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CONTENTS

	<u>Page</u>
TABLE OF CONTENTS	1 – 2
EXECUTIVE SUMMARY	3 – 4
1. INTRODUCTION	5 – 6
2. REVIEW OF PAST STUDIES AND METHODOLOGIES	7 – 15
Three Main Approaches	7
Mincer-type Earnings Equation Method	8 – 10
Internal Rate of Return Method	11 – 12
Summary of Main Findings	13 – 14
External Benefits to Education	15
3. ESTIMATING PRIVATE RATES OF RETURNS TO EDUCATION	16 – 27
Data and Sampling	16
The Variables and Model Specifications	18 – 20
The Results	21 – 27
Experiments with Extended Earnings Equations	28 – 31
4. THE COMPLETE METHOD: SOCIAL AS COMPARED WITH PRIVATE RATES OF RETURNS	32 – 42
Private Costs	32 – 34
Social Costs	35 – 37
Private and Social Rates of Return Based on the IRR Approach	38 – 41
Education-related Variation in Unemployment	42
5. CONCLUSIONS	43 – 46
APPENDIX	47 – 57
REFERENCE	58

Consultancy Study on Rates of Return to Education – Draft Final Report

TABLE	<u>Page</u>
2.1 Returns on Investment to education by Education Level, Full Methods, Latest year, Regional Averages	13
2.2 Returns to Education by Gender	13
2.3 Return to Secondary Education by Curriculum Type	14
2.4 Returns to Higher Education by Faculty	14
3.1 Restrictions for Sampling	16
3.2 Assumptions about Years Required for Different Levels of Education	17
3.3 Variable Meanings, Means and Standard Deviations	19
3.4a Estimated Private Rates of Return to Education (Full Sample)	21
3.4b Estimated Private Rates of Return to Education (Male Sample)	23
3.4c Estimated Private Rates of Return to Education (Female Sample)	23
3.5 Estimated “Truncated Rates of Return” over Time by Age Groups (Full Sample)	25
3.6 Estimated Earnings Equation for Different Subjects (Degree Holders Only)	27
3.7 The Results of Estimated Extended Earnings Equation (1991 & 1996)	30
3.8 Estimated Private Rates of Return to Education (Extended Earnings Equation)	31
4.1 Tuition Fees/Educational Charges for Different Education Levels	33
4.2 Private Costs of University Education	33
4.3 Expenses on Books and Stationery for Different Education Levels	34
4.4 Public Expenditures on Education	35
4.5 Calculation of Opportunity Costs of Lending Money to University Students	36
4.6 Imputed Rental Cost for School Buildings	37
4.7a Private Rates of Return (1981) IRR Method	39
4.7b Private Rates of Return (1986) IRR Method	39
4.7c Private Rates of Return (1991) IRR Method	39
4.7d Private Rates of Return (1996) IRR Method	40
4.8a Social Rates of Return (1981) IRR Method	40
4.8b Social Rates of Return (1986) IRR Method	40
4.8c Social Rates of Return (1991) IRR Method	41
4.8d Social Rates of Return (1996) IRR Method	41
4.9 Unemployment Rates by Educational Categories in 1996	42

APPENDIX	<u>Page</u>
1. Regression Results for Earnings Equation	47
2. Comparison of Estimated Rates of Return to Education in Hong Kong	56

EXECUTIVE SUMMARY

- 1 This study uses Hong Kong Census data to estimate rates of return to various education qualifications. This exercise throws light on how returns from investment in education vary with different programs and with different levels of education. Obtaining such information is the first step towards efficiently allocating public funds between investment in education and investment in other social investment projects, and among different educational programs.
- 2 The current study is distinguished from similar studies done for Hong Kong in the past in the following aspects. First, this study uses *full* Census data-sets maintained by the Census and Statistics Department, covering from the 1981 Census year to 1996 the By-census year. Second, it classifies education programs in great detail and produces estimated rates of return for both academic and vocational education qualifications. Third, we try, for the first time, to find out how rates of return vary over time for different age cohorts. Fourthly, it compares the returns for different university subjects. Finally, it estimates both private and social rates of return to education and considers building costs as part of its estimated social costs.
- 3 The estimated rates of return to education for Hong Kong are generally higher than those for OECD countries. The rates also tend to be higher for higher levels (post-secondary) of education. More particularly, a professional qualification as a teacher and a post-graduate degree command the highest rates of return.
- 4 Similarly to those found elsewhere in the world, the study shows that the rates are generally higher for academic programs than for vocational programs, especially during the 1990's.
- 5 Rates of return to a first degree program had experienced an increase in the 1980's. They started to decline in 1990's, which is as expected in view of the fast expansion in tertiary education from the late 80's to the early 90's. However, even in 1996 both the private and the social rates of return were still over 10%. In particular, rates of return to post-graduate degree had shown some increase from 1991 to 1996. These facts indicate that the demand for tertiary graduates in Hong Kong is still high.

Consultancy Study on Rates of Return to Education – Draft Final Report

- 6 Data limitation has prevented us from constructing complete age-earnings profiles for different age cohorts. Instead we can only construct rates of return for a particular age group at a time using the observed earnings gap for that time. The “truncated” rates of return estimated in this way give a glimpse into the cohort effects. By cohort effects is meant variations in rates of return due to the different career opportunities available to different cohorts. We found that most of the facts summarized above for the population as a whole hold for population cohorts as well. However, the year to year returns to investment in education for an age cohort do vary substantially.
- 7 The benefit of having Form 5 over Form 3 appears to grow for the same cohort over time. This is not so with all categories of higher education over Form 5. Furthermore, there seems to be an across the board decline in rates from 1991 to 1996.
- 8 Studies in Engineering, Medical Science, Law and Social Sciences generally command higher returns than studies in Arts, Humanity, Natural Sciences and business. However, we observe huge swings in estimated relative returns over time. Such swings may reflect both the cyclical nature of some industries and the tremendous role played by “administered salary scales” for some professions which had been revised dramatically as a result of structural reforms.
- 9 Most of the estimated social rates of return to education are close to 10%, a figure considered to be very good by all accounts. After taking account of the huge public subsidy university students receive the estimated social rates of return to university degree and post-graduate degree are still quite high in Hong Kong and do not appear to be lower than those for other education levels.
- 10 It should be noted that our estimates of social rates of return have not taken into account any non-monetary and external benefits of education. Such benefits range from lower unemployment rates and population growth rates, lower crime rates, to better health for Hong Kong’s population and faster economic growth. Data and time limitations have prevented us from carrying out a thorough study of these effects, but it is well known that the better educated are less likely to be unemployed and less likely to be involved in criminal activities.

I: INTRODUCTION

- 1.1 The SAR Government has made it a priority to refurbish Hong Kong's education system. This is part of a strategy to enhance Hong Kong's competitiveness. The Education Commission commenced an overall review of the education system in April 1998. A "Review of the Academic System: Aims of Education" consultation document was released in January 1999. It received one of the most enthusiastic responses from the public in Hong Kong's history. Educators, parents, as well as students and employers, "went to the basics" and discussed the aims of education. Surely the economy has to be powered by people, and particularly by people who can take advantage of the recent advances of the "knowledge economy." Given that the government has already committed the largest share of public expenditures on education, to the tune of \$53.2 billion or some 3.8 per cent of the GDP (1998-99 fiscal year), the big question is whether expenditures on education should be further expanded, and whether the composition of the expenditures should be refocussed.
- 1.2 The Consultancy Brief specifically described the following task for the consultants: to compile and interpret the rates of return to education in Hong Kong, covering *inter alia*, private and social costs and benefits of education, and compare the rates of return across education sectors.
- 1.3 In principle, such information should give us an idea of what individuals and parents perceive to be the value of different levels or kinds of education, and whether the public investment in education is worthwhile. Both kinds of information are important. Parents' and students' perception of the value of education will be reflected in different demands for different programs. If the demand for an educational program is low, then either enrollment suffers (with the exception of the compulsory component) or the quality of students enrolled will fall. If the social return to education is perceived to be low, then it would be difficult to justify the massive resources committed to provide education opportunities.

Consultancy Study on Rates of Return to Education – Draft Final Report

- 1.4 In the next Chapter we review the literature on rates of return to education. We first discuss the main approaches used by researchers to estimate the rates of return, and their associated problems. We then present some information about external benefits to education. Finally, we summarize some main findings in this area.
- 1.5 Chapter Three presents our data and estimates on private rates of return to education. Apart from university programs, students in Hong Kong have the choice of taking non-degree programs, which include sub-degree programs offered by the Hong Kong Institute of Education, and various technical and vocational programs offered by the Vocational Training Council. Moreover, there are taught postgraduate programs and research postgraduate programs offered by universities. The rates of returns to education are estimated for all these different programs at the aggregate level. The relative returns for specific fields of education will also be estimated.
- 1.6 We show our estimated social rates of return to education in Chapter Four. Also presented in Chapter Four is an estimated age-earnings profile for a particular cohort and the corresponding estimates of rates of return to education. Chapter Five concludes the whole study.

II: REVIEW OF PAST STUDIES AND METHODOLOGIES

Three Main Approaches

- 2.1 There are, within the literature, three main approaches of measuring rates of return to education investment, as summarized by George Psacharopoulos (1985). They are: (1) the “short-cut” method; (2) the Mincer-type earnings equation method; and (3) the internal rate of return method. The short cut method is used only when aggregate data is available. The estimates derived using the short cut method, based as they are on aggregate rather than on data on individuals, are inevitably crude. In this report, since we can use census data we can apply (2) to calculate the private rates of return to education and (3) to calculate social rates of return to education in Hong Kong. In the following two sub-sections, we give a brief account of how these two methods operate.
- 2.2 These approaches to measuring rates of return to education investment can be grouped under what can be called the “reduced form” approach. “Reduced form” is a technical term used in econometrics that absolve from the structure of the causal relationship between key variables, and simply relate the dependent variables to all those variables that directly and/or indirectly determine the magnitude of the dependent variables. The alternative approach would be the “structuralist approach,” which spells out the entire web of causal relations. In principle, returns to education can be estimated as the benefits from the qualities which are produced by education. As such it would be necessary to know what qualities are produced by education, how each of these qualities are valued in the market place and outside the market, and we would also have to know the effectiveness of various inputs that go into the education process in producing the various valued qualities. This approach would be ideal, except that it is highly demanding of data. In the absence of sufficiently good data, estimates based on the structuralist approach may be wrong and the results may be misleading. However, only the structuralist approach will throw light on how and where we should invest in education. Unlike the structuralist approach, the reduced form approach cannot deliver this information. Because of data problems and time constraint, we cannot use the structuralist approach in this study, and simply follow the standard practice of using a reduced form approach.

Mincer-type Earnings Equation Method

- 2.3 As the name suggested itself, the method was first invented by Jacob Mincer (1974). It estimates the following earnings equation:

$$\ln W = a + bS + cEXP + dEXP^2 + Xf + e$$

where $\ln W$ is the natural logarithm of earnings, S is years of schooling completed, EXP is working experience, X is a vector of other wage determinants (factors such as union status, socio-economic-demographic status, etc., which either affect the wage setting process or the productivity of an individual worker). a , b , c , d and f are parameters, and e is an error term.

