Title	A study on the relationship between construction and the economy of Hong Kong
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Citation	
Issued Date	2005
URL	http://hdl.handle.net/10722/48883
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THE UNIVERSITY OF HONG KONG

A STUDY ON THE RELATIONSHIP BETWEEN CONSTRUCTION AND THE ECONOMY OF HONG KONG

A DISSERTATION SUBMITTED TO

THE FACULTY OF ARCHITECTURE

IN CANDIDACY FOR THE DEGREE OF

BACHELOR OF SCIENCE IN SURVEYING

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY

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HONG KONG

MAY 2005

Declaration

I declare that this dissertation represents my own work, except where due acknowledgment is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

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Abstract

The construction industry always plays an important role in meeting the changing demands of the community for better physical infrastructure arising from population expansion and growing economic prosperity. The objective of this study is to study the relationship between the construction industry and the economy of Hong Kong. After comparing relevant papers and books of different scholars and discussing the special nature of construction and the relationship them, the viewpoints of different scholars are then verified using the data in Hong Kong, which shows that construction activities do relate to the overall economy. However, value added in construction as percentage of gross domestic product, as well as the proportion of construction workers in total employment are not necessarily increased with the development of a region.

Acknowledgements

I would like to express my sincere gratitude to Mr. K. G. McKinnell for his trust and valuable assistance to me. I would also like to express my love to my parents and my sister. They have been very supportive to me, although I have sacrificed much of my family time into my studies.

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1. Introduction

1.1. Background

The construction industry has been playing an important role in meeting the expanding needs of the community for more and better physical infrastructure arising from population expansion and growing economic prosperity. In the last two decades, construction activity contributes about 4-6% directly to the gross domestic product (GDP). The gross domestic fixed capital formation of construction in Hong Kong has been above HK$ 100 billion in the last 10 years, and constitutes 40% to 60 % of total gross domestic fixed capital formation. In year 2004, the gross domestic fixed capital formation due to building and construction industry was about 8.6%[1] of the gross domestic product (GDP) of Hong Kong. Actually, that figure has always been greater than 10% except in last two years (*i.e.*, 2003 and 2004). Back in the early 1980's, that figure was even as high as 20%. Although the importance of the property market seems to deteriorate from the peak since the financial turmoil in 1998, the construction industry still steadily remains one of the main pillars of the

[1] _ (2004) *Gross Domestic Product*. Hong Kong : Census and Statistics Dept., HKSAR. P.80

Hong Kong economy.

In fact, real estate and construction firms, as well as their subsidies not directly related to construction, account for a majority of the market value of Hong Kong stock market. The construction can also provide a vast number of employment opportunities, from architects, engineers and surveyors, to estate agents, bankers and site foremen, construction workers, *etc*. People employed in the industry make up 8.4%[2] of the total Hong Kong workforce in 2004. Construction provides a steady and stable employment opportunity for the various people, including both professionals and less educated people.

Land, as well as the buildings and infrastructure over it, is an essential element of production. Without land no production activities can occur. However, it is often said that land, being one of the production factors, is scare and limited by a finite quantity. Unless by means of invasion, leasing or reclamation of sea, there is usually fixed amount of land available for a particular country to produce goods or provide services. Very often, construction and reconstruction of buildings and civil engineering works are involved to allocate spaces with reference to the changing

[2] Hong Kong Census and Statistics Dept. (2005) *Hong Kong in Figures*. Hong Kong : Hong Kong Census and Statistics Dept.

production needs. Therefore, the significance of the construction industry as the locomotive of the economy deserves much attention.

In fact, the influences of the construction industry on the economy and of the economy on the industry occur at different levels and in different areas. Hillebrandt (1985) suggested four kinds of relationships between them, including demand and output, employment and incomes, balance of payments and level of prices. He believed that employment, incomes, output or demand of construction are closely interconnected with one another so that a small change in anyone of them will eventually alter the status of others.

1.2. Objectives of the Study

The objective of this dissertation is to study the relationship between the construction industry and the economy of Hong Kong.

1.3. Methodology

In this dissertation, relevant papers and books of different scholars are first

studied and compared. The special nature of construction and the relationship between them are investigated. The viewpoints of different scholars are then verified using the data in Hong Kong.

1.4. Limitation of the Study

One of the limitations of this study is that the data I used is limited to those published by the government of Hong Kong Special Administration Region. Due to limited varieties of data, choices in choosing which kinds of analysis to be carried out are limited. Furthermore, while many of the statistics from the Census and Statistics Department of the Hong Kong government can be traced back to the 1960's, many other items are still unavailable or unrecorded by the 1980's. Therefore, the relevant period in investigating the relationship between the construction industry and the economy is limited to about 20 years. Although the duration of time in the research data may seems satisfactory and was adopted by other scholars like Wells (1985), an analysis with a longer period of raw data would certainly be more convincing.

On the other hand, the statistics for the number of people employed is based on official records which carry a chance of incompleteness. For example, on-site

construction workers are usually self-employed and seldom registered for this. On the other hand, the time, nature and profit of each worker are fluctuating. Therefore, the figures may not fully reflect the whole picture of the economy in Hong Kong.

2. Literature Review

Many of the past research work had used input–output analysis to gauge the backward and forward linkages between industries. For instance, Ranko Bon and his colleagues have carried out different input-output analysis in countries like Italy, US, Japan, and Turkey to study the role of construction sector in national economy. (Bon and Minami, 1986; Pietroforte and Bon, 1995; Bon and Yashiro, 1996; Bon et al., 1999; Pietroforte et al, 2000)

It is found that construction has large impact on the whole economy, and investment is a critical factor for economic growth. One can deduce that a close relationship exists between construction investment and economic growth. Therefore, it is not surprising that Edmonds (1979) proposed that a minimum of 5% contribution to GDP by construction is necessary if a country is to attain continuous economic growth.

To quantitatively analyze this kind of relationship between construction output and economic growth, Turin (1978) collected data from 87 countries and carried out

different analysis with these data. He investigated briefly the dynamic relationships between construction and other economic indicators. The total value added by construction into the economy as a percentage of GDP in different countries around year 1970 is first estimated. These values of data are then plotted against *per capita* GDP of respective countries, and he managed to show that there exists a strong statistical correlation between the two. In his study, not only did he find a clear positive relationship between GDP *per capita* with value added by construction as a percentage of GDP, he also found that a relationship exists between capital formation (gross output) as a percentage of GDP, as well as employment in construction as a percentage of the total economically active population.

The result of Turin shows that if countries are divided into three groups according to the GDP *per capita*, the value added in construction was found to be about 3.6% of GDP in the poorest group, 5.2% in the middle-group and 7.3% in the wealthier group. Wells (1985) therefore suggested that the construction output could occupy an increasing share of the total GDP with increasing *per capita* GDP, in any one country over time.

Nevertheless, Turin has not mentioned the rationale behind this phenomenon and

investigated how the cause-effect relationship develops. This is one of the deficiencies of Turin's work criticized by Drewer (1980). At the same time, the validity of the result largely depends on the accuracy of the data provided by relevant official bodies. Many of the data coming from countries in the third world might not be totally reliable. Moreover, the bases on which different nations calculate their national statistics could be different. For some countries, how those statistics are defined and presented has been deviated from the commonly accepted system in the international world, which imposes extra difficulties in using the data for comparison under the same basis. In addition, there are also deviations between the nature of property market of developed and developing countries. In developed countries, a significant proportion of the activities of construction industry took place in the monetary system. These are usually not counted in the construction sector in most of the national statistics.

Moreover, the statistical coverage of construction is generally neither systematic nor comprehensive.

In fact, we may encounter quite many difficulties if we try to develop the relationship between construction and the economy by accessing national accounts of

different counties. In my empirical analysis in Chapter 5 of this dissertation, I will try to avoid such problem by utilizing only data of one region, *i.e.* the Hong Kong SAR of China.

In some previous studies of Tan (2002), it is shown that as industrialization of a country continues, the demand for infrastructures like roads, railways, power stations, as well as residential buildings also changes accordingly. Such changes are not confined to its absolute figures; the percentage of construction output in gross domestic product also increases. For countries of low income level, the construction output as a proportion of gross domestic product is also low both in absolute and relative terms. The proportion reaches a peak in countries with middle income level, but the rate of increase diminishes when the country further develops, when infrastructure become more developed and shortages for housing become less severe in those countries.

3. Nature of the Construction Industry

3.1. What is Construction?

From the viewpoint of the general public, the meaning of the word "construction" may generally be "the process or method of building or making something, especially roads, buildings, bridges, *etc*."[3] However, this definition may not be precise enough for the forthcoming discussion. "Construction", as perceived by Well(1985), is a term generally used to describe the activity of the creation of physical infrastructure, superstructure and related facilities. It generally includes civil engineering work and all other types of new building projects. Examples of civil engineering projects are transport facilities, irrigation, drainage, water-supplies, power projects, *etc*, while building projects includes offices, hospitals, schools, factories and other buildings. "Construction" can also comprise the repair and maintenance of existing facilities.

[3] Cited from *Oxford Advanced Learner's Dictionary*.

In the International Standard Industrial Classification of All Economic Activities, Revision 3.1, (ISIC Rev. 3.1), construction is classified as division 45 of ISIC, which bears the following explanations:

> "This division includes general construction and special trade construction for buildings and civil engineering, building installation and building completion. It includes new work, repair, additions and alterations, the erection of prefabricated buildings or structures on the site and also construction of a temporary nature.
>
> General construction is the construction of entire dwellings, office buildings, stores and other public and utility buildings, farm buildings *etc*., or the construction of heavy constructions such as motorways, streets … *etc*. This work can be carried out on own account or on a fee or contract basis. Portions of the work and sometimes even the whole practical work can be subcontracted out to trade contractors.
>
> Special trade construction includes the construction of parts of buildings

and civil engineering works or preparation therefor. It is usually specialized in one aspect common to different structures, requiring specialized skills or equipment… such as pile-driving, foundation work… The erection of steel structures is included provided that the parts are not produced by the same unit. Special trade construction is carried out mostly under subcontract, but in repair construction especially it is done directly for the owner of the property.

Building installation activities include the installation of all kind of utilities that make the construction function as such. These activities are usually performed at the site of the construction, although parts of the job may be carried out in a special shop…

Building completion encompasses activities that contribute to the completion or finishing of a construction ... Also included is repair of the same type as the above-mentioned activities."

However, the above classification does not include some activities which are essential to carry out a construction project, like manufacture of building materials, project management, design of construction project, installation of industrial

equipment, *etc*. When studying the implication of the growth of the construction industry on the whole economy, we need to consider the above industries as a whole.

