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The Construction and Related Industries in a Changing Socio-Economic Environment: The Case of Hong Kong*

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Hong Kong is well known for its "housing market bubble". Both theoretical and empirical studies point to the supply side being the "root of all evil". This paper takes a preliminary step in understanding the supply side of the Hong Kong market by investigating the construction and related industries. After taking into consideration of the unusual public expenditure, the construction industry seems to be "normal" in international standard. Its relationship with the aggregate economy is also examined. Directions for future research are also suggested.

Keywords

housing, construction, government policy, employment, investment

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Introduction

The housing market of Hong Kong is well known for its volatility and the "bubble" in 1990s. Among others, Lai and Wang (1999), Wang and Zhou (2000), Wang et al. (2000) have provided theoretical models as well as empirical evidence for the Hong Kong housing market cycles. A common theme of these studies is that the supply side of Hong Kong housing market exhibits strong strategic behavior and that tends to exaggerate the magnitude of the cycle. This finding is clearly consistent with an emerging literature on how the supply side of the housing market affects the whole market, such as DiPasquale (1999), Somerville (1999), Glaeser et al. (2005), among others.

It is then natural to ask if the supply side of the Hong Kong housing market different from the counterparts in other places. This paper attempts to take another look on one compartment of the supply side of the Hong Kong housing market. The aim of this paper is to carry out an economic analysis of the construction industry in Hong Kong since 1990 in the context of changing socio-economic environment and government policies. The analysis starts from 1990 through 2003 because this period embraces a comprehensive coverage of the economic cycle of the construction industry. Apart from this, Hong Kong also underwent major changes in the social and political environment during the period, in particular before and after the changeover in 1997. Clearly, the supply side of the housing market is not restricted to the construction industry, but also the land sale process, the reclaiming of land, the second-hand housing market, etc. This paper attempts to take an initial step towards the understanding of the supply side of the Hong Kong housing market, and leave the other components for future research.

Specifically, this paper covers three major parts:

1) Assessing the significance of the industry;
2) Reviewing the market structure of the industry;
3) Analyzing the factors affecting the prospect of the industry.

The first part provides an overall picture by examining the role of the construction industry in the Hong Kong economy. We attempt to answer this question: how important is the construction industry to Hong Kong? The second part narrows down the focus to the construction industry and describes its market structure by tracing the supply chain of construction works from workers, through contractors, to clients. This would show a clearer picture of, among others, how the government has been involved in the construction industry. The third part conducts statistical analyses to explore the relationship between the construction industry and other economic indicators such as gross domestic product (GDP), unemployment

rates, and property prices. It serves to quantify their dynamic relationships and provides a basis for further inference.

This paper follows a descriptive and quantitative approach to analyzing published data. Whenever possible, the latest figures, including provisional figures, up to 2003 will be used. "Provisional figures" refer to those figures that are subject to further revision by the Government. Unless otherwise stated, the data used in this report was retrieved from the publications of the following departments of the HKSAR Government:

- Architectural Services Department
- Census and Statistics Department
- Hong Kong Housing Authority
- Hong Kong Housing Society
- Rating and Valuation Department

The qualitative aspect of the analysis, however important, is beyond the scope of this report. It is expected to be covered by interviews and questionnaire survey in other studies.

Construction and the Economy

The significance of an industry to an economy is commonly assessed by the percentage contribution of the industry to GDP. We follow this simple method to assess the significance of the construction industry in Hong Kong. In 2002, the nominal GDP of Hong Kong was HK$1,247 billion, of which HK$53 billion or 4.4% was spent on construction activities. To put things into perspective, Figure 1 compares Hong Kong's GDP share with other countries, including the United States, the United Kingdom, and several Asian countries.[1] It shows that the contribution of construction activities to the economy in Hong Kong was more or less the same as that in the United States. Compared to other Asian countries, Hong Kong was within the middle band (South Korea was at the top while Thailand at the bottom). This aggregate picture suggests that the importance of Hong Kong's construction industry was roughly comparable to other countries.

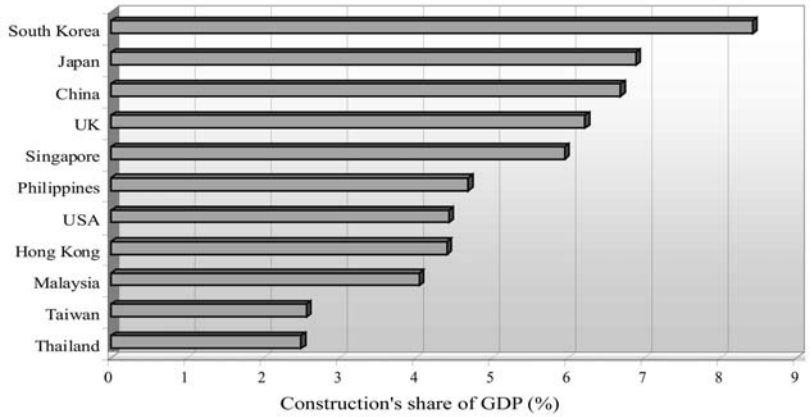
We then focus on Hong Kong and compare the share of GDP on construction activities over time. Figure 2 indicates that, over the period 1990-2002, the construction industry contributed 4%-6% to GDP.[2] The rise

[1] It should be noted that different countries may have different definitions for "construction" and thus their GDP shares may not be strictly comparable.

[2] Following the definition adopted by the Census and Statistics Department, "construction" refers to the activities undertaken by contractors for the construction of buildings and other structures and facilities.

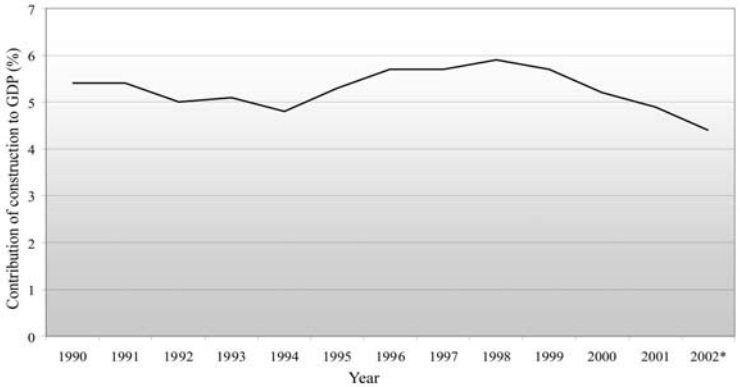
between 1994 and 1998 was consistent with Government's massive investment in infrastructure such as the new airport and ports. After 1998, the contribution of construction activities fell steadily, and the contribution in 2002 was the lowest over the period concerned.

Figure 1: Construction's share of GDP in selected countries, 2002



Source: Country Profile, Economist Intelligence Unit

Figure 2: Percentage contribution of construction to GDP (at factor cost)



(*provisional figures)

To better understand why there was such a fall, we need to take a closer look at the economic structure of Hong Kong. A comparison made between 1992 (Figure 3a) and 2002 (Figure 3b) suggests that the economic structure of Hong Kong has not changed much, except for two industries. On the one

hand, the manufacturing industry declined dramatically from 13% to 4% because a lot of production activities moved to places with lower labour and land costs, notably to mainland China. On the other hand, the community, social and personal services industry (e.g. education and medical services) grew substantially from 14% to 21%. Despite these structural changes in demand from manufacturing facilities (e.g. factories) to commercial or institutional premises, the share of construction activities remained rather stable at 4% to 5%.

