation of materials and resources, the labor system, and prices. Guangdong was allowed to keep a larger share of its output and foreign exchange than other provinces but it was required to be self-sufficient in terms of capital investment. The province was given greater control over economic planning, approval of foreign investments and foreign trade. Guangdong also took control over several state-owned enterprises located in the province. These measures launched rapid economic development in

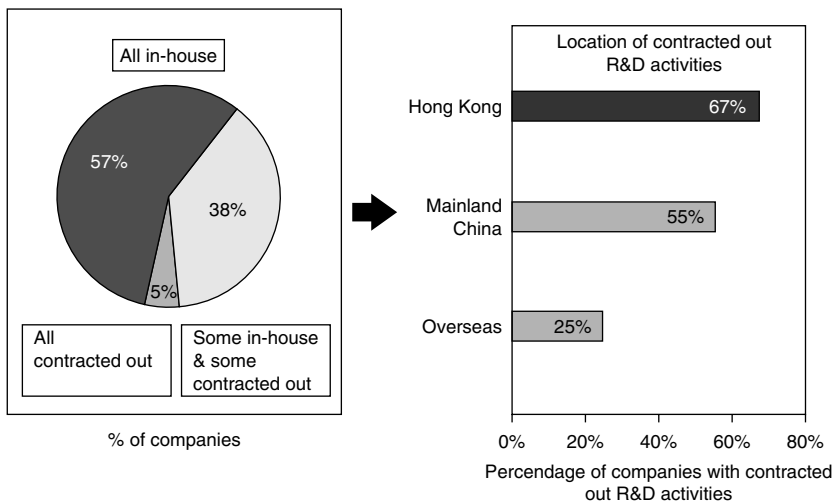
Guangdong Province, mostly in the Special Economic Zones established in the PRD.

It was at this point that deeper economic links began to emerge between Hong Kong and the PRD as Hong Kong's economy began to switch from manufacturing to services and manufacturing began to move from Hong Kong to the PRD region. The open door policy coupled with economic reforms not only provided an enormous production hinterland and market outlet for Hong Kong's manufacturers, but also generated abundant business opportunities for a wide range of its service activities. In particular these include freight transport, storage, telecommunications, banking, real estate development, and professional services such as legal services, insurance and accounting. This emphasis on services allowed Hong Kong businesses and their managers to build an unparalleled fund of knowledge about what it takes to operate production systems distributed across long distances and to turn out high-quality goods in a wide range of industries in China. For this reason Hong Kong's experience in the PRD region stands as a benchmark for working in China. While 'Made in Hong Kong' manufacturing therefore declined, 'Made by Hong Kong' manufacturing – manufacturing in Hong Kong-owned and managed plants in the PRD region – flourished (Berger and Lester, 1997, p. 5).

By shifting parts of their operations to China, Hong Kong industrialists vastly increased the scope of their enterprises. By 1997 Hong Kong manufacturing companies were estimated to employ some 5 million people in their plants in Hong Kong and China (Berger and Lester, 1997, p. 10) – more than five times the workforce they had employed in Hong Kong at the peak of the manufacturing era in 1984. Today the figure is estimated to be in the region of ten million (Cheng in SCMP, 2003, p. 26). Over the period from 1980 to 2001 the PRD region was the fastest-growing portion of the fastest-growing province in the fastest-growing large economy in the world (Enright et al., 2003, pp. 21–25). A study of economic interaction between Hong Kong and the PRD region sponsored by the Hong Kong-based '2022 Foundation' outlined several clusters of service-enhanced industrial development that involved a division of labor between international services located in Hong Kong and production located in the PRD (Enright et al., 2003). Another report sponsored by the Federation of Hong Kong Industries similarly underscored the close economic linkages in the region and the strengthening of the overall infrastructure to facilitate R&D activities among companies in Hong Kong and the PRD. It was hoped that such initiatives would take advantage of the various strengths in the region, such as the intellectual property rights protection framework in Hong Kong and the availability of affordable R&D staff in the PRD (Federation of Hong Kong Industries, 2003).