3.2. Special Characteristics of Construction Industry

The characteristics of buildings include immobility, durability, complexity, uniqueness, heaviness, bulkiness, long production process and involvement of large capital. Many of the above characteristics are not shared with other industries. This distinguishes construction them from other sectors. Not only the end products of construction are bulky, they are also built with materials and components of large size. Therefore, off-site prefabrication and export are more difficult. Resources are not interchanged easily due to the uniqueness of each construction project. Therefore it is more difficult for contractors to benefits from economy of scale. Even if there exist large international contractors, they usually assume a managerial role and seldom work solely on their own without cooperating with local construction firms. When transportation cost is high, these construction firms are also limited to work within certain geographical area to make the business profitable.

3.3. Products of Construction Industry

It is quite difficult to categorize all the goods that construction industry produces. However, it is still necessary to adopt some kind of classification in order to help us understand the nature of construction activity. Generally, the products of the construction industry can be categorized into two types, *i.e.*, capital goods and social goods. Capital goods in the construction industry are items that are used as inputs to create other products or services. Examples are offices, factories, warehouses, shops, *etc*. Infrastructures like roads, ports and railways which are required for distributing goods and services also fall into this category. It is obvious that the demand for capital goods in the construction industry depends on the demand for goods and services to be produced.

Social goods in the construction industry are those enjoyed as end products, such as residential units, parks, community centres, museums and churches. Although they are not directly utilized as an input to provide other goods and services, some people still consider it productive because they are enhancing the non-material side of human life. However, although this kind of social goods can enhance the productivity of the population eventually, it is very difficult to measure, and outside the scope of

discussion in this dissertation.

4. The Construction's Relation with the Economy

4.1. Characteristics of Public and Private Sectors

In Hong Kong, construction activities can be divided into the public and private sectors. The public sector includes government-funded building and civil engineering work. The private sector, on the other hand, comprises mainly construction projects undertaken by profit-making property developers.

4.1.1. Public Sector

The public sector of construction industry can be a political issue. It involves housing projects undertaken by the Housing Authority and construction works initiated by public bodies like Airport Authority, the Kowloon-Canton Railway Corporation (KCRC) and the Mass Transit Railway Corporation (MTRC).

Government's decision to construct can be based upon internal studies on the demand of respective uses. However, the political pressure from different interest groups can effectively disrupt government decisions if they have enough bargaining power. Such kind of influences may not be related to the economy at all. Hence, we can hardly comprehend without an understanding of political environmnet in the territory. Besides public housing, the government is also involved extensively in different areas of civil engineering works. The public construction sector is highly susceptible to government policies which obviously affect how much the government invests into construction.

4.1.2. Private sector

The primary objective of a private firm is to maximize its profit. Therefore, when a firm invests into a new factory or a new office, it is quite natural to deduce that it has relatively higher confidence in the future. Therefore it is quite straightforward that construction for commercial and industrial sectors is more prosperous in a boom period rather than in a recession.

Also, as building a new factory or office need to be financially feasible. High

interest rates will often lead to abandonment of many new construction projects because the expected profit after paying high interest rates for the premises may be reduced significantly.

The acceleration principle is also significant in explaining the effect of the economy onto the construction industry. This principle is based on the idea that a change in the demand for durable capital goods will often lead to far greater change in the industry which supplies the capital goods. This would be explained in further details in later section.

4.2. Construction as an Investment goods

The construction industry can produce both consumer goods and investment goods. Consumer goods are those bought by households for private use. Residential property purchased by a person for self-use can fall within this category. Investment goods, or capital goods, are goods which are added to the productive capacity of the economy, examples are machines and buildings. For a normal economy, it must spend its income on investment and consumer goods because a certain amount of investment is always required to produce goods in the future.

By purchasing a construction product and charging other people on the rights of use, one may obtain a steady inflow of income. For instance, one may lease out an apartment in a residential building to a family to receive rent on a monthly basis. One may also opt for a bridge and receive tolls from drivers of every vehicle passing through the bridge. Such kinds of activities occur in every society and may be perceived as an investment action.

Purchasing the products of construction usually involves a large amount of money; as a result more complex analysis will normally be made before making an investment decision on the construction products. This may include cost-benefit analysis or discounting.

Based on the reasons mentioned above, construction output can be considered as an investment good instead of consumer goods, and it can form a part of fixed capital in the future.

4.3. Demand of Construction

Generally, the construction industry produces capital goods according to the demand from other firms, which is mainly in the form an invitation to tender for a building or civil engineering work for developers or owners of the real property. A contractor usually has to compete with a number of other contractors in order to get the project. After success in the bidding process, contractors are required to perform according to a set of documented specification on the construction project at a predetermined price within a specific period.

The total demand for construction varies both in size and in mix. That is why each construction project is usually unique in nature. Such great variety and uncertainties in the pattern of construction demand have led to three consequences. Firstly, the construction industry finds it very difficult to plan and acquire resources since their future workload is difficult to predict. Secondly, the resources and workers employed by the construction industry are dynamic in nature. Contractors have been depending on casual labour and invest little in plants and equipments, which consequently hinders the introduction and development of new construction techniques. Thirdly, construction productscannot be stocked for a long period, because any significant increase in demand will trigger off different developers to invest into the industry.

4.3.1. Demand from Consumers

In a country, there will always be people who have some purchasing power and enter into the market to buy necessities or luxuries. The demand for these necessities or luxuries depends on a large number of factors, such as their incomes, expectation of the future, personal desire for saving or investment, government policies, *etc*. If the culture of consumers in a country is to spend out any increment in their income, then the marginal propensity to consume becomes higher, and there will be greater need to produce more in order to meet the increased demand of the people.

When we look at the 'expectation' factor, we can see that if people are pessimistic about the future of the economy, they will postpone their plans on consumptions in order to save or invest their capitals to elsewhere. On the other hand, if they expect the price of a particular product will fall, they will also delay consumption, which then decreases the demand for that.

The government's interventions also take a major role. Its policies on taxation,

interest rate, availability of credits, *etc*, have a significant influence on the economy and affect the purchasing decisions of people.

4.3.2.Demand from Private Firms

In order to carry out a business, firms have to first demand goods and services as "raw materials" in order to produce their own output, very much like factory has to purchase some machines before producing their products. Such demands are "derived demand" only, because firms do not consume these items as end products but require them to produce consumption goods and services. As almost all firms require a certain area of built environment to perform their business, their demand for buildings is derived from the production process of their end products, and as a result dependant upon the economic growth of a country.

This situation does not only apply to the manufacturing industry, it also applies to the tertiary industry. For example, the finance, insurance, real estate and business service sectors are the major sources of demand for office space in the economy. The growth of these business services sectors is co-integrated with new office space construction, and can influence office space development in terms of location, type

and quality.

4.3.3.Demand from Government

Other than demand from private parties, a large amount of building and civil engineering work depends on the demand of the government and other public organizations. One factor affecting the demand is mainly dependent upon the political viewpoint of the ruling party. Some provoke small government policy and avoid engaging too much in construction projects, while some may prefer a big government which actively interferes the market. Another determinant is the current situation of the economy. If there is a depression, a government may want to promote recovery by investment into infrastructure. However, even if a government want to remains small and adopt a non-intervention policy, it still has to be involved inevitably into the construction industry in order to provide public facilities like road networks, hospitals, schools, prisons, *etc*.

4.3.4.Inelasticity of Demand

It is very have to change the quantities or uses of land or buildings. This is a very special character which makes them very different from other production product. It is very difficult for parties utilizing the buildings to rent or buy extra spaces to meet the changing economic atmosphere and customer requirements. An expansion of working space or a substantial change in usage will usually result in large scale renovation works or moving into other working areas. And this has great cost implication. Also, the investment involved in property is usually very large that decision makers usually need more time to figure out. Many of them may try to reallocate spaces they already have to meet their needs instead of resorting to the property market. All theses dampen the effect of the changing needs for construction products and render its demand less elastic.

4.4. Supply of Construction

4.4.1. Supply from Consuming Parties

Construction products can be supplied by the parties in need, which may either be a firm or an individual. Large firms (especially the property developers) may develop their own working area for self-use without exploitation by another property

developer. On the other hand, individuals may also carry out small scale construction of houses for self-use. It is more common in rural and undeveloped areas, where people erect woodworks and brickworks for their own accommodation. However, such cases are rare in Hong Kong. At the same time, the supply due to consumers themselves is usually insignificant to the overall economy because the scale involved is usually very small,

4.4.2.Supply from Developers

For most cases, parties needing the premises do not build the required premises on their own. They may directly opt to purchase or rent the premises already developed by a property developer. All firms supplies goods or services to others in order to make profit. Therefore, property developers decide the volume and types of development to be built according to their forecasts in profit, which is influenced by the supply and demand of that kind of premises at that time.

4.4.3.Supply from Government

The government can be involved in supplying construction products in various

forms. Other than buildings for self-use of different government departments, the government also carries out civil engineering work for the common benefit of people, the government may itself act like a developer to supply construction products, especially residential units. In Hong Kong, residential buildings are sold or rented by the government to private owners by Home Ownership Scheme (HOS), Tenant Purchase Scheme (TPS), or by Public Rental Housing (PRH), which accommodate about half of the total population in Hong Kong nowadays.

4.4.4. Inelasticity of Supply

Since construction projects usually last for years and the amount of land available for development is limited, the supply of the construction could not easily catch up with the fluctuating market demand. Hence, it is usually considered as inelastic within a certain period, *i.e.* irrespective of large increases in demand, relatively less additional supply can be put forward by new construction into the market even though it is highly profitable to do so. As presented in Fig., large increase in demand from D_1 to D_2 leads to an increase in prices from P_1 to P_2, but the quantity of supply from the products of construction only increase from Q_1 to Q_2. The slope of the supply curve is large.

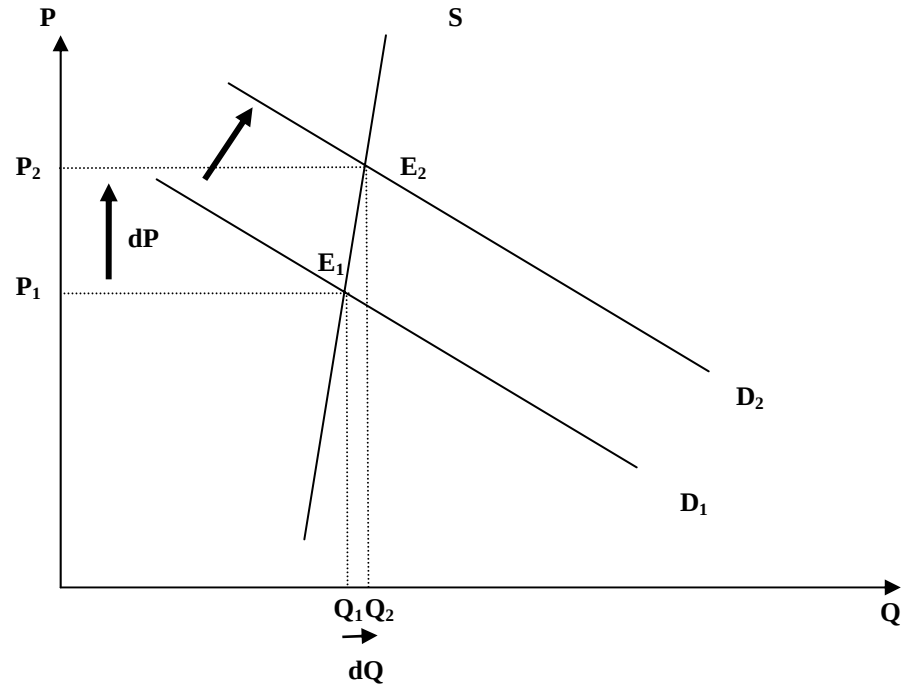


Fig 4.1

One reason for this inelasticity in supply is that there is a time lag between the implementation of a decision and the result of the decision. Such time lag can be categorized into two: decision lags or execution lags. (Warren 1993) Decision lags is due to the time required to recognize the change economy. Before a developer decides to build more, it takes time to obtain relevant statistics, and to decide whether it is only a short-period fluctuation or the signal of a major change in the construction demand. Execution lags are lags that due to the time required to get new output onto the market. Another reason originates from the large difference between the total stock and annual output of the construction industry.