Figure 3a: Percentage contribution to GDP by various economic activities, 1992

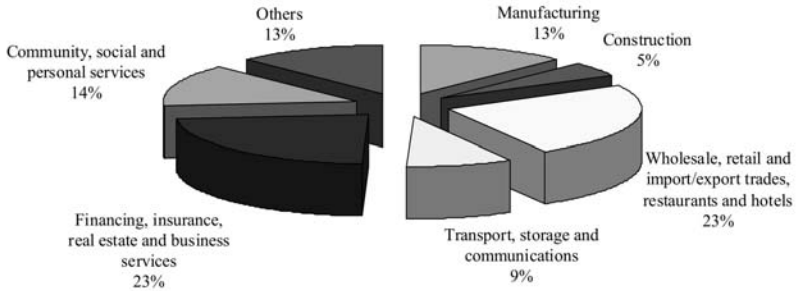
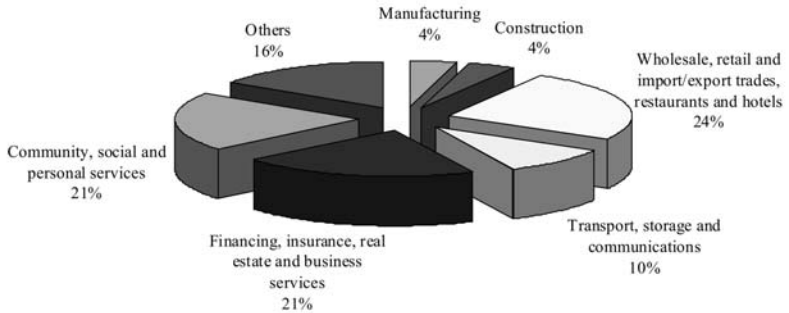


Figure 3b: Percentage contribution to GDP by various economic activities, 2002*



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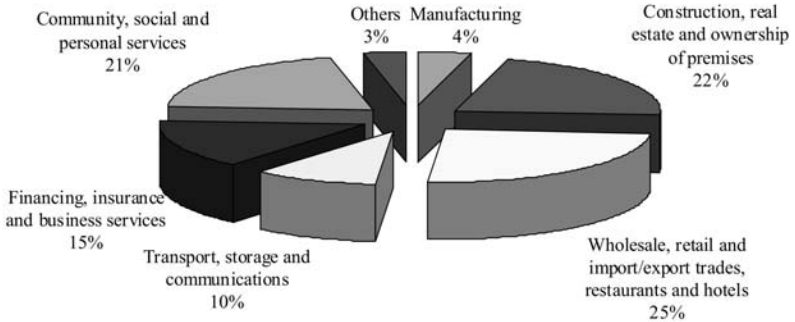
Some people may argue that "construction" should not be so narrowly defined such that it includes only those on-site activities. What if we adopt a broader view and take more construction-related activities into account? Based on the reordering method of Rowlinson and Walker (1995), construction-related activities include architectural, surveying and project engineering services, real estate development, leasing, maintenance management, brokerage and agency, property holding and resale, and the ownership of premises.[3] When the contributions of these activities are grouped into a single category, the construction industry accounted for 22% of GDP or HK$287 billion in 2002 (Figure 4). This broadly defined construction industry then became the second largest industry in Hong Kong.

Figure 4: Percentage contribution to GDP by recordered economic activities, 2002*



(*provisional figures)

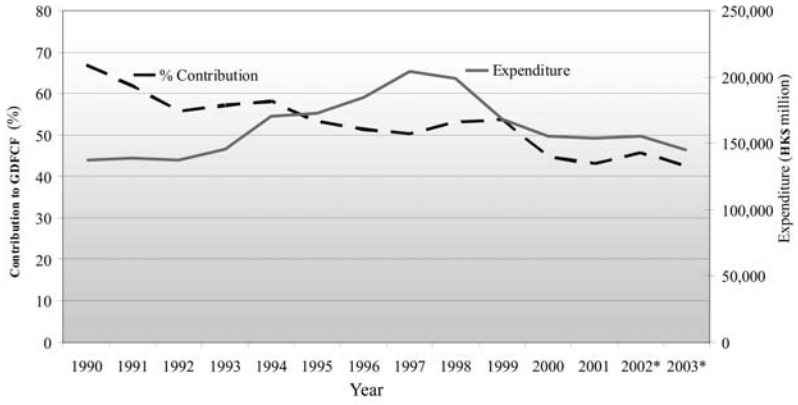
Construction and Capital Investment

Since construction is a kind of capital investment, another way to assess the significance of the construction industry is to look at investment expenditure on building and construction. Total investment expenditure of a country is often measured by gross domestic fixed capital formation (GDFCF). The expenditure on building and construction as well as its percentage share of GDFCF over time is plotted in Figure 5. To control for the effect of inflation, GDFCF is expressed at constant (2000) market prices. The graph shows that there was a real growth in annual investment in building and

[3] According to the Census and Statistics Department, "ownership of premises" refers to (a) the leasing services provided by residential owner-occupiers to themselves; (b) owner-occupied premises of government and private non-profit institutions; and (c) the leasing services provided to tenants by owners of premises in individual capacity.

construction from HK$137 billion in 1990 to HK$204 billion in 1997. After 1997, it declined to HK$145 billion in 2003 – a level close to that in 1990. In percentage terms, building and construction accounted for about half of the total investment expenditure, with a steady decline from 67% to 43% over the period 1990-2003.

Figure 5: Expenditure on building and construction at constant (2000) market prices



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To reconcile the declining contribution of but fluctuating expenditure on building and construction, we need to examine the other two types of investments: 1) costs of ownership transfer and 2) machinery, equipment and computer software. [4] By comparing the breakdown of investment expenditure between 1992 (Figure 6a) and 2002 (Figure 6b), we find that the contribution of machinery, equipment and computer software rose sharply from 39% to 51%. This suggests that the relative decline in investment in building and construction might be attributed to the faster growth of investment in machinery, equipment, and computer software.

[4] Costs of ownership transfer refer to the trading costs such as stamp duties, legal fees and agents' commissions.

Figure 6a: Breakdown of investment expenditure, 1992

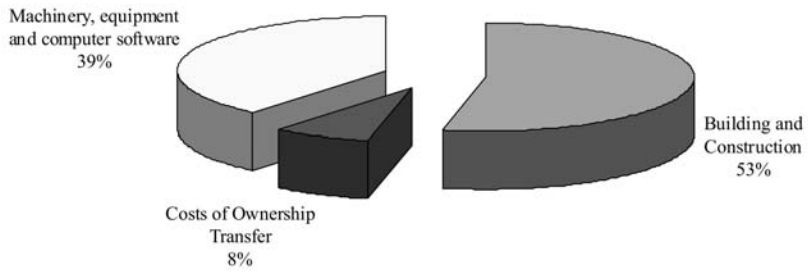
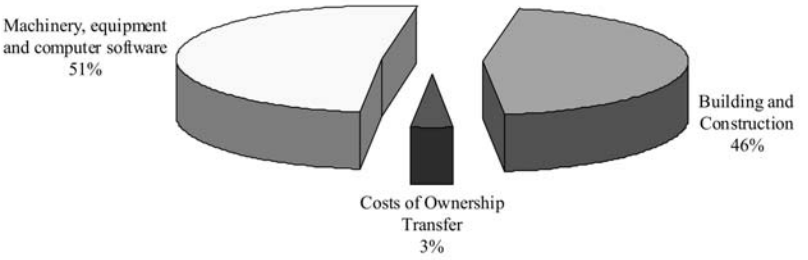
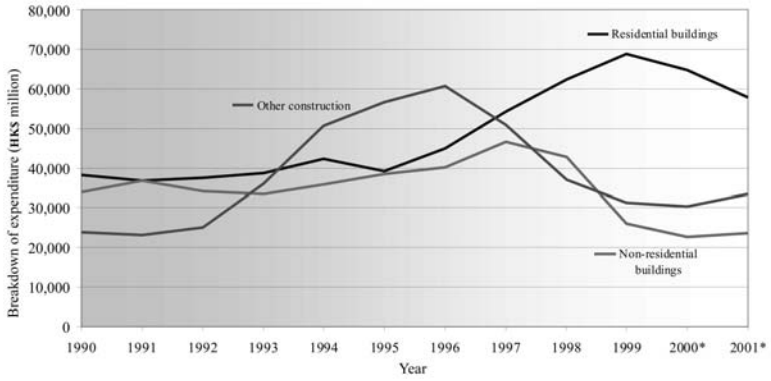


Figure 6b: Breakdown of investment expenditure, 2002



Further insights can be gained if we break down the investment expenditure on building and construction into 3 components: residential buildings, non-residential buildings, and other construction (e.g. infrastructure). Figure 7 depicts their cyclic trends over time. In the early 1990s, the residential and non-residential components remained relatively stable at around HK$40,000 million, whereas the component of other construction expanded sharply from HK$23,933 million in 1991 to HK$60,619 million in 1996 as a result the substantial investment in infrastructure (e.g. the new airport and ports). After the completion of most of the infrastructure works in 1997, the component of other construction declined to HK$33,483 million in 2001. On the other hand, during 1997-1999, residential investment grew much quicker than non-residential investment, despite the negative impacts of the Asian Financial Turmoil. This possibly reflects the change in government policy towards a higher home ownership rate. But after 1999, the residential component declined with the non-residential component.