- 2.4 Mincer showed that b , the coefficient of years of schooling, is an approximation of the private rate of return to an additional year of schooling completed. One alternative specification to the above equation is to replace S , years of schooling completed, by a set of education qualification dummies, S_1, S_2, \dots, S_k , where S_t ($t = 1, \dots, k$) equals to 1 for people who have completed t level of education, 0 otherwise. Usually t starts from primary school to secondary, and then to university. So the earnings equation would look like the following:

$$\ln W = a + b_1S_{\text{primary}} + b_2S_{\text{secondary}} + b_3S_{\text{university}} + cEXP + dEXP^2 + Xf + e$$

Under this somewhat more elaborated specification, the rate of return to an extra year of education is calculated as:

$$\begin{aligned} r_{(\text{primary over less than primary})} &= b_1/n_1 \\ r_{(\text{secondary over primary})} &= b_2/n_2 \\ r_{(\text{university over secondary})} &= b_3/n_3 \end{aligned}$$

where n_1 , n_2 and n_3 are the years of education associated with primary, secondary and university qualifications, respectively.

- 2.5 Despite its popular usage, the Mincer-type earnings equation method can only be applied to estimate private (monetary) rates of return to education. This is because the method only takes into account the individual forgone earnings as the cost of investment.

Consultancy Study on Rates of Return to Education – Draft Final Report

- 2.6 It is recognized in the literature that the private benefits of education do not consist of higher earnings alone. It is believed that education enhances the productivity of housework and the effectiveness of child care, so that not only will individuals get more pleasure out of their household production, but also there may be benefits that “reverberate through generations,” as more able children in turn will provide better care for their own children.(Alsalam and Conley, 1995)
- 2.7 There is another reason cited in the literature as to why the private returns to education may be underestimated. Quite apart from the understatement of benefits there may be an overstatement of costs. Because all men and all women are not the same, assuming that the opportunity cost of undergoing an educational program is the forgone earnings as estimated through aggregative data ignores the fact that people being different, those that give up on an educational program are likely to be those who stand to benefit the least from it. A process of self-selection based on one’s own comparative advantage means that assuming, say, students deciding to do graduate studies are subject to an opportunity cost reflected by earnings made by university graduates may not be correct, if those university graduates who opt not to go for higher studies do so because they have special qualities that enable them to do better than those who opt for graduate studies.(Willis and Rosen, 1979)
- 2.8 There is also the possibility that people with higher innate abilities go on to higher levels of education, so that when they graduate and go into the labor market, their higher abilities at the job may reflect their innate abilities rather than their abilities as enhanced by education. Employers choose students with higher education levels because the higher education levels signal that the individuals have higher abilities in the first place. This is the so-called “signaling hypothesis.” Economists studying returns to education using cross section data have an intrinsic difficulty distinguishing whether the higher earnings reflect abilities acquired from education and whether they reflect the innate abilities. There is little doubt that these considerations mean that rates of return to education estimated from cross section data may overstate the true benefits of education. However, a case can be made that because people tend to over-report their levels of education, while some benefits are not included in reported earnings, the rates of return to education may be understated. A recent article by Ashenfelter and Rouse (1998) suggested that the measurement error effects essentially offset the innate ability effects so that estimated rates of return to education from cross

Consultancy Study on Rates of Return to Education – Draft Final Report

section data may be about right.

- 2.9 There is also the concern that even if the rates of return to education as estimated from the cross section data are about right, they may not provide the necessary or the right clue as to whether and, if so, where we should invest more in education. The estimated rates of returns are *average* rates of return, i.e., the benefits are what accrue to the average worker with the specified educational background. If we extend the net of education wider so that an additional 100 persons will get it, there is no guarantee at all that the additional 100 persons will benefit in the way that the average worker with the specified educational background would. That is to say, the *marginal* benefit of education, or the *marginal* rate of return to education (marginal with respect to enrollment), may be much lower than the average benefit.
- 2.10 This effect could be important for Hong Kong. University places were expanded rapidly in the late 80s, so that between 1985 and 1995 the percentage of the 17-20 age group provided with first-year first degree places rose from 3.8 per cent to 18 per cent. The increased supply of university graduates no doubt had reduced their relative wages. With the average rates of return to university education dropping markedly, the marginal rates of return must have dropped even faster.

Internal Rate of Return Method

- 2.11 This method requires the construction of detailed age-earnings profiles by level of education. The rate to education are then computed as the rate of discount that equates the stream of benefits to the stream of costs, i.e.:

$$\Sigma (B_t - C_t)/(1+r)^t = 0$$

where B_t and C_t are the average benefits and costs of the particular educational investment in year t , n is the expected life of the investment, and r is the rate of return.

- 2.12 The internal rate of return method is sometimes referred to as the “complete method”, as it is theoretically superior to the Mincer equation method in that benefits other than earnings can be incorporated. Total private benefits are measured as the average additional benefits, monetary as well as non-monetary, received by the persons with the particular education level of interest over and above those received by the persons with the next lower level of education. Total private costs should include, apart from forgone earnings which are captured in the Mincer equation approach, also the direct costs such as tuition fees and the cost of books which must be incurred as additional costs borne by the household when the child attends school. The cost of food and school uniforms should not be added, as the child would still need food and clothing even if he or she does not go to school.
- 2.13 When the social rate of return to education is sought benefits should also cover any extra benefits to the society brought about by this additional investment in education. On the cost side, many more items must be added. The full resources costs of providing the educational service, including any explicit and implicit subsidy to cover costs not borne by the individual or the individual’s family, should be incorporated.

2.14 As a “complete method,” the internal rate of return approach requires far more data compared with the Mincer-equation method. Much of this information is not readily available to researchers. So the method is less commonly applied and when it is used it is usually applied to estimate the social rate of return by incorporating the social costs of education into the total cost calculation. In general, researchers using this approach have to make various assumptions “to fill in the missing data.”

Summary of Main Findings

2.15 The article by Psacharopoulos (1994) represents one of the most exhaustive reviews of all past studies on rates of return to education around the world. Table 2.1 gives his summary on the estimated private and social rates of return in different parts of the world. Table 2.2, 2.3 and 2.4 present return to education by gender, curriculum types of secondary education, and faculties of higher education, respectively.

**Table 2.1:
Returns on Investment to education by Education Level
Full Methods, Latest year, Regional Averages**

Country	Social			Private		
	Prim.	Sec.	Higher	Prim.	Sec.	Higher
Sub-Saharan Africa	24.3%	18.2%	11.2%	41.3%	26.6%	27.8%
Asia*	19.9%	13.3%	11.7%	39.0%	18.9%	19.9%
Europe/Middle East/North Africa*	15.5%	11.2%	10.6%	17.4%	15.9%	21.7%
Latin America/Caribbean	17.9%	12.8%	12.3%	26.2%	16.8%	19.7%
OECD	14.4%	10.2%	8.7%	21.7%	12.4%	12.3%
World	18.4%	13.1%	10.9%	29.1%	18.1%	20.3%

Source: Table 1 of Psacharopoulos (1994). *Non-OECD.

**Table 2.2:
Returns to Education by Gender**

Educational level	Men	Women
Primary	20.1%	12.8%
Secondary	13.9%	18.4%
Higher	13.4%	12.7%
Overall*	11.1%	12.4%

Source: Table 7 of Psacharopoulos (1994). *Mincerian method.

Table 2.3:
Return to Secondary Education by Curriculum Type

Curriculum type	Rate of Return	
	Social	Private
Academic/General	15.5%	11.7%
Technical/Vocational	10.6%	10.5%

Source: Table 9 of Psacharopoulos (1994)

Table 2.4:
Returns to Higher Education by Faculty

Subject	Social	Private
Agriculture	7.6	15.0
Soc. Science, Arts & Human.	9.1	14.6
Economics & Business	12.0	17.7
Engineering	10.9	19.0
Law	12.7	16.8
Medicine	10.0	17.7
Physics	1.8	13.7
Sciences	8.9	17.0

Source: Table 10 of Psacharopoulos (1994).

- 2.16 He gave the following conclusions. First, the rate of return to primary education is still the highest among all other levels of education in developing countries. Secondly, the rates of return to education are slightly higher for females than for males. Thirdly, the academic track of secondary curriculum is better investment than the vocational track of secondary curriculum. Finally, the investment in education follows the law of diminishing return.

External Benefits to Education

- 2.17 The literature recognizes that the external benefits are also quite sizable. These external benefits may be in the form of greater effectiveness in public health programs leading to savings in health care expenditures, lower fertility rate leading to slow population growth. They may also be in the form of lower crime rate leading to savings in lower insurance costs, a greater sense of personal security, less incidents of vandalism, and more effective environmental protection. Better Education is also found to be associated with more democracy, lower unemployment rate, faster economic growth and less income inequality.
- 2.18 According to one recent survey by McMahon (1998), the estimated external benefits of education are substantial. For example, the estimated effects of education on health alone indicate that the true return to new investment in lifelong learning is 4-5% higher than existing estimates based on monetary earnings (see McMahon, p318). Education is also said to be responsible for increasing returns to scale in the new endogenous growth theory, which offset diminishing returns to investment in physical capital that would otherwise appear. Studies by Barro and Sala-I-Martin (1995) indicate that the income gap between the richest countries and poorest countries in the world is increasing and human-resource development is primarily responsible for this. McMahon concluded that the total external benefits of education were at least as large as monetary benefits normally estimated by researchers.

III: ESTIMATING PRIVATE RATES OF RETURNS TO EDUCATION

Data and Sampling

3.1 We apply the Mincer-type of earnings equation method to find out the private rates of return to education. The data sources are the 1981, 1986, 1991 and 1996 Population Censuses or By-Censuses. We use the full sample Census data maintained by the Census and Statistics Department. However, for the purpose of estimating the earnings equation, we restrict the sample to those aged between 15 and 65 and engaging in paid employment, with pay exceeding a specified threshold (see below). We further restrict our sample to Hong Kong residents who were born in Greater China area (Hong Kong, Chinese Mainland, Taiwan and Macao) (see Table 3.1). This is to reduce possible biases caused by quite different earnings patterns associated with foreign imported labour and/or domestic helpers.

**Table 3.1:
Restrictions for Sampling**

Demographics	Restrictions
Age	15 or above and 65 or below
Monthly Earning	\$500 or above for 1981 \$1000 or above for 1986 \$2000 or above for 1991 \$2500 or above for 1996
Place of Birth	Hong Kong, China, Taiwan, and Macau
Activity Status	Employees, outworkers, employers, and self-employed

3.2 We have to make some assumptions about how many years are required for different levels of education. These assumptions are listed in Table 3.2. It is further also assumed that earnings and the benefits of education end at age 65. We ignore non-earnings-related benefits.

Table 3.2:
Assumptions about Years Required for Different Levels of Education

	Age	Time Spent (in Years)
Primary	6 - 11	6
Junior Secondary (Form 1 to Form 3)	12 - 14	3
Upper Secondary (Form 4 to Form 5)	15 - 16	2
Matriculation (Form 6 to Form 7)	17 - 18	2
Technical Level at Technical Institutes	17 - 18	2
Higher Technical Level at Technical Colleges	19 - 20	2
Education	19 – 21	3
Degree	19 – 21	3
High Degree	22 – 23	2

3.3 We first estimate three Mincer-type earnings equations for each set of Census data. Of these one is for the overall sample, one is for the male sub-sample and the last one is for the female sub-sample. The conventional wisdom tells us that the earnings functions for males and females are often structurally different, as it is quite difficult to control for females' true labour market experiences. So we also run earnings equations separately for male and female to see if this is true for the Hong Kong case.

