

Human Resources: Hong Kong's Challenges and Opportunities

David M. Hart and Fangmeng Tian¹
School of Public Policy
George Mason University

Book Chapter
Prepared for Hong Kong Innovation Project
February 2009

I. Introduction: The Moving Target

Hong Kong's recent economic history, viewed from a distance, is a success story. Most obviously, real per capita income has risen sixfold in less than 40 years. (USDA 2008) The region maintained its economic momentum despite the enormous structural shift entailed by the rapid development since 1978 of mainland China as a whole and of the Pearl River Delta area in particular. (Berger and Lester 1997; Enright, Scott, and Chang 2005) The economy now relies predominantly on services, notably the four pillar industries identified by the SAR administration: finance, logistics, tourism, and information services. (Tsang 2007)

In the future, Hong Kong will continue to face a complex and dynamic strategic environment that poses hard choices as well as enormous opportunities. There is no time to bask in the warm glow of past success. Mainland China is aggressively moving beyond its manufacturing-heavy strategy, seeking to upgrade its economy by using and creating technology, science, and innovation. ("Guidelines" 2006) In doing so, it follows in the footsteps of the rest of East Asia, which is quickly converging with the west in this regard. (Hu and Mathews 2005) Global industry is in a phase of massive restructuring as well, in response to the growth of emerging markets, the opportunities created by new technologies, and now the financial crisis and consequent recession.

Some of the most important choices that Hong Kong must make in order to sustain its economic success involve human resource development. If it is true that knowledge is the most valuable asset in the twenty-first economy, then educated and creative people are its most essential inputs. The Hong Kong population, though, is rapidly aging, and its fertility rate is among the lowest in the world. Hong Kong's institutions of higher education and research are characterized by entrepreneurship and excellence, but also by inertia. Immigration from the Chinese mainland could be a huge source of skills and knowledge, but the flow must be managed carefully lest public opinion turn sour on it. The alternative of attracting talent from the rest of the world is complicated not only by Hong Kong's unique geopolitical situation, but also by an intensifying competition for highly-skilled migrants among the leading economies.

¹ The authors thank Savantas Policy Institute and Douglas Fuller for their support and assistance; the persons interviewed (see list at end of paper) for their insights and cooperation; the Hong Kong Immigration Department, University Grants Council, and Census and Statistics Department for supplying data; and Kevin Au, Erik Baark, John Ma, Naubahar Sharif, Eugene Wong, Xiaogang Wu, and David Zweig for their aid and ideas.

This paper analyzes Hong Kong's talent pool. We describe stocks and flows of several key human resource indicators, both general and specialized to science and technology. We find that Hong Kong's working population is acquiring the skills and knowledge required to support innovation fairly rapidly. We do not draw a conclusion as to whether the pace is fast enough, given the region's changing context. However, we believe this question to be quite worthy of further serious consideration and, in light of that, explore potential policy options for accelerating the pace, should that be desired. Before we get to these main tasks, though, we turn our attention first to the role of human capital in economic development, to provide a context for the numbers and policy options that follow.

II. Human Capital and Growth: Four Cases

In the early 1960s, economists began to recognize formally what historians and other social scientists had long taken for granted: that skills and knowledge embodied in people contribute powerfully to economic growth. (Ehrlich and Murphy 2007) In the late 1980s, these insights were developed into full-fledged theories of "endogenous growth" by Lucas (1988) and Romer (1990), among others. Quantitative research grounded in these theories has convincingly demonstrated a correlation between measures of skills and knowledge on the one hand and income per capita at the national, regional, and individual levels on the other. (Abel and Gabe 2008 and references therein).

Although the correlation is strong, the causal relationship between human capital² and economic development is anything but simple. In our view, the causal arrows may plausibly go in both directions. A rich supply of human capital can create opportunities for capital investment, enterprise formation, and innovation, boosting economic growth. But it is also the case that rising incomes can provide incentives for individuals and governments to invest in education, skill acquisition, and knowledge creation. Ideally, a virtuous, self-reinforcing circle is established between the economic growth process and the human capital formation process.

These reciprocal causal relationships may hold true, we would suggest for (1) general human capital and overall economic growth and (2) specialized human capital in science and technology (S&T) fields and industry-level growth in innovation-oriented industrial sectors. However, in both directions of causation and for both general and industry-level growth, other variables may confound the relationship, especially in a small and open economy like Hong Kong's. In the remainder of this section, we briefly lay out four cases that this line of thought yields.

Let us take as the first case exogenous growth in general human capital, in other words, a broad "supply push." Would an economy expand in response? The answer that the literature gives is "yes," but only over the long run and at the highest level of aggregation (that is, at the global level in a globalized economy). The key response factors are technology and management. (Acemoglu 2002) As skills and knowledge become more widely available and less dear, new systems of production that take

² Ehrlich and Murphy (2007, 2) provide a helpful definition of human capital: "an intangible asset, best thought of as a stock of embodied and disembodied knowledge, comprising education, information, health, entrepreneurship, and productive and innovative skills, that is formed through investments in schooling, job training, and health as well as through research and development projects and informal knowledge assets." This definition encompasses both formal and tacit knowledge embodied in human beings

advantage of them are invented. The information revolution of the past few decades, for instance, depends on the highly-educated work force that became available in that period; effective IT-using organizations demand high skill levels, rather than simply automating tasks in a fashion better suited to the unskilled work force of the industrial era.

In the short run and for a small economy like Hong Kong's, though, the adjustment envisioned in this case could be very slow or even fail to materialize. If the supply of general human capital is expanding simultaneously in many countries (or even in a single very large country like mainland China), the suppliers of other factors of production, especially capital and entrepreneurial know-how, may have a choice of investment sites. Even local investors, in an age of footloose capital, may seek the best deal they can find anywhere in the world. Some attention to labor market demand would therefore be a useful check on a general human capital "supply push" policy. Weak labor market demand does not necessarily indicate that supply should be constrained. It might be an indication that additional policies are required in order to attract or develop other factors of production that are complementary to the newly-created human capital.

Now let us consider causation in the opposite direction: would a sustained strong demand for knowledge and skills generated by a thriving modern economy stimulate human capital formation? Here, too, the answer, in general, is "yes" over the long run. As workers recognize that they can make more money over their lifetimes if they make an upfront investment in knowledge and skill acquisition, they should choose to do so – if they can.

But sometimes they cannot. Absent public subsidies, they may lack the funds to make such an investment. Or, the educational system may not be flexible enough to accommodate the growing demand. In addition, older workers may be reluctant to invest in education, which might put at risk the value of their accumulated experience. Immigration is another possible source of human capital, but it depends on at least two uncertain factors, the perception of opportunity by potential immigrants and openness to immigration by the local population. Institutional bottlenecks and information barriers, then, are clear dangers to a non-interventionist human resource development policy that relies primarily on labor market demand.

If we turn to the cases that relate specialized human capital to growth in innovation-oriented industries, we find that additional conditions must be taken into account, beyond those present in the first two cases. Our third case assumes an expansion in the supply of technical experts trained to work in a particular industry. The key concept we need to add in this case is industrial clustering. Establishments in the same line of business tend to be located near one another, and the resulting geographical "agglomerations" tend to endure over time. Clustering benefits both the workers who possess specialized human capital and the employers who hire them. Workers prefer to live where they will have a wide range of career options; firms like to have many talented job candidates to choose from. Another reason for clustering is localized knowledge spillovers. The hottest ideas are passed by word of mouth through social networks; geographical proximity allows workers and firms to take advantage of them.