As construction for buildings and civil engineering work usually requires an extensive period of time, the supply of the construction could not easily catch up with the fluctuating market demand. Hence, it is usually considered as inelastic, *i.e.* irrespective of large increases in demand, relatively less additional supply can be put forward into the market even if it is highly profitable to do so. As shown in the Fig 4.1 abuve, large increase in demand from D_1 to D_2 leads to an increase in prices from P_1 to P_2, but the quantity of supply from the products of construction only increase from Q_1 to Q_2. For inelastic supply, the slope of the supply curve is large.

One reason for this inelasticity in supply is that there is a time lag between the implementation of a decision and the result of the decision. Such time lag can be categorized into two: decision lags or execution lags. (Warren 1993) Decision lags is due to the time required to recognize the change economy. Before a developer decides to build more, it takes time to obtain relevant statistics, and to decide whether it is only a short-period fluctuation or the signal of a major change in the construction demand. Execution lags are due to the time required to get new output into the market, as well as the difference between the total stock and annual output of the construction

industry.

4.5. Time Lag between Supply and Demand

To understand the need to recognize the importance of time lags in the output pattern of construction, we should first study how they may affect every developer and contractor in the microscopic level.

Time lags exist when there are changes in the situations of the property market and the understanding of the developers about the situations. This is caused by the collection and provision of the relevant statistical information relating to the firm, its industry, and the economy as a whole, and time is required for developers to make decision corresponding to the changes of property market.

On the other hand, construction projects usually last very long. The production cycles of the construction industry are among the longest in the economy. Time is required before construction work commences, if the construction industry has already reached its highest working capacity, new works has to wait until the pressure is over.

There exist a long time lag between the start of construction work and the completion time. As contractors are usually paid on interim basis, the capital expenditure will be made by the firm at intervals during the construction period.

When we consider the time lag at the industry level, the case would become more complex. Different firms have different decisions with different time lag when reacting to different economic situations. Considerations in the decision making process is constantly changing over time as firms may have different strategies, entrepreneurship, and different sources of information at different time.

4.6. Construction and the Labour Market

As I mentioned before, construction is a labour-intensive industry which is able to provide a large number of employment opportunities to less educated or unskilled labour. Hence, from time to time we can hear politicians of different countries urging for more construction projects with an aim to reduce employment rate, and at the same time boost up the growth of gross domestic product. There is a high proportion

of self-employed labour in the industry that consists of virtually small sub-contractors. This can help main contractors minimize wage costs and provide minimal employment conditions.

On the other hand, if a country has a trade deficit, the government may probably consider decreasing its expenditure on civil engineering projects or public housing in order to reduce internal demand for products.

4.7. Contribution of Construction to the Economy

We can regard construction as an “investment goods” which form a part of fixed capital in the future. And actually a significant portion of “gross fixed capital formation” in a country comes from the output of the construction sector.

For an economy to grow more rapidly, a higher rate of investment is required. In many countries, economic growth is usually accompanied by an active construction industry in the territory. As a result, it is reasonable to expect a close relationship between the growth of an economy as a whole and construction output.

4.7.1.Contribution to GDP

Although volume of construction work varies, the construction industry is commonly considered as the leading sector of the economy because it has great implication on national economy both directly and indirectly. Not only does the construction sector involve the assembly of building materials on site, it has also extensive linkages with other sectors and stimulates their growth through a complex system of commercial linkages. (Chan, 2001; Kuznets, 1972) For example, the raw materials and building components are provided by different suppliers; such materials and components are delivered to the site by different vehicles; the financing of a construction project is provided by banks; the construction process is managed by professionals like architects and engineers; the end products of construction when being put on sale through estate agents, *etc*. These involve business in mining and quarrying, manufacturing, transportation, finance, *etc*. Therefore, it should be noted that construction activity involves inter-sectoral flow of capital. Besides, the construction industry is a labour-intensive industry. When the construction industry booms more people will be employed, which will in turn raise their incomes and enables them to spend more. At the end it stimulates the demand for consumption.

As the construction industry of most countries occupies as large as 40 to 60 % of the gross fixed capital formation, it certainly has a strong influence on the overall economy. Early studies of the relation between construction and economic development during the 1970s were based on Keynesian economic philosophy, which argues that government policies could be used to promote demand at the macro level. Turin (1978) provided statistical correlations between different measures of construction output and *per capita* national income. He has shown that when *per capita* GDP rises, the value added into construction as a percentage of the gross domestic product also increases. There is also a positive relationship between the construction output of a country and the level of capital formation.

Later, Edmonds (1979) studied the value added by construction to the economy, which was expressed as a percentage of GDP differs according to the income level *per capita* of different countries, and the percentage varies from 1% to 11%. Although it is true that the percentage of construction increases as GDP *per capita* increases, such increase is not linear. It was found that middle-income countries generally have less increase in the percentage of value added in construction than low-income countries, given the same absolute increase in *per capita* GDP.

4.7.2.The role of Multiplier Effect in GDP contribution

The effect of boosting up the construction industry on the whole economy is sometimes explained by the "multiplier effect". A multiplier effect occurs when a change in spending causes a disproportionate change in aggregate demand. As the name suggests, it magnifies the net impact of an alteration in an economy. Such effect may act in both positive and negative ways. An initial injection of money into the economy would lead to positive multipliers. Such injection may be generated by an increase in investment, increase in government expenditures or increase in the volume of export orders. The output of the construction industry, on the other hand, can also be interpreted as a series of investment. As a result of such investments, more labour will be employed. Those who gain employment have more money to spend on goods and services. Those engaged in this process will on the one hand save a proportion of their earnings for future consumption or investment, while on the other hand spend on goods and services which create more employment opportunities. As a result, money paid by the investors, government or foreign purchasers will continue to circulate within the economy, which is passed from

person to person and from company to company. The multiplier effect arises when spending increase due to increased incomes, and, because of the feedback into increasing business revenues, jobs, and their incomes are increased again. This loop-like process will continue until all the effect of original investment fades away. If all the incremental increases in spending are added altogether, they would amount to far more than the initial increase in spending that started the process off. It is this cumulative effect of increases in spending in the economy as a whole that results in the final impact of a change in spending being much larger than the initial change. The amount by which spending is increased by this multiplier effect is governed by the marginal propensity to save, which is the proportion of extra income that is saved rather than consumed. If the marginal propensity to save is large, less money is returned into the economy with each circulation so the multiplier effect is smaller. The value of the multiplier in a closed economy with no taxes is given by

mult = 1/s

,where s is the marginal propensity to save, *i.e.*, the increase in consumer saving divided by the increase in consumer disposable income. In the Keynesian model, s equals one minus the mpc, *i.e.*, the increase in consumer spending divided by the increase in consumer disposable income.

In this simple model, the multiplier can be used to predict changes in GDP for a given change in spending, X.

predicted $\Delta GDP = mult * \Delta X$

When we come back and relate it to the built environment, if the government increases its expenditure on the construction of new public housing, the construction firm would have to employ more workers and order more building materials so as to successfully perform the contract. Consequently, more people will be employed in the construction and building material supply industries. Participants in the these sectors, having more money to spend, will acquire more goods and services from other sectors, resulting in higher spending in other areas including housing, which in turn stimulate the demand for construction. However, this short-term effect is independent of the long term contribution from which the investment goods produced or bought. As long as the investment goods are produced and bought by others, the multiplier effect would be effective even though these investment goods were not utilized. Once the income of more people increased by the increase in investment in construction, more money would be spent on consumption goods. Nevertheless, if the economy starts from a position of spare capacity and

unemployment, extra investment demand would only boost up the prices of resources and labour required for the investment. Therefore, in the Keynesian sense, the construction industry is a potential agent of economic growth. And acceleration of construction projects is sometimes considered to have the ability to generate further growth.

4.7.3.The acceleration principle

Quite a number of scholars have tried explaining the fluctuation in total demand form construction work by the acceleration principle. (Hillebrandt 1975, Ive and Gruneberg 2000, Ofori 1990, Shutt 1995, Wells 1985) One principle concept for the acceleration principle comes from the capital-output ratio, where capital is the total of plants, machineries, cash, materials, *etc*, in stocks, while output is the value of goods and services produced by a firm each year, *i.e.*:

$$\text{Capital/Output Ratio} = \frac{\text{Capital}}{\text{Annual Output.}}$$

The formula shows the amount of capital required for some quantity of output. If the ratio is 4:1, then for every $ 10 million of annul output, $ 40 million of capital

is required. If we want to increase the output increased by 10%, *i.e.* $ 1 million, then additional $ 4 million of capital will be required. That means the increase in capital required should be a lot greater than the desired increase in output.

Assuming technology and the process of production in construction, which have not undergone drastic change over the years, to be constant, then there is always some stock of capital, K, which is necessary for production at an output level Y. And this relationship can be simplified into:

(4.1) $$K_{t-1} = {}_{t-1}kY_t.$$

, where ${}_{t-1}k$ is the amount of is the capital required to produce an output of one dollar during time t – 1 to t.

If the required stock of capital at time t-1 is equal to ${}_{t-1}kY_t$, *i.e.* the actual stock of capital K_{t-1}, then we may further deduce that the capital stock will increase from K_{t-1} to ${}_tk\ Y_{t+1}$. The required increase in the capital stock, ${}_tI_{t+1}$, can then be expressed as follows:

(4.2) $${}_tI_{t+1} = {}_tk\ Y_{t+1} - {}_{t-1}k\ Y_t$$

(4.3) $$i.e.\quad {}_tI_{t+1} = k\ ({}_tY_{t+1} - {}_{t-1}\ Y_t) \qquad \text{, for a constant k}$$

The relation between net investment and the change in the rate of output is referred

as the acceleration principle. The volume of investment and the rate of increase of output are interrelated with one another.

