CHAPTER THREE: RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter describes the research methodology used in this study. There are mainly four sections in this chapter. Section 3.2 deals with the classification of data. The PHEIs are classified into different categories according to the setup of the institutions. Then a brief description of each category is given. The distribution of the PHEIs will also be discussed. The degree programs are classified according to the type of program and the field of study. A brief description will be given to each category of both classifications. In section 3.3 a hedonic model is developed. Based on firm's behavior of profit maximizing and consumer's behavior of utility maximizing subject to a budget constraint, a hedonic model is developed to relate the attributes of a degree program to its tuition fee. This is followed by a discussion of the econometric specifications of the model. In section 3.4, explanations of the variables in the regression model are given. The sources of data employed in this study are also revealed here. Finally, section 3.5 of this chapter discloses the estimation techniques employed in this study.

3.2. CLASSIFICATION OF DATA

3.2.1. CLASSIFICATION OF PHEIs

According to the Ministry of Education, the private higher educational institutions (PHEIs) can be categorized into 2 groups:

a) The PHEIs which are of the status of university, university college or branch campus of a foreign university
b) The PHEIs which are not of the status of university, university college or branch campus of foreign university

For the purpose of this study, the PHEIs investigated are categorized into 3 groups:

a) Private colleges: These institutions can award internal and external certificates and diploma qualifications. The colleges investigated in this paper include 3 generations (see chapter one) of private colleges in Malaysia. Even though they cannot confer their own degrees, they can conduct franchised degree programs and foreign universities' external programs that allow their students to be awarded with degrees from foreign universities. Some of them also act as tuition center for external professional qualifications such as ACCA.

b) Private universities: These PHEIs are granted university status by the Ministry of Education under the Private Higher Educational Institutions Act, 1996. They can confer their awards of bachelor degree and other higher qualifications. This study investigates five local private universities. Two of these universities were set up by public service providers that had been privatized: Multimedia University (MMU) by Telekom Bhd (National Telecommunication Company) and Universiti Tenaga Nasional (UNITEN) by Tenaga Natioanal Bhd (National Electricity Board). There is one state government owned university namely the University Industri Selangor and one virtual universities - University Tun Razak. Kolej Universiti Teknologi dan Pengurusan Malaysia (KUTPM) is also included for the fact that they can confer their own degrees.

c) Branch campuses of foreign universities: These are branch campuses set up by foreign universities by the invitation from the Government of Malaysia. They conduct and confer
identical degree programs and awards as the host universities. The two branch campuses investigated in this study are Monash University and University of Nottingham. They are the pioneers in the setting up of foreign branch campuses in Malaysia.

Current number of various PHEIs is given in the Table 2. Out of the 652 colleges 32 of them were approved by the Private Education Department (JPS) to run 3+0 programs. The location of the 32 private colleges with 3 + 0 status is given in Table 3. Out of these 32 colleges 22 are in the Klang Valley (Kuala Lumpur, Petaling Jaya and Klang) and 2 in Nilai.

<table>
<thead>
<tr>
<th>TYPE OF PHEI</th>
<th>NUMBER OF INSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIVATE COLLEGE</td>
<td>652</td>
</tr>
<tr>
<td>PRIVATE UNIVERSITY</td>
<td>10</td>
</tr>
<tr>
<td>BRANCH CAMPUS</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>666</strong></td>
</tr>
</tbody>
</table>

Source: JPS approvals as at February 2001

This paper investigates 85 degree programs offered by the 24 private colleges in the Klang Valley and Nilai, 34 degree programs offered by 4 private universities and 16 degree programs offered by 2 branch campuses. All the private universities and branch campuses investigated are located in the Klang Valley.
Table 3
Location of colleges with 3 + 0 status

<table>
<thead>
<tr>
<th>Location</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuala Lumpur / Petaling Jaya</td>
<td>21</td>
</tr>
<tr>
<td>Klang</td>
<td>1</td>
</tr>
<tr>
<td>Ipoh</td>
<td>1</td>
</tr>
<tr>
<td>Penang</td>
<td>4</td>
</tr>
<tr>
<td>Johor Baru</td>
<td>1</td>
</tr>
<tr>
<td>Nilai</td>
<td>2</td>
</tr>
<tr>
<td>East Malaysia</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>32</strong></td>
</tr>
</tbody>
</table>

Source: JPS approvals as at February 2001

3.2.2. CLASSIFICATION OF PROGRAMS

The degree programs being studied in this paper are those that can be completed within a particular PHEI itself. These include:

(A) **Degree programs of the local private universities:** The programs are formulated and conducted by each individual local university. The university will then confer its own degree. There are 34 of these programs in the sample.

(B) **Degree programs of the foreign branch campuses:** As the branch campuses are an integral part of the host university, the degree programs conducted and the awards conferred are the same as the host universities. This paper investigates 16 of these programs.

(C) **3 + 0 programs:** These are extension of the 1 + 2 and 2 + 1 twinning models. (see chapter one) They are conducted by the private colleges in collaboration with
foreign universities who will eventually confer the degrees. There are 72 of these programs in the sample.