One danger, then, of a specialized human capital "supply push" policy is emigration by the newly-trained specialists to established clusters abroad. This argument is compatible with a policy that concentrates on human resource development for industries in which a location is already specialized. Alternatively, it might be part of a

broader case for a sustained, multi-pronged investment that extends beyond human resources to other factors of production in the hope that a new cluster might be established.

The fourth and final case contemplates whether specialized human capital would be formed in response to the expansion of industrial clusters that use the relevant skills and knowledge. Although the supply bottlenecks and information barriers that we discussed in the more general case above would likely be present in this specialized case as well, they may not be as severe. The very prominence of such clusters in the region's economic profile should draw the attention of people, both domestically and overseas, who have or may be able to acquire sector-specific knowledge and skills. The growing clusters' financial and political clout should also help to induce change in educational institutions, and it may also facilitate liberalization of targeted immigration policies.

Looking forward to the empirical section of our paper, these four theoretical discussions suggest the importance of attending to both supply and demand indicators in assessing Hong Kong's human resource situation. Foreign competition, demographic trends, institutional rigidities, and misperceptions among firms and workers are some of the obstacles that may impede balanced growth of capabilities and opportunities. Our argument to this point provides some warrant for policy intervention, because of these imperfections in the labor market. But policy-makers must also take the complexity that we have sketched into account if their efforts are to hit the mark.

We would be remiss if we concluded this section without stressing that there are very good reasons besides economic growth for individuals and societies to invest in people. Education, skill acquisition, and knowledge creation are virtuous activities in their own right. They help people to fulfill their creative potential, to become more autonomous, and to experience a better quality of life. A view of workers that reduces them to mere factors of production would be cramped indeed. In what follows, then, we will lean toward more such investment in human resources, rather than less, whenever a reasonable case can be made.

III. Human Resource Indicators: Stocks, Flows, and Comparisons

This section provides the empirical basis for understanding Hong Kong's human resources. Our conclusion on this point is unequivocal: whether viewed through the lens of supply or demand, the evidence shows that Hong Kong *is moving* toward a better educated workforce that holds higher-status jobs. Whether it is doing so quickly enough, given the strategic context, is more difficult to say. What public policy-makers ought to do to hasten the process, should they so choose, is equally challenging. This section provides some insights into these matters, and they are taken up more directly and more fully in the paper's final section.

Human capital is intrinsically difficult to measure. It encompasses skills and knowledge, both formal and tacit. There are two ways to acquire it: education and experience. We therefore use two indicators to assess Hong Kong's human resources, looking first at educational attainment and then at occupational status. For each of these indicators, we first consider all fields of activity and then science and technology (S&T) fields in particular. This multiple indicator approach allows us to paint a fuller picture than any single indicator would. However, we do not seek in this paper to assess the

quality of education or experience, which would enrich the portrait further. It is important to stress that the indicators we employ are only imperfect proxies for human capabilities, a complex and elusive real variable.

III.1 Educational Attainment: Undergraduate Degrees, All Fields

Although there is no firm cut-off for entry into knowledge-based work (indeed, accomplished teenage computer hackers are far from unheard of), a university education is a reasonable prerequisite for most such work. Undergraduate education provides advanced competencies in specific disciplines. The high level of knowledge and the degree of specialization are both important in fostering autonomous judgment and creativity. The higher education system sorts students in addition to training them and signals employers about their potential economic contributions.

The number of Hong Kong workers who hold an undergraduate degree, both male and female in roughly equal proportions, has risen rapidly in recent years.³ As Figure 1 shows, the total went up by about 70% between 1996 and 2006, an annualized growth rate of 5.5%. Since the working population of the SAR has grown by only about 1% per year during this period, the proportion of this population holding an undergraduate degree has grown substantially, from an estimated 12.1% to 18.6%.⁴

³ Unless otherwise noted, the data in section III.1 are drawn from the Hong Kong By-Census (including a special tabulation provided by the Census and Statistics Department on November 10, 2008) and refer to holders of a three or four year degree granted by a college or university. As Olsen and Burges (2007) note, Hong Kong data sometimes fail to distinguish between attendance in a degree program, receipt of a subdegree, and completion of an undergraduate degree.

⁴ The 1996 by-census did not report a figure for degree holders. Averaging the figures from the 2001 and 2006 by-censuses, we estimate that 90.7% of those in the working population who were reported as attending degree programs in 1996 ultimately received a degree. We use this figure in the text whenever degree holding in the 1996 population is discussed.

Figure 1: Undergraduate Degree Holders as a Share of Working Population

Education Attainment	1996	2001	2006
Degree holders in working population	368000 (est.)	494560	627140
Working population	3043698	3252706	3365736
Share	12.1%	15.2%	18.6%

Source: Hong Kong By-Census, 1996-2006.

The sources of this growth, a positive net flow into the working population of some 26,000 undergraduate degree holders per year, are complex. Demographic replacement accounts for some of it. Younger Hong Kong residents are more likely to hold undergraduate degrees than their parents or grandparents. Well under 10% of those aged 60-64 years who were in the labor force in 1996, for instance, held such degrees, compared with almost 30% of their counterparts two generations later (those aged 25-29 years who were in the labor force in 2006). However, we find rising levels of educational attainment within many such cohorts as well. For instance, a higher percentage of those aged 50-54 who were in the labor force in 2006 held undergraduate degrees than of those aged 40-44 who were in the labor force in 1996. The same pattern holds for all the younger cohorts in these years as well.

The UGC-funded programs of Hong Kong's most prestigious higher education institutions have made a steady contribution to educating the traditional university-age cohort, producing about 15,000 undergraduate degrees per year since 1997. The growth rate has been less than 1% per year.⁵ Undergraduate degree programs not funded by UGC have grown more rapidly. They now amount to some 5,000 annually, up from about 2000 ten years ago.⁶ The institutions granting these degrees include the self-financing arms of UGC-funded institutions and five others that receive no UGC support.

The rest of the inflow is comprised (1) of Hong Kong people obtaining degrees abroad and later returning home and (2) of immigrants and temporary residents. The latter group is easier to estimate. The General Employment Policy (GEP) for immigration for the purpose of high-skill work has grown by about 50% in recent years, from about 15,000 annually in the late 1990s to almost 22,000 in 2006.⁷ About three-quarters of these workers are in occupations that are highly likely to require a university education. High-skill immigration from mainland China is handled through the Admission Scheme for Mainland Talents and Professionals (ASMTP), which was

⁵ UGC degree figures were provided by Ms. Jenny Yip of UGC on November 10, 2008.

⁶ This estimate is calculated from the UGC figures referenced above and *Hong Kong as a Knowledge-Based Economy* (Census and Statistics Department, 2007), P51.