4.7.3.1. Non-Residential

When we compare the demand for consumer goods or services with the demand for the products of construction, we shall see they have significant differences. Consumer goods, like food or clothes, are usually be used for a limited number of times. No matter durable or not, they are seldom resold. Even if they are resold the selling price will usually be significantly lower than the original price. This reflects that consumer goods have a high rate of value depreciation.

In contrast, it would be a different case for non-residential buildings and other civil engineering works. Unlike consumer goods, these construction productsare not built for its own sake but for the value of the commodities they help to produce. Therefore, construction productsare different from other products or services which can be enjoyed directly by the consumers. What they can do is only to enable or facilitate the provision of other products and services. For instance, a hospital building is not built for its own sake, but as a place to provide medical and surgical services. Residential building can also be considered as a place to provide

accommodation services to people. The clients request a services rather than the building itself. Hence, the investment on construction industry is based on the expected values of the goods or services to be provided by the buildings or construction work. (Ive and Gruneberg 2000)

In addition, the products of construction like buildings, bridges, roads, *etc*, are usually able to last for tens and even hundreds of years, which means that they are more "durable" than almost all consumer goods. Therefore, a short delay of the construction industry will contribute less . When the economy declines, and when private firms, or even the government, run into financial difficulties, one of their solutions to relieve financial pressure is to cancel, postpone or reduce the size of investments. Buildings are very durable. They can continue to stand even if they are not required any longer. Moreover, construction is different from other consumer goods. The total stock of construction work is a lot greater than the annual production of construction. The new demand for new construction productsis inevitably equivalent to the increase in total demand of the stock. Therefore, Hillebrandt (1985) suggested that small variations in the total demand for the stock of buildings and civil engineering works will result in a large fluctuation in the demand of construction work. This kind of relationship between the demand of total

fixed capital stock and the production of new stock of capital is illustrated by the acceleration principle (or accelerator principle).

If a firm does not want to increase its size of output, some investment is still required for depreciations of capitals like plants and equipments. Assume that an office, a shop or a factory building can be used for 30 years, then about 3% of the buildings have to be replaced each year.

Hillebrabdt (1985) has suggested modifications in practical application of the acceleration principle, that the actual fluctuations in the demand would not be as large as they would be on the basis of the acceleration principle alone. The surplus capacity in the construction industry would absorb the increase of demand because workers can work overtime or shift hours if there is extra works. Also, for industrial and commercial buildings, layout of machinery and furniture can be altered to accommodate more machines or people. Moreover, if people expected that the increase in the demand of products or services would not persist, or the growth in profit by expansion in space is not attractive enough, then they will not demand for more space. Ofori (1990) also agreed that the acceleration principle cannot fully explain changes in demand. He also pointed out that the ability for expansion is

influenced by government policy and availability of credit. Advancement in technology reduces the requirement for more spaces. Such modifications gave a more practical view that the demand is dependent on a lot more factors, and we should take a more elastic view on the principle when we try to use the acceleration principle to explain the demand for construction products.

4.7.3.2. Residential

Just like non-residential construction projects mentioned above, Winger (1971) residential construction may be considered as an induced demand. By analysing the theoretical and empirical foundations of the links between the residential industry and final demand through the acceleration principle, we may be able to provide an insight to the fluctuation of residential construction. Using formula (4.3), we may state that

(4.4) $$ {}_tR_{t+1} = k\,({}_tY_{t+1} - {}_{t-1}Y_t) $$

, where R is the net investment in residential construction. However, it is quite obvious that the output is not so highly dependent on the output of the economy. The main purpose of residential building is not for producing goods or services but for people to live in there, which is a kind of consumption activities. We therefore

amend the formula to

(4.5) $${}_tR_{t+1} = k\,({}_tP_{t+1} - {}_{t-1}P_t)$$

, where P represents the factors about the population of the territory concerned, and k can be considered as the amount of housing required for one unit of population factor.

4.7.4.Empirical analysis on Acceleration Principle

To empirically analyse whether the acceleration principle can be used to explain the output of residential construction output in Hong Kong, it is crucial to consider the population factor. In a small place like Hong Kong, the population is determined by a large number of factors. They include birth and death rates of local people, migration from other regions into Hong Kong, migration of local citizens to other countries, and these factors are in turn related to the economic, political, cultural and natural environment within the territory.

Although the acceleration principle may help explain the pattern of residential construction, it cannot itself constitute an explanation. There are still other factors to be considered.

We may consider the following function for empirical investigation for residential construction:

(6) $$R = f(P, V, G)$$

, where P is some population variable, V is a variable representing vacancy level, G represents the economy in terms of gross domestic product *per capita*, and R is the output of in residential construction which is measured by the number of units supplied by private domestic property.

It is expected that an acceleration factor can be derived from P of the above function. We decide to use the number of households instead of number of people as the variable denoting the population factor. It is because purchasing decisions on new residential premises are made with a view to the integrity of a household. Normally only one premises is bought for use of one household. Even if the number of members in a household increases, people will try to rearrange the space of existing residential unit before they split into two households and buy an additional unit. There are a lot of factors resulting in the vacancies of the standing stock, including household mobility and the mechanism of pre-sale for newly developed residential units. A high vacancy level usually deters the decisions to undergo new residential developments until the vacancy rate drops to a reasonable level. We decide to use the number of

units of vacant private domestic property for V. Finally, it is also expected that the wealth of people will also affect the purchasing decisions to buy a residential unit. People having economic power to spend are more likely to buy a new unit for improving their lives. In this case, gross domestic product (GDP) *per capita* is used to reflect the wealth of Hong Kong residents. There are also some other factors which might influence the output of residential construction but are not considered here. For instance, the influence of the credit market is disregarded because it is largely a short-term phenomenon and is less important when we considered the effect in the long run. On the other hand, the factor of age of buildings is also disregarded due to unavailability of data. As a result, the regression used to investigate the empirical relations of these factors to construction can be expressed as

$$R = a_0 + a_1 (P_{t+n} - P_t) + a_2 V + a_3 V^2 + a_4 G + a_5 G^2 + \varepsilon \quad (7)$$

, where t is the starting time, n is the period of time to be in investigated, and ε is the stochastic or error term. On the basis of these, the relation between ($P_{t+n} - P_t$) and ${}_tR_{t+n}$ should be positive. Those for V and V^2 should be negative, and those for G and G^2 should be positive.

The regression of (7) using data from 1983-2000 in App. gives the following result:

$$R = -86110+14.168(P_{t+n}-P_t) -0.82669V+1.5517\text{x}10^{-5}V^2 +1.9161G +7.0671\text{x}10^{-6}G^2$$

t =	*2.4134*	*0.1917*	*0.9788*	*1.6179*	*4.0050*	*3.9932*
p =	*0.0327*	*0.8512*	*0.3470*	*0.1317*	*0.0017*	*0.0018*

(R^2= 0.67, adjusted R^2= 0.53, d.f. = 12)

Except for *G and* G^2, it is quite obvious that the t-statistics and p-value of other independent variables shows that they have little explanatory power on the output of residential construction. Hence, we cannot deduce that the acceleration principle has unimportant implications on the output pattern of residential construction. Other attempts of using total population instead of number of households for *P*, as well as using total gross floor area of constructed instead of number of units supplied by private domestic property for *R*, also failed. Either the result gives a negative relationship between *P* and *R*, or the variables would become too insignificant for a meaningful interpretation of the data.

The result here reiterates the viewpoint of Hillebrabdt (1985) and Ofori (1990). And the actual fluctuations in construction demand would not be as large as they would be on the basis of the acceleration principle alone. In fact, I believe this

may be due to the inelasticity of supply and demand as mentioned in section 4.3.4 and 4.4.4. .

4.8. Cyclic Movement of Construction work and GDP

The construction industry has an important role in the development of the economy. A bloom in the construction industry means an increase in disposable incomes, which in turn generates demand for more construction activity. Thus there is a cyclic relationship between construction activity and development.

The gross domestic capital formation of building and construction has continuously been occupying over 10% of the gross domestic product of Hong Kong. Therefore, cyclical instability of in such a large sector will cause a noticeable fluctuation to local economy. When the building and construction industry is shrinking, lots of construction workers will lose their jobs. Other resources in the society will also be underused. On the other hand, when the industry is expanding, it will be a difficult and time-consuming task to recruit workers from other industries.

As a construction project needs to be performed in specific sites, and specific and

workers are employed only within a short period, the mismatch of resources is therefore more complicated than industries with fixed machinery and labour force in an unstable economy.

5. Analysis on the Factors Affecting the Demand of Construction Activity

In this chapter, I will analyze the relationship of the construction industry and the economy in Hong Kong by applying the indicators of the level of economic development of Hong Kong to examine the differences in: construction value added; contribution of construction to GDP; annual growth rate of the construction value added; mix of construction output; contribution of construction to overall employment; and levels of technology used in the industry. The analysis uses the data from 1973 to 2003.

Various sets of data from the Census and Statistics Department of the Hong Kong Special Administrative Region would be used in order to prove whether relationship between the two exists and can be applied to explain the situation of Hong Kong. The source of data mainly includes the yearly publications and the website of the Department.

When Turin (1978) investigated the relationship between construction and the

economy, he only analyzed it on the basis of cross-section data between different countries of different income levels a particular point in time, and did no analysis on the validity on such relationship within one region over a period of time. Performing analysis within one economy region has at least two advantages over the previous one:

1. Generally, sovereignty over a region seldom changes, and the way in which different data sets are defined, collected and interpreted usually remains consistent over the years. Therefore, researchers need not worry much about incorporating data collected with different standards together and render the whole analysis invalid.

2. There is no need to worry about the differences between the economic structures of developed and development countries Although the proportion of the activities of the construction industry in the monetary system is not accounted for in the category of construction in the Statistics, all data are collected with more or less the same criteria throughout the years.

Nevertheless, there also exist drawbacks if we only investigate one region. As there are no comparisons between different countries, the validity of the result will be diminished, as we would then be unsure whether the interpretation is valid in that

particular region.

5.1. Construction Activity and Economy

We may regard construction products which form a part of fixed capital in the future as an “investment goods”. And actually a significant portion of “gross fixed capital formation” in a country comes from the output of the construction sector.

Investment can stimulate an economy to grow more rapidly. In many countries, economic growth is usually accompanied by an active construction. As a result, it is reasonable to expect a close relationship between the growth of an economy as a whole and construction output. Such relationship will be discussed in section 5.3 in greater details.

5.2. Statistical sources and data collection

The major statistical source for this study is the Census and Statistics Department of Hong Kong SAR government, which follows closely the widely accepted

definitions, concepts and methods on statistical matters and classification systems of international organisations like the United Nations, International Labour Organisation and International Monetary Fund in compiling and disseminating statistics. The Department adopted the Fundamental Principles of Official Statistics by the United Nations in 1994 as its central references. The adoption of internationally accepted standards ensures a definite level of quality in the statistics compiled and comparability with statistics of other economies.