The Variables and Model Specifications

- 3.4 The earnings variable in our study is *monthly earnings*. Since there is no information on the number of working weeks per month and on hours of work per week (1981 Census and 1986 By-Census did contain hours of work per week question, but the quality of the data was very poor), we cannot use an hourly pay variable as our earnings measure. Such a measure, if available, would have been more appropriate. More seriously, due to lack of information on working hours, we cannot distinguish a part-time worker from a full-time one. To minimize data contamination due to including part-time workers in a data-set assumed to represent full time workers, we restrict our samples to those with monthly pay no less than HK\$1,000 in 1981, HK\$1,500 in 1986, HK\$2,000 in 1991 and HK\$2,500 in 1996, respectively.
- 3.5 Our *education variables* are dummies, and are defined for: (1) below Form 2 (“Primary”); (2) Form 2 to Form 4 (“Form 3”); (3) Form 5 (Form5”); (4) Form 6 to 7 (“Matriculation”); (5) secondary level technical/vocational diploma or certificate qualifications for those who have completed Form 5 (“Tech”); (6) Diploma/Certificate courses in Colleges of Education or Technical Teachers’ College(“Teacher”); (7) higher level of technical/vocational qualifications (including nursing qualification) (“Htech”); (8) diploma from universities or post-secondary colleges (for 1991 and 1996b data, we also distinguish diploma offered by universities or statutory approved post-secondary colleges from those offered by other post-secondary (private) colleges(“Diploma” or “Diploma1”); (9) degrees (“Degree”); and (10) post-graduate qualification (Hdegree). A detailed explanation of these dummies can be found in Table 3.3.
- 3.6 We also include *labour market experience* and its square term in the earnings equation. No direct information on working experience is readily available in the Census data. So the variable is constructed as age *minus* years of (full-time equivalent) schooling *minus* 6 (the common age for a child to start primary 1 in Hong Kong).

**Table 3.3:
Variable Meanings, Means and Standard Deviations**

Variables	Meanings	Means (Standard Deviations)			
		1981	1986	1991	1996
LogW	logarithm of monthly pay. 7.37 (0.569)	7.97 (0.582)	8.77 (0.599)	9.27 (0.645)	
Expe	years of working experience. 17.89 (13.316)	18.27 (12.583)	14.26 (9.385)	19.52 (11.592)	
Nosch	dummy (=1) for education levels lower no higher than lower primary. 22.7% (0.419)	15.6% (0.363)	5.8% (0.309)	5.8% (0.234)	
Primary	dummy (=1) for education levels higher than lower primary and lower than Form 2. 29.1% (0.454)	23.8% (0.426)	15.7% (0.364)	17.9% (0.384)	
Form3	dummy (=1) for education levels higher than Form 1 and lower than Form 5. 18.1% (0.385)	19.9% (0.399)	20.5% (0.404)	21.5% (0.411)	
Form5	dummy (=1) for education level equivalent to Form 5. 19.5% (0.396)	25.3% (0.434)	35.1% (0.477)	32.1% (0.467)	
Matriculation	dummy (=1) for education levels equivalent to Form 6 or Form 7. 3.4% (0.181)	4.8% (0.213)	6.7% (0.250)	3.9% (0.194)	
Tech	dummy (=1) for people completed Diploma/Endorsement Certificate courses in Technical/Polytechnics. 0.6% (0.077)	2.4% (0.151)	3.4% (0.183)	0.9% (0.094)	
Htech	dummy (=1) for people completed Higher Diploma/Endorsement courses in Technical Institutes/Polytechnics, or Associateship or equivalent courses in Polytechnics, or nursing training courses. 1.3% (0.114)	1.5% (0.123)	2.7% (0.161)	3.2% (0.175)	
Teacher	dummy (=1) for people completed courses in Colleges of Education or Technical Teachers' College. 0.7% (0.081)	0.8% (0.089)	0.9% (0.095)	0.6% (0.079)	
Diploma (for 81 & 86)	dummy (=1) for people completed Diploma courses in Post-secondary Colleges and Universities. 1.1% (0.104)	1.2% (0.109)	N/A	N/A	
Diploma1 (for 91 & 96)	dummy (=1) for people completed Diploma courses in non-statutory or approved Post-secondary Colleges. N/A	N/A	0.7% (0.081)	0.9% (0.092)	
Diploma2 (for 91 & 96)	dummy (=1) for people completed Diploma courses in statutory or approved Post-secondary Colleges or Universities. N/A	N/A	1.2% (0.107)	1.6% (0.124)	
Degree	dummy (=1) for people completed degree courses. 3.0% (0.169)	4.1% (0.199)	6.2 % (0.242)	9.7% (0.296)	
Hdegree	dummy (=1) for people completed post-graduate courses. 0.4% (0.061)	0.4% (0.064)	0.7% (0.082)	1.8% (0.134)	

3.7 There is much debate over what X variables should be included in the earnings equation. It is argued by some economists that because some of the potential X variables are themselves very much affected by education, putting them and the education variables in the same equation could bias the effects which should be attributed to education. Accordingly, we have decided not to include any X variables in our main specification of the earnings function. The results of our estimated earnings functions are presented in Table A1.1a, A1.1b, A1.1c and A1.1d in the Appendix for 1981, 1986, 1991, and 1996 respectively. Table 3.4a, 3.4b, and 3.4c contain the estimated rates of return to education. We will, however, present some results for a model specification that includes some selected X variables towards the end of this chapter for reference, noting that the results should be interpreted with caution.

Consultancy Study on Rates of Return to Education – Draft Final Report

The Results

A. Table 3.4a reports the estimated rates of return to education for the full (male + female) sample, while Table 3.4b and 3.4c show the corresponding results for the male and female sample, respectively. Looking at Table 3.4a first, the figures in the top two rows (rates of return of Primary over no schooling and Form 3 over Primary) are considerably lower than those in the other rows. This is due to the fact that by 1981 9-year compulsory education had already been fully enforced in Hong Kong, and it is illegal to work under age 15. Without the option to stay out of school and work, calculating rates of return on the basis of earnings differentials between primary and secondary school graduates is not meaningful.

Table 3.4a:
Estimated Private Rates of Return to Education (Full Sample)

	1981	1986	1991	1996
Primary over no schooling	12.7%	12.6%	13.2%	8.6%
Form 3 over Primary	8.1%	10.3%	18.2%	13.5%
Form 5 over Form 3	10.9%	11.6%	14.0%	15.6%
Matriculation over Form 5	11.4%	13.5%	14.7%	12.8%
Diploma of Technical Institutes over Form 5	11.1%	12.6%	12.7%	9.9%
Teacher's Colleges over Form 5	21.4%	24.1%	21.4%	19.0%
High Diploma of Technical Institutes /Polytechnics over Matriculation	15.9%	19.2%	15.2%	9.8%
Diploma over Matriculation	6.1%	7.9%	6%/10.1% *	5.1%/8.7% *
Degree over Matriculation	13.5%	16.0%	19.6%	14.5%
Post-graduate degree over First Degree	17.3%	27.4%	16.7%	18.3%

Note:

- The rates of return to various education levels are calculated as follows: (1) Primary over no schooling: β_{primary} (we assume no forgone earnings for receiving primary education); (2) Form 3 over Primary: $\beta_{\text{Form3}} - \beta_{\text{primary}}$ (we assume no forgone earnings for receiving Form 3 education); (3) Form 5 over Form 3: $(\beta_{\text{Form5}} - \beta_{\text{Form3}}) / 2$; (4) Matriculation over Form 5: $(\beta_{\text{Matriculation}} - \beta_{\text{Form5}}) / 2$; (5) Diploma of Technical Institutes over Form 5: $(\beta_{\text{Tech}} - \beta_{\text{Form5}}) / 2$; (6) Teacher's College over Form 5: $(\beta_{\text{Teacher}} - \beta_{\text{Form5}}) / 3$; (7) High Diploma from Technical Institutes/Polytechnics over Matriculation: $(\beta_{\text{Htech}} - \beta_{\text{Matriculation}}) / 2$; (8) Diploma over Matriculation: $(\beta_{\text{Diploma}} - \beta_{\text{Matriculation}}) / 3$; (9) Degree over Matriculation: $(\beta_{\text{Degree}} - \beta_{\text{Matriculation}}) / 3$; and (10) Post-graduate Degree over Degree: $(\beta_{\text{Hdegree}} - \beta_{\text{Degree}}) / 2$.
- We are advised by the Census and Statistics Department not to calculate rates of return to those who have taken craft courses and apprenticeship as the number of people in this group are particularly small and the group was not well defined over time.

Consultancy Study on Rates of Return to Education – Draft Final Report

- 3.9 Let us now turn our attention to the comparison of rates of return to various general education levels (Form 5, Matriculation, First Degree and Postgraduate Degree). The pattern is quite clear that for Hong Kong rates of return for higher levels of education (First Degree and Postgraduate Degree) are far higher than those for lower levels of education (Form 5 and Matriculation). In fact, the rates are almost monotonically increasing up until First Degree level in all census years except for 1996. Such a pattern reflects the fact that with the increasing pace of economic restructuring in the 80's, the demand for labour was tilted towards better-educated workers and was outstripping supply.
- 3.10 However, the rapid expansion of higher education since the late 80's apparently had reversed this tendency by 1996. By 1996 while the rates of return to First Degree has dropped significantly following the policy of expansion of higher education, the rates of return to Postgraduate Degree had not been affected that much. It even showed a continued upward trend.
- 3.11 The next useful comparison is between general and vocational education. Here we can compare the rate of return for Matriculation over Form 5 against that for Diploma of Technical Institutes over Form 5, and similarly compare the rate of return for First Degree over Matriculation against that for Higher Diploma of Technical Institutes/Polytechnics over Matriculation. We see that general education commands higher rates of return than vocational education since 1991. Such a pattern follows closely the pattern found elsewhere in the world (see Psacharopoulos 1994).
- 3.12 Another fact worth mentioning is that the rate of return to Teacher's qualifications is particularly high. The high rate of return has prevailed over time.
- 3.13 We can now turn to Table 3.4b and 3.4c to see if there are any notable differences for the rates of return to education between males and females in Hong Kong. We find that in general, there are no big differences. In particular, the three patterns we summarized above are all show in the separate male and female results. However, females seem to have particularly high rate for Form 5 over Form 3. That, to a large extent, reverses the order for the rates of return between Form 5 over Form 3 and Matriculation over Form 5. The exact reason behind this finding is unknown.

**Table 3.4b:
Estimated Private Rates of Return to Education (Male Sample)**

	1981	1986	1991	1996
Primary over no schooling	10.3%	12.0%	13.2%	8.0%
Form 3 over Primary	8.1%	9.5%	15.9%	11.3%
Form 5 over Form 3	9.0%	10.4%	12.1%	12.7%
Matriculation over Form 5	11.8%	11.6%	14.8%	12.7%
Diploma of Technical Institutes over Form 5	11.1%	14.8%	13.2%	9.7%
Teacher's Colleges over Form 5	14.7%	19.1%	20.0%	15.5%
High Diploma of Technical Institutes /Polytechnics over Matriculation	16.7%	22.7%	15.7%	11.3%
Diploma over Matriculation	5.7%	7.5%	6.4%/9.9%*	5.2%/9.4%*
Degree over Matriculation	13.1%	15.7%	20.3%	15.2%
Post-graduate degree over First Degree	19.7%	29.5%	17.4%	19.7%

Note: see Note 1 and 2 in Table 3.2a.