⁷ These figures were provided by the Immigration Department on October 29, 2008. The 2007 figure was well over 26,000, and arrivals in 2008 through September were on pace to surpass that figure by several thousand.

initiated in 2003. In 2006, about 5000 mainlanders were admitted under this program, virtually all of whom hold an undergraduate degree.⁸

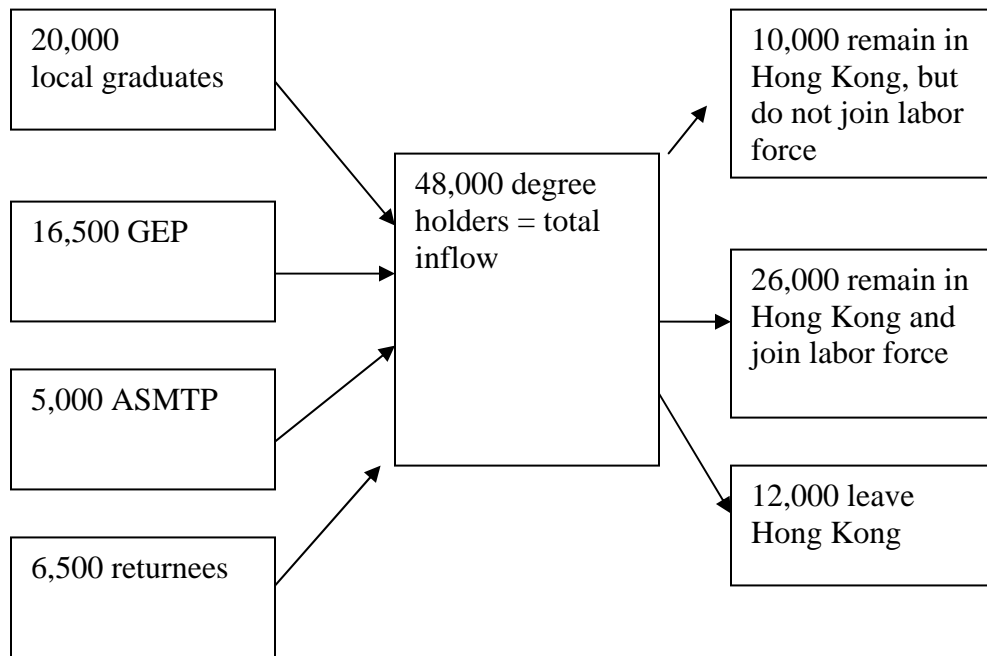
We can calculate only indirectly and roughly the number of those who leave Hong Kong to get a university degree and then later return. Relying primarily on census data, we estimate that about 6,500 such individuals returned each year between 2001 and 2006. This figure is somewhat lower than that of the previous five year period (1996-2001), which may be accounted for by the uncertainty that attended the 1997 transition to Chinese sovereignty and its positive resolution, which encouraged return in the post-1997 period.

We do not have direct evidence about departures from Hong Kong of university degree holders, whether Hong Kong- or mainland-born or otherwise. Our estimates of the inflows to the resident population for 2006 add up to about 48,000 (20,000 from local universities, 16,500 under the GEP, 5,000 under ASMTP, and 6,500 returnees with non-local degrees). (See Figure 2.) If we assume, conservatively, that 80% (38,000) of this inflow to the resident population joins the working population, we can estimate very imprecisely that about 12,000 degree holders depart each year, based on an annual growth in the working population of about 26,000 undergraduate degree holders.⁹

⁸ As we discuss below, Hong Kong recently instituted a program that will permit mainland-born graduates of Hong Kong universities access to the Hong Kong labor market. This channel was too small to be accounted for in the text, but may grow rapidly in the future.

⁹ Some of the local undergraduate degree recipients and returnees may go to graduate school, be unemployed, work without pay in the home, or be retired. However, those admitted under the GEP and ASMTP are expected to be working as a condition of their admission. The *Hong Kong Yearbook* estimates emigration, including all levels of education, to be about 10,000 per year. However, recent graduates who go abroad, presumably temporarily, may not be included in this figure.

Figure 2: Estimated Flows of Undergraduate Degree Holders in 2006



We can conclude that Hong Kong has accumulated general human resources, as measured by its university-educated population, steadily and rapidly over the past decade. The growth has been made possible by the SAR's liberal immigration policy, the willingness of its residents to travel (and pay) for higher education abroad, and the emergence of self-financing degree-granting institutions.

Human capital theory argues that investments in education are recouped through higher earning power over the entire lifecycle. We do not have long-run data to test this proposition. However, we can look at short-term indicators of demand that may provide insight into whether Hong Kong people will continue to make investments in their own human capital.

These data generally suggest that they will.¹⁰ Employment of undergraduate degree holders, for example, has grown steadily each year in recent years. Unemployment amongst this group has trended down and, as of the end of 2007, was about 2%. Cross-sectional income data from the census show that the gap between those who have attended university degree courses and those who have not widened considerably between 1996 and 2006.¹¹ Time-series income data, on the other hand,

¹⁰ Data on income, employment, and unemployment in this paragraph are drawn from the General Household Survey. Similar data in later sub-sections also rely on this source.

¹¹ The survey does not distinguish between those who attended degree programs and those who ultimately received a degree.

inject a note of caution on this issue. During the late 1990s boom, the earned incomes of the highly-educated went up, but these gains were largely given up during the recession of the early 2000s. Indeed, some in this group, especially those earning the highest incomes before the recession, may still be worse off today than they were in 2001.

Two simple extrapolations provide a sense of the impact if the ten-year trend in growth of undergraduate degree holders were to continue into the future. If the growth rate of 5.5% per year was maintained, the number of Hong Kong workers holding an undergraduate degree would double in about thirteen years. A more conservative approach, using a simple linear projection, predicts a rise of about 50% in this population over this period. Of course, many other factors, from Hong Kong's low birth rate to the potential for expanded immigration from the mainland to the evolving structure of the Hong Kong economy, would need to be considered to assess whether basic "business-as-usual" scenarios like these would be realized.¹²

International comparisons provide another lens through which to view Hong Kong's position. To be sure, such comparisons are rough, due to differences among statistical authorities in their classification schemes and data collection methods. Still, allowing a substantial cushion for error, these comparisons suggest that Hong Kong would need to sustain and perhaps accelerate its human capital accumulation process if it were to seek to match other "global cities" and other small, rapidly-growing "tiger" economies. For instance, among large cities in the Asia-Pacific region and global financial centers, Hong Kong's share of tertiary-educated population lies in the same tier (10-15%) as Beijing, Shanghai, and Singapore. It lags significantly behind Vancouver and Tokyo (20-25%) and far behind Taipei, New York, San Francisco, and London (30-35%). Hong Kong also seems to be a few years behind the economies of Taiwan and Ireland in this respect. About 30% of those economies' adult populations have some tertiary education, although the share of undergraduate degree holders is smaller than that. Investors may be interested in the size of the talent pool as well as its composition. Viewed this way, Hong Kong is comparable to Taipei and more attractive than Singapore.¹³

As we will discuss in more detail below, higher education in Hong Kong confronts a tension between positive trends, even higher aspirations, and institutional and political constraints. The SAR's recent accomplishments are impressive. But, given the sources of growth in the recent period, pushing the pace – and perhaps even maintaining it – may force policy-makers to confront difficult trade-offs.

¹² The Hong Kong Education and Manpower Bureau is expected to complete soon a labor force projection based on a major modeling effort.

¹³ These figures should be treated with caution. In particular, we would stress that the degree to which they capture economic regions of differing sizes and compositions as well as variations in definitions and methods. Some observers also suggest that data on degree holders in mainland China are inflated.

III.2 Educational Attainment: Tertiary Degrees, Science and Technology Fields

Science and technology (S&T) are important resources that innovation-oriented industries must draw upon. Specialists in S&T fields are required to generate discoveries, inventions, and new products and processes. To an important degree, these specialists are also necessary to effectively use S&T generated elsewhere. Advanced training in S&T fields creates a pool of talent that can participate in these tasks.