Figure 7: Breakdown of expenditure on building and construction at constant (2000) market prices



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Construction and the Labour Market

Besides GDP and investment expenditure, the third way to assess the significance of the construction industry is to look at its interactions with the labour market. According to official figures, at the end of 2003, the construction industry employed 65,065 site workers (non-Civil Service). Its time trend is also plotted in Figure 8. This appears to be a small figure compared to the total workforce of 3.5 million persons in Hong Kong. In fact, this figure under-estimates the amount of labour force employed by the construction industry because non-site workers as well as those providing construction-related services have been ignored. A full picture should include persons engaged in 1) building and civil engineering establishments, and 2) architectural, surveying and project engineering establishments, and 3) real estate development, leasing, brokerage and maintenance management establishments. Figure 9 provides a breakdown of the construction workforce in Hong Kong in 2002. Over half of the workers were engaged in building and civil engineering establishments (i.e. contractors). One third of the construction workforce worked in real estate development, leasing, brokerage, maintenance management establishments. 8% worked as professionals such as architects, surveyors, and engineers.

Figure 8: Number of site workers

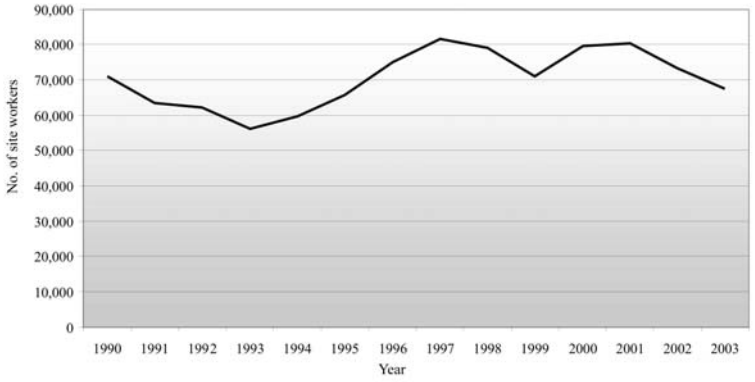
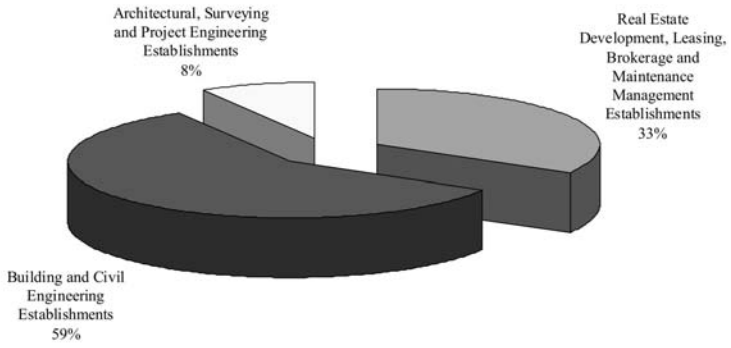


Figure 9: Breakdown of labour force in the construction industry in 2002



If all the above non-site and construction-related workers were included, the labour force in the construction industry in fact amounted to 233,095 workers in 2002, contributing 7% to the total workforce. Figure 10 shows the number of labour employed in 1) building and civil engineering establishments together with architectural, surveying and project engineering establishments and 2) real estate development, leasing, brokerage, maintenance management establishments over time. Loosely speaking, the trend of construction workforce of the former category follows closely to that of the investment expenditure on building and construction.

Figure 10: Labour force in the construction industry

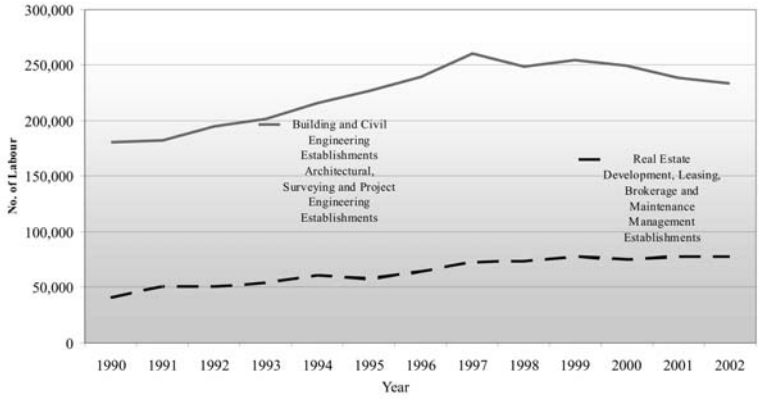
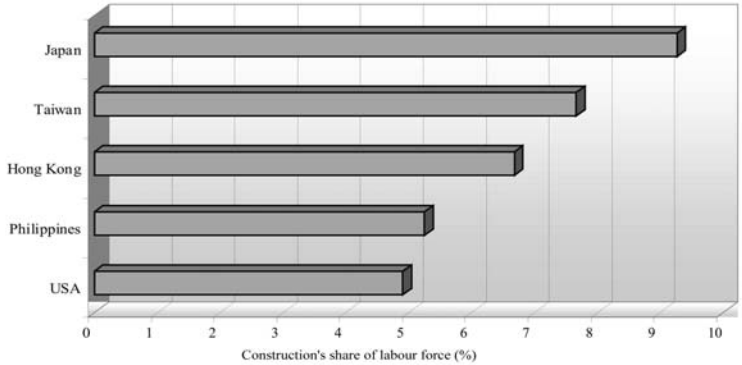


Figure 11 provides an international perspective by comparing the percentage of construction labour to total labour force in the United States, Japan, Taiwan, Philippines, and Hong Kong in 2002.[5] Unlike the figures for GDP shares, not many countries provide the employment share data for the construction sector. We therefore restrict our attention to a much smaller set of countries. Similar to its GDP share, Hong Kong was again in the middle among other countries (Japan was at the top while the United States at the bottom).

Finally, Figure 12 reports the unemployment rates in 1993, 1998, and 2003 by industry. Six industries are included: 1) manufacturing, 2) construction, 3) wholesale, retail, trading, restaurants, and hotels, 4) transport, storage, and communications, 5) financing, insurance, real estate, and business, and 6) community, social and personal services. The graph shows that unemployment in the construction industry was more severe than other industries in all periods. This is especially the case during economic recession in 2003, when the unemployment rate of the construction industry was at least double that of other industries. Figure 13 gives further support to this by revealing a rising trend of unemployment in the construction industry from 1.4% in 1990 to 19% in 2003.

[5] It should be noted that different countries may have different definitions for "construction" and thus their GDP shares may not be strictly comparable. The Hong Kong figure is based on the wider definition of "construction", i.e. including construction-related workers.