Given the close economic linkages that now exist in the region, a regional innovation system is clearly also in the making. If, however, one employs the definition of an innovation system as the set of institutions that jointly and individually contribute to the development and diffusion of new technologies, it becomes an important issue as to *how* such an integrated system is actually emerging. The fundamental conditions that brought about Hong Kong's extraordinary societal and economic flourishing in the past included institutions such as the rule of law, limited or 'small' government, honesty and transparency in administration, an effective civil service, free private enterprise, public commitments to relatively high levels of social goods and equity, and protection of individual freedoms of expression, association and belief. While it is possible to debate the degree to which these fundamental conditions still exist as intensely as they did previously – particularly given Hong Kong's recent experiences – there is universal agreement among all analysts that the conditions enjoyed by Hong Kong are not as readily present on the mainland, including in the PRD region. The conundrum this poses is whether there should be some degree of equivalence among basic, elemental conditions in Hong Kong and the PRD for there to be a truly regional innovation system. In particular, need there be correspondence in terms of the rule of law, promotion of private enterprise and so on? However these questions are answered, what cannot be mistaken are the closer ties that Hong Kong has been forging with the PRD region on a number of fronts.⁵ This is after all the region whence many of Hong Kong's present day residents trace their roots. Despite these ties, especially at the industry, trade and firm levels between Hong Kong and the regions north of its border, there remain pointed policy disjunctions between Hong Kong and the PRD. These differences question even further the extent to which a regional innovation system is developing and make it more difficult to understand how Hong Kong's innovation system is being transformed in an attempt to embrace the PRD region more readily.

A recent survey of R&D in Hong Kong and the mainland indicates that many firms in Hong Kong were carrying out R&D in both Hong Kong and the PRD. Based on the information supplied by 229 firms (49 per cent of the sample of firms operating in both Hong Kong and the mainland), it was clear that both R&D outsourcing and investments in R&D beyond the borders of Hong Kong were very significant. Only 17 per cent of the total R&D staff of these firms were located in Hong Kong, while 53 per cent were located in Guangdong Province, 3 per cent in the Yangtze River Delta, 19 per cent in other mainland provinces and 8 per cent overseas (Federation of Hong Kong Industries, 2003, pp. 47–8). Figure 6.1 shows that many Hong Kong firms are contracting out R&D services on the Chinese mainland or overseas.



Source: Federation of Hong Kong Industries (2003), *Made in PRD: The Changing Face of HK Manufacturers*, p. 46.

Figure 6.1 Pattern of contracting out R&D by Hong Kong firms

The primary reason for locating R&D in the mainland was the supply of talent and research facilities; research costs ranked only third. The majority of firms with mainland operations surveyed (78 per cent) indicated that they planned to continue or expand their R&D efforts, and almost half (46 per cent) planned to recruit more R&D staff in Guangdong. Only 13 per cent had plans to recruit more R&D staff in Hong Kong. Table 6.3 indicates the comparative proportions of R&D expenditures and personnel in Hong Kong, Guangdong and Beijing. Given the substantial amount of R&D undertaken in Guangdong by Hong Kong firms, the figures for Hong Kong R&D expenditure probably understate the total R&D effort made by these firms; the table nevertheless illustrates that Guangdong has become a much more important site for innovation and that Hong Kong could benefit significantly from a closer association with this province.

Among the initiatives with the potential to promote Hong Kong's economic development is the Closer Economic Partnership Arrangement (CEPA). Under this arrangement, which came into effect on 1 January 2004, 273 Hong Kong products qualify for zero-tariff status under rules governing origin of manufacture.⁶ It has been estimated that Hong Kong will save HK\$750 million from zero-tariff exports (SCMP, 17 October 2003). Eighteen service sectors are allowed easier access to mainland markets,

Table 6.3 Comparison of Research and Development (R&D) expenditures and personnel in Hong Kong, Guangdong and Beijing, 2001

	Hong Kong (HK\$100 million)	Guangdong (RMB100 million)	Beijing (RMB100 million)
Total R&D expenditure	70.76	137.43	171.17
– As % of regional GDP (in region)	0.55%	1.29%	6.02%
Expenditure by:			
– Scientific Research Institutions	1.47#	5.18	91.04
– Higher Education	48.47	4.65	20.86
– Large & Medium Enterprises	20.83*	89.60	21.10
Total FTE of R&D Personnel	7365	79 052	96 255
FTE of R&D Personnel in:			
– Scientific Research Institutions	280#	4209	43 982
– Higher Education	3791	9949	18 171
– Large & Medium Enterprises	3294	43 279	12 277

Notes: # Government; * Business.