The reader should note that there is a substantial difference between those who receive training in S&T fields and those employed in S&T-related occupations. Many who hold S&T degrees do not work in S&T-related occupations; some who work in S&T occupations do not have educational backgrounds in S&T fields. Occupational data are explored below.

The number of Hong Kong workers with undergraduate degrees in S&T fields¹⁴ grew at roughly the same rate as that of the broader tertiary-educated working population. We estimate that the total rose by about 62% between 1996 and 2006, an annualized growth rate of about 5% (compared with 5.5% for degrees in all fields).¹⁵ As Figure 3 shows, the share of S&T undergraduate degree holders in the working population rose over this period from 4.9% to 7.2%. Although the number of females within this population grew at a slightly faster pace than the number of males, the female share remained below a third in 2006.

Figure 3: S&T degree holders and share in working population

Education Attainment	1996	2001	2006
S&T degree holders in working population	148500 (est.)	198720	241114
Working population	3043698	3252706	3365736
Share (S&T / working population)	4.9%	6.1%	7.2%

Source: Hong Kong By-Census, 1996-2006.

Some in Hong Kong have expressed concern that recent graduates are less inclined to select S&T fields than in the past. Census data do not confirm these fears, however. If anything, younger people who have received an undergraduate degree are slightly more likely to hold it in an S&T field than their older counterparts.

The annual net inflow to the population in Hong Kong holding an S&T undergraduate degree averaged about 9300 over this decade.¹⁶ The annual contribution of UGC-funded programs is not far from that. It rose from about 8200 in 1997 to 9600 in 2004, before declining slightly to about 8600 in 2007. We do not have specific data on

¹⁴ We include in these totals the census categories of life sciences, physical sciences, mathematics and statistics, computing, health, architecture, environmental protection, construction, engineering (civil, structural, mechanical, marine, production, industrial, chemical, electrical, and electronic), and textiles and clothing technology.

¹⁵ The ratio of degree holders to degree attendees in the 2001 and 2006 censuses is slightly higher for S&T degrees (about 93%) than for all degrees (91%). We use this figure to estimate the 1996 population of degree holders, which was not included in that year's by-census.

¹⁶ UGC categories included in this total are medicine, sciences, and engineering.

the contributions of non-UGC-funded institutions to this pool, but our impression is that the contributions are smaller in these fields than in others, such as business. The 2006 census shows that there were about 39,000 holders of S&T degrees from local institutions in the 25-29 age group, which compares to over 46,500 graduates with S&T degrees from UGC-funded institutions in the 1999-2003 period.

The difference in these two figures implies that quite a few graduates from UGC-funded institutions in S&T fields did not join the working population or left Hong Kong between the time of graduation and the 2006 census.¹⁷ Data on in-migration of S&T undergraduate degree holders into the resident population seem to confirm the point. About 2500 Hong Kong-born S&T undergraduate degree holders returned annually between 2001 and 2006. About 3000 foreign-born S&T undergraduate degree holders per year, who had not lived in Hong Kong in 2001, were living there in 2006.¹⁸

Labor market data are somewhat less encouraging for graduates of S&T fields than for undergraduate degree holders in general. The share of S&T degree holders among all degree holders in the working population declined slightly between 1996 and 2006, from 40.4% to 38.4%, which means that their employment growth was less rapid. Salaries, at least since 2000, have not kept up, according to UGC and census figures. Starting salaries for graduates of UGC-funded undergraduate programs across all S&T fields peaked in that year. As of 2006, they still stood about 10% below the peak and lagged behind other fields. Of course, these short-run data are imperfect proxies for the perceptions of opportunities of the entire lifecycle that human capital theory suggests drive students' decisions about their major field. Perhaps more importantly, these data aggregate across a wide range of fields. Faculty members and employers interviewed for this project suggest that there may be shortages in specific sub-disciplines of engineering.

Since the trends are the same among S&T degree holders as the broader tertiary-educated population, our projections are similar. The doubling time based on growth rates, for instance, is fourteen years for S&T degree holders (compared to 13 for all degree holders). International comparisons for this indicator are limited to only two other cities and must be taken only as suggestive, due to definitional differences and varying dates of data collection. Measured as a share of the population, Hong Kong's S&T talent pool is about the same as Singapore's, but it lags far behind Vancouver's. However, in absolute size – which may be important to investors concerned about recruiting an S&T workforce -- Hong Kong's pool of S&T undergraduate degree holders is significantly larger than Singapore's.

Our analysis of the limited data on S&T degree recipients varies slightly from our analysis of higher education as a whole. Both supply and demand in S&T fields have lagged slightly behind all fields combined, with demand a bit weaker than supply. These findings suggest that any concerted effort to expand S&T enrollments among

¹⁷ Some portion of the difference is surely accounted for by differences in definitions between census and UGC data.

¹⁸ To elaborate briefly, the 5500 persons referred to in this paragraph are in the resident population, rather than the working population. If we assign 80% of them to the working population (as in figure 2), we have a 4400 person inflow. The total annual growth in the population is 9300 and the annual inflow from UGC-funded institutions is 9000, leaving a gap between total growth and the two sources of inflow of about 4000. However, the definition of fields in census and UGC data do not match precisely, so measurement problems may explain some or all of the gap.

undergraduates should be undertaken carefully. The occupational payoff from such an educational investment might be limited unless S&T graduates’ salaries grow faster as well, since those trained in these fields may choose other fields upon graduation. As one interviewee put it, many such graduates already go into financial services and “never look back.”

III.3 Occupational Status: Professionals and Managers

While tertiary education may prepare people to engage in knowledge-based work, they may choose not to undertake such work or be unable to find it. More important, some of those whose occupations involve considerable autonomous judgment and creativity have gained these skills through their work and life experiences, rather than through formal schooling. Thus, although there is overlap between them, occupational status data provide a perspective complementary to that of educational attainment data.

We focus in this sub-section on high occupational status (HOS), which includes all jobs classified as managers and administrators, professionals, and associate professionals. About 1.1 million Hong Kong residents held such positions in 2006, accounting for about a third of all workers. (See Figure 4) The growth rate of these occupations over the past ten years was about 2.2% per year, somewhat faster than that of the labor force as a whole, but much slower than that of the tertiary-educated population.

Figure 4: High Occupational Status (HOS)

Year	Total HOS	Total employment	Share
1996	890046	3043698	29.2%
2001	1028133	3252706	31.6%
2006	1109635	3365736	33.0%

Source: Hong Kong By-Census, 1996-2006.

Despite the large difference in the growth rates of the two indicators, the HOS population remains much bigger than that of the tertiary-educated. About 43% of Hong Kong residents holding HOS positions in 2006 had received undergraduate degrees, up from an estimated 33% in 1996. The higher educational attainment in the HOS workforce reflects the replacement of older, less educated workers by their better educated children and grandchildren.¹⁹ On the other hand, of all undergraduate degree holders in the working population in 2006, about 77% held HOS positions, a decline of about 5 percentage points from five years earlier. In addition, the bulk of the growth in HOS positions over the past decade – almost 80% of it – has been among associate professionals; the number of managers and administrators, as measured by the census, actually shrank during that period.²⁰

¹⁹ This replacement process includes both males and females. Females accounted for about 40% of the HOS working population in 2006, and the female share has grown steadily since 1996 across all subcategories of this population.

²⁰ The General Household Survey shows more balanced growth among the three components of HOS. Since 2001, the population of managers and administrators as measured by the GHS has grown by more than 100,000, whereas the census shows a growth of only about 12,000.