5.3. Relationship between Key Indicators of Hong Kong's Economy

5.3.1. Contribution of Construction to GDP

Professor Duccio Turin examined the position of construction in the world economy by analyzing its dynamic relationships with other major economic indicators in a number of countries, and showed that the share of construction in the national product, as well as the value added in construction per capita, increases when an economy becomes more developed. In addition, when the economy prospers, both the

value added per person employed and the proportion of people employed in construction in the labour market grows. (Turin, 1978) These kinds of results are usually interpreted as the result of changing profile of construction within an economy when it moves through different stages of development. It implies that an increase in construction expenditure by countries with lower GDP *per capita* will stimulate economic and social development.

Drewer (1980) pointed out that in countries of UN Economic Commission for Europe region, the proportion of value added by construction and the level of economic development measured by GNP *per capita* are not simply correlated. There was also no obvious relationship between variations in the growth rate of construction output and different levels of development between these countries. However, the rate of growth of gross domestic product is to some extent dependent on the rate of growth. The proportion of value added in construction in GDP, as well as *per capita* GDP, is greater in lower-income countries.

With reference to the work of Turin, Wells (1985) suggested that the growth rate of construction output would be greater than the growth rate of GDP for the low and middle-income group of countries. His argument was supported by data from South

Korea, Singapore, the Philippines, *etc*. For each country, the construction output and the overall GDP are expressed as index numbers which reflect output in constant US dollars with respect to the data of the first period under investigation. However, it should be noted that the GDP of some countries starts at a very low base. As their economies are relatively vulnerable to small changes in external and internal environment, the representing power of such countries would be relatively lower. Furthermore, as the author himself mentioned, if nine OPEC and 9NIC countries the average percentage for the remaining countries would be less than 5%. Consequently, we may cast doubts on the validity and universality of his findings.

5.3.2.Situation in Hong Kong

There is a rapid growth in Hong Kong in the previous 30 years during before the financial crisis in 1998. Since 1970, the increase of construction output is faster the increase of gross domestic products, thus contribute a higher GDP. Unlike cross-sectional data of different countries, time-series data can reflect actual changes occurred within an economy over the period As Hong Kong does not have any significant oil deposit or other significant natural resources, we can therefore assume that the construction industry has been expanding without much international supply

of investment.

It could not be denied that construction activity and economic growth are closely related to one another because construction is a major component of investment in the territory. The required expansions of construction output must be based largely upon the development of local resources.

5.3.3.GDFCF of Building & Construction

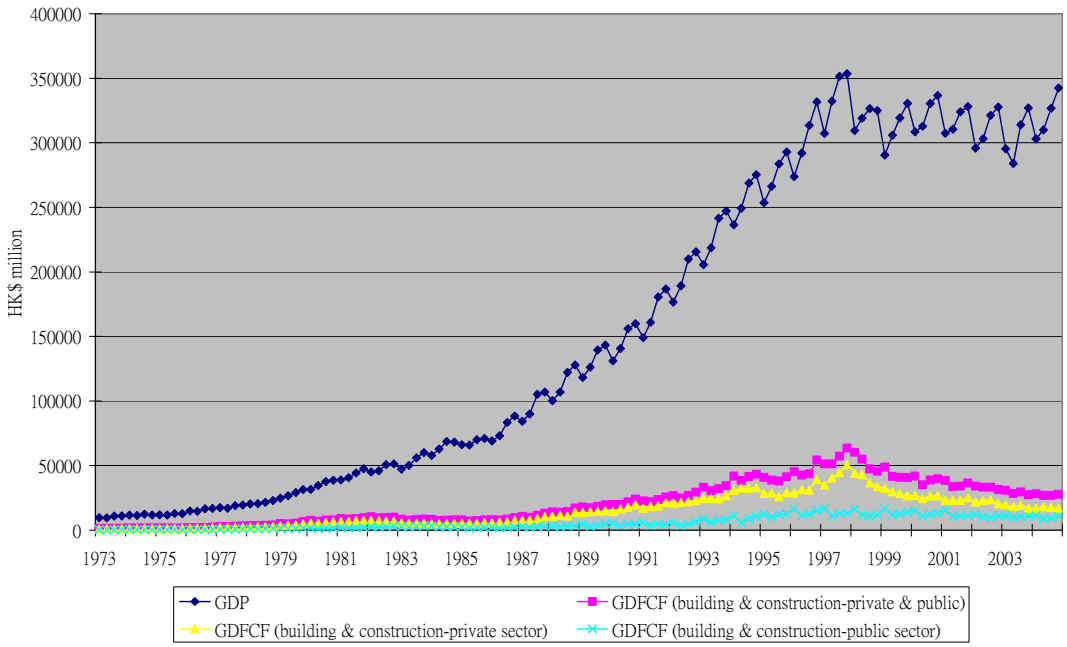
The gross domestic product (GDP) is a measure of an economy's annual income, which is the total value of production of all residents in a specified period before deducting allowance for consumption of fixed capital. It is the sum of the value of all goods and services produced in a given year. The contribution of a construction project to the income of a region does not confine to the actual period of construction. Rather, the benefits from buildings or civil engineering work extend over the working life of buildings or structures.

Gross domestic fixed capital formation (GDFCF) is measured by the gross value of investment expenditure on building and construction as well as machinery,

equipment and computer software. It represents the gross addition to value assets. It also includes the cost incurred in the transfer of ownership of assets representing services used during the transfer of ownership of the assets, like taxes and duties paid, but does not include expenditure incurred in the acquisition of existing fixed assets which corresponds to the transfer. In this study, the gross domestic fixed capital formation for building and construction is the value of construction works carried out for residential buildings, non-residential buildings and other construction works, together with the margin of real estate developers. This includes payments to contractors, building materials and fittings supplied, architectural design and technical consultant fee, interest payments and other project expenses. The expenditure can be divided into two sectors, the public and the private. The public sector covers government departments, quasi-government institution and public corporations. For expenditures unrelated to these organizations, we shall consider them private. The construction expenditure on public rental housing is classified into the public sector whereas the expenditure on Home Ownership Scheme is classified as private.

Let us first directly investigate the relationship between the output of the construction industry and the Hong Kong economy as a whole by simply plotting a graph (Fig. 5.1) showing the change of GDP of the overall economy and the

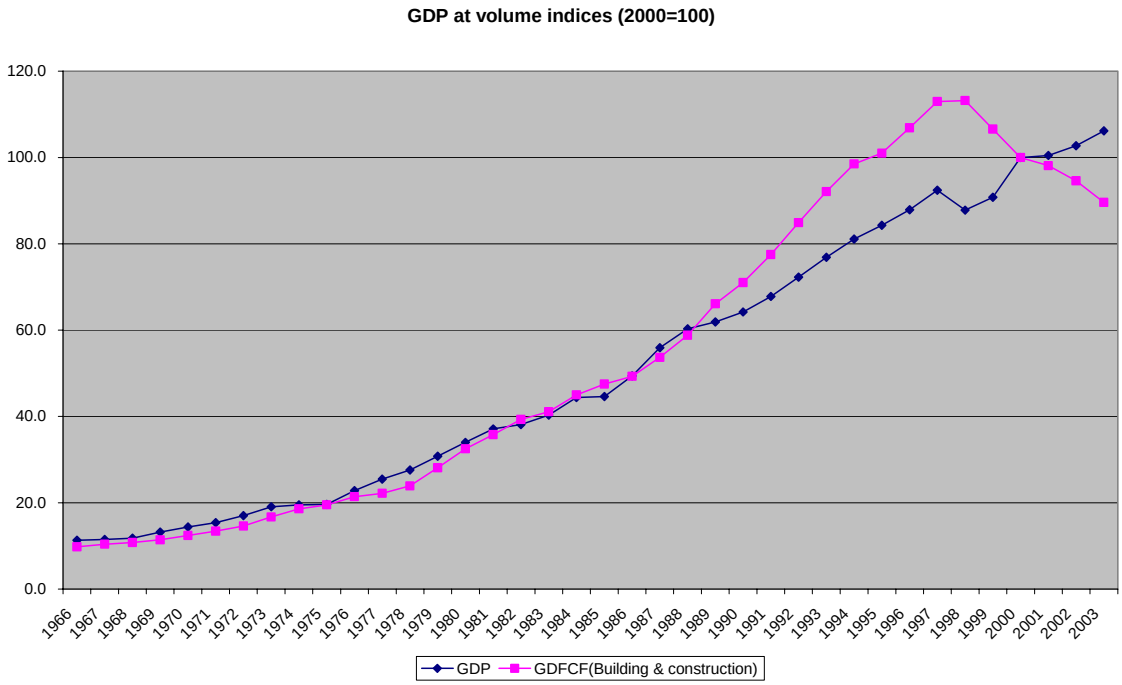
construction industry. From the graph we can only see that the there is positive relation between the two. However, correlation but not causation can be derived.



Graph 5.1

According to Graph 5.1, Hong Kong's gross domestic product has increased steadily from 1973 to 1997. However, since 1997 the rate of growth has levelled off. From the graph we can also see seasonal fluctuations occurring every year, but the seasonal changes should not hinder us from understanding the general trend. The gross domestic fixed capital formation of the building and construction sector also takes similar trend as the GDP. For ease of comparison, we compare the two sets of figures by their volume indices with 2000 as the reference year. In graph 5.2, we can

immediately visualize the relationship between these two sets of figures since we can see great overlap of the two curves.