(D) External programs: There are 7 of these programs in the sample. All of them are external programs of University Of London. The entry requirement, syllabus and examinations are determined by the university. The colleges only act as tuition center.

(E) Local public university degree franchised programs: They have the same concept as the 3 + 0 program except the collaborating universities are local public universities. There are 6 of these programs in the sample. The participating universities are UUM, USM, UPM and UKM.

The degree programs investigated in this study are related to 4 major disciplines: business, computer studies, art and design and engineering. These disciplines are chosen because they constitute the majority of courses offered by the private colleges (the largest group of PHEIs investigated in this study). The categories of degree program according to the field of study are:

a) **Business degree programs:** These consisted of degree programs in the areas of business administration, accounting, finance, marketing, commerce, international business, human resource management, economics and entrepreneur development.

b) **Information technology degree programs:** These are programs related to multimedia technology, software technology, computing, game design, digital business, network system, information technology and communication and information system.
c) **Engineering degree programs:** These are electronics, electrical mechanical, mechatronic, electrical power, civil engineering.

d) **Arts and design degree programs:** These are interior architecture and design, graphic design, industrial design and design programs.

c) **Business and Information Technology degree programs:** These are programs related to both business and computer science.

f) **Engineering and computing degree programs:** These are electrical engineering programs that are related to computing such as software engineering

### 3.3. THE THEORETICAL MODEL AND THE ECONOMETRIC SPECIFICATION

#### 3.3.1 THE THEORETICAL MODEL

Consider a student who has made up her mind as to the field of study she wants to pursue and is now choosing the program with the right attributes subject to certain budget constraint. She has preference for a program with a set of attributes $Z$. Even though two programs may be of the same field of study, the attributes of each will differ if offered by two different institutes and sometimes within the same institute itself. Assuming that she has a choice of 2 programs offered by 2 institutes $i$ and $j$; each with a set of attributes $Z$ and $Y$ respectively. Her utility function is given by

$$U = \begin{cases} 
\beta + \alpha i(Zi) - Pi(Zi) & \text{enrolled in institute } i \\
\beta + \gamma j(Yj) - Pj(Yj) & \text{enrolled in institute } j \\
0 & \text{choose not to enroll in any institute,}
\end{cases} \quad (1.1)$$

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where $\beta > 0$ is the basic utility she gets from being able to do the type of program she likes regardless which institute she choose. Whereas $\alpha_i(Z_i)$ is the additional utility derives from the attributes of the program offered by institute $i$. $P_i(Z_i)$ is the tuition fee charged by institute $i$ is a function of its attributes. On the other hand, $\gamma_j(Y_j)$ is the additional utility derives from the attributes of the program offered by institute $j$. $P_j(Y_j)$ is the tuition fee charged for the program which is the function of its attributes. If the student prefer $Z$ to $Y$, therefore,

$$\alpha_i(Z_i) > \gamma_j(Y_j).$$

Consider a situation where both institutes try to recruit her. In order to induce the student to enroll with the institute, institute $i$ must fulfill the following conditions:

$$\beta + \alpha_i(Z_i) - P_i(Z_i) \geq \beta + \gamma_j(Y_j) - P_j(Y_j)$$

$$\alpha_i(Z_i) - P_i(Z_i) \geq \gamma_j(Y_j) - P_j(Y_j)$$

$$P_i(Z_i) \leq \alpha_i(Z_i) - \gamma_j(Y_j) + P_j(Y_j)$$

$$P_i(Z_i) \leq \lambda + P_j(Y_j), \text{ where } \lambda = \alpha_i(Z_i) - \gamma_j(Y_j) > 0.$$ (1.3)

Equation (1.3) implies that, due to the student’s preference, institute $i$ can charge a fee higher than institute $j$ by $\lambda$. In fact institute $i$ would charge the highest fee of $P_i(Z_i) = \lambda + P_j(Y_j)$. Assuming that both $\gamma_j(Z_j)$ and $\alpha_i(Y_i)$ are observable by the student as $Z_i$ and $Y_j$ are both publicly accessible, the student will enroll in institute $i$ even though the fee charged is higher than institute $j$. This also implies that given 2 programs with identical attributes, the lower-priced program would be expected to be able to recruit more students.
The PHEI industry is one with highly differentiated products. Each program has its own attributes. Each student has her own preference for these attributes and may be willing to pay significantly different fee for different program. Consider two groups of student: group $z$ has preference for a set of attributes $Z$ and group $y$ has preference for a set of attributes $Y$. Let there be equal number of student in the two groups, $n$. The number of student institute $i$ can manage to recruit would be:

\[
q_i = \begin{cases} 
0 & \text{if } P_i(Z_i) > P_j(Y_j) + \lambda \\
\eta & \text{if } P_i(Z_i) \leq P_j(Y_j) + \lambda \\
2\eta & \text{if } P_i(Z_i) \leq P_j(Y_j) - \lambda, \text{ where } \lambda = \alpha_i(Z_i) - \gamma_j(Y_j) > 0.
\end{cases}
\]