Growth in the HOS population is not even over time. In the year of its most rapid expansion (according to the General Household Survey), it added about 85,000 Hong Kong residents, while in lean times, it shrank. Although the average net inflow between 1996 and 2006 was 20-25 thousand per year, the short-term fluctuations make it difficult to account for the flows into and out of HOS positions with much precision. We can say with some confidence that the cumulative growth is almost entirely among the Hong Kong-born. The number of foreign-born and mainland-born residents in HOS positions declined slightly between 1996 and 2006. Hong Kong-born residents in such positions numbered about 40% more in 2006 than in 1996.

The in-migration pattern of holders of HOS positions has been stable. About 6% of this group reported living outside Hong Kong five years earlier in both 2001 and 2006. Among HOS position-holders who held undergraduate degrees, there was a very large growth in the number holding non-local and distance learning degrees, relative to those holding local degrees, between 2001 and 2006. This may be interpreted as a promising sign that Hong Kong is effectively attracting back students who go abroad for university, or as an indicator that the talent pool for local universities to draw upon in recruiting students (who would otherwise go abroad) is deeper than some think.

The annual fluctuations in HOS positions point to an important difference between the educational and occupational approaches to assessing the Hong Kong talent pool. A degree takes a long time to complete, while a new job title can be gained overnight. The HOS population is therefore much more elastic than the population holding an undergraduate degree, and it responds more quickly and directly to economic incentives.

Our findings about economic incentives are interesting. Salary indices for HOS positions have risen fairly steadily over the past decade or so, particularly if one looks at career paths, rather than at starting salaries.²¹ However, a closer look within this population (using census data) shows that the incomes of managers and administrators rose more than those of professionals and associate professionals and sustained their gains through the recession of the early 2000s. This difference may indicate a shortage of managers and administrators, especially in light of the fact that the size of this group shrank slightly during these years. Unemployment is also extraordinarily low (1% or below) among managers and administrators and among professionals.

At its current rate of growth, the doubling time for the HOS population is about 30 years, about twice as fast as the working population as a whole. More rapid growth would depend on both the overall pace of economic growth and the structure and composition of Hong Kong enterprises. Other things being equal, a more rapidly expanding pool of highly-educated workers might also enable such an acceleration, although the correlation between HOS and educational attainment is imperfect.

International comparisons using occupational data are somewhat more favorable to Hong Kong than those using educational data. Relative to other Asia-Pacific and “global cities,” the share of Hong Kong’s labor force that holds HOS positions is quite a bit larger than Beijing’s and on a par with Singapore’s. It is about half the size of London, New York, and San Francisco. It is also roughly the same share as those of

²¹ *Hong Kong Social and Economic Trends, 2001-2007; 2007 Report of Salaries and Employee Benefits.*

Taiwan, Ireland, and Israel, economies which have become centers of high-technology industry in recent years.

Data on high occupational status show that Hong Kong employers have been able to fill most HOS positions, even though the pool of degree-holding workers is not that large relative to their needs. Although the overall trend for HOS employment is positive, employers reduce HOS headcount with alacrity when the Hong Kong economy slows. This pattern seems to characterize associate professionals especially, who comprise most of the HOS group. We would expect it to continue, since the degree-holding population continues to grow quite rapidly. Managers and administrators, particularly at the top level, have been harder to find, and their lack of availability may be a constraint on growth. This finding may imply that any policy program should emphasize practical experience and managerial training as well as general and technical education.

III.4 Occupational Status: S&T-Related Occupations

The S&T workforce can be defined in many ways. The U.S. National Science Board provides estimates for the U.S. that vary by a factor of four (from five to twenty million), based on differing combinations of educational attainment and occupational status. (U.S. National Science Board 2008) Far more Americans hold an S&T degree as their highest degree than work in S&T jobs. To the best of our knowledge, the Hong Kong government does not compile estimates of the S&T working population that are comparable to those of the U.S.

However, the SAR does gather data on two occupational groups that are important components of an economy capable of supporting innovation. Research and development (R&D) personnel perform the functions of discovering new scientific knowledge, improving production processes, and generating new products. It is important to note that other workers who are *not* accounted for in R&D may also perform these functions, especially in the service sector. The figures reported in this section should be seen as indicative, rather than definitive. A similar caveat applies to the high-skill IT workforce, which is the second indicator that we focus on here. Many workers other than those whose job title places them in this category may modify or improve IT systems.²²

Hong Kong's R&D workforce has been growing very rapidly and steadily, especially since 2000. Between 1998 and 2006, it grew by 154%, a growth rate of about 12% per year, to about 23,000.²³ The R&D workforce employed by Hong Kong businesses (as opposed to government or higher education) accounted for the lion's share of this growth. From less than half the size of the academic R&D workforce in 1998, the business R&D workforce grew at a rate of more than 20% annually and by 2006 was about a quarter larger.²⁴ These impressive growth rates must be understood in the context of a low base period. As a share of the total working population, R&D workers grew from about .3% to about .7%.

²² High skill information technology (IT) workers cover personnel working in areas of IT/software development; IT sales; telecommunications and networking; IT education and training; general IT management; field support; systems programming; database; and IT security.

²³ Census and Statistics Department, *Research and Development Statistics of Hong Kong*, various years. Data before 1998 are not publicly available. From 2000 to 2006, the growth rate was over 15% per year.

²⁴ Between 2000 and 2006, the rate of growth in business R&D personnel was about 30% per year.

The high-skill IT workforce grew by almost 70% between 1996 and 2000, but it has declined a bit in the years since then, to about 52,000 in 2006. These occupations represented 1.1% of the labor force in 1996 and 1.5% a decade later, after a peak in 2000 at 1.7%.²⁵ Males dominate both the R&D and high-skill IT workforces, accounting for about 90% of the former and 80% of the latter.

We have relatively little data about the flows into and out of the R&D workforce. R&D occupations are more likely to be filled by those who have graduate degrees than other occupations. The research-intensive universities of Hong Kong awarded 1351 research-based graduate degrees in S&T fields in 2007, more than twice the 640 awarded in 1997. Census data for 2001 and 2006 suggest that roughly a third of R&D workers in Hong Kong during those years received their highest degrees outside of the SAR, but only about 10% reported that they had lived outside of Hong Kong five years earlier. The vast majority of these positions are filled by Hong Kong-born permanent residents.²⁶

High-skill IT workers have less need for formal education than R&D workers. Only about half of IT/computer professionals and associate professionals, as classified by the 2006 census, held undergraduate degrees, compared to approximately three-quarters of R&D workers.²⁷ The late 1990s boom seems to have prompted a large number of Hong Kong residents – more than 60,000 – to acquire some advanced training, although not necessarily a degree, in the IT/computing field. This figure is far greater than the growth in the high-skill IT work force, which was less than 20,000. Undergraduate degrees in IT programs funded by the UGC numbered about 1400 in 1997, hit a peak of almost 2000 in 2003, and sagged to about 1750 in 2006.²⁸ The cumulative ten-year total is just over 17,000 undergraduate degrees, but the timing of this production does not match the growth of the high-skill IT work force, which peaked in 2000.

As it does for the R&D workforce, in-migration plays a modest role for the high-skill IT work force. Only a tiny fraction (well under 5%) of this group in either of the two census years were not permanent residents of Hong Kong. Of those that held at least an undergraduate degree, about a third received their highest degree abroad.