Figure 11: Construction's share of labour force in selected countries, 2002



Source: Country Profile, Economist Intelligence Unit

Figure 12: Unemployment rates by industry

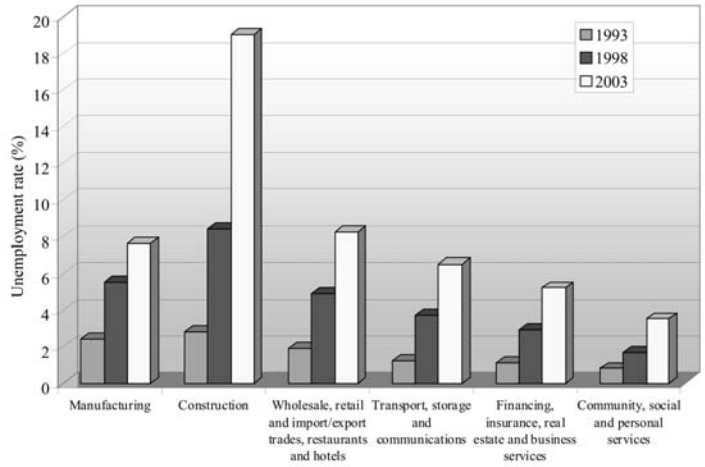
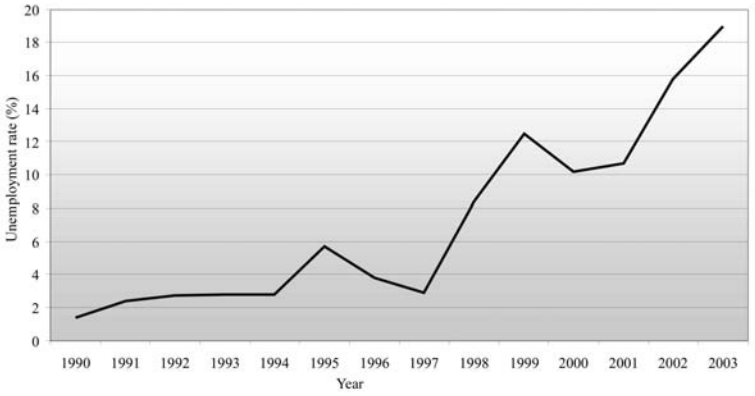


Figure 13: Unemployment rate of the construction industry



Summary

To summarize, this section showed that the importance of the construction sector in Hong Kong was comparable to other countries in terms of the GDP share. There was, however, a tendency of decline in building and construction investment relative to investment in machinery, equipment, and computer software. Since capital stock is roughly the accumulation of investment net of depreciation, this weakening of investment also means that the stock of property and other infrastructure have decreased their importance over time. There was some preliminary evidence that the decline was initialized by fewer government projects and other infrastructure, followed by the reduction in non-residential investment, and finally by the reduction in residential investment.

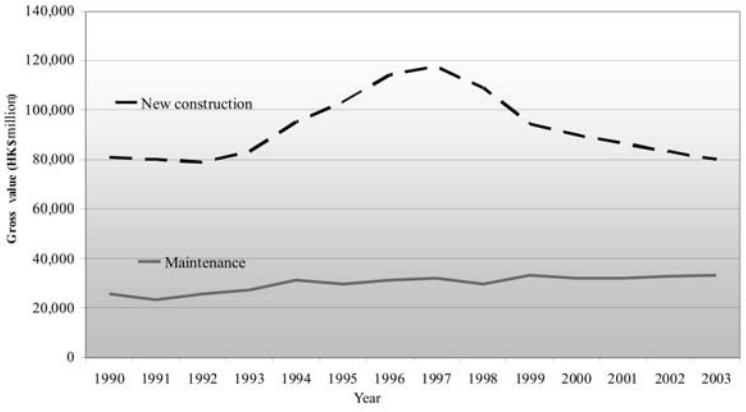
However, the labour market may not be as flexible as capital investment, as observed by Becker (1964). Becker (1964) found that some human capital is "industry specific" and certain workers are "locked-in" in a certain industry. As an industry experiences significant decline, its labour could suffer. This seems to be a good description of the construction industry of Hong Kong nowadays. The unemployment rate of the construction industry has exhibited an upward trend since 1997 and was close to 20% in 2003, while other industries only had an unemployment rate of 8% or lower. This suggests that the labour adjustment aspect of the construction industry should be the concern of policy makers.

Market Structure of the Construction Industry

Types of Work

Construction works are the products of the construction industry. They can be broadly classified into new works and maintenance works. Figure 14 shows the gross value of these works in real terms over the period 1990-2003. New construction works include the erection of buildings, structures, and facilities. The substantial expansion in new works before 1997 and contraction thereafter suggest that contractors faced fluctuating workload in the market for new works. On the other hand, the amount of maintenance works, which mainly include decoration, repair and maintenance, electrical and mechanical fitting, plumbing, etc., have remained stable over the years. Compared to new works, the market for maintenance works was quite small. Most of the activities in the construction industry were new works.

Figure 14: Gross value of new construction and maintenance works at constant (2000) market prices



Due to their significant size in the construction industry, we further break down new construction works into two types and examine their trends in Figure 15. One type of new works is buildings and the other is structures and facilities (i.e. civil engineering works). From the graph, building works had a larger share of the construction industry than civil engineering works in Hong Kong in terms of gross value. The chart also shows that the expansion in new works before 1996 was largely driven by the construction of structures and facilities (notably by the new airport and ports), after which more building works took place and peaked in 1998. That building works lagged civil engineering works by 2 years is observed.

Figure 15: Types of new construction works at constant (2000) market prices

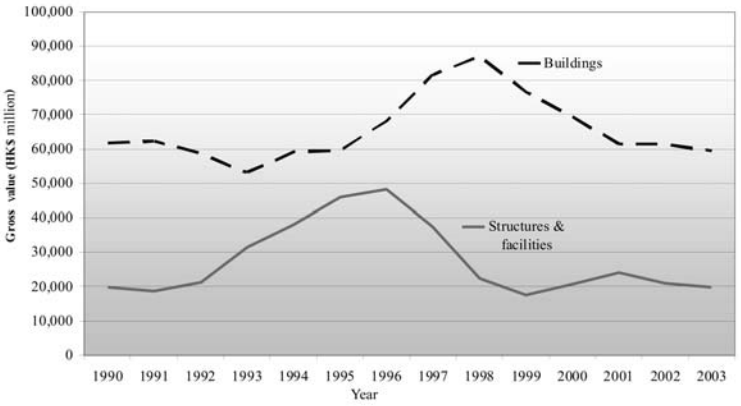
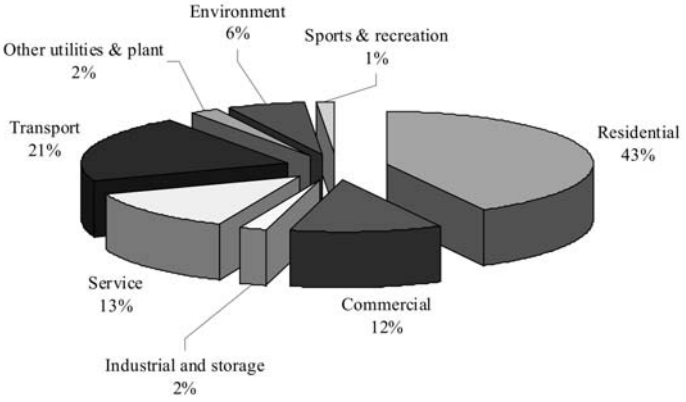


Figure 16 shows the contribution of various types of buildings, structures and facilities to the gross value of new works in 2003. Building works refer to the construction of residential, commercial, industrial and storage, and service buildings, while structures and facilities refer to those for transport, environment, sports and recreation, and other utilities and plant. Residential developments were the dominant type of construction activities in 2003, comprising 43% of all new works. They are followed by transport (e.g. roads and rail), service, and commercial developments.

Figure 16: Breakdown of the gross value of new construction works, 2003*



(*provisional figures)

Clients

In the construction industry of Hong Kong, "clients" are usually the developers. They buy construction works from contractors. Clients emerge both from the private sector and the public sector, and they may have very different considerations in forming their demand for construction works. Private developers buy construction works for profits while public sector developers for social and political needs. Since they may respond to changing market conditions in a different way, it is useful to examine each type of clients separately.

In Hong Kong, private sector works are the projects commissioned by private developers[6]. A private development site can be bought from government land sale (e.g. new grant land) or acquired from private owners (e.g. redevelopment sites). Some private developers also hold land bank (e.g. agricultural land) for future development. In fact, several developers were among the largest listed companies in the Hong Kong Stock Exchange (Chau et al., 2003). On the other hand, public sector works include projects commissioned by the HKSAR Government[7], Housing Authority[8], MTRC, KCRC, and Airport Authority. Apart from being a client, the Government is also the regulator of the construction market. It can indirectly influence the amount of construction works through controlling the development density, land supply, taxation, etc.