Source: Based on Table 4.2 in Federation of Hong Kong Industries (2003), p. 54.

including telecoms, banking, accounting, logistics and tourism and there is 'enhanced cooperation' in various areas of trade and investment. In essence, CEPA is designed to allow Hong Kong firms to benefit early from the liberalization of the mainland's restricted sectors, which will open up to all foreign companies from 2005 as a result of its accession to the World Trade Organization. For this reason others have branded CEPA as more talk than action. To be sure CEPA still includes limitations on the operation of Hong Kong firms on the mainland market and all benefits accrue either to goods made in Hong Kong (of which there are increasingly fewer as manufacturing moves to the mainland) or to Hong Kong-based service firms providing a limited range of products in cooperation with mainland partners. CEPA will nevertheless promote economic integration with the whole of the mainland, including the PRD region (Hong Kong Trade Development Council, 2003).

A final noteworthy point concerns the co-evolution of systems of innovation. While this chapter focuses on Hong Kong's innovation system, it is important not to forget that China's innovation system is also undergoing massive changes with its move from a socialist to a market-oriented

economy. While it is therefore analytically justifiable for the purposes of scope and concentration to examine only Hong Kong's innovation system, changes north of the border also merit independent assessment. We conjecture that changes to the PRD's innovation system continuously affect the development and transformation of Hong Kong's innovation system. While Hong Kong may thus endeavor to *pre-empt* its future direction and niches, there are many times when for all its best efforts it must, either by design or by default, *react* to developments in the PRD's innovation system. In this way one possible fruitful subject of analysis is the co-evolution of Hong Kong's and the PRD's systems of innovation: are the two systems converging?

POLICIES FOR DEVELOPMENT OF KNOWLEDGE-BASED INDUSTRIES IN HONG KONG

In March 1999, the Hong Kong Government announced plans to build Cyberport, a US\$1.76 billion technology park in Pokfulam, in collaboration with the Pacific Century Cyber-Works (PCCW) company. Cyberport is designed to create a strategic cluster of leading IT and service companies in Hong Kong in the shortest possible time. It will concentrate on communication-oriented industries, calling for the building of telecommunications, network and wireless communications, optical electronics, and Internet appliances in Hong Kong. The giant project will purportedly serve as a multimedia and information technology hub, with state-of-the-art wiring, room for 130 companies and adjacent housing. Designed as a pocket-size Silicon Valley, the futuristic office and residential park will occupy 64 acres on the southwest coast of Hong Kong island. The project is expected to generate more than 12 000 jobs in Hong Kong, while approximately 4000 jobs will be created in the construction industry to build Cyberport. With the first phase completed in 2002, Cyberport is expected to generate demand for support services such as accounting, legal and other back-office functions (Pun and Lee, 2002, p. 9).

When the Cyberport project was announced, it was seen as a vehicle with which to attract international high tech companies. Additionally, it was hoped that Cyberport would also be home to 100 smaller companies with the aim of incubating local business and retaining Hong Kong's indigenous technological talent. With the global economic slowdown and the technology bubble bursting, there have however been reports that Cyberport has had problems attracting new IT operations to Hong Kong. Sin Chung Kai, who speaks for the IT industry in the LegCo, thus comments: 'one problem is that the fall in the property market has taken away Cyberport's

raison d'être'. Consequently Cyberport's ability to fill up the empty offices depends mostly on cannibalizing existing commercial space from tenants in Central district and Quarry Bay (Einhorn, 2002).