**Table 3.4c:
Estimated Private Rates of Return to Education (Female Sample)**

	1981	1986	1991	1996
Primary over no schooling	10.9%	8.5%	7.5%	4.2%
Form 3 over Primary	9.5%	12.7%	23.2%	18.4%
Form 5 over Form 3	13.7%	14.7%	16.5%	20.2%
Matriculation over Form 5	11.1%	11.9%	14.5%	12.9%
Diploma of Technical Institutes over Form 5	10.1%	12.1%	12.6%	9.0%
Teacher's Colleges over Form 5	25.0%	26.1%	21.7%	19.3%
High Diploma of Technical Institutes /Polytechnics over Matriculation	16.4%	14.6%	15.9%	9.2%
Diploma over Matriculation	7.4%	9.0%	6%/10.6%*	4.9%/7.8%*
Degree over Matriculation	16.5%	18.2%	19.7%	14.2%
Post-graduate degree over First Degree	10.7%	23.2%	15.3%	16.7%

Note: see Note 1 and 2 in Table 3.2a.

Consultancy Study on Rates of Return to Education – Draft Final Report

- 3.14 The second sets of earnings equations that we estimated are meant to reveal the cohort effects of rates of return to education. By cohort effects, we mean differences in rates of returns due to differences in career and employment opportunities available to individuals born into different cohorts. To do so, we estimate earnings equations separately for the age groups: 25-27, 30-32, 35-37, 40-42 and 45-47 for each census year. The reasons why we choose these 5 age groups are: first, they are prime working age groups and second, the sample sizes for these groups are relatively large. Ideally, we would like to look at the rates of return to education for people at a specific age rather than for an age group. However, this would seriously reduce the sample size for the estimation and would cause unacceptably large errors in estimation. The results are presented in Table 3.5.
- A. Data in Table 3.5 do not show true rates of return for different education categories, because the “rates of return” are “truncated” in the sense that they ignore changes in wage gaps between the different educational groups over time. Because we have only four data points we cannot generate life earnings profiles for different cohorts. A table like Table 3.5 is the only way to get a glimpse into the cohort effects.
- B. First of all, we note that the rates of return for the same age group rose quite markedly from 1981 to 1986 for all of the age groups for Degree over Form 6 and High Diploma of Technical Institutes/Polytechnics over Form 6. This indicates that over this period the more recent cohorts benefit much more from higher education than the earlier cohort. This tendency continued through 1991 for Degree over Form 6, except for the 25-27 age group. Throughout the 80s Hong Kong was transforming into a knowledge based society so that the education premium was rising. For the 25-27 age group, apparently the rapid expansion in tertiary education opportunities has diluted the average quality of university graduates, so that the truncated rates of return dropped slightly in 1991. The rates dropped even more markedly by 1996.
- C. Interesting, for the 25-27 age group, a more recent cohort seems to benefit more from having Form 5 education compared to having only Form 3. Moreover, the benefit of having Form 5 over Form 3 appears to grow for the same cohort over time (as read diagonally southeast). This may suggest that Form 5 was increasingly regarded as a significant educational qualification relative to Form 3.

Consultancy Study on Rates of Return to Education – Draft Final Report

- D. This is not so with all categories of higher education over Form 5. For Matriculation over Form 5, for Diploma of Technical Institutes over Form 5, for Degree over Form 6, as well as for High Diploma of Technical Institute/Polytechnic over Form 6, the “truncated rates of return” have been falling for the more recent cohorts. This is typical of societies which witness rapid expansion in higher educational opportunities.
- E. For the same cohort, the benefits of having higher education have generally declined from 1991 to 1996 (which can be read off Table 3.5 diagonally). Since university graduates aged 35 and above in 1996 have graduated well before the rapid expansion of tertiary education places, their quality was not affected by any “dilution effect.” This suggests that there is an increase supply of quality university graduates that had led to a reduction in the education premium and this effect works quite independently of the dilution effect. This result suggests that Hong Kong’s universities have produced many more quality university graduates than before, even though they may also have produced less well qualified graduates.

Consultancy Study on Rates of Return to Education – Draft Final Report

Table 3.5:

Estimated “Truncated Rates of Return” over Time by Age Groups (Full Sample) #

Age Group	1981	1986	1991	1996
<i>Form 5 over Form 3</i>				
25-27	11.1%	9.8%	10.9%	11.8%
30-32	14.8%	15.4%	15.8%	14.0%
35-37	7.1%	17.2%	17.3%	16.1%
40-42	13.6%	11.7%	18.0%	17.3%
45-47	13.6%	13.5%	21.7%	16.8%
<i>Matriculation over Form 5</i>				
25-27	15.6%	14.0%	14.7%	10.1%
30-32	13.8%	13.2%	15.9%	12.1%
35-37	7.9%	15.9%	17.4%	14.8%
40-42	9.5%	5.0%	19.1%	16.7%
45-47	7.9%	10.4%	17.8%	12.1%
<i>Diploma of Technical Institutes over Form 5</i>				
25-27	13.8%	15.1%	13.1%	6.9%
30-32	16.2%	18.5%	17.8%	12.2%
35-37	12.1%	17.2%	19.4%	14.3%
40-42	14.9%	25.6%	23.4%	12.8%
45-47	15.1%	19.5%	25.7%	18.7%
<i>Degree over Form 6</i>				
25-27	21.2%	21.3%	19.9%	15.5%
30-32	19.9%	19.6%	22.4%	15.4%
35-37	8.7%	20.6%	21.6%	15.7%
40-42	5.2%	9.8%	19.0%	16.1%
45-47	2.8%	6.7%	20.6%	10.0%
<i>High Diploma of Technical Institutes/Polytechnics over Form 6</i>				
25-27	18.0%	21.1%	16.5%	9.3%
30-32	16.1%	18.0%	19.3%	9.3%
35-37	18.6%	30.4%	18.5%	12.8%
40-42	16.1%	23.9%	13.8%	16.1%
45-47	17.4%	26.1%	20.1%	7.1%

Note: # These are calculated, for each age group, using the observed wage gaps for workers of different education categories in the particular year. Changes in wage gaps throughout the rest of life are ignored.

Consultancy Study on Rates of Return to Education – Draft Final Report

- A. Finally, we also estimated earnings equations for all First Degree holders by controlling for their fields of study. Here changes in the coding framework for courses of study has posed certain difficulties for making proper comparison of rates of return to different fields of study over time. Given the limitations, nevertheless, we have compiled Table 3.6 to illuminate, on a partial basis, how returns to education differ with respect to the different fields of study.
- B. Table 3.4 suggests that studies of Engineering, Medical Science, Law and Social Sciences generally command higher return than studies of Arts, Humanity, Natural Sciences and Business. The most eye-catching result is the apparently huge swings in estimated relative returns. For example, the rate of return to the study of Law changed from 21% lower to 38% higher than the return to the study of Engineering. Similarly, Medicine was behind Engineering by a significant margin in 1991 but in 1996 was way ahead of Engineering. Such swings reflect both the cyclical nature of some industries and the tremendous role “administered salary scales” play in rates of return. In the case of Engineering there was a big boom in the early 1990s and a big shortage of high calibre engineering personnel on account of emigration. For medicine the big difference between 1996 and 1991 is that in 1996 the Hospital Authority had been established and most medical professionals enjoyed a big gain in salaries compared to 1991.
- 3.22 In 1996, the rate of return to the studies of Law and Medical Science had shown a clearly leading position while the rate of return to the study of Arts was substantially behind others. The gaps amongst returns to the studies of the rest of the subjects were fairly small.
- 3.23 Another interesting observation is obtained when we add an interactive variable with experience multiplied to the field of study dummy. We found that business students used to enjoy a relatively rapid rise in salaries compared with other fields of study(1981 and 1986) but this advantage seems to have disappeared in 1991. The 1996 Census results suggest, however, that this advantage may have re-emerged but the results are not very significant. Overall, it seems that the increase in the supply of business graduates have reduced their advantage over other fields of study.
- 3.24 Given the apparently big swings in rates of returns among different fields of study, it is important not to assume the same rates of return to education over time. The

Consultancy Study on Rates of Return to Education – Draft Final Report

role of administered pay scales must also be fully considered in trying to draw policy implications from the figures.

**Table 3.6:
Estimated Earnings Equation for Different Subjects (Degree Holders Only)**

Variables	1981	1986	1991	1996
Constant	8.009 (323.704)	8.423 (940.622)	8.847 (537.975)	9.234 (860.291)
Experience	0.013 (5.821)	0.043 (49.602)	0.108 (52.620)	0.094 (83.856)
Experience ²	-0.0004 (6.810)	-0.001 (51.066)	-0.0023 (36.803)	-0.0023 (75.423)
Arts+ Humanity+ Social Science+ Law	-0.019 (1.073)	0.029 (4.274)		
Arts			-0.177 (5.411)	-0.206 (7.863)
Humanity+ Social Science			-0.048 (3.469)	
Humanity				-0.049 (4.287)
Social Science				0.084 (7.132)
Natural Sciences	-0.191 (7.966)	-0.045 (5.241)	0.005 (0.306)	-0.047 (3.655)
Business	-0.015 (0.654)	0.020 (2.484)	-0.092 (4.166)	-0.013 (1.365)
Medical	0.121 (4.603)	0.126 (12.715)	-0.079 (3.643)	0.291 (20.207)
Law			-0.211 (4.259)	0.380 (16.282)
Male	0.209 (12.073)	0.144 (24.933)	0.089 (7.445)	0.101 (13.614)
Adjusted R ²	0.024	0.039	0.449	0.200
Sample size	12,272	13,181	12,383	36,393

Note: The default subject dummy is Engineer. t-statistics are presented in the brackets. For all t-statistics and F-statistics, a (*) means insignificant (at above 5% level).

Experiments with Extended Earnings Equations

- A. The estimated earnings equations so far have followed the *basic* Mincerian specification, and no **X** variables have been incorporated except for the sex dummy. We have argued that this is largely due to a lack of appropriate candidates in the Census data-sets to be used as **X** variables without confounding different effects. Bearing in mind that results from the exercise must be interpreted with caution, we now report earnings equations and estimated rates of return to education after adding certain selected variables.
- B. Variables in the additional estimation exercise include: (1) a dummy for married; (2) a dummy for divorced/widowed; (3) a dummy for living in Hong Kong for less than 3 years; (4) a dummy for living in Hong Kong for less than 7 years; (5) a dummy for employers; (6) a dummy for self-employed; (7) 9 dummies for respondents' occupations (following Census one-digit occupation classification); (8) 8 dummies for respondents' industries (following Census one digit industry classification). In addition, we also separate the university degree dummy into a local university degree dummy and a foreign university degree dummy.
- C. The estimated coefficients are shown in Table 3.5. All the **X** variables except for a couple of industry and occupation dummies have statistically significant coefficients. The Adjusted-R² also improved slightly.
- D. Looking at each individual variable, we can see that married, divorced and widowed people as well as employers command higher earnings while self-employed and new immigrants have lower earnings. Everything else being held constant, people working in the manufacturing sector also seem to earn the least amongst all industries. The order of occupations in terms of earnings largely follows our intuition, with professionals and managers at the top and elementary occupation and agricultural workers at the bottom of the list.
- E. Married people seem to command a big pay premium (about 10%). This fits the picture elsewhere around the world. It is argued that the marriage dummy often captures the effect of unobserved ability (able people are more successful in the “marriage market”) as well as the effect of efficient allocation of time over market vs home production through division of labour within the family. An alternative argument is that married people, particularly those intending to or raising a family,

Consultancy Study on Rates of Return to Education – Draft Final Report

are more motivated to make money.