We have limited data on the demand for R&D and high-skill IT workers. Annual surveys suggest that the market for R&D talent is fairly tight. In 2004, about 20-25% of Hong Kong establishments identified lack of qualified personnel as an important barrier to innovation, although this number declined to 10-15% in 2006.²⁹ R&D jobs also pay quite well, with 40% of workers in the field reporting incomes of over HK\$40,000 in 2001. However, this share shrank to just under 30% in 2006. IT workers also suffered income declines in the 2001-2006 time frame, as one might anticipate given the decline in employment.³⁰

²⁵ Census and Statistics Department, *Hong Kong as a Knowledge-Based Economy* (2007).

²⁶ It is very important to note that the definition that we provided to the Census for these R&D workforce data cover “Physical, Mathematical and Engineering Science Professionals” only. We therefore use only proportions and urge caution in interpreting these data.

²⁷ Please note that the census data used here may not match precisely the definition of high-skill IT worker used in the reports from which we derive other figures in this section. We use the occupations listed in the text: “IT/computer professionals and associate professionals.”

²⁸ Census and Statistics Department, *Hong Kong as an Information Society*, 2001 and 2007 editions.

²⁹ *Annual Survey of Innovation Activities in the Business Sector, 2001-2006*

³⁰ For further detail and a different perspective on the IT workforce, please see Mei-Chih Hu’s paper in this volume.

Looking forward, if the growth rate from 1998 to 2006 were to be maintained until 2012, Hong Kong's R&D workforce would double. Assuming that the overall working population of Hong Kong continues to grow at the same rate as in the past (1%), R&D's share would grow to almost 1.3%. This figure approximately matches the 2005 R&D share of the working populations of Beijing and Singapore and is slightly less than Taiwan's 1.5%. We have no internationally comparable figures for the high-skill IT workforce.

IV. Expanding the Pool: Policy Options

Our review of the data reveals that Hong Kong has been accumulating human resources, both general and specialized to science and technology, at a relatively rapid rate in the past decade. The demand for this talent kept pace reasonably well overall, although income data suggest some softness in recent years. There is evidence of a talent shortage only in a few specific categories, notably (in our review) for managerial, executive and R&D positions and (anecdotally) for certain engineering specialties (which our data are too coarse to confirm). These trends reflect the private decisions of individuals and employers, but also the attention that has been paid to human resource issues, such as higher education and immigration, by Hong Kong's public policy-makers. "The government," wrote the Commission on Strategic Development in 2007, "strongly believes that a larger pool of talent will increase our competitiveness, make Hong Kong more prosperous, attract more capital, and create more jobs." (CSD 2007, 5)³¹

Although the trends point in the right direction and the gap seems to be closing, Hong Kong's talent pool still trails the leading "global cities" with which it is often compared. The region appears to be keeping up, broadly speaking, with its competitors in East Asia, but these competitors are developing quite rapidly themselves. The dynamic nature of international competition and the aspirations of the Hong Kong population suggest that policy-makers ought to continue to focus on the human resources agenda as a key part of Hong Kong's economic development strategy. Merely maintaining the momentum of the past decade will present challenges, and these challenges would be heightened if the government seeks to accelerate the human capital formation process.

We discuss in this section a variety of options that the government might employ to bolster higher education and high-skill immigration. We want to be quite clear that our endorsement of any specific proposals, much less a full-fledged "supply push" approach, would depend on their being embedded in a coherent broader package that incorporates demand considerations as well. Particularly for specialized fields, an intensive supply push would be risky without an equally intensive commitment to complementary policies that would facilitate job creation in these fields. A systematic approach of this sort requires careful policy coordination.

IV.1 Higher Education

Traditional universities have a central role to play in any human resource development policy. They also present distinct challenges for policy-makers. Their

³¹ In his November 2007 visit to Hong Kong, Chinese Premier Wen Jiabao also called upon Hong Kong to boost its efforts in this area.

capital facilities, especially for science and technology fields, are expensive, long-lived assets. Faculty hiring also represents a long-term commitment. Academic programs tend therefore to acquire inertia that insulates them somewhat from shifts in labor market demand and student interests. Hong Kong's demographics sharpen the challenge; the number of high school graduates in 2020 is projected to be just half that of today. (Olsen and Burges 2007) There are, of course, non-traditional modes of delivering higher education, often to non-traditional students, that can fill many human resource needs. Hong Kong has relied heavily on these in recent years, as we discuss in the end of this subsection.

The eight UGC-funded institutions, especially the four that rank in the global top 200 list for 2008 compiled by the *Times*,³² are the most important sources of elite talent for Hong Kong. Their prestige constitutes a capital asset that must be preserved. Dilution of quality is worth worrying about. But such concern can easily lead to excessive conservatism in a dynamic environment that calls for continual change.

We are not implying that Hong Kong's higher education system has fallen into this trap. HKUST's founding just seventeen years ago, for instance, was a bold move that has paid off splendidly. It ranked 39th on this year's *Times* list. A very different kind of shift in the higher education system is currently in prospect. The UGC-funded institutions will move in 2012 from a three year to a four year undergraduate degree, "a daunting task," in the words of UGC deputy secretary-general Kesson Lee. Nearly 1000 new academic staff are being hired in preparation for this shift.³³

As we noted in the previous section, the number of graduates from UGC-funded institutions has not grown very much in the recent past. For undergraduate degrees, the growth rate has been only about .7% per year over the past decade. While expansion of the graduating class would create numerous additional challenges – physical, fiscal, and managerial – on top of those faced in moving to a four year system, we suggest that it be given careful consideration. An additional 4000 graduates per year (on a current base of about 16,000) would require the growth rate to roughly triple for a ten year period.

If we imagine such a program being carried out by 2020, UGC-funded institutions could in principle enroll almost half of Hong Kong's shrinking population of 18 year olds. It may reasonably be argued that reaching this deep into the pool of high school leavers would compromise quality. Students from the mainland are an obvious alternative. They currently make up about 8% of undergraduates at UGC-funded institutions, a figure which might need to triple or quadruple under this scenario. That would mean raising or eliminating the 20% quota on non-local enrollment, which was raised from 10% only in 2006.

Given the size of the mainland population, this approach seems likely to address any concern about student quality. Hong Kong's universities would have to compete for the top mainland students with the rest of the world's great universities. Hong Kong's universities have great strengths, such as prestige, proximity, linguistic commonality, and post-graduation career opportunities, to draw upon in such a competition. The SAR

³² The universities listed are Hong Kong University (#26), HKUST (#39), Chinese University (#42), and City University (#147). "University Top 200 in Full," *Times Online*, October 9, 2008.

³³ David Mowery's paper in this volume addresses the question of how these additional staff might be allocated across fields.

government may want to encourage stronger linkages between Hong Kong and mainland universities in order to facilitate recruitment and improve the educational experience.

Some mainland students may need public financial support in order to attend Hong Kong universities, and Hong Kong taxpayers may resist providing it. One justification for such subsidies would be the future contributions that many of these students will ultimately make to the Hong Kong economy. In fact, subsidies to mainland students might be made conditional upon post-graduation work in Hong Kong. Hong Kong has begun to permit non-local graduates of its accredited universities to stay for up to a year after finishing their degrees to look for a job. If they remain employed, they can stay on indefinitely. Using the university system as a mechanism to facilitate skilled migration seems to be an effective policy for Australia and (less explicitly) the U.S. This strategy allows potential immigrants to become socialized, and it provides a screening tool for the receiving country as well.