Graph 5.2

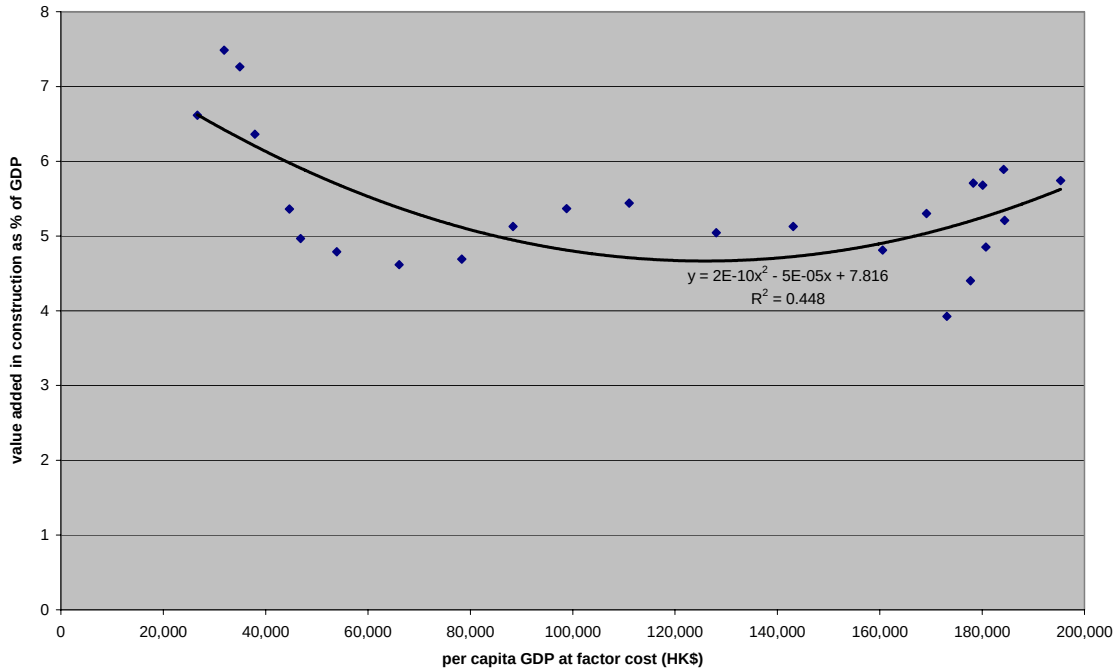
5.3.4. Value Added in Construction Industry

Value added of a producing unit measures the increase in value due to the production process of an industry. It is the value of goods and services it produces ('gross output') less the value of goods and services it uses up in the course of production ('intermediate consumption'), which includes: (1) the consumption of

sundry supplies like fuels, electricity and water; (2) maintenance services rent, rates and government rent for land and buildings; and (3) estate management expenses, other operating expenses (excluding interest payments).

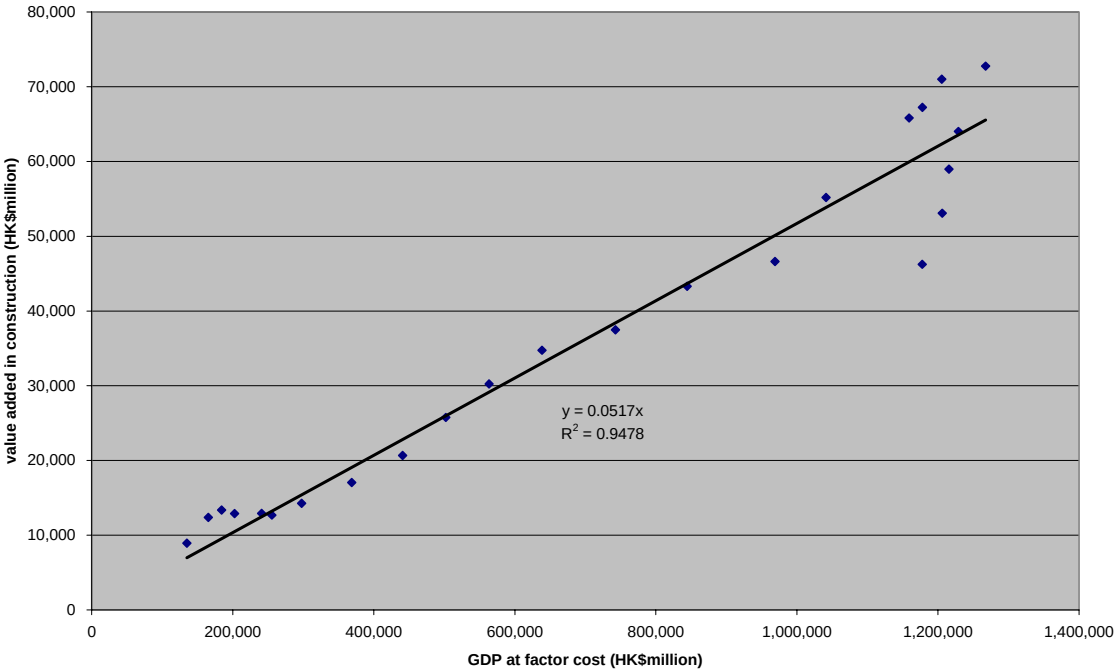
The statistics for "construction" only refers to construction contractors of both buildings and other structures and facilities, and include the erection of architectural superstructures, piling, demolition, site formation, civil engineering construction, electrical and mechanical installation work, *etc*. The activities of property development are not accounted for.

Turin (1978) suggested that value added in construction as a percentage of GDP increases as GDP *per capita* increases, and that in countries with high GDP *per capita*, the percentage are generally higher than those with a low GDP *per capita*.

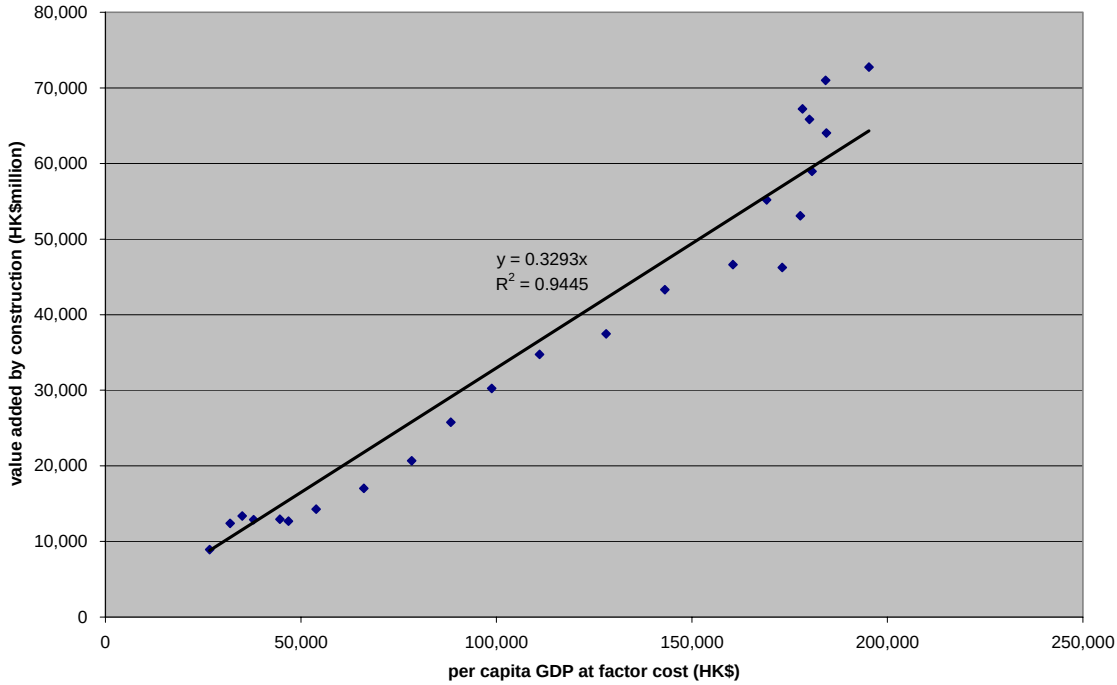


Graph 5.3

However, we can clearly see that the value added in construction as a percentage of GDP falls when *per capita* GDP is smaller than HK$ 130,000 , while it rises afterwards.



Graph 5.4



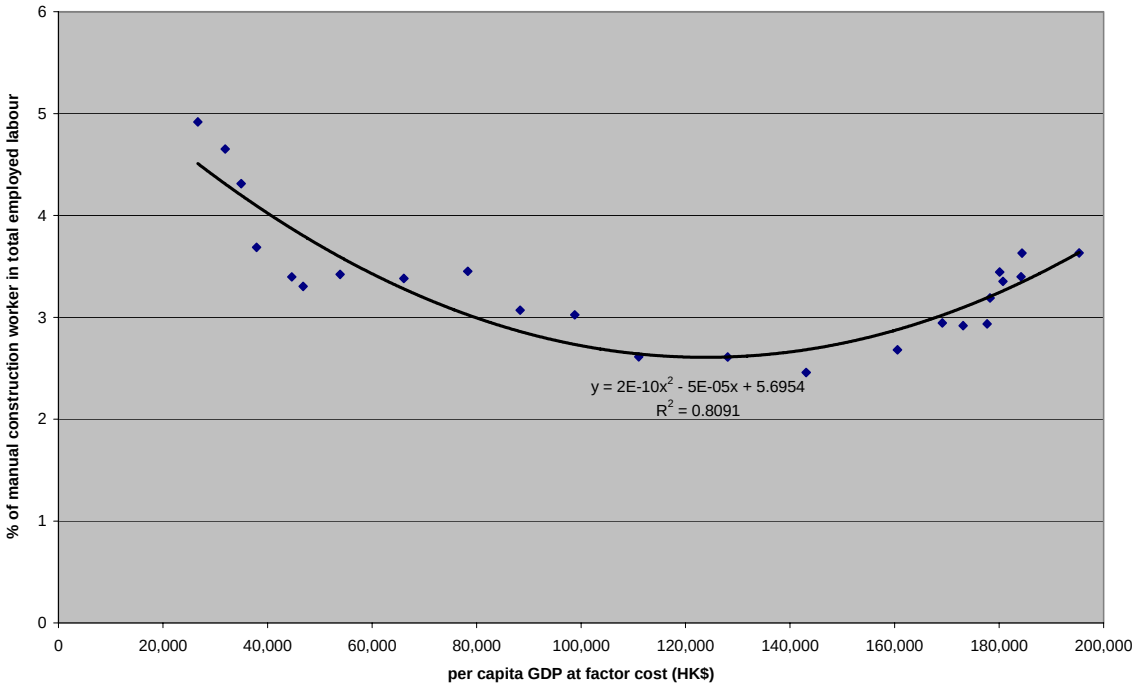
Graph 5.5

Graph 5.4 Graph 5.5 shows a graphical summary of how value added in

construction relates to GDP and *GDP per capita* of Hong Kong from year n1980 to 2003. Both demonstrate a clear linear relationship.