Rowlinson and Walker (1995) noted that the amount of public sector works was only two-third of the amount of private sector works from 1980 to 1993. In other words, private sector developers were the major client of construction works during that period. However, as shown in Figure 17, the situation has changed since the 1990s. The proportion of public sector works has risen quickly since 1992, probably due to the development of the new airport and ports by the Government. From 1995 onwards, public sector clients have become as important as the private sector ones in the market for new construction works.

Construction Companies

Contractors are the main producer of construction works. Table 1 classifies contractors by their value-added in 2002.[9] Clearly, the industry was

[6] Private projects also include those under the Private Sector Participation Scheme (PSPS).
[7] The HKSAR Government includes the Architectural Services Department, Civil Engineering and Development Department, Electrical and Mechanical Services Department, Highways Department, Water Supplies Department, Drainage Services Department, etc.
[8] This includes projects under the Home Ownership Scheme (HOS).
[9] Value added is calculated as the gross output less 1) the value of sub-contract work rendered

characterized by a large number of small firms, and a small number of large firms. In terms of number of establishments, almost 90% of contractors were very small, with value-added less than HK$2.5 million per company. These contractors also employed fewer than 5 persons each on average. On the other hand, a smaller number of large contractors (0.8%) carried out a large portion of works, contributing 48% to the value-added in 2002. This suggests that the construction sector is highly concentrated.[10]

Figure 17: Gross value of private and public new construction works at constant (2000) market prices

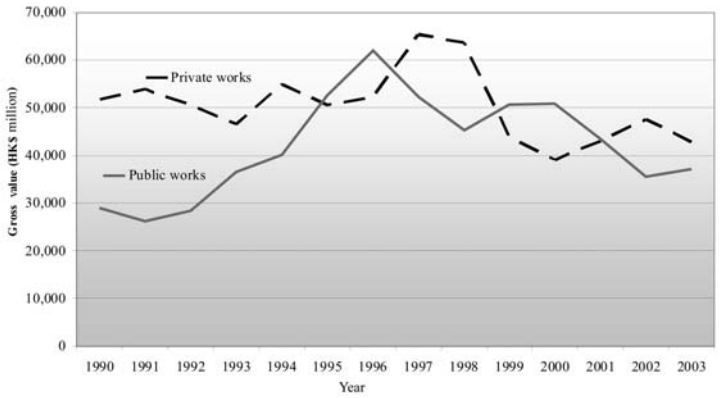


Table 1: Distribution of contractors by value-added in 2002

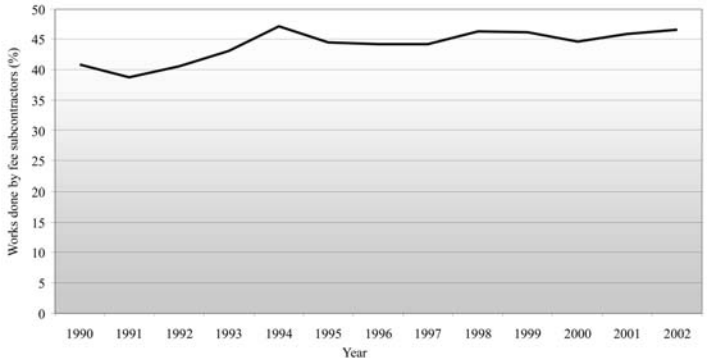
Company size (by value-added)	No. of establishments		No. of employees		Total value-added	
(HK$ '000)	(No.)	(%)	(Total)	(Average)	(10^3 HK$)	(%)
<500	12,267	61.7%	20,150	1.6	1,980,633	4%
500 - 2,499	5,173	26.0%	22,858	4.4	5,625,214	11%
2,500 - 9,999	1,668	8.4%	24,521	14.7	7,531,338	14%
10,000 - 49,999	613	3.1%	28,232	46.1	12,077,022	23%
50,000+	157	0.8%	40,108	255.5	25,088,433	48%
Total	19,878	100%	135,870	6.8	52,302,640	100%

by fee sub-contractors, 2) consumption of materials, supplies, fuels, electricity, water and maintenance services, 3) rent, rates and government rent for land and buildings, 4) rentals for hiring machinery and equipment, and 5) other operating expenses (excluding interest payments).

[10] In the UK, McCloughan (2004) reported that the largest 100 private contractors only contributed 20% to the activities in the sector. This suggests that the construction industry in Hong Kong was more concentrated than that in the UK.

In fact, this market structure reflects the common practice of multilevel subcontracting in the construction industry. Developers award main construction contracts to large contractor, who in turn subcontracted work packages to small and medium-sized contractors. The popularity of subcontracting is revealed by Figure 18, which shows that about half of the construction works, in terms of gross value, were done by fee subcontractors.[11] It also presents a slight rising trend of subcontracting works from 1990 to 2002.

Figure 18: Percentage of works done by fee sub-contractors



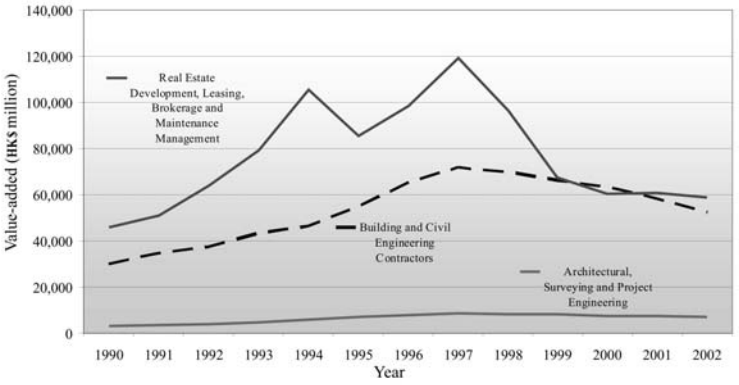
This subcontracting arrangement evolved because small firms had lower fixed costs and were more flexible to accommodate fluctuating and unpredicted workload. As pointed out by Chiang et al. (2001), the entry barrier to the construction industry, especially for building works, was relatively low due to their low technological requirements. Chiang et al. (2002) also suggested that contractors generally had low capital requirements as they could obtain project finance from developers through interim payments. The only barrier was resulted from the selective tendering system adopted by the Government and some private clients in large projects, which required contractors to have a proven track record, sufficient experience, and strong financial capabilities. This deters small contractors from getting the main contracts of large projects directly.

As mentioned in Section 2.3, contractors are normally not the sole producer of construction works. A wider interpretation of the construction industry would include professional consultants such as architects, surveyors, engineers, planners, and project managers. There are also construction-related parties who are responsible for pre and post-construction works, such

[11] Fee subcontractors provide labour, materials and plant to a construction project. They contrast with labour-only subcontractors who provide labour only.

as real estate development, leasing, brokerage, and maintenance management. It would be interesting to compare their value-added over time, as given in Figure 19. It indicates that professional works constituted only a small share of value-added (HK$6,267 million on average) compared to the value-added of contractors (HK$53,254 million) and developers, leasing agents, etc. (HK$76,204 million). The latter sector tended to fluctuate widely with the economy. As a result of the decline in the property market in late 1997, the value added of developers, leasing agents, etc. dropped significantly to a level similar to the value-added of contractors.

Figure 19: Value added of contractors and other construction-related companies



Construction Workers

As the construction industry is often described as being labour-intensive, it is also necessary to review the industry from the workers' perspective. Manual workers are the ones who actually carry out construction works on sites. Figure 20 compares the work hours of manual workers in the construction industry to workers in all industries. During 1996-1997, the work hours of construction workers were obviously higher than other industries. Workers had to work overtime in view of the large amount of construction works during that period and the relative inelastic supply of construction labour (excluding illegal workers). Li et al. (2000) claimed that excessively prolonged overtime work would lead to poor construction quality. However, since 1998, the situation has reversed. The decline in the number of construction works greatly reduced the work hours of construction workers. This is probably because construction workers were often employed using informal contracts with daily wages, allowing employers to reduce the work hours of workers easily. This arrangement also leads to a higher and more fluctuating underemployment rate in the

construction industry than other industries, as depicted in Figure 21.[12] Similarly, referring back to Figure , the construction industry was characterised by a much higher unemployment rate than other industries. Nevertheless, the daily wages of workers engaging in public sector projects stayed at about HK$900 during the recession in recent years (Figure 22).