Some 2% of the undergraduate population of UGC-funded institutions currently comes from outside Hong Kong and China. Although this group may be more difficult to recruit and to induce to work in Hong Kong after graduation, it has other attributes that may justify a more aggressive outreach effort. To the extent that Hong Kong's economic advantage lies in linking China to the rest of the world, and vice-versa, these students may contribute by creating long-lasting social connections with their local and mainland colleagues. These students also strengthen the cosmopolitan outlook of Hong Kong's great universities, which is essential to a high quality educational experience in an age of globalization.

With respect to the disciplinary composition of degree recipients, our view is generally consistent with the current policy, which is to let it be driven largely by student demand. But, as we have noted, lags and path dependencies help to shape demand, especially in the S&T fields, which are more capital-intensive than others. (In other words, students may choose their majors on the basis of the available facilities, rather than their true interests or opportunities.) Hong Kong has been rapidly expanding its capital investment for research training, as evidenced by the more than doubling of research-based graduate degrees awarded in 2007 compared to 1997 and the announced addition of some 40% (800) more places. These moves should go some considerable way toward alleviating shortages in R&D personnel. Some measures targeted at drawing women into S&T fields might also be valuable, given the extreme gender imbalance in the R&D workforce. Continued expansion of S&T fields at the graduate level would make sense if Hong Kong's broader economic strategy emphasizes R&D-intensive industries and the R&D service sector itself. Undergraduate enrollments have not changed nearly as much as graduate enrollments, but the growth of research capacity overall suggests that a future surge in undergraduate demand might be accommodated fairly easily if it should materialize.

Much of the growth in the provision of undergraduate education in the past decade has occurred without UGC funding, although the providers are often arms of UGC-funded institutions. Self-financed sub-degrees, in particular, have experienced "phenomenal" growth. (Education and Manpower Bureau 2006) What seem to be in short supply are so-called "top up" programs that allow individuals with some undergraduate education to complete their degrees. During the 2007-2008 academic year, for instance, there were nearly nine times as many places available in self-financed

subdegree programs as in self-financed degree programs.³⁴ Government policy seems to envision the sub-degree as a terminal degree, but that is not how many sub-degree holders and sub-degree seekers perceive it.

It seems sensible to encourage Hong Kong's colleges and universities, both public and private, to expand their capacity to meet this emerging, self-financed demand. The government (or appropriate educational organizations) may need to articulate the regulatory framework that governs such matters as accreditation, transfer of credits, and experiential learning.³⁵ Such a framework will be valuable to non-traditional students who return to school later in life as well as university-age students who first move through sub-degree programs. In the absence of opportunities to pursue "top up" degrees in Hong Kong, some ambitions will be stifled, while many of those with the means to do so will go abroad.

IV.2 Immigration

Immigration is the second major source of human resources that Hong Kong might draw upon. Siu *et al.* (2005) note the city's historical dependence upon this source, originating as a "space of flow" with porous boundaries. They also stress that "global cities" like New York and London rely on "continuous circulation" of population to remain economically vibrant. Like these cities, Hong Kong has long been relatively open to long-distance migration from the rest of the world. Circulation between Hong Kong and its nearby hinterland on the mainland, by contrast, was disrupted for many decades and has only recently begun to bear a faint resemblance to that of, say, London to the rest of England. The more aggressively Hong Kong seeks to build up its human resource base, the more rapidly the balance of flows from China on the one hand, and from the rest of the world on the other, is likely to tip toward China. This shift will test popular attitudes about immigration.

Before we consider immigration policy options with respect to the mainland and the rest of the world, we will briefly mention a third potential source of human resource inflows, the Hong Kong diaspora. We estimated in the previous section that 6,500 Hong Kong-born undergraduate degree holders returned to the SAR annually between 2001 and 2006. Olsen and Burges (2007, 7) estimate that about 9,000 students from Hong Kong begin undergraduate work abroad each year, although this number may well grow as more seek "top up" degrees abroad. These figures are a tiny fraction of the total stock of skilled Hong Kong expatriates in OECD countries, which was estimated to be over 290,000 in 2000. (Docquier and Marfouk 2004)

Undoubtedly, many of these people are long-settled and have no interest in returning to Hong Kong. But perhaps some do or could be enticed to. A number of other Asian economies, including Taiwan and South Korea, have benefited greatly from return migration, including migrants who had been away from their home country for decades. (Saxenian 2006) Return migration to these countries has been encouraged by public policy. To our knowledge, the SAR government has no policy toward the diaspora and very little information about it. Data gathering would be a minimal first step in order to

³⁴ *Hong Kong Yearbook, 2007*. Combining self-funded programs with publicly-funded programs, there are about twice as many places for subdegrees as for degrees.

³⁵ Vivek Wadhwa's paper in this volume addresses continuing education in the workplace.

allow the government to assess whether more extensive measures, such as outreach and the provision of incentives to return, might be worthwhile.³⁶

Hong Kong's immigration policy toward the mainland must be viewed in light of its troubled history. The ideological conflict between the British colonial government and the People's Republic and the vast gulf in living standards between Hong Kong and the mainland have inevitably left a complex legacy. One aspect of this legacy is an Immigration Department whose historic core competence is exclusion. Public opinion, too, has historically been skeptical about immigration from the mainland and occasionally alarmed about it. (Of course, many Hong Kong people have family ties to the mainland that temper these views.)

The notion that human resource considerations ought to shape immigration policy toward the mainland is a relatively new idea, which has taken some time to penetrate these obstacles. A series of programs in the late 1990s and early 2000s that focused on particular occupations and industrial sectors drew in (at most) only a few hundred people annually, just a few percentage points of Hong Kong's skilled immigration from the rest of the world, admitted under the GEP. (Siu *et al.*, 130 and table 3.3.6) In 2003, the mainland-oriented programs were consolidated into the ASMTP, which is not restricted by occupation or sector. ASMTP has grown to about a quarter the size of GEP now.³⁷

ASMTP is a demand-driven approach. A Hong Kong employer who wishes to hire a skilled mainlander must demonstrate that the new hire's skills, knowledge, or experience are not readily available in the Hong Kong labor market. The compensation package must be commensurate with local norms. The vast majority of applications under the ASMTP are approved, about half of them for academic positions. The new program for non-local graduates of Hong Kong universities has a similar design.

The design is a good one for general human resource development, facilitating access to the large mainland talent pool without crowding Hong Kong residents out of opportunities. However, it is possible that demand to immigrate is somewhat suppressed, as a result of the history described above. Continued positive experience with skilled immigration from the mainland ought to provide an impetus toward further growth, in the context of a public that is "less resistant, but not yet supportive," in the words of Immigration Department deputy director David Chiu.

The Hong Kong government added a modest supply-push component to skilled immigration policy in 2006, the Qualified Migrant Admission Scheme. Like comparable programs in Canada, Australia, and elsewhere, individual applicants earn "points" toward admission on the basis of attributes such as age, education, work experience, and language. The initial response to this opportunity was far below the quota of 1,000 per year; only 322 applicants were accepted in the first year and a half. About 60% of those accepted were mainlanders. The point scheme was revised in early 2008, in part to dispel the perception that QMAS applied only to Nobel prize-winners, Olympic medalists, and entertainment superstars, such as the pianist Lang Lang.

³⁶ Douglas Fuller's paper in this volume argues that the chip industry in Hong Kong would benefit from an effort to reach out to the Hong Kong diaspora in Silicon Valley.