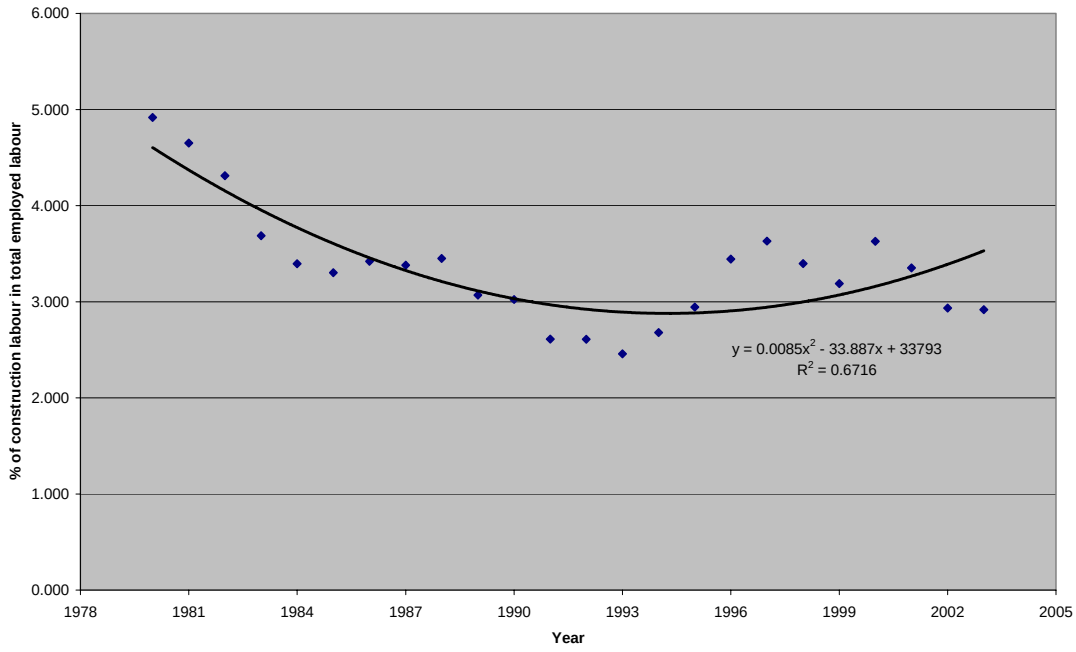
5.3.5.Employment by construction

When we study the relationship between the net construction output per person employment in construction and the wealth of people in a Hong Kong, we encounter completely different result with that of Turin (1978), who found out that employment in construction in lower income countries only accounts for 0.4% to 0.8% of employed labour, while it accounts for 3% to 4% and tends to stabilize for countries with higher GDP *per capita*, and therefore concluded that the proportion of employment in construction in the population grows with economic development.



Graph 5.6

The above figure shows the relationship between the percentage of manual construction workers in total employed labour to *per capita* GDP. We can clearly see that the significance of construction in providing jobs for people at first falls when per capita GDP is smaller than HK$ 130,000 and rises afterwards. This is very much similar to the previous case on value added in construction industry, but is not in line with the trend in the percentage of construction value added to the GDP during the period This also contradicts with the conclusion of Turin. We found similar trend when we replace the x-axis of Graph 5. with time.



Graph 5.7

The fall at the beginning may be explained by the fact that manual construction works is not a comfortable job which are unable to attract people to join when the economy grows better and better. Some of the manual job may be replaced by improved machine and equipments, enabling the contractors to employ less labour. However, during the property boom by 1997, there was a larger demand for premises of higher quality. As a result, a larger proportion of workforce is attracted to the construction industry again.

6. Conclusion

This paper contributes to the debate on the role of construction in economic development by adding a regional dimension to the study of the relationship between the construction industry and economic growth. Analyses of Hong Kong data of over two decades have shown incoherence with famous scholars like D. A. Turin. Verification using the data in Hong Kong shows that construction activities do relate to the overall economy. However, value added in construction as a percentage of gross domestic product, as well as the proportion of construction workers in total employment, does not necessarily go up along with the development of a region. The commonly discussed accelerator principle also shows little explanatory power to the situation of Hong Kong. Therefore, these kinds of saying should be treated with great caution before actual application.

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8. Appendices

8.1. Statistics on annual GDP

Year	GDP by major expenditure componet at current price		Current Market Prices (HK$million)			Volume Index (2000=100)	
	GDP (HK$ milion)	GDP per capita (HK$)	Gross domestic fixed capital formation			Gross domestic fixed capital formation	
			Building & Construction	% of Bldg & Con in GDP	Private Sector	Building & Construction	Private Sector
1973	41,043	9,676	5406	13.172	4395	70.8	145.4
1974	46,900	10,713	6826	14.554	5229	69.6	147.4
1975	49,254	11,040	6620	13.441	5027	71.1	152.9
1976	62,751	13,889	7982	12.720	6119	81.0	171.8
1977	72,724	15,866	11741	16.145	8819	101.9	221.3
1978	85,206	18,255	14450	16.959	10304	112.4	220.1
1979	111,754	22,670	21491	19.231	16204	129.3	248.6
1980	142,202	28,086	29959	21.068	23796	155.6	311.2
1981	171,242	33,037	35972	21.007	28700	169.9	338.6
1982	193,086	36,677	39519	20.467	28929	173.2	351.6
1983	213,478	39,939	32510	15.229	21439	158.9	300.3
1984	257,473	47,699	30934	12.014	20648	163.1	288.0
1985	272,886	50,014	29810	10.924	21842	163.3	297.5
1986	314,001	56,837	33997	10.827	25955	173.0	318.9
1987	386,327	69,228	45206	11.701	35088	197.6	330.7
1988	457,248	81,251	59347	12.979	47204	210.6	343.8
1989	527,080	92,695	73166	13.881	57212	218.7	359.1
1990	587,620	103,010	85669	14.579	67462	236.5	398.3
1991	677,247	117,741	93814	13.852	75226	258.8	410.4
1992	791,319	136,423	107666	13.606	87161	282.9	396.6

1993	912,809	154,687	130034	14.245	99636	293.1	384.5
1994	1,029,773	170,622	164916	16.015	128504	337.9	453.6
1995	1,096,263	178,078	158898	14.49451455	111833	373.1	425.8
1996	1,210,925	188,163	185648	15.33108987	130109	413.9	445.7
1997	1,344,546	207,194	223264	16.60515892	170104	466.4	539.7
1998	1,279,850	195,585	208235	16.27026605	157247	432.3	546.7
1999	1,246,134	188,622	171930	13.79707158	116952	360.4	431.3
2000	1,288,338	193,299	155441	12.06523443	104125	400.0	400.0
2001	1,269,896	188,835	142651	11.2332821	94401	410.5	403.4
2002	1,247,958	183,875	131752	10.55740658	88477	391.8	407.8
2003	1,220,038	179,336	116207	9.524867258	73991	392.5	363.9
2004	1,281,999	186,267	109589	8.548290599	69279	410.0	316.7

8.2. Statistics on quarterly GDP by major expenditure component

Year	Quarter	Current Market Prices (HK$million)						Volume Index (2000=100)				
			Gross domestic fixed capital formation						Gross domestic fixed capital formation			
				Building & Construction						Building & Construction		
		Gross Domestic Product	Total*	All Sectors	% of Bldg & Con. in total GDFCF	Private Sector	Public Sector	Gross Domestic Product	Total*	All Sectors	Private Sector	Public Sector
1973	1	9630	2147	1327	61.81	1030	297	19.4	18.7	35.2	39.6	24.4
	2	9529	2320	1330	57.33	1127	203	18.8	18.4	31.8	38.6	16.1
	3	10910	2261	1309	57.89	1092	217	19.3	16.8	28.7	34.3	15.4
	4	10974	2426	1440	59.36	1146	294	19.0	16.9	28.9	32.9	19.6
1974	1	11601	2568	1741	67.80	1299	442	20.6	17.8	36.3	39.3	28.5
	2	11289	2701	1645	60.90	1317	328	19.2	17.3	31.5	36.3	20.9

	3	12321	2826	1765	62.46	1352	413	20.0	18.0	33.6	37.2	25.7
	4	11689	2651	1675	63.18	1261	414	18.3	16.5	32.0	34.6	26.3
1975	1	11838	2621	1666	63.56	1140	526	19.6	17.8	36.0	36.1	35.5
	2	11754	2540	1632	64.25	1269	363	19.6	17.1	34.1	38.4	25.3
	3	12927	2678	1600	59.75	1229	371	20.0	17.7	33.4	37.1	25.2
	4	12736	2809	1722	61.30	1389	333	19.3	18.5	35.8	41.3	22.9
1976	1	14800	2944	1841	62.53	1355	486	23.1	20.4	40.1	42.6	33.7
	2	14626	3177	1872	58.92	1482	390	22.2	19.7	37.1	42.0	26.5
	3	16552	3324	2030	61.07	1557	473	22.9	20.0	38.5	42.2	30.3
	4	16773	3606	2239	62.09	1725	514	23.2	20.9	41.0	45.0	32.1
1977	1	17372	4226	2828	66.92	2134	694	25.6	25.9	54.0	58.1	43.6
	2	16982	4319	2674	61.91	2110	564	24.5	24.5	47.6	53.6	34.9
	3	19004	4291	2979	69.42	2287	692	25.8	24.8	51.2	56.0	40.9
	4	19366	4898	3260	66.56	2288	972	26.1	26.7	53.6	53.6	55.1
1978	1	20200	5200	3452	66.38	2397	1055	28.5	29.1	59.3	58.7	60.1
	2	20523	5297	3364	63.51	2526	838	28.0	27.2	52.8	56.2	47.0
	3	21531	5621	3660	65.11	2579	1081	26.8	27.3	52.7	52.5	54.9
	4	22951	6460	3974	61.52	2802	1172	27.5	28.8	53.0	52.7	55.4
1979	1	24682	7426	5020	67.60	3443	1577	30.7	33.6	66.4	64.7	69.8
	2	26592	7627	4742	62.17	3727	1015	30.8	30.2	53.7	59.8	41.3
	3	29130	8638	5186	60.04	4050	1136	30.5	31.8	52.8	58.3	40.5
	4	31350	9830	6543	66.56	4984	1559	31.6	33.7	61.8	65.8	53.6
1980	1	31489	10779	7477	69.37	5610	1867	32.8	39.7	77.1	82.1	64.4
	2	34505	11012	6770	61.48	5573	1197	34.4	37.6	63.9	74.4	40.5
	3	37641	11913	7755	65.10	6090	1665	34.4	39.4	69.7	77.2	53.0

	4	38566	12522	7957	63.54	6523	1434	34.4	38.9	67.4	77.5	44.2
1981	1	38830	13193	8886	67.35	6792	2094	36.3	43.2	81.2	87.6	65.1
	2	40632	14146	8449	59.73	6962	1487	36.6	42.7	70.3	81.8	44.9
	3	44307	14296	9074	63.47	7323	1751	36.6	42.3	74.0	84.3	50.5
	4	47473	14947	9563	63.98	7623	1940	39.0	41.7	75.4	84.9	53.7
1982	1	45042	15132	10263	67.82	7610	2653	38.3	45.8	89.4	95.8	73.0
	2	45973	13812	9424	68.23	7290	2134	37.1	40.3	78.5	87.9	58.9
	3	50703	15286	9749	63.78	7092	2657	37.7	44.5	80.0	84.8	70.4
	4	51368	14952	10083	67.44	6937	3146	39.4	42.6	82.4	83.1	83.2
1983	1	47199	12734	8298	65.16	5500	2798	38.4	41.0	81.1	82.4	77.2
	2	50214	12583	7565	60.12	5365	2200	39.4	37.5	69.2	74.3	60.1
	3	55978	13733	8227	59.91	5219	3008	40.6	40.1	72.4	71.1	78.1
	4	60088	14388	8420	58.52	5355	3065	43.1	40.3	73.5	72.5	78.4
1984	1	57852	13842	8174	59.05	4884	3290	43.2	40.6	75.5	71.1	85.4
	2	62840	14486	7319	50.52	5112	2207	45.0	40.1	66.2	70.9	58.0
	3	68580	14504	7586	52.30	5231	2355	45.0	40.7	68.0	72.1	59.8
	4	68200	15112	7855	51.98	5421	2434	44.5	41.7	69.8	73.9	61.8
1985	1	66118	14326	7874	54.96	5282	2592	45.8	42.2	73.7	75.7	67.9
	2	65849	14584	6890	47.24	5329	1561	43.7	40.4	62.5	72.3	41.1
	3	69969	13694	7157	52.26	5276	1881	43.7	38.7	63.8	70.8	48.3
	4	70951	15469	7889	51.00	5955	1934	45.4	42.0	70.0	78.7	50.2
1986	1	69108	15384	8094	52.61	5707	2387	45.9	41.8	71.6	75.3	62.0
	2	73102	15914	7731	48.58	6241	1490	47.3	40.4	65.9	78.3	37.8
	3	83372	16883	8541	50.59	6572	1969	51.0	42.4	69.5	79.1	47.5
	4	88419	20415	9631	47.18	7435	2196	53.4	48.4	75.9	86.2	52.0