We can better understand our focus on Cyberport by looking at some of the initiatives that were undertaken before and shortly after the project was launched. The government had already created several industrial estates providing fully serviced industrial land through the government-funded Hong Kong Industrial Estates Corporation (HKIEC). In addition the Hong Kong Industrial Technology Centre Corporation (HKITCC) had provided, since being initiated in the mid-1990s, low-cost accommodation as well as marketing, financial and technical assistance through an incubation program. The center had hosted 80 new ventures in high technology during three-year incubation periods. Finally a range of consultancy studies had been conducted regarding the establishment of a science park in Hong Kong, and an ultimate decision had been taken to create a Provisional Hong Kong Science Park Company to undertake construction of new park facilities at reclaimed land near the Chinese University of Hong Kong. Both the HKITCC and the Science Park were designed to promote the creation of high technology industries and technological innovation in Hong Kong by supporting clusters of knowledge-intensive small and medium-sized firms. The HKIEC was also targeting more advanced industries and services, although the emphasis here was to supply land for manufacturing rather than services.

In May 2001 the three organizations were merged to form the Hong Kong Science and Technology Parks Corporation, which aims to provide a full range of services and infrastructure for high technology firms in Hong Kong. To a large extent, these facilities provide an environment that appears more appropriate for high technology industries and services than Cyberport, which can be seen as competing primarily on the basis of prestigious office space and price. The science park and the HKITCC are both located in close proximity to universities, while Cyberport is at a considerable distance from the University of Hong Kong (which has therefore rented office space at Cyberport to set up liaison contacts). Both Cyberport and the Science Park have been extremely eager to attract overseas tenants, conducting extensive marketing activities in advanced industrialized countries. In other words the two initiatives appear to be complementary in some respects while also overlapping rather unproductively in other respects.

Another of the important follow-up activities resulting from the work of the Chief Executive's Commission on Innovation and Technology was the creation of the Innovation and Technology Fund (ITF) in 1999, to replace the existing Industrial Support Fund and Services Support Fund (HKSAR, 1999). With a total endowment of HK\$5 billion the ITF has

supported 236 projects amounting to a total funding of HK\$526 million during 2000–2002. A considerable proportion of the projects (approximately one-third) support R&D in the area of information technology (LegCo Panel, 2002). The majority of ITF funding (60 per cent) has, however, been earmarked for research projects to be undertaken by the Applied Science and Technology Research Institute, which will be located in a building in the Science Park. ASTRI has formulated initial areas of focus for its research and development programs that include photonics, wireless technologies, Internet content and applications, and integrated circuits design. Again we see the potential for overlap and duplication of development efforts. Cyberport's role in the commercialization of such technologies is unclear.

The general picture that emerges from an examination of Cyberport's role in the various policy initiatives related to innovation and high technology development in Hong Kong is one of dismal policy coordination. Most of the services that Cyberport intended to offer had already been planned for or directly provided by other organizations or programmes. Little evidence can be found of coordination between the Cyberport project and the broad range of schemes to support innovation and high technology development initiated by the SAR government in recent years.

Experience elsewhere in the world suggests that one of the key factors behind the rapid growth of high technology industries in a region is its ability to mobilize and attract skilled professionals and workers from all corners of the world (Saxenian, 1999). In addition, highly innovative clusters of high technology industries and services have generally emerged in places where advanced research organizations or educational establishments such as universities provide both a regular supply of highly skilled engineers and strong communicative links with new entrepreneurial ventures. Hong Kong has improved and expanded higher education during the 1990s, and has intensified the training of IT professionals as part of this effort. Unfortunately this expansion of educational opportunities has not yet created a sizeable local body of skilled specialists in IT and communication technologies; demand for these types of people still exceeds supply.