Figure 20: Median hours of work during the seven days before enumeration

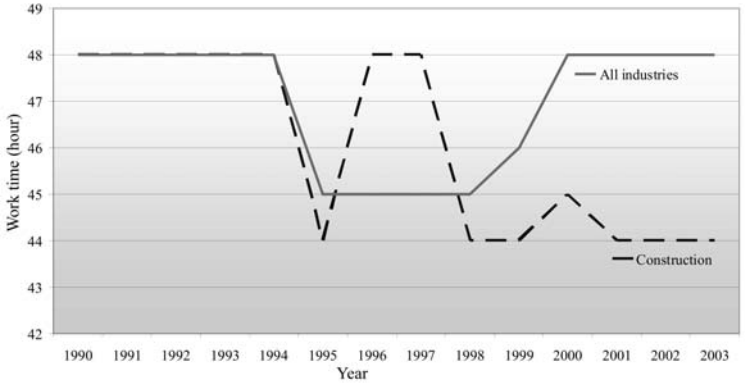
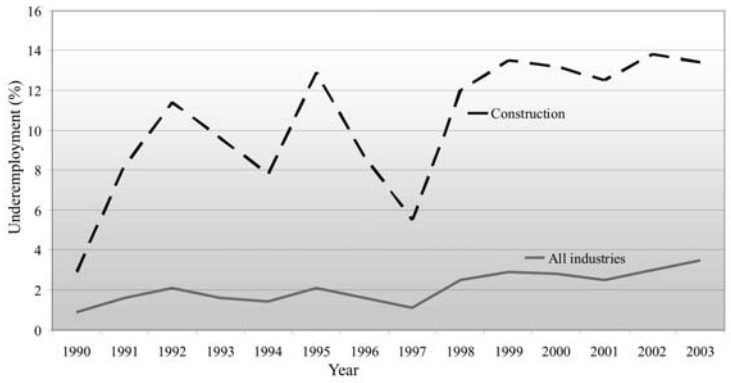
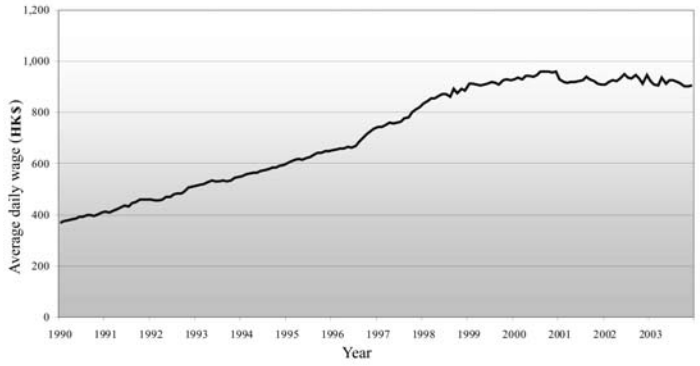


Figure 21: Underemployment



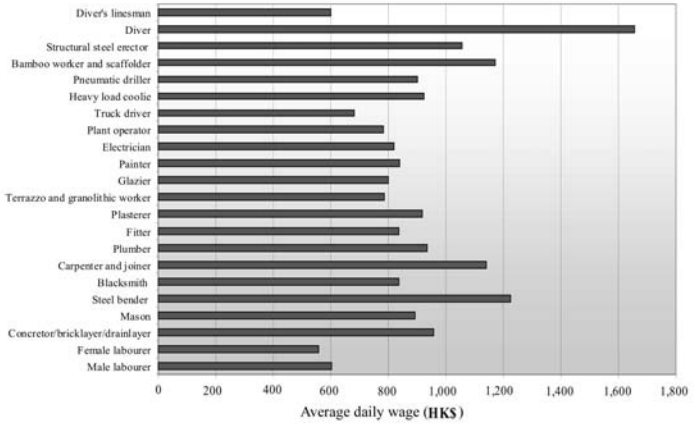
[12] According to the Census and Statistics Department, underemployment rate refers to the proportion of employed persons in the labour force who "has involuntarily worked less than 35 hours during the 7 days before enumeration and have sought additional work during the 30 days before enumeration, or have not sought additional work but have been available for additional work during the 7 days before enumeration" (http://www.info.gov.hk/censtatd).

Figure 22: Trends of average daily wages of all trades in government building and construction projects



It must be noted that Figure 22 has aggregated wages in a wide range of trades. In the construction industry, trades are the basis for dividing construction works into work packages for subcontracting. The major trades are listed in Figure 23, which reveals the average daily wages of construction workers in public sector projects at the end of 2003.[13] The average daily wage for all trades was HK$905. The lowest paid job was female labourers with a wage of HK$558. In contrast, divers were the highest-paid job, which commanded a wage of HK$1,655. The large dispersion of wages generally reflects the risk involved and the level of skill required in different trades.

Figure 23: Average daily wages of workers engaged in government building and construction projects as of the end of 2003



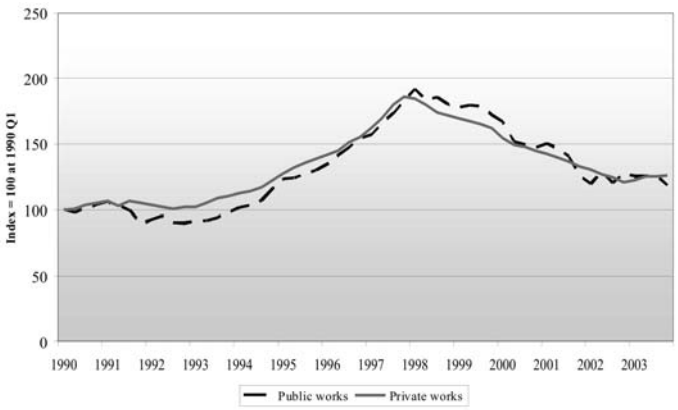
[13] For a full list of trades, please refer to *Trade Classification in the Construction Industry* compiled by the Environment, Transport and Works Bureau of the Government.

Construction Costs

Up to now, we have introduced the supply chain of construction works, from developers as the client, through contractors as the producer, to workers as a major input factor. We now complete the full picture by describing the product price (for tenders) and the factor price (for labour and materials).

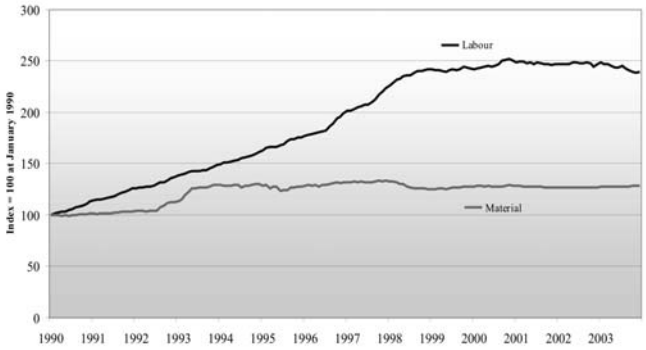
Tender prices are the sum of money the client agreed to pay to the contractor for the construction works specified in the tender documents. A tender price index (TPI) tracks changes in the price level of accepted tenders over time, keeping quality constant. Figure 24 presents the TPIs for public works and private works. The two indices followed a similar trend, with a peak in 1998. The private TPI was slightly higher than the public TPI prior to 1998 possibly because a fluctuation clause was normally included in public sector contracts, which shifts the risk of material and labour costs from contractors to the Government. Such a fluctuation clause was usually absent from private sector contracts. The importance of this fluctuation clause is evidenced from Figure 25, which shows that labour costs in public sector works have increased sharply by 150% over the period 1990-1999. Yet, material costs did not change much. Chau (1998) explained the long-term divergence between the product price (TPI) and the factor price (labour and material costs) by improvement in productive efficiency in the construction industry through imported construction technologies (substitution of factors) as well as upgraded quality of human resources.