- F. Employers are also paid higher, *ceteris paribus*, than employees. This may reflect the family background effect. Many employers come from wealthy families. Some actually inherit businesses from their parents. In any case people from wealthier families are more likely to get family help to further their education or enhance their job opportunities. The self-employed people, in contrast, may come from poorer family backgrounds.
- G. It is no surprise that new immigrants suffer from lower pay as most of them came from the Chinese Mainland. Their education qualifications are often not fully recognized by Hong Kong employers. They also need time to adjust to the new environment and to catch up Cantonese and/or English.
- H. A further interesting finding is the seemingly differential returns to university education for local vs. overseas degrees. For both 1991 and 1996, we can see that the return to local undergraduate education is higher than that to overseas undergraduate education. Yet, the opposite is true for local postgraduate education versus overseas postgraduate education (for 1996 only due to availability of data). This may reflect the fact that local universities are generally well recognized among employers for providing quality undergraduate education, while overseas universities are generally better recognized among employers for providing quality graduate level education.
- I. Reflecting this perception, able students tend to choose local universities for their undergraduate education and overseas universities for their postgraduate education. However, the earnings gap between local degree holders and overseas degree holders seem to have narrowed by 1996, possibly due to a rapid expansion of high education in Hong Kong since late 1980's.
- J. We calculated the rates of return to education based on the estimated results in Table 3.7. The rates are listed in Table 3.8. It can be seen that all the rates here are lower than the corresponding rates in Table 3.4a. However, the basic pattern we have shown earlier is still largely maintained. The rates of return to education are higher for higher education qualifications. It is also generally the case that an academic track of education has a higher rate of return than a vocational one. The lower estimated rates of return to education in the new exercise are largely due to the high correlation between education levels and occupations.

Consultancy Study on Rates of Return to Education – Draft Final Report

Table 3.7 The Results of Estimated Extended Earnings Equation (1991 & 1996)

Variables	Estimated Coefficients and t-statistics (in brackets)	
	1991	1996
Constant	7.633 (1064.240)	8.047 (957.951)
Expe	0.034 (75.415)	0.038 (83.664)
Expe ² x 100	-0.001 (79.186)	-0.001 (82.940)
Primary	0.062 (12.191)	0.035 (5.491)
Form3	0.127 (23.532)	0.110 (16.577)
Form5	0.255 (44.369)	0.274 (39.679)
Form6	0.407 (52.839)	0.429 (45.886)
Craft	0.142 (7.072)	0.220 (8.045)
Tech	0.427 (44.151)	0.395 (26.032)
Htech	0.613 (55.902)	0.526 (52.068)
Teacher	0.600 (37.978)	0.542 (29.860)
Diploma1	0.404 (25.599)	0.463 (30.432)
Diploma2	0.528 (37.612)	0.542 (43.272)
Degree	0.779 (77.303)	0.673 (71.270)
Oversea Degree	0.533 (54.741)	0.578 (60.670)
Hdegree	0.975 (51.951)	0.883 (51.177)
Oversea Hdegree	N/A	0.967 (61.099)
Male	0.205 (68.328)	0.177 (58.904)
Married	0.133 (37.896)	0.093 (25.992)
Widowed/Divorced	0.097(10.823)	0.063 (7.727)
Employer	0.135 (21.235)	0.054 (8.978)
Self-employed	-0.058 (9.337)	-0.117 (16.765)
Less than 3 yrs	-0.241 (21.769)	-0.146 (14.569)
Less than 7 yrs	-0.205 (22.528)	-0.142 (17.297)
8 Industry dummies	Included ¹	Included ³
9 Occupation Dummies	Included ²	Included ⁴
Adjusted-R ²	0.503	0.486
Sample Size	112,302	131,343

Note: The omitted education dummy is Nosch.

- Following the descending order of the coefficients, the eight industry dummies are: (1) mining, quarrying, electricity, gas & water; (2) community, social & personal services; (3) financing, insurance, real estate & business services; (4) transport, storage & communication; (5) agriculture & fishing; (6) construction; (7) wholesale, retail, import/export trades, restaurants & hotels; (8) manufacturing.
- Following the descending order of the coefficients, the nine occupation dummies are: (1) professionals;

Consultancy Study on Rates of Return to Education – Draft Final Report

- (2) managers & administrators; (3) associate professionals; (4) service workers & shop sales workers; (5) Clerks; (6) plant and machine operators & assemblers; (7) craft and related workers; (8) market-oriented skilled agricultural and fishery workers; (9) elementary occupations;.
3. The sizes of the coefficients followed almost the same ordering as in 1991 except those for construction and agriculture & fishing, which were reversed.
4. The order of the coefficients are: (1) professionals; (2) managers & administrators; (3) associate professionals; (4) service workers & shop sales workers; (5) market-oriented skilled agricultural and fishery workers; (6) Clerks; (7) craft and related workers; (8) plant and machine operators & assemblers; (9) elementary occupations;.

Table 3.8
Estimated Private Rates of Return to Education (Extended Earnings Equation)

	1991	1996
Primary over no schooling	6.2%	3.5%
Form 3 over Primary	6.5%	7.5%
Form 5 over Form 3	6.4%	8.2%
Matriculation over Form 5	7.6%	7.8%
Diploma of Technical Institutes over Form 5	8.6%	6.1%
High Diploma of Technical Institutes/Polytechnic over Matriculation	10.3%	4.9%
Diploma over Matriculation	0%/4%	1.1%/3.8%
Local Degree over Matriculation	12.4%	8.1%
Overseas Degree over Matriculation	4.2%	5.0%
(Local) Higher Degree over Local Degree	9.8%	10.5%
Overseas Higher Degree over Overseas Degree	N/A	19.5%

IV: THE COMPLETE METHOD: SOCIAL AS COMPARED WITH PRIVATE RATES OF RETURNS

Private Costs

A. Earning Foregone

4.1 The average monthly earnings for workers with various levels of education are calculated from the data captured from four Census years. The data were then multiplied by 12 months to annualize the figures. The average earnings foregone for the workers at an education category is assumed to correspond with the earnings that would have been earned by someone one level of education lower during the years of school attendance. We will examine the following pairs of educational categories for analytical purposes:

- Primary versus No-schooling
- Form 3 versus Primary
- Form 5 versus Form 3
- Technician Training in Technical Institute versus Form 5
- Matriculation versus Form 5
- High-level Technician Training in Technical College versus Matriculation
- Degree versus Matriculation
- High Degree versus Degree

B. Tuition Fee

4.2 Another component of the private costs would be the tuition fee. Tuition fees paid by an average student undergoing studies in the primary schools, secondary schools, or universities were calculated by the actual tuition fee and extra charges received by the schools divided by the number of enrollment. Tuition fees chargeable at Technical Institutes and Technical Colleges were provided by the Vocational Training Council and the Education and Manpower Bureau.

**Table 4.1:
Tuition Fees/Educational Charges for Different Education Levels**

	1981	1986	1991	1996
Primary	17	37	56	76
Junior Secondary (Form 1 to Form 3)	17	37	56	76
Upper Secondary (Form 4 to Form 5)	3082	5480	8377	11312
Matriculation (Form 6 to Form 7)	4614	8202	12538	16932
Technical Level at Technical Institutes	NA	NA	3100	6800
Higher Technical Level at Technical Colleges	NA	NA	NA	21000

Sources: Education Department Annual Report (various years), Education and Manpower Bureau, (Tam, 1999)

4.3 It is noted that following the government’s announcement of a new policy of recovering 18% of the recurrent cost of tertiary education, tuition fees have increased substantially after 1990. Instead of providing a corresponding increase in grants to means-tested eligible students, the government provided a low interest loan to all students who asked for it. The loan scheme, which is still in operation, requires the student to provide quarterly repayments within five years after graduation. In this study, only the direct subsidies in the form of grants are taking into account. Implicit subsidies in student loans are ignored.

4.4 As many university students received full non-repayable grants from the government the average value of grants received from the government should be subtracted from the tuition/miscellaneous fees:

**Table 4.2
Private Costs of University Education**

Year	Tuition Fee minus Average Grants Received
1981	970
1986	1,510
1991	9,150
1996	10,620

Consultancy Study on Rates of Return to Education – Draft Final Report

C. Expenses on Books and Stationery

A. As the government subsidizes students for their transportation cost, transportation cost is rather insignificant as a component of private costs. In contrast, expenditures on book and stationery would be another important component of private costs (see Table 4.3).

**Table 4.3:
Expenses on Books and Stationery for Different Education Levels**

	1981	1986	1991	1996
Primary	220	300	460	640
Junior Secondary (Form 1 to Form 3)	360	500	760	1060
Upper Secondary (Form 4 to Form 5)	380	530	810	1130
Matriculation (Form 6 to Form 7)	500	700	1060	1480
Tertiary: Non Degree	690	970	1480	2060
Degree & High Degree	1030	1430	2190	3050

Sources: Education Department Annual Report (various years), Hong Kong Year Book (various years), (Tam, 1999).

Social Costs

4.6 Two major components of the social costs are public expenditure on each level of education and the implicit rent to the school building premises.

$$\text{Social Cost} = \text{Public Expenditure on Education} + \text{Market Rent of School Buildings}$$

A. Public Expenditures on Education

4.7 Public expenditures on each level of education are listed in the table 4.4. We made an assumption that from Form 1 to Form 5, 1.3 teachers are provided for each class. At matriculation level, the provision is raised to 2 teachers per classes. As remunerations to teachers accounts for around 70% of the total recurrent expenditure, the cost of matriculation class should be 1.4 times higher than that of Form 1 to Form 5. For 1991 and 1996, the opportunity cost of lending money to university students would be taken into accounts so as to reflect the social cost at university level (see Table 4.5 for its calculation).