1987	1	84318	20514	10622	51.78	7789	2833	51.7	48.3	77.8	82.3	66.0
	2	89861	21393	9859	46.09	7939	1920	53.5	46.6	68.5	79.7	43.3
	3	105262	24336	11506	47.28	8987	2519	58.6	50.7	72.1	81.2	51.3
	4	106886	26484	13219	49.91	10373	2846	59.5	52.0	77.2	87.5	53.6
1988	1	100261	26023	14104	54.20	10712	3392	56.1	50.7	80.1	87.4	62.1
	2	106898	28079	13843	49.30	11486	2357	58.1	51.4	74.0	88.2	41.8
	3	122224	30390	14320	47.12	11098	3222	62.8	53.5	69.5	76.8	52.8
	4	127865	32946	17080	51.84	13908	3172	64.4	55.0	78.8	91.4	49.8
1989	1	118206	33666	17997	53.46	13685	4312	59.6	56.1	84.3	91.2	66.9
	2	126058	35048	17299	49.36	14351	2948	59.9	54.9	76.2	90.2	44.6
	3	139551	34787	18387	52.86	14380	4007	63.6	55.0	79.3	88.9	57.5
	4	143266	34601	19483	56.31	14796	4687	64.7	52.7	81.9	88.8	66.1
1990	1	131033	35758	19781	55.32	14354	5427	60.1	56.7	85.7	89.0	76.7
	2	140688	37799	20004	52.92	16295	3709	62.4	58.2	84.1	98.4	51.9
	3	155950	39529	21910	55.43	17478	4432	66.7	59.3	88.6	101.3	59.5
	4	159949	43072	23974	55.66	19335	4639	67.8	62.3	95.0	109.6	61.5
1991	1	149003	40345	22563	55.93	16911	5652	63.4	59.4	91.0	97.7	74.1
	2	160942	44152	22054	49.95	18417	3637	65.6	64.1	85.7	102.8	46.9
	3	180580	46545	23559	50.62	18709	4850	70.3	66.2	87.2	99.0	60.3
	4	186722	49767	25638	51.52	21189	4449	72.0	69.1	94.0	110.9	54.8
1992	1	176661	47798	26682	55.82	20848	5834	67.4	64.1	92.6	99.9	74.1
	2	189129	54278	24938	45.94	21344	3594	70.0	70.8	81.2	97.6	44.1
	3	210027	57359	26806	46.73	22111	4695	75.4	73.4	84.9	97.4	56.5
	4	215501	58202	29240	50.24	22858	6382	76.5	74.6	94.3	101.7	77.3
1993	1	205568	57214	33214	58.05	24479	8735	71.8	69.7	100.3	97.1	106.2

	2	218604	63290	30360	47.97	24452	5908	74.5	74.4	86.5	94.0	70.1
	3	241488	64956	32077	49.38	24237	7840	80.3	75.0	90.4	92.1	86.7
	4	247149	63983	34383	53.74	26468	7915	81.1	74.0	97.2	101.3	87.8
1994	1	236370	71334	41886	58.72	30698	11188	76.6	79.6	117.2	111.9	127.6
	2	249299	77578	38358	49.44	32507	5851	78.7	85.6	100.1	115.9	64.7
	3	268834	75341	41405	54.96	32425	8980	83.9	82.8	108.9	112.9	100.3
	4	275271	81504	43267	53.09	32874	10393	85.4	89.9	113.1	112.9	113.7
1995	1	253532	77152	40803	52.89	28439	12364	81.0	88.9	118.1	110.5	133.6
	2	266221	87064	38779	44.54	28587	10192	82.1	93.5	107.1	108.3	105.7
	3	283671	85334	37972	44.50	25866	12106	86.2	96.1	106.3	98.3	125.3
	4	292840	84813	41344	48.75	28941	12403	87.9	94.6	112.9	108.7	122.9
1996	1	273698	86156	45181	52.44	28746	16435	83.1	97.0	124.6	105.5	166.6
	2	291996	93535	42610	45.56	31274	11336	85.1	102.1	110.0	109.9	111.5
	3	313538	92147	43548	47.26	31038	12510	90.8	101.8	110.4	106.3	120.5
	4	331695	106648	54309	50.92	39051	15258	92.6	113.0	130.3	124.0	145.2
1997	1	307279	104926	51219	48.81	34721	16498	87.8	113.3	131.3	119.4	156.6
	2	332335	113142	51368	45.40	40481	10887	90.6	115.5	122.3	131.9	101.6
	3	351501	113367	57250	50.50	44417	12833	96.1	113.6	129.6	135.3	116.9
	4	353431	120456	63427	52.66	50485	12942	95.0	124.0	141.8	153.1	116.1
1998	1	309548	103441	60259	58.25	43983	16276	85.5	110.7	145.4	144.8	144.4
	2	318978	108158	54962	50.82	43050	11912	86.0	119.5	132.9	146.3	103.4
	3	326421	88801	47392	53.37	36452	10940	89.6	101.3	119.0	131.4	90.8
	4	324905	88331	45622	51.65	33762	11860	90.0	100.8	115.8	124.2	96.5
1999	1	290525	81439	48808	59.93	32261	16547	83.2	88.1	124.7	118.1	138.1
	2	305798	80716	41604	51.54	29763	11841	87.6	89.9	104.6	108.7	96.3

	3	319225	81375	40843	50.19	28287	12556	93.8	90.5	101.2	103.2	97.0
	4	330586	81798	40675	49.73	26641	14034	98.4	91.9	103.1	101.3	107.6
2000	1	308457	83397	41834	50.16	26732	15102	94.6	94.1	105.7	99.6	118.1
	2	312780	83316	35095	42.12	24529	10566	96.5	95.0	89.9	93.6	82.4
	3	330500	91118	38789	42.57	26339	12450	103.4	105.1	100.4	102.1	96.9
	4	336602	89544	39723	44.36	26525	13198	105.5	105.8	104.0	104.7	102.6
2001	1	307424	84767	38346	45.24	23010	15336	96.7	103.4	103.9	96.0	119.8
	2	310521	79927	33687	42.15	23106	10581	97.9	97.7	92.8	97.6	82.9
	3	323873	88267	34078	38.61	23116	10962	103.0	108.3	95.0	99.1	86.6
	4	328077	80075	36540	45.63	25169	11371	104.3	101.1	104.0	110.7	90.2
2002	1	295858	67825	34010	50.14	21830	12180	95.8	90.8	98.3	97.8	99.4
	2	303171	70995	33167	46.72	22850	10317	98.3	96.7	97.4	103.4	85.3
	3	321243	75028	33159	44.20	23427	9732	106.1	103.5	100.2	109.4	81.5
	4	327685	72172	31416	43.53	20370	11046	109.4	100.8	95.4	97.2	91.9
2003	1	295393	65707	30882	47.00	19551	11331	100.0	94.6	95.2	94.9	95.8
	2	283916	63142	28228	44.71	18399	9829	97.9	91.6	89.1	91.5	84.4
	3	313863	69324	29606	42.71	19201	10405	110.3	103.5	93.6	95.5	89.7
	4	326866	70954	27491	38.74	16840	10651	114.6	102.8	85.9	82.0	94.1
2004	1	302969	70709	28103	39.74	16854	11249	106.9	99.8	84.1	78.0	96.6
	2	309873	73355	26858	36.61	17933	8925	109.5	103.2	80.2	82.3	75.9
	3	326720	72732	26903	36.99	17707	9196	117.8	106.3	80.7	80.9	80.3
	4	342437	71023	27725	39.04	16785	10940	122.8	100.7	81.5	75.5	93.6

* includes both "building and construction" and "machinery, equipment and computer software"

8.3. Statistics on value added by construction

Year	GDP at factor cost (HK$ million)	Population('000)	per capita GDP at factor cost	value added by construction (HK$ million)	value added by construction as % of GDP	value added by construction per capita (HK$)
1980	135,037	5,063.10	26,671	8,931	6.6137	1,763.9
1981	165,459	5,183.40	31,921	12,388	7.4871	2,389.9
1982	184,124	5,264.50	34,975	13,375	7.2641	2,540.6
1983	202,637	5,345.10	37,911	12,890	6.3611	2,411.6
1984	241,083	5,397.90	44,662	12,922	5.3600	2,393.9
1985	255,416	5,456.20	46,812	12,686	4.9668	2,325.1
1986	297,731	5,524.60	53,892	14,261	4.7899	2,581.4
1987	368,847	5,580.50	66,096	17,033	4.6179	3,052.2
1988	440,850	5,627.60	78,337	20,671	4.6889	3,673.1
1989	502,227	5,686.20	88,324	25,756	5.1284	4,529.6
1990	563,517	5,704.50	98,785	30,242	5.3667	5,301.4
1991	638,606	5,752.00	111,023	34,737	5.4395	6,039.1
1992	742,760	5,800.50	128,051	37,471	5.0448	6,460.0
1993	844,322	5,901.00	143,081	43,295	5.1278	7,336.9
1994	968,900	6,035.40	160,536	46,612	4.8108	7,723.1
1995	1,041,072	6,156.10	169,112	55,192	5.3015	8,965.4
1996	1,158,963	6,435.50	180,089	65,822	5.6794	10,228.0
1997	1,267,489	6,489.30	195,320	72,759	5.7404	11,212.1
1998	1,205,349	6,543.70	184,200	71,000	5.8904	10,850.1
1999	1,177,796	6,606.50	178,278	67,232	5.7083	10,176.6
2000	1,228,897	6,665.00	184,381	64,026	5.2100	9,606.3
2001	1,215,354	6,724.90	180,724	58,971	4.8522	8,769.1
2002	1,206,150	6,787.00	177,715	53,089	4.4015	7,822.2
2003	1,177,668	6,803.10	173,108	46,233	3.9258	6,795.9