Figure 24: Tender price indices



Sources: The index for private works was derived from the indices published by two major quantity surveying firms, namely Davis Langdon & Seah and Levett & Bailey. The index for public works was collected from Architectural Services Department, HKSAR Government.

Figure 25: Indices of labour and material costs



Future Construction Works

Looking forward, there are clearly several large-scale construction projects ahead or in progress in Hong Kong. They include Central reclamation phase III, the Central-Wan Chai Bypass and Island Eastern Corridor Link, West Kowloon reclamation, South East Kowloon development, Route 9 between Tsing Yi and Shatin (including the Stonecutters Bridge), and Penny's Bay development.[14] There are also on-going or future railway projects, which include the Penny's Bay Rail Link, the Sheung Shui to Lok Ma Chau Spur Line, the Shatin to Central Link (comprising the Tai Wai to Diamond Hill Link, the East Kowloon Line and the Fourth Rail Harbour Crossing), the Island Line Extensions (comprising the North Hong Kong Island Line and West Hong Kong Island Line), the Kowloon Southern Link, the Northern Link, and the Port Rail Line.[15] To strengthen the co-operation with the Pearl River Delta, more cross-boundary links between Hong Kong and Mainland China will be built, notably the Shenzhen-Hong Kong Western Corridor, the Hong Kong-Macau-Zhuhai Bridge, and the Guangzhou-Shenzhen-Hong Kong Express Rail Link. With the improvement in infrastructure, it is expected to see more private building developments in the future. Figures 26 and 27 show the Government's forecast completions of housing (private and public[16]) and commercial (office and retail) premises, respectively.

Perhaps more importantly, in view of China's WTO accession, there will

[14] A full list of projects can be obtained from the *Development Programme 2002/03 Edition* published by the Territory Development Department (now the Civil Engineering and Development Department) of the Government.

[15] For details, please refer to the *Railway Development Strategy 2000* published by the Transport Bureau of the Government.

[16] Public housing includes Public Rental Housing, Home Ownership Scheme/Private Sector Participation Scheme, and Housing Society's subsidized sale flats.

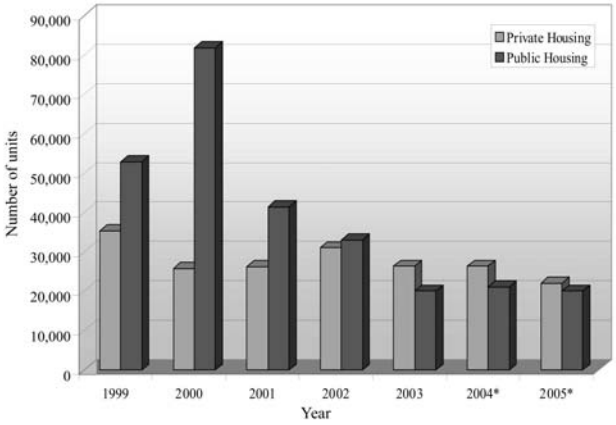
also be huge investment opportunities in Mainland China, such as the 2008 Olympics, the upgrading of road infrastructure, and the massive development of housing (TDC, 2001). Some of these works have already begun. Hong Kong companies should be advantageous to the investment opportunities in Mainland China because of the Closer Economic Partnership Arrangement (CEPA). The Ministry of Construction and the Ministry of Commerce promulgated a decree, with effect from 1st January 2004, to permit Hong Kong companies to wholly purchase a construction enterprise in the Mainland. Moreover, Hong Kong companies which have acquired the construction quality certification are permitted to participate in nationwide project tenders.

Summary

This section described different aspects of the market structure of the construction industry in Hong Kong. The industry was clearly dominated by a small number of disproportionately large firms. Thus, it is very likely that imperfect competition would prevail. As well known in the Industrial Organization literature (for instance, see Carlton and Perloff, 2004), wage would likely to be below the marginal product of labour, and unemployment would result at the equilibrium. In fact, this section reported clear evidence that the "underemployment" issue was much more severe in the construction industry than other industries.

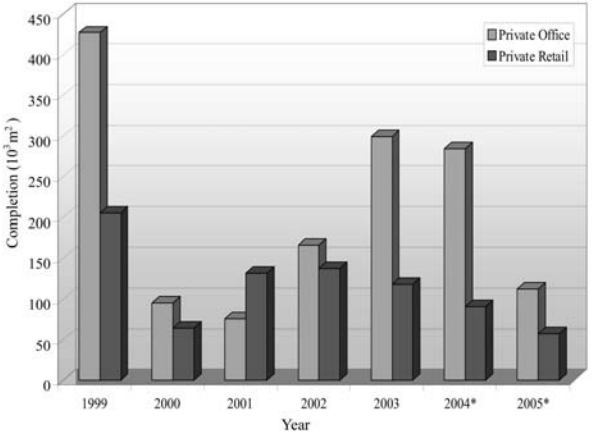
This section also suggested a list of large-scale construction work to be taken place in Hong Kong in the near future. Nevertheless, it is clear that such large-scale projects would be much more easily found in Mainland China. It is also true that the amount of construction work has decreased in the recent years. Thus, policy makers may find it beneficial to consider how to facilitate an appropriate amount of the Hong Kong construction workers to participate in those projects in China.

Figure 26: Completions of private and public housing



(*forecast figures)

Figure 27: Completions of private offices and retail premises



(*forecast figures)

Factors Affecting the Prospect of the Construction Industry

Analysis

The previous literature suggests that there exist some correlations between economic conditions (e.g. GDP, unemployment rate) and construction output/prices. For instance, Tse and Ganesan (1997) studied the lead-lag relationship between GDP and construction output and Tse and Raftery (2001) examined the relationship between money supply and construction output. It is also reasonable to suggest that the construction sector, as a labour-intensive industry, may have some interactions with the labour market. Furthermore, it is mostly natural to conjecture that there exists non-trivial correlation between property market conditions (e.g. prices, transaction volume) and construction output/prices. In a sense, the construction sector is the "upstream market" and the property market is its "downstream counterpart". In fact, Tse et al. (1999) estimated the investment demand schedule and new construction of residential properties. Jayantha et al. (2001) also studied the relationship between the size of service sectors and office supply.

Based on the above speculations, correlation analysis is used to examine the relationship between the following two sets of variables:

Construction indicator	Variable
Real investment expenditure on private construction	CE_private
Real investment expenditure on public construction	CE_public
Real private construction output	CO_private
Real public construction output	CO_public
Construction price level of private works	CP_private
Construction price level of public works	CP_public
Unemployment rate in the construction industry	C_unemp

Economic indicator	Variable
Real GDP	GDP
Unemployment rate	Unemp
Property price level	PP

The data ranges from 1990Q1 to 2003Q4 on a quarterly basis.

It should be noticed that CE_private and CE_public (collectively called CE) are components of Gross Domestic Fixed Capital Formation (GDFCF), while CO_private and CO_public (collectively called CO) are the gross values of construction works performed by main contractors. Although CE and CO are highly correlated[17], they are not mirror image to one another.

[17] The correlation between the log differences of CE and CO is 0.87.

Furthermore, the way CO and CE are related in the private sector is not the same as the public sector counterpart. In particular, CO_public has a low correlation with CE_public contemporaneously but is related negatively with CE_public 2 quarters later.[18]

Due to the data availability, VAR estimation will suffer from small sample problem and thus this paper emplys only correlation analysis to study the interactions among different variables. Before carrying out any correlation analysis, the Augmented Dickey-Fuller Test (Dickey and Fuller, 1979) was used to verify the stationarity of the variables. This is necessary because standard statistical inference procedures do not apply to non-stationary variables. The test showed that the variables are non-stationary at level but become stationary after first-differencing. This implies that the variables should be first-differenced before any correlation analysis. Moreover, in order to make the variables scale-independent, log-differences were used. Intuitively, log-difference can be interpreted as percentage differences.

Results

After taking log-differences, correlation analysis was conducted to study the relationship between the two sets of variables. Since their relationships might not be contemporaneous, cross-correlations up to four leads/lags were used to account for the dynamics. The results of the correlation coefficients are shown in Table 2.