**Table 4.4:
Public Expenditures on Education**

Education Level	Public Expenditures			
	1981	1986	1991	1996
Primary	2,394	4,433	9,105	13,726
Form 1 – Form 5	2,678	6,148	12,906	19,786
Form 6 – Form 7	3,750	8,607	12,906	19,786
Craftmanship	Nil	Nil	25,500	58,000
Certificate Level in Technical Institutes	Nil		25,400	54,300
Diploma/Higher Diploma in Technical College	Nil	Nil	Nil	58,000
Hong Kong Institute of Education	Nil	Nil	Nil	146,000
University Degree	42,672	72,544	101,982 + 1,632	131,420 + 3445

Sources: Education Department Annual Report (various years), Education and Manpower Bureau, (Tam, 1998)

Table 4.5:
Calculation of Opportunity Costs of Lending Money to University Students

	Effective Rate	Nominal Rate	Nominal Rate / 4	Annual Loan Amount per Student	Payment	Present Value of the Difference between Two Payments
1991	9.41%	9.10%	2.27%	10848	680.84	1632.20
	2.50%	2.48%	0.62%	10848	578.40	
1996	8.52%	8.26%	2.07%	25706	1582.73	3445.15
	2.50%	2.48%	0.62%	25706	1370.61	

Note: The number of terms is assumed to be 20 (4 quarters * 5 years)

Source: Education and Manpower Bureau, Hong Kong Annual Digest of Statistics, and Consultant's Estimates

B. Opportunity Cost of School Building Premises

- 4.8 In Hong Kong, most of the actual rental costs for school building premises are completely subsidized by government in the provision of free land and building premises. Market rental rate is used as a proxy to estimate the opportunity cost for using the building premises for educational purpose. Market rental rates could be obtained from the Rating and Valuation Department by searching the dataset in Land Registry under the heading of ratable value.
- 4.9 Tam (1998) extracted a 10% sample from the relevant schools for the years of 1986 and 1996 by using the stratified sampling method, taking into account of the level, size, location and age of the buildings. The market rental for school building premises are estimated by using the interpolated method with the average rental indices published by the Rating and Valuation Department.
- 4.10 The weighted average of the cost of school building premises used for primary and secondary education is applied to universities, technical institutes, Technical Colleges and the Hong Kong Education Institute to obtain a proxy for their market rental cost of building premises. The estimated total annual market rental cost for the building premises are listed below

**Table 4.6:
Imputed Rental Cost for School Buildings**

	1981	1986	1991	1996
Primary	218	634	1,826	3,061
Junior Secondary (Form 1 to Form 3)	244	879	2,853	4,052
Upper Secondary (Form 4 to Form 5)	244	879	2,853	4,052
Matriculation (Form 6 to Form 7)	341	1,231	2,853	4,052
Technical Level at Technical Institutes	1,119	4,968	7,729	9,014
Higher Technical Level at Technical Colleges	1,119	4,968	7,729	9,014
Degree & High Degree	3,883	10,374	18,153	22,736

Source: Tam (1998) and Consultants Estimates

Private and Social Rates of Return Based on the IRR Approach

- 4.11 This section presents results on the private and social rates of return based on the age earnings profile as inferred from each census or by-census. The social rates of returns are computed by incorporating the costs involved in public spending as well as the imputed rental cost of educational premises. If the benefits of a lower crime rate and better health are also included, the social rates of returns should be higher than those reported herein.
- 4.12 On the surface, (social) returns to primary education are the lowest among all levels of education. However, this direct interpretation is misleading because primary education is the prerequisite to all higher levels of education. Moreover, the figures for rates of returns up to Form 3 are rather unreliable on account of the implementation of compulsory nine-year education, which calls into question the meaning of opportunity cost of undergoing education at such levels. These figures are therefore not reported. Also not reported are rates of return for craftsman courses, as definitions are not consistent through the censuses.
- 4.13 Form 5 is an important milestone in a person's education. The social rates of return to completing Form 5 over and above Form 3 have stayed at a high level ranging from 9.37 to 9.81 per cent. More interestingly, completing Form 5 (grammar school) appears to be a better investment than completing a course on craftsmanship (vocational stream). Unfortunately, it is not clear to what extent this reflects a signaling effect, as those who opt for a craftsmanship course after Form 3 usually are the less capable academically.
- 4.14 Returns to completing university education over and above matriculation have stayed fairly high through 1996, though the rate of return in 1996 is significantly lower than that in 1991 (10.03 per cent as compared with 12.9 per cent for the social rate and 17.4 per cent compared with 21.6 per cent for the private rate). This reversal is quite significant because, at the margin, the rate of return to university education for someone actually facing the option of studying for a degree or going to work after matriculation, within the five years terminating in 1993 (thus graduating in 1992-1996), must have fallen very greatly if the average rate of return has fallen by this much.

**Table 4.7a:
Private Rates of Return (1981) IRR Method**

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	10.61%						
Form 5			13.75%				
Technical							
Matriculation						23.91%	
Teacher							
Htech							
Degree							

**Table 4.7b:
Private Rates of Return (1986) IRR Method**

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	10.77%						
Form 5			13.18%				
Technical							
Matriculation						26.03%	
Teacher							
Htech							
Degree							

**Table 4.7c:
Private Rates of Return (1991) IRR Method**

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	10.77%						
Form 5		15.99%	19.09%				
Technical							
Matriculation						21.60%	
Teacher							
Htech							
Degree							

Consultancy Study on Rates of Return to Education – Draft Final Report

Table 4.7d:

Private Rates of Return (1996) IRR Method

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	11.36%						
Form 5		11.38%	13.18%	16.47%			
Technical							
Matriculation					10.59%	17.40%	
Teacher							
Htech							
Degree							16.03%

Table 4.8a:

Social Rates of Return (1981) IRR Method

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	9.66%						
Form 5			12.09%				
Technical							
Matriculation						9.32%	
Teacher							
Htech							
Degree							

Table 4.8b:

Social Rates of Return (1986) IRR Method

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	9.53%						
Form 5			11.21%				
Technical							
Matriculation						9.93%	
Teacher							
Htech							
Degree							

**Table 4.8c:
Social Rates of Return (1991) IRR Method**

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	9.37%						
Form 5		12.78%	12.15%				
Technical							
Matriculation						12.03%	
Teacher							
Htech							
Degree							

**Table 4.8d:
Social Rates of Return (1996) IRR Method**

	Form 5	Technical	Matriculation	Teacher	Htech	Degree	Hdegree
Form 3	9.81%						
Form 5		8.36%	11.15%	9.12%			
Technical							
Matriculation					7.57%	9.93%	
Teacher							
Htech							
Degree							10.02%

Education-related Variations in Unemployment

4.15 There is a clear pattern in the unemployment rate among people with different educational backgrounds. For example, from the 1996 Census we can see that better educated people tend to have lower unemployment rate. If we weight the rates of return to education with the probability of being employed, the rates of return to higher levels of education must be even bigger than what have been presented so far.

Table 4.9:
Unemployment Rates by Educational Categories in 1996

Education Level	Unemployment Rate
No schooling	5.43%
Primary	5.17%
Form 3	6.69%
Form 5	3.41%
Form 6	2.96%
Tech	2.78%
High Tech	2.51%
Teacher	2.13%
Diploma1	2.60%
Diploma2	2.96%
Degree	2.97%
High Degree	2.14%

Note: Estimates are from 5% sample of 1996 Population By-Census

4.16 Such a pattern has persisted to this day. The General Household Survey shows that in the first quarter of 1999 those with tertiary education are least subject to the risk of unemployment, while those with primary education only are subject to the highest risk. The GHS does not provide as much detail as does the Census in regard to education categories, but it is important to note that an educational qualification matters a lot in an individual's chances of getting a job.

V: CONCLUSIONS

- 5.1 We applied both Mincerian earnings equation method and the elaborated (internal rate of return) method in this study to estimate rates of return to education in Hong Kong. The current study is distinguished from past similar studies for Hong Kong in several aspects.
- 5.2 First, this study uses full census data maintained by the Census and Statistics Department and covers the period from the 1981 Census to the 1996 By-census. Second, it classifies education programs in great detail and produces estimated rates of return for both academic and vocational education qualifications. Third, it makes an attempt to look at the changes in the rates of return over time for different age cohorts. Fourth, it compares the returns for different university subjects. Finally, it estimates both private and social rates of return to education.
- 5.3 According to our study, the estimated rates of return to education for Hong Kong are generally higher than those for OECD countries. The rates also tend to be higher for higher levels (post-secondary) of education. On average, teacher's qualification and post-graduate degree command the highest rates of return. Similarly to those found elsewhere in the world, we found that the rates are generally higher for academic programs than for vocational programs, especially during the 1990's.
- 5.4 The rates of return to first degree had experienced an increase in the 1980's but started to decline in the 1990's, which might be a result of the fast expansion in tertiary education from late 80's to early 90's. However, both the private and the social rate of return to first degree for 1996 were still over 10%. In particular, the rate of return to post-graduate degree had shown some increase from 1991 to 1996. These facts indicate that the demand for graduates with tertiary education in Hong Kong remains high.
- 5.5 The estimated "truncated" rates of return to education for different age groups over the four census years indicate that the benefit of having Form 5 over Form 3 education qualification appears to grow for the same cohort over time. This is not so with all categories of higher education over Form 5. Conversely, they all seem to experience a drop in rates from 1991 to 1996.

Consultancy Study on Rates of Return to Education – Draft Final Report

- 5.6 Studies in Engineering, Medical Science, Law and Social Sciences generally command higher returns than studies in Arts, Humanity, Natural Sciences and Business. However, there are apparently huge swings in estimated relative returns over time. Such swings may reflect both the cyclical nature of some industries and the tremendous role played by “administered salary scales” for some professions.
- 5.7 Most of our estimated social rates of return to education are close to 10%, a very attractive return to investment by any account. After taking account of the huge public subsidy that university students receive the estimated social rates of return to university degree and post-graduate degree are still quite high in Hong Kong and do not appear to be lower than those for other education levels.
- 5.8 It is important to note that our estimation has not taken account of any non-monetary and external benefits of education. Such benefits range from lower unemployment rate and population growth rate, less crime to better health condition and faster economic growth. Data and time limitation have prevented us from carrying out a study to quantify these effects in Hong Kong. However, growing international evidence shows that these benefits are quite substantial and are often comparable to the observable monetary benefits.
- 5.9 We can compare our estimates with those from previous studies for Hong Kong. The figures are listed in Table A3.1 for private rates of return and Table A3.2 for social rates of return. Although our estimated rates of return to primary over no schooling and Form3 over primary appear to be much higher than found in other studies, this is due to the different methods used for accounting the opportunity costs of these two levels of education. We assume that the opportunity costs are zero while the others do not. Apart from these two rates of return, our results seem to be closely in line with that of Tam (1998), despite of the fact that we had a more detailed set of education dummies than Tam.
- 5.10 The current study, like any previous ones for Hong Kong, employed only cross section data. Hence, it is likely to suffer from the unmeasured individual ability problem. It is that the high returns could be a reward to those who are born to be more capable than others, and it is only natural that those who are more capable than others who can complete a higher level of education successfully.
- 5.11 There are in principle two ways to overcome the problem, each of which, however,

Consultancy Study on Rates of Return to Education – Draft Final Report

is beset with great difficulties of another kind. The first way is to use cross-country data. By controlling such variables as the stage of development of the countries, degree of aging, the ratio of population size to the capital stock, the size of the country, the openness of the country, etc., we can trace differences in productivity growth and productivity level to different levels of investment in education. Unfortunately, this requires a lot of data and an ability to control the different qualities of data of different countries. Such difficulties render the approach not feasible.

- 5.12 The second way is to use a “structuralist” approach to decipher the effects of education on productivity. If we know what kind of qualities of the labour force command a premium payment from employers, and if we can trace improvements in these qualities to education investment, then we know that education investment does enhance the productivity and earnings of workers. The qualities in demand include: language abilities, communication skills, social skills, organizing skills, technical skills, analytical skills and intellectual capability, work ethic, motivation, etc. Different kinds of educational courses emphasize different skills and aptitudes and vary in the effectiveness of enhancing such skills and aptitudes.
- A. This second approach is in principle the preferred approach, as it will generate specific information about where and how educational investment should be increased. Without such information, the results from returns to education study can be misleading. Suppose a returns to education investment study suggests that university education yields a higher rate of return than primary education. It does not follow that reallocating resources from the primary education sector to the university education sector is appropriate. Actual policies are always implemented at the margin and in specific terms.
- B. For example, one could increase university enrolment, if we decide that the quality of our graduates is about right. One could keep university enrolment intact while putting more resources on quality improvement, if quality rather than quantity is the problem. If so, we may want to enhance our language training facilities. Alternatively, one could higher better qualified teachers. One could higher more equally qualified teachers. One could support extra curricular activities, if social skills of our students are lacking and such skills are in demand. One could run special seminars, workshops, or training camps to enhance the work ethic.