For this reason the SAR government promulgated an Admission of Mainland Professionals Scheme in 2001 for the purpose of encouraging the immigration of mainland professionals in finance and information technology to Hong Kong. The policy has not, however, been very popular among firms in Hong Kong or among the mainland Chinese IT professionals, primarily because of restrictions that require the potential employer to document whether a local professional could fill the post. Other restrictions could be cited as well, such as not allowing professionals to bring their families with them to Hong Kong or requiring mainland

students who graduate from Hong Kong universities to return to the mainland before they can qualify for an application. Belatedly recognizing the weaknesses of the scheme, the SAR government has recently adopted an 'Admission Scheme for Mainland Talents and Professionals' that seeks to improve the conditions for this special class of immigrants from the mainland, including letting them bring their families to Hong Kong.

An important component of the growth of high technology industries in advanced industrialized countries – and in particular in Silicon Valley, the precedent upon which Cyberport is allegedly modeled – is the availability of venture capital (Florida and Kenney, 1988). In Hong Kong various venture capital funds have been set up during recent years, but these appear to have had little impact on the local high tech industry. The SAR government initiated a Venture Capital scheme in the late 1990s, which it left to a major bank to operate – with little success, as the scheme was discontinued due to difficulties in finding a project that would meet the bank administrator's criteria for investments (Kwong, 1997). On the other hand around 200 international venture capital firms have set up regional headquarters in Hong Kong, but these firms – with a portfolio of around US\$10 billion in 2000 – primarily target opportunities for investment in the Chinese mainland. Overseas capital funds contributed 90 per cent of the funds available to the industry, and most of these are invested overseas in the regional market, to exploit beneficial tax treatment (Lowtax.net, 2005). Thus Hong Kong firms receive only 10 per cent of the disbursements. Although Hong Kong boasts one of the region's most advanced financial services sectors, the lack of a transparent institutional framework for high-risk financing and the preponderance of relational contracting has held back investments locally (Carney and Gedajlovic, 2000).

A new Growth Enterprise Market was set up in November 1999 to provide an alternative fundraising channel for emerging growth companies under a well-established market and regulatory infrastructure. At the end of August 2002 152 companies were listed on the GEM, with a total market capitalization of US\$8 billion. The emerging high tech stock boom was hijacked, however, by property developers and short-term speculative interests, quickly eroding serious confidence in high technology investments and bursting the 'high tech bubble' following the NASDAQ landslide in 2000. Under these conditions it has become extremely difficult for genuinely innovative people and firms in Hong Kong to raise the capital necessary to commercialize their technology.

The Cyberport project, the Science Park, and the Applied Science and Technology Research Institute, like most of the other high tech innovation policy initiatives in Hong Kong, reveal the persistence of the 'linear paradigm' of high technology innovation, a model that has been increasingly

questioned in recent decades. Technological innovation is interpreted, according to this paradigm, as originating in the results of scientific research, where these scientific results are subsequently developed into commercial technologies and finally marketed by firms. Being envisaged as a linear process (like a river flowing to the sea), the knowledge available from 'upstream' research by universities or research institutes will be transferred to 'downstream' research and development (R&D) in enterprises. The construction of infrastructure for such 'downstream' R&D in manufacturing and service industries consequently becomes a worthwhile project – not unlike the facilities constructed in Cyberport. If there is a potential demand for the ultimate 'innovation', the market will ensure that entrepreneurial people and capital will undertake such commercial 'downstream' R&D.

The problem is that innovation processes seldom follow such simple linear sequences. An innovation process typically provides opportunities for parallel processes involving the exploration of new knowledge and the exploitation of existing knowledge, as well as for interaction among many actors in an extended network that supports learning (Rosenberg et al., 1992; Van de Ven, 1999). Endogenous innovation processes are thus promoted in a milieu that fosters interactive relationships and creative learning. They depend to a considerable extent on the wider institutional context and the resources available to individual actors. Innovation policies formulated in the vein of the outmoded linear paradigm simply provide funding for research and perhaps infrastructure for commercialization by firms, but assume automatic transfer and diffusion in the market. In contrast, interactive innovation policies attempt to promote learning and diffusion of knowledge, often implemented through intermediary organizations providing technological services. Such policies are oriented towards the needs and demands of small and medium-sized firms and particularly of local productive systems (Vazquez-Barquero, 2002).