³⁷ An additional 200-300 mainland passport holders who have been living abroad for at least a year are admitted annually under the "Relaxed Scheme," which adheres to the same conditions as ASMTP. And, about the same number are admitted under a similar policy that applies to mainland graduates of Hong Kong universities who left Hong Kong after graduation. (CSD 26 January 2007, 8)

Another potential deterrent for applicants under QMAS is the discretionary nature of the decision. In “point” systems abroad, surpassing a set threshold earns admission. In Hong Kong, the Immigration Department and any expert advisors that it chooses to engage decide each case individually. In principle, this set-up may allow this supply-push policy to be coordinated with the broader economic development strategy, as we have urged in this paper. In practice, the program has so far been too small to make a difference. If a broader policy aimed at improving innovation in Hong Kong is enacted, the QMAS could provide the foundation for an associated human resource thrust, particularly if the expert advisors are knowledgeable about the strategy and given more authority over admission decisions.

The GEP is a demand-driven immigration policy that applies to skilled immigrants from other countries. The structure of the program is similar to that of the ASMTP, except that the applicant is the employee, rather than the employer. Although admissions under this policy have generally grown over time, they declined in 2002 and 2003, suggesting that applications do indeed reflect demand. Some interviewees expressed concern that broad quality of life considerations, such as education for school-age children and environmental pollution, were a deterrent to some potential in-migrants.

Some interviewees also suggested that the Hong Kong government should make a greater effort to promote in-migration opportunities in the world’s talent centers. One characterized the current policy as “sit and wait.” We have not looked into this issue in any detail but would offer the suggestion that the major responsibility for any such promotional effort not be vested in the Immigration Department. It performs its core functions with exceptional efficiency. Promotion of opportunities is, to some extent, at odds with these functions. Invest HK, which promotes inward investment in the SAR, is a logical alternative agency for this assignment.

This brings us to our final point in this section. An effective human resource development policy depends on adequate coordination of a variety of agencies and organizations that perform very different functions, but whose collective efforts have a profound effect on Hong Kong’s talent pool. If Hong Kong departs further from its tradition of “positive non-intervention” by pursuing an innovation-oriented economic strategy, the policy coordination challenge will be heightened. Matching future human resources, produced by higher education institutions and immigration policies, to future demand, produced by investments in R&D and the like, may require the government’s central administration to be strengthened.

V. Conclusion

Hong Kong has made impressive strides in building up its talent base over the past decade. Growth in both general and specialized human resources, as measured by undergraduate degree holders in all fields and in S&T fields, has been strong, and the expansion of the R&D working population has been exceptional. The SAR fares reasonably well in international comparisons. A sound basis has been laid for continued movement in these directions.

Demand for highly-skilled people has, if anything, lagged a bit behind supply, especially in the past few years. We would therefore caution against moving forward on an aggressive stand-alone “supply-push” policy. However, accelerating the human

capital formation process may well be a crucial component of a broader economic development strategy.

Hong Kong would face both challenges and opportunities in pursuing this objective. Demographic and institutional forces will constrain the domestic supply. Hong Kong will need to find ways to reach out more assertively to the rest of the world for talent, especially to mainland China. Its excellent higher education system ought to be a valuable resource in this effort, and it can build on its nascent achievements in immigration policy toward trained professionals as well.

References

- Abel, Jason R., and Todd M. Gabe, "Human Capital and Economic Activity in Urban America," Federal Reserve Bank of New York, Staff Report no. 332, July 2008.
- Acemoglu, Daron, "Technical Change, Inequality, and the Labor Market," *Journal of Economic Literature* 40:7-72 (2002)
- Berger, Suzanne, and Richard K. Lester, *Made by Hong Kong* (New York: Oxford University Press, 1997).
- Commission on Strategic Development, "Policies and Schemes for Attracting Mainland and Overseas Talents," January 26, 2007.
- Docquier, Frederic, and Abdesalam Marfouk, "Measuring the International Mobility of Skilled Workers (1990-2000) – Release 1.0," World Bank working paper 3381, 2004.
- Education and Manpower Bureau, "Review of the Post-Secondary Education Sector," March 2006.
- Ehrlich, Isaac, and Kevin Murphy. 2001. "Why Does Human Capital Need a Journal?," *Journal of Human Capital* 1:1-7.
- Enright, Michael J., Edith E. Scott, and Ka-mon Chang, *Regional Powerhouse: The Greater Pearl River Delta and the Rise of China* (John E. Wiley, 2005).
- "Guidelines for the Medium- and Long-Term National Science and Technology Development Program, 2006-2020," reprinted in Levin Institute, *Industrial Innovation in China* (2006).
- Hu, Mei-Chih, and John A. Mathews, "National Innovative Capacity in East Asia," *Research Policy* 34:1322–1349(2005).
- Lucas, Robert E., Jr., "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22:3-42 (1988).
- Olsen, Alan, and Peter Burges, "Ten Years On: Satisfying Hong Kong's Demand for Higher Education," Strategy for Policy and Research in Education, June 30, 2007.
- Romer, Paul M., "Endogenous Technological Change," *Journal of Political Economy* 98:S71-102(1990).
- Saxenian, Annalee, *The New Argonauts* (Cambridge: Harvard University Press, 2006).
- Siu, Helen, Richard Wong, and David Faure, Rethinking Hong Kong's Human Resources and Competitiveness," Hong Kong Institute for Humanities and Social Science, October 2005.
- Tsang, Donald, "A New Direction for Hong Kong," 2007-2008 Policy Address, October 10, 2007.
- US Department of Agriculture (USDA), Economic Research Service, "International Macroeconomics Dataset," available at

<<http://www.ers.usda.gov/Data/Macroeconomics/>>, accessed November 11, 2008.

U.S. National Science Board, *Science and Education Indicators 2008* (Washington: U.S.N.S.B., 2008).

Persons Interviewed

Akers-Jones, David, Business and Professionals Federation of Hong Kong.
Chan, Karyn, Labor and Welfare Bureau, SAR Government.
Chan, Philip, HKUST.
Chau, Wilton, QLeap Venture.
Cheung, Paul, HKU.
Cheung, Peter, Intellectual Property Department, SAR Government.
Ching, P.C., CUHK.
Chiu, David, Immigration Department, SAR Government.
Chow, K.C., Hong Kong Former Immigration Staff Service Association.
Chu, John, Centro Digital Pictures, Ltd.
Eastham, Tony, HKUST.
Ho, Aaron, CUHK.
Huang, Erwin, Tae Sui Luen Jewellery Ltd.
Ip, Regina, Savantas Policy Institute.
Kwok, Hoi S., HKUST.
Lau, Chin-shek, LegCo.
Lee, Kesson, UGC.
Leung, George, HSBC.
Leung, P.C., CUHK.
Lo, Yuk-lam, Perkin-Elmer Life and Analytic Sciences.
Mak, Agnes, Principle, Ltd.
Mok, Charles, Internet Society of Hong Kong.
Mok, Joshua, HKU.
Olsen, Alan, Strategy Policy and Research in Education, Ltd.
Tam, Samson, Group Sense, Ltd.
Wong, M.Y., Hong Kong Electronics and Technologies Association.
Wong, Richard, HKU.
Yang, Nicholas C., Cyberport.
Yau, Dennis, Federation of Hong Kong Industries.
Yeung, T.K., Innovation and Technology Commission, SAR Government.
Yu, Jimmy, CUHK.
Yuen, Matthew, HKUST.
Zee, Benny, CUHK.