Consultancy Study on Rates of Return to Education – Draft Final Report

- C. Clearly, our study did not follow such an approach as this was not our mandate. However, we have already pointed out in Chapter 1 that upward bias created by the unmeasured ability problem may be just offset by the downward bias brought by various measurement errors. So our estimated rates can still be treated as valid estimates for Hong Kong.
- 5.15 To the extent that these estimates cannot fully reflect the true returns to investment in education it is the proper control for non-monetary and external benefits to education which is still not done here. Such a problem indicates that the estimated rates of return to education may be considered as a lower bound for the true ones. We suggest that the government should encourage further studies to be carried in this direction.
- D. Overall, both private and social rates of return to education investment are quite high for Hong Kong. The SAR Government is correct in emphasizing the importance of education.
- E. Resources devoted to academic education yield higher returns than resources devoted to the vocational training, especially at secondary level on average. We do not, however, have estimates for rates of return at the margin. So we cannot conclude that at this point resources should be reallocated from vocational education to academic education.
- F. Despite the declining rates of return to university degrees after 1990's, university education still commands very high private rate of return compared to other forms of investment. In particular, post-graduate education appears to be an excellent investment, enjoying a rising rate of return in recent years. The little evidence that we have obtained suggest that our universities continue to supply quality graduates even though a dilution effect is inevitable given the rapid expansion in university places in recent years.

APPENDIX I: REGRESSION RESULTS FOR EARNINGS EQUATION

**Table A1.1a:
The Results of Estimated Earnings Equation for 1981**

Variables	Estimated Coefficients and t-statistics (in brackets)		
	Full-sample	Male-sample	Female-sample
Constant	6.536 (2399.506)	6.762 (1922.928)	6.668 (1598.892)
Expe	0.045 (215.492)	0.055 (207.333)	0.027 (86.461)
Expe ² x 100	-0.0008 (188.661)	-0.001 (181.608)	-0.0005 (78.516)
Primary	0.127 (58.727)	0.103 (38.315)	0.109 (30.287)
Form3	0.208 (83.568)	0.184 (60.096)	0.204 (49.039)
Form5	0.426 (172.395)	0.363 (114.765)	0.477 (122.874)
Form6	0.654 (153.110)	0.598 (108.756)	0.698 (108.127)
Tech	0.647 (69.836)	0.584 (47.476)	0.679 (51.523)
Htech	0.971 (151.109)	0.932 (113.770)	1.025 (104.708)
Teacher	1.067 (121.371)	0.805 (54.096)	1.227 (122.700)
Diploma	0.836 (120.731)	0.770 (88.841)	0.921 (84.054)
Degree	1.060 (238.687)	0.990 (186.454)	1.192 (149.746)
Hdegree	1.405 (122.003)	1.384 (103.899)	1.406 (60.976)
Male	0.295 (190.941)	N/A	N/A
Adjusted-R ²	0.345	0.276	0.350
Sample Size	415,454	276,366	139,088

Note:

1. The omitted education dummy is Nosch.
2. t-statistics are presented in brackets in all following tables.

Table A1.1b:

The Results of Estimated Earnings Equation for 1986

Variables	Estimated Coefficients and t-statistics (in brackets)		
	Full-sample	Male-sample	Female-sample
Constant	6.994 (5047.818)	7.174 (4016.081)	7.079 (3272.767)
Expe	0.051 (530.744)	0.058 (467.299)	0.042 (282.358)
Expe ² x 100	-0.001 (458.263)	-0.001 (407.451)	0.001 (243.693)
Primary	0.126 (115.381)	0.120 (87.720)	0.085 (46.350)
Form3	0.229 (193.763)	0.215 (146.629)	0.212 (105.455)
Form5	0.473 (405.117)	0.423 (281.647)	0.506 (269.469)
Matriculation	0.705 (405.242)	0.654 (288.191)	0.744 (279.057)
Tech	0.743 (324.754)	0.718 (245.360)	0.748 (208.930)
Htech	1.088 (400.822)	1.108 (308.156)	1.036 (258.681)
Teacher	1.196 (330.006)	0.995 (154.028)	1.290 (309.267)
Diploma	0.941 (314.241)	0.878 (228.337)	1.015 (218.940)
Degree	1.185 (660.848)	1.124 (508.895)	1.290 (422.958)
Hdegree	1.734 (346.644)	1.714 (289.505)	1.755 (186.306)
Male	0.232 (342.862)	N/A	N/A
Adjusted-R ²	0.358	0.313	0.382
Sample Size	317,860	207,629	110,231

Note:

1. The omitted education dummy is Nosch.
2. t-statistics are presented in brackets in all following tables.

**Table A1.1c:
The Results of Estimated Earnings Equation for 1991**

Variables	Estimated Coefficients and t-statistics (in brackets)		
	Full-sample	Male-sample	Female-sample
Constant	7.534 (1322.295)	7.681 (1022.597)	7.610 (910.034)
Expe	0.062 (188.791)	0.072 (164.479)	0.053 (105.675)
Expe ² x 100	-0.001 (137.504)	-0.001 (123.333)	-0.001 (76.021)
Primary	0.132 (25.201)	0.132 (19.218)	0.075 (9.369)
Form3	0.314 (59.862)	0.291 (42.694)	0.307 (38.081)
Form5	0.594 (116.016)	0.532 (78.621)	0.636 (83.110)
Form6	0.887 (144.120)	0.827 (99.793)	0.925 (103.000)
Tech	0.848 (118.446)	0.796 (83.634)	0.888 (84.030)
Htech	1.191 (154.252)	1.141 (112.096)	1.243 (108.071)
Teacher	1.235 (110.348)	1.133 (53.426)	1.288 (99.749)
Diploma1	1.067 (83.314)	1.019 (59.562)	1.106 (59.312)
Diploma2	1.189 (115.923)	1.123 (80.383)	1.244 (85.404)
Degree	1.476 (236.376)	1.436 (178.046)	1.516 (156.350)
Hdegree	1.810 (141.897)	1.784 (114.474)	1.821 (81.351)
Male	0.205 (99.713)	N/A	N/A
Adjusted-R ²	0.446	0.432	0.449
Sample Size	208,535	125,706	82,829

Note:

1. The omitted education dummy is Nosch.
2. t-statistics are presented in brackets in all following tables.

**Table A1.1d:
The Results of Estimated Earnings Equation for 1996**

Variables	Estimated Coefficients and t-statistics (in brackets)		
	Full-sample	Male-sample	Female-sample
Constant	8.170 (1723.322)	8.322 (1371.550)	8.202 (1117.013)
Expe	0.051 (197.288)	0.059 (177.749)	0.044 (106.012)
Expe ² x 100	-0.001 (174.562)	-0.001 (159.949)	-0.001 (90.700)
Primary	0.086 (21.250)	0.080 (15.443)	0.042 (6.381)
Form3	0.221 (53.275)	0.193 (36.926)	0.226 (33.347)
Form5	0.533 (129.425)	0.447 (84.565)	0.629 (95.581)
Form6	0.788 (138.076)	0.700 (93.387)	0.887 (101.813)
Tech	0.731 (76.252)	0.641 (44.296)	0.808 (63.957)
Htech	0.984 (160.407)	0.926 (119.121)	1.070 (109.297)
Teacher	1.104 (98.900)	0.912 (43.674)	1.209 (92.188)
Diploma1	0.942 (97.009)	0.857 (65.745)	1.033 (72.741)
Diploma2	1.050 (136.206)	0.983 (94.975)	1.122 (98.882)
Degree	1.224 (258.085)	1.156 (191.709)	1.314 (173.133)
Hdegree	1.590 (217.918)	1.549 (173.814)	1.648 (130.535)
Male	0.201 (114.493)	N/A	N/A
Adjusted-R ²	0.366	0.347	0.249
Sample Size	385,456	242,736	57,565

Note:

1. The omitted education dummy is Nosch.
2. t-statistics are presented in brackets in all following tables.

**Table A1.2a:
Estimated Earnings Equations for 25-27 Age Group**

Variables	Estimated Coefficients and t-statistics (in brackets)			
	1981	1986	1991	1996
Constant	6.128 (113.906)	6.749 (344.426)	7.442 (145.451)	8.296 (182.192)
Expe	0.142 (13.604)	0.129 (32.910)	0.122 (12.058)	0.103 (13.072)
Expe ² x 100	-0.005 (10.153)	-0.005 (23.637)	-0.004 (7.609)	-0.005 (9.605)
Primary	0.085 (11.361)	0.087 (21.749)	0.079 (3.770)	0.005 (0.189)
Form3	0.183 (23.447)	0.200 (50.046)	0.206 (10.144)	0.090 (3.357)
Form5	0.405 (45.197)	0.396 (91.210)	0.424 (20.188)	0.325 (11.910)
Matriculation	0.717 (50.009)	0.676 (116.673)	0.717 (30.559)	0.526 (17.354)
Tech	0.681 (27.180)	0.697 (117.497)	0.685 (28.998)	0.463 (13.869)
Htech	1.076 (51.882)	1.097 (135.648)	1.046 (38.657)	0.712 (22.329)
Teacher	1.259 (44.637)	1.256 (114.919)	1.179 (35.567)	0.873 (22.425)
Diploma (for 81 & 86)	1.049 (38.382)	1.012 (99.566)		
Diploma1 (for 91 & 96)	N/A	N/A	1.072 (27.709)	0.723 (18.743)
Diploma2 (for 91 & 96)	N/A	N/A	1.105 (34.447)	0.797 (23.517)
Degree	1.352 (54.809)	1.316 (142.345)	1.314 (45.520)	0.986 (30.409)
Hdegree	1.621 (35.889)	1.695 (92.986)	1.593 (34.339)	1.204 (30.947)
Male	0.232 (57.758)	0.145 (97.825)	0.121 (27.559)	0.046 (9.980)
Adjusted- R ²	0.300	0.286	0.290	0.250
Sample Size	43,456	39,507	31,924	34069