The interpretations of these results are straightforward. Suppose we mainly take 1% as the significance level in all our interpretations. We start with the relationship between GDP and the construction sector. Although the GDP and private investment in construction (CE_private) are not significantly correlated, GDP relates positively with private construction output (CO_private) today and next year (p=0.413 and 0.426, respectively). This means that the economy leads construction works, with some time lag. On the other hand, CO_private is negatively related with GDP next quarter (p=–0.350). This is not always predicted by macroeconomic theory which assumes perfect capital market (such as Greenwood and Hercowitz, 1991), but is consistent with the imperfect capital market theory that is proposed by Kiyotaki and Moore (1997), and later surveyed by Leung (2004). Construction firms can only borrow when there is a "surplus" of resources in the economy, which happens some periods after an economic boom (in this case, it is about a year). Thus, we observe a (positive) leading relationship.

[18] The correlation between the log differences of CO_public and CE_public is just 0.04. Yet, the cross-correlation between the log differences of current CO_public and CE_public 2 quarters later is –0.51.

On the other hand, the fixed cost of each construction project is large and when the construction industry "expands", it will withdraw resources from other sectors. In particular, it will decrease the investment of other sectors, which leads to the (negative) lagging relationship.

Notice also that GDP is related with public investment in construction (CE_public) or public construction output (CO_public) at various leads/lags, sometimes positively and sometimes negatively. The most prominent results are that both CE_public and CO_public are related positively with GDP 3 quarters later (p=0.702 and 0.355, respectively). Interestingly, CE_public and CO_public are also negatively related with GDP 3 quarters earlier (p=–0.403 and –0.339, respectively). These results are consistent with the existence of a pro-active fiscal policy, or "stabilization policy". The economic mechanism is simple. During an economic downturn, the government may have an incentive to stimulate the economy (or to "stabilize" the economy) by increasing the amount of public construction projects. In fact, it is cheaper to do public projects! Therefore, even if the government does not intend to stabilize the economy, a cost-minimizing motive will lead to a similar pattern of behaviour. On the contrary, when the economy booms, the labour cost, interest cost, material costs are typically higher and the government would optimize by reducing the scale of construction projects.

It should not be surprising that the GDP is related with construction unemployment (C_unemp) at various leads/lags. What is perhaps more interesting is that the overall unemployment (Unemp) is related negatively with CE_private and CO_private 1 year later (p=–0.357 and –0.405, respectively). This is consistent with our previously stated view that the government construction policy is counter-cyclical and exhibits some stabilization effect.

Finally, GDP has no significant relationship with construction price levels (CP_private or CP_public). Property price levels (PP) also have no significant relationship with construction expenditure or output or unemployment. But PP leads the construction price level of private construction works (CP_private) positively up to 3 quarters (p=0.363, 0.384, and 0.378). This is probably because both PP and CP_private capture the effect of general inflation/deflation of the economy.

In sum, the construction sector can play the role of a stabilization policy instrument and has indeed functioned that way in the past. Thus, it is in the interest of the policy makers to investigate the evolution of the construction sector more closely.

Table 2: Correction results

	dlog(CE_private)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	0.192	-0.044	-0.085	-0.276*	0.244	0.036	0.005	-0.116	0.205
dlog[Unemp(*t*)]	0.213	0.245	0.112	-0.011	-0.199	-0.011	-0.276*	-0.037	**-0.357****
dlog[PP(*t*)]	-0.066	-0.087	0.053	0.109	0.193	0.222	0.330*	0.229	0.098

	dlog(CE_public)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	-0.251	**0.702****	-0.004	**-0.409****	-0.252	**0.664****	0.025	**-0.403****	-0.278*
dlog[Unemp(*t*)]	-0.012	-0.242	0.303*	-0.195	0.137	-0.244	0.205	-0.067	0.100
dlog[PP(*t*)]	0.002	-0.041	0.040	0.098	-0.014	-0.128	0.114	0.104	-0.026

	dlog(CO_private)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	0.342*	0.028	-0.260	**-0.350****	**0.413****	0.094	-0.120	-0.240	**0.426****
dlog[Unemp(*t*)]	0.177	0.218	0.169	-0.011	-0.198	-0.023	-0.248	-0.090	**-0.405****
dlog[PP(*t*)]	-0.112	-0.048	0.081	0.035	0.168	0.221	0.314*	0.188	0.029

	dlog(CO_public)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	0.117	**0.355****	0.210	-0.295*	-0.008	0.150	0.188	-0.339*	0.013
dlog[Unemp(*t*)]	**-0.381****	-0.190	-0.269	0.076	-0.039	0.079	-0.011	0.316*	-0.109
dlog[PP(*t*)]	0.183	0.241	0.228	0.097	-0.074	-0.128	0.002	-0.026	0.005

Table 2: Correlation results: (continued)

	dlog(CP_private)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	0.042	0.037	-0.156	-0.030	0.074	0.113	-0.040	0.034	0.110
dlog[Unemp(*t*)]	0.150	0.112	0.202	-0.002	-0.113	-0.168	-0.104	-0.233	-0.085
dlog[PP(*t*)]	-0.026	0.143	0.206	0.232	**0.363****	**0.384****	**0.378****	0.281*	0.221

	dlog(CP_public)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	-0.233	-0.017	0.022	0.025	-0.137	-0.076	0.160	0.128	-0.129
dlog[Unemp(*t*)]	0.076	0.205	0.198	-0.057	0.101	-0.150	-0.198	-0.110	0.201
dlog[PP(*t*)]	0.099	-0.031	-0.018	0.085	0.069	0.165	0.179	0.276*	0.173

	dlog(C_unemp)								
	***t*-4**	***t*-3**	***t*-2**	***t*-1**	***t***	***t* +1**	***t* +2**	***t* +3**	***t* +4**
dlog[GDP(*t*)]	**-0.479****	0.090	**0.465****	-0.091	**-0.564****	-0.004	**0.458****	-0.051	**-0.497****

*: significant at the 5% level

**: significant at the 1% level (also bolded for clarity)

Summary

This section provided a rigorous and quantitative analysis of the interactions of the construction industry with the aggregate economy. It was found that the GDP led construction works statistically. Also, the public construction works tended to increase when the aggregate economy declined. It could be due to the government's "stabilization motives," or due to the fact that the government found it too expensive to do construction works when the economy boomed. Also, the private construction sector tended to increase after the economy-wide unemployment rate increased. This seems to suggest that there were some substitutability of construction workers with other workers, and the private sector exercised the "option to build" only when the cost of labour was "right".

Conclusion

This paper provides an objective yet policy-relevant assessment of the construction industry of Hong Kong. In many measures, the Hong Kong construction industry was "normal" compared to other countries. What drove the rapid expansion in early 1990s and the later decline seems to be related to the government's infrastructure building projects, and some housing policies. While capital seems to respond relatively quickly to the change of economic prospects, the human capital does not. The apparently imperfect competition within the industry might have led to more adjustment in terms of employment rather than wages, and hence intensified the unemployment or underemployment issue of the construction industry. Careful statistical analysis revealed that an increase in general unemployment tended to encourage later increase in private construction. Similarly, a decay of the aggregate economic situation would likely to be followed by an increase in the public construction. Whether this was due to intentional stabilization efforts or purely due to cost-minimizing motives is not clear with the available data and awaits future research and investigation. On the other hand, there seems to be some preliminary evidence that public construction work can play a moderate role in stabilizing the aggregate economy.

An important drawback of this research is the dependency of aggregate data. As it is explained earlier, one of the distinguishing features of the Hong Kong construction industry is the multi-layer contracting. Will this feature intensify the strategic interactions and thus making "bubble" more likely to occur? Also, this paper only covers the construction industry, a component of the supply side. It is possible that the oligopolistic interactions among the developers which make Hong Kong market more vulnerable to "bubble"

formation. Clearly, more empirical work as well as theoretical work on the "micro-structure" of the construction industry, and perhaps housing supply as well, will be needed to answer this question. Future research along these lines may be able to offer more insights on the formation, as well as prevention, of the "housing bubble". This kind of research will definitely draw attention from both academics and policy makers, and thus should be encouraged.

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