CONCLUSIONS

Our research on the transitions made by and challenges facing Hong Kong's innovation system during the past century offers two types of contributions to the literature. *Empirically* our research has highlighted key facets of the evolution of Hong Kong's innovation system as it traversed periods of industrialization and de-industrialization and extended its linkages to the global marketplace. *Theoretically* these empirical observations open multiple pathways to methodological and analytical advances in the field of innovation studies.

A commonly neglected feature of Hong Kong's innovation system, overlooked by analysts and scholars alike, is its early history. All too often histories of Hong Kong's industrial structure and economic development begin 'out-of-the-blue' during the 1950s, following the takeover of China by the Communists. This is supposed to have initiated a train of events leading to Hong Kong's becoming a prosperous entrepôt over the five ensuing decades. While the significance of the events of 1949 on Hong Kong's innovation system should not be downplayed, this chapter attempts to show that there were in fact antecedents to the innovation system that developed in the 1950s and evolved continuously until the handover of Hong Kong and beyond. In this way, we show that – and how – the transformation of Hong Kong's innovation system has been taking place over a far longer period than is commonly supposed. By tracing two important traits that characterize Hong Kong's people and thereby its firms – resourcefulness and entrepreneurial spirit – to a period before the magic milestone of 1949, we uncover the roots of Hong Kong's innovation system in the early 1900s. As a result, the empirical analysis that follows is better grounded in fact and therefore more insightful in helping one understand Hong Kong's present-day innovation system. The implications of this finding for innovation systems theory in general are twofold: first it suggests that innovation systems are in continuous evolution. When this evolution is studied within a broad time frame (of, say, a century) transformations between various periods can be identified, as we have done in the case of Hong Kong. Second it suggests that, in order to better understand present-day innovation systems, it is imperative that a country's commonly understood assumptions and trajectories are unpacked and 'opened-up' in order to determine the extent to which they hold true.

This leads to the second contribution suggested by our empirical analysis of the two main challenges facing Hong Kong – the need for a clear awareness of the opportunities and limitations attaching to a more active role played by the government in shaping the future of innovation in Hong Kong. Targeting closer integration with the PRD front and the development of knowledge-based industries in Hong Kong, we can identify a range of areas where private and public initiatives to develop innovative capabilities coexist. In some cases, these initiatives appear to be mutually supporting. In other cases public policies seem preoccupied with serving narrow business interests, sometimes to the point of contravening the professed ambitions of innovative industries.

Lying at China's doorstep, opportunities abound for Hong Kong's further integration with the PRD and thereby the extension and knowledge-based upgrading of its industrial clusters. This calls for a more systematic analysis of existing trends and resources with a reduced emphasis

on meeting the demands of a handful of strong business interests in Hong Kong. This implies not that the Hong Kong government should start planning technological change in detail but rather that government policies should be based on extensive and continuous monitoring and analysis of Hong Kong's innovation system. In this endeavor the government should be guided by broader social and economic needs than those reflecting the interests of a limited group of tycoons. In other words the role of government should be grounded in the principles of comprehensive and coherent policy-making that have been informed by innovation systems research (see, for example, OECD, 1997; 1999 and 2002).

NOTES

1. When Hong Kong Island was ceded to the British in perpetuity, it was only a fishing community, inhabited by about 150 000 people, and dismissed by the then British Foreign Secretary, Lord Palmerston, as 'a barren rock'.
2. Loh (2002) ascribes this to the seizure of Hong Kong for trade purposes rather than for territorial aspirations – for Hong Kong to serve as a base for penetration of China and other Asian nations.
3. This blockade was imposed to penalize China for its support of North Korea during the Korean War.
4. Several surveys of electronics firms in Hong Kong, for example, have found that 60–70 per cent of these have copied or modified other products instead of initiating independent product design (Yu and Robertson, 2000).
5. The massive Severe Acute Respiratory Syndrome (SARS) outbreak in the first half of 2003, for example, drove home the fact that Hong Kong and its PRD neighbors live and die together, literally. Whatever affects one affects the other.
6. Certificate of Hong Kong origin is a requirement for eligibility of zero tariffs.

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