**Table A1.2b:
Estimated Earnings Equations for 30-32 Age Group**

Variables	Estimated Coefficients and t-statistics (in brackets)			
	1981	1986	1991	1996
Constant	6.452 (41.162)	7.092 (122.744)	6.924 (50.285)	8.519 (91.244)
Expe	0.063 (3.038)	0.048 (6.197)	0.154 (8.014)	0.039 (2.973)
Expe ² x 100	-0.002 (2.396)	-0.001 (3.782)	-0.004 (6.420)	-0.001 (2.271)
Primary	0.091 (10.277)	0.090 (21.356)	0.114 (6.414)	0.018 (0.855)
Form3	0.194 (20.612)	0.207 (47.807)	0.256 (14.418)	0.139 (6.800)
Form5	0.489 (44.500)	0.514 (103.739)	0.571 (30.366)	0.419 (19.707)
Matriculation	0.765 (40.438)	0.778 (101.263)	0.889 (38.303)	0.661 (26.294)
Tech	0.813 (23.107)	0.884 (105.722)	0.926 (38.280)	0.663 (21.047)
Htech	1.087 (37.550)	1.137 (103.307)	1.274 (42.880)	0.847 (30.216)
Teacher	1.177 (34.393)	1.224 (90.907)	1.289 (29.245)	0.880 (21.855)
Diploma (for 81 & 86)	0.975 (27.171)	1.070 (75.189)	N/A	N/A
Diploma1 (for 91 & 96)	N/A	N/A	1.180 (27.968)	0.912 (24.832)
Diploma2 (for 91 & 96)	N/A	N/A	1.297 (35.318)	0.892 (28.924)
Degree	1.362 (40.443)	1.366 (110.427)	1.562 (48.349)	1.124 (39.225)
Hdegree	1.567 (27.825)	1.637 (76.506)	1.915 (35.953)	1.344 (36.882)
Male	0.340 (59.051)	0.235 (105.768)	0.208 (37.215)	0.127 (25.895)
Adjusted-R ²	0.352	0.369	0.393	0.335
Sample Size	34,382	29,510	28,202	40,634

**Table A1.2c:
Estimated Earnings Equations for 35-37 Age Group**

Variables	Estimated Coefficients and t-statistics (in brackets)			
	1981	1986	1991	1996
Constant	7.767 (18.296)	6.250 (46.484)	7.318 (20.965)	7.786 (39.784)
Expe	-0.061 (1.429)	0.134 (9.932)	0.085 (2.368)	0.099 (4.842)
Expe ² x 100	0.001 (0.994)	-0.003 (9.690)	-0.002 (2.061)	-0.003 (4.670)
Primary	0.094 (8.406)	0.095 (21.530)	0.114 (6.694)	0.114 (6.702)
Form3	0.182 (14.643)	0.209 (45.400)	0.267 (15.340)	0.239 (14.157)
Form5	0.408 (26.416)	0.553 (101.194)	0.612 (31.523)	0.560 (30.772)
Matriculation	0.565 (18.804)	0.870 (92.619)	0.960 (33.899)	0.855 (35.374)
Tech	0.649 (10.401)	0.896 (81.662)	0.999 (30.904)	0.846 (23.390)
Htech	0.936 (20.078)	1.477 (98.905)	1.329 (32.597)	1.110 (38.662)
Teacher	0.966 (19.542)	1.293 (80.625)	1.291 (24.010)	1.119 (22.962)
Diploma (for 81 & 86)	0.565 (10.150)	1.063 (59.944)	N/A	N/A
Diploma1 (for 91 & 96)	N/A	N/A	1.071 (18.298)	1.037 (26.352)
Diploma2 (for 91 & 96)	N/A	N/A	1.239 (23.969)	1.124 (34.013)
Degree	0.827 (16.452)	1.488 (91.769)	1.607 (36.851)	1.372 (46.501)
Hdegree	1.093 (12.836)	1.917 (71.597)	1.849 (26.667)	1.704 (42.101)
Male	0.466 (52.257)	0.302 (108.965)	0.314 (39.848)	0.224 (39.372)
Adjusted-R ²	0.320	0.392	0.457	0.378
Sample Size	18,525	24,586	18,601	39,804

**Table A1.2d:
Estimated Earnings Equations for 40-42 Age Group**

Variables	Estimated Coefficients and t-statistics (in brackets)			
	1981	1986	1991	1996
Constant	6.487 (10.367)	8.868 (30.385)	7.788 (10.486)	7.197 (17.142)
Expe	0.031 (0.623)	-0.081 (3.449)	0.035 (0.588)	0.125 (3.864)
Expe ² x 100	-0.001 (0.508)	0.001 (2.547)	-0.001 (0.586)	-0.003 (3.957)
Primary	0.099 (9.573)	0.044 (8.818)	0.102 (5.779)	0.131 (9.511)
Form3	0.212 (16.841)	0.142 (25.919)	0.249 (13.316)	0.263 (18.718)
Form5	0.483 (30.858)	0.375 (53.524)	0.608 (28.390)	0.608 (37.655)
Matriculation	0.673 (20.763)	0.474 (37.495)	0.990 (28.528)	0.942 (35.788)
Tech	0.741 (10.916)	0.886 (49.831)	1.076 (23.918)	0.864 (14.704)
Htech	0.995 (19.851)	0.952 (43.114)	1.266 (23.019)	1.263 (35.551)
Teacher	1.127 (23.693)	1.075 (49.273)	1.278 (22.063)	1.303 (23.917)
Diploma (for 81 & 86)	0.776 (14.638)	0.703 (27.375)	N/A	N/A
Diploma1 (for 91 & 96)	N/A	N/A	1.042 (13.690)	1.025 (21.813)
Diploma2 (for 91 & 96)	N/A	N/A	1.306 (18.144)	1.226 (29.221)
Degree	0.828 (17.217)	0.769 (34.125)	1.561 (26.889)	1.426 (41.431)
Hdegree	1.321 (14.977)	1.395 (34.125)	1.926 (20.033)	1.765 (34.487)
Male	0.470 (52.884)	0.397 (104.138)	0.395 (38.512)	0.335 (50.428)
Adjusted-R ²	0.309	0.319	0.480	0.409
Sample Size	19,450	14,309	12,244	31,766

**Table A1.2e:
Estimated Earnings Equations for 45-47 Age Group**

Variables	Estimated Coefficients and t-statistics (in brackets)			
	1981	1986	1991	1996
Constant	7.981 (7.789)	6.411 (15.728)	7.754 (3.638)	12.248 (17.020)
Expe	-0.069 (1.020)	0.076 (2.786)	0.020 (0.142)	-0.216 (4.452)
Expe ² x 100	0.001 (1.020)	-0.001 (2.820)	-0.0002 (0.093)	0.003 (3.940)
Primary	0.099 (10.920)	0.116 (24.141)	0.123 (4.294)	0.106 (7.990)
Form3	0.232 (18.321)	0.213 (36.396)	0.304 (9.362)	0.218 (15.753)
Form5	0.504 (31.287)	0.482 (65.766)	0.737 (19.570)	0.554 (33.384)
Matriculation	0.661 (18.116)	0.689 (47.766)	1.093 (16.650)	0.795 (27.699)
Tech	0.806 (13.259)	0.872 (41.774)	1.250 (15.434)	0.927 (14.079)
Htech	1.009 (18.145)	1.211 (51.993)	1.494 (14.334)	0.936 (21.941)
Teacher	0.909 (16.119)	1.123 (51.348)	1.409 (14.379)	1.137 (22.558)
Diploma (for 81 & 86)	0.606 (9.519)	0.901 (35.434)	N/A	N/A
Diploma1 (for 91 & 96)	N/A	N/A	1.133 (7.868)	0.671 (11.700)
Diploma2 (for 91 & 96)	N/A	N/A	1.361 (9.396)	0.902 (18.090)
Degree	0.745 (13.322)	0.890 (41.330)	1.712 (15.625)	1.096 (26.958)
Hdegree	1.214 (12.203)	1.773 (43.425)	2.074 (11.027)	1.375 (21.660)
Male	0.480 (56.170)	0.352 (88.228)	0.395 (19.615)	0.367 (49.091)
Adjusted-R ²	0.317	0.309	0.518	0.390
Sample Size	20,248	13,477	3,368	26,671

APPENDIX II: COMPARISON OF ESTIMATED RATES OF RETURN TO EDUCATION IN HONG KONG

**Table A3.1:
Comparison of Estimated Private Rates of Return to Education for Hong Kong**

	Primary over No Schooling	Junior Second over Primary	Senior Second over Jun. Second	Matric. over Senior Second	Tertiary: Non-Degree over Sen. Second	Tertiary: Degree over Matric.
<u>1976</u>						
Hung (1982)	N/A	N/A	18.5%	N/A	N/A	25.2%
Kwok (1984)	N/A	N/A	15.6%	N/A	N/A	21.4%
Chung (1990)	6.7%	11.5%	14.7%	17.8%	N/A	22.6%
Wong (1992)	N/A	N/A	18.0%	24.8%	N/A	15.1%
Tam (1998)	4.6%	N/A	8.2%	23.4%	N/A	10.4%
<u>1981</u>						
Kwok(1984)	N/A	N/A	12.6%	N/A	N/A	21.4%
Chung (1990)	3.3%	8.6%	12.3%	15.7%	N/A	20.9%
Wong (1992)	N/A	N/A	10.7%	19.0%	N/A	23.4%
Tam (1998)	4.6%	4.1%	11.6%	12.5%	15.0%	12.3%
This Report*	12.7%	8.1%	10.9%	11.4%	13.7%	13.5%
<u>1986</u>						
Chung (1990)	2.9%	9.0%	13.1%	17.2%	N/A	23.3%
Wong (1992)	N/A	N/A	12.2%	13.9%	N/A	26.9%
Tam (1998)	3.3%	6.3%	11.1%	11.7%	17.3%	15.4%
This Report*	12.6%	10.3%	11.6%	13.5%	15.6%	16.0%
<u>1991</u>						
Tam (1998)	3.0%	6.3%	12.8%	10.5%	14.0%	15.2%
This Report*	13.2%	18.2%	14.0%	14.7%	15.8%/19.8%**	19.6%
<u>1996</u>						
Tam (1998)	3.5%	5.4%	12.2%	10.6%	14.6%	13.8%
This Report*	8.6%	13.5%	15.6%	12.8%	13.6%/17.2%**	14.5%

*The assumption that there are no earnings forgone for schooling up to lower secondary (Form 3) level was used to estimate rates of return to primary over no schooling and to lower secondary over primary.

** Two types of tertiary diploma qualifications are defined in Table 1 in the text.

**Table A3.2:
Comparison of Estimated Social Rates of Return to Education in Hong Kong**

	Primary over no Schooling	Junior Second. over Primary	Senior Second. over Jun. Second.	Matricu- lation over Sen. Second.	Tertiary: Non- degree over Sen. Second.	Tertiary: Degree over Matricu.
<u>1976</u>						
Hung(1982)	N/A	N/A	15.0%	N/A	N/A	12.4%
Wong(1992)	N/A	N/A	14.7%	22.5%	N/A	5.3%
Tam (1998)	6.7%	N/A	13.7%	22.2%	N/A	3.7%
<u>1981</u>						
Wong(1992)	N/A	N/A	10.4%	17.8%	N/A	9.9%
Tam (1998)	8.4%	9.4%	10.3%	12.4%	11.6%	8.1%
This Report	6.5%	11.9%	9.7%	12.1%	N/A	9.3%
<u>1986</u>						
Wong(1992)	N/A	N/A	9.6%	10.6%	N/A	12.0%
Tam (1998)	7.5%	6.1%	13.1%	11.4%	10.5%	10.1%
This Report	5.6%	9.6%	9.5%	11.2%	N/A	9.9%
<u>1991</u>						
Tam (1998)	6.2%	10.6%	9.1%	9.4%	9.7%	10.6%
This Report	5.6%	10.3%	9.4%	11.2%	N/A	12.1%
<u>1996</u>						
Tam (1998)	8.8%	13.6%	8.4%	8.3%	9.7%	8.9%
This Report	6.3%	8.2%	9.8%	11.2%	N/A	10.0%

Note: Both Tam and this report had included rental costs for school buildings in their estimation of rates of return while others had ignored such costs.

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