Equation (1.4) shows that institute $i$ will be able to recruit more student if it undercuts institute $j$ by $\lambda$. Assuming that due to its flexible nature to accommodate additional students, institute $i$ has zero marginal cost and the fixed cost is a function of its attributes and does not vary according to number of student intake. The cost structure is given as:

\[
TC_i = FC_i(Z_i) + VC_i \\
= \phi(Z_i) + \mu q \\
MC_i = \mu = 0 \\
TC_i = \phi(Z_i),
\]

where $TC$ is total cost, $FC$ is fixed cost and $VC$ is variable cost. The profit function of the institute would be given as:
\[ \Pi_i = TR_i - TC_i \]
\[ = P_i(Z_i)q_i - \varphi(Z_i) \quad (1.6) \]

Profit maximizing first order condition:
\[ \delta \Pi / \delta Z_i = q_i P_i'(Z_i) - \varphi'(Z_i) = 0 \]
\[ q_i P_i'(Z_i) = \varphi'(Z_i) \quad (1.7) \]

Equation (1.7) implies that for a given number of students, a profit maximizing institute would only improve on the attributes of its program if the marginal cost incurred would equal the marginal increase in price times the given number of students. This paper uses a hedonic price model to examine the extent to which identifiable quantitative and qualitative attributes of a particular program are important in determining its fee. Implicit marginal prices for the characteristics can be calculated as derivatives of the hedonic price equation with respect to levels of the characteristics (Berndt, 1991). The estimates for the coefficients of the variables of the hedonic price equation which measure the impact of the presence of a attributes, would be the estimates for \( P'(Z_i) \) in equation (1.7). Taking into consideration the marginal cost incurred (which is observable by the institute) the institute can then decide which attribute to include or exclude for the programs they offer.
3.3.2. THE ECONOMETRIC SPECIFICATION

A hedonic price function relates the price of a product to its various characteristics. However the theory of hedonic pricing does not suggest any function governing the relationship between the price of a product and its characteristics.

In this study, an analysis of covariance model, a regression model which contains a mixture of quantitative and qualitative variables was used. The general form of the model can be written as: \( P = F(Q,C) + U \), where \( P \) is the observed tuition fee of a program, \( Q \) is a set of qualitative variables in the form of dummies, \( C \) is a set of quantitative variables and \( U \) is a residual error term.

The dummy variables that take on values of 1 and 0 were employed to indicate the presence or absence of a quality or an attribute. For example, 1 indicates that a program is related to engineering and 0 that it is not. The estimator for the coefficient attached to a dummy variable is significant if the mean tuition fee of the type of program with a particular attribute differs from other programs without the attribute. Therefore the estimated coefficient measures the impact of the presence of the given attribute.

For quantitative variables in the regression, the slope coefficient measures the change in mean tuition fee for a unit change in the value of the quantitative variable. For example, how much the tuition fee increase with an increase of duration of a year of the program.

Having considered the various factors that might affect the tuition fee of a degree program, the following regression model was formulated:
\[ p_i = a + b_1IT_i + b_2ENG_i + b_3ARTDSN_i + b_4BUSIT_i + b_5ENGIT_i + b_6FOBRH_i + b_7LOUNI_i + b_8UKDEG_i + b_9AUSDEG_i + b_{10}SO_i + b_{11}MSC_i + b_{12}ADVANCE_i + b_{13}RANK_i + c_i\text{AGE}_i + U_i \]  

Where,

\[ P \] = price of a degree course in year 2002

\[ IT \] = 1 if the course is related to IT, 0 if not.

\[ ENG \] = 1 if the course is related to engineering, 0 if not.

\[ ARTDSN \] = 1 if the course is related to art and design, 0 if not.

\[ BUSIT \] = 1 if the course is related both to business and IT, 0 if not.

\[ ENGIT \] = 1 if the course is related to both engineering and IT, 0 if not.

\[ FOBRH \] = 1 if the program is conducted by a branch of a foreign college, 0 if not.

\[ LOUNI \] = 1 if the program is conducted by a local university, 0 if not.

\[ UKDEG \] = 1 if the student would be awarded with a UK degree, 0 otherwise.

\[ AUSDEG \] = 1 if the student would be awarded with an Australian degree, 0 otherwise.

\[ ISO \] = 1 if the college obtained ISO 9000 Status, 0 otherwise.

\[ MSC \] = 1 if the college obtained MSC Status, 0 otherwise.

\[ ADVANCE \] = 1 if the college also conduct post graduate programs, 0 if not.

\[ RANK \] = 1 if the degree is awarded as the top 10 ranking university in Britain or Australia, 0 if not.

\[ AGE \] = the age of the PHEI.
3.4. THE VARIABLES AND DATA

3.4.1. THE EXPLANATORY VARIABLES

The different types of program according to the field of study as discussed in 3.2.2 are represented by the first five dummy variables in the regression model (1.8). Different program requires different amount of start up and maintenance cost. For example, engineering program would involve higher investment because of the setting up of comprehensive laboratory and workshops. One would expects the different cost involved in providing different programs be translated into different tuition fee.

The market of private higher education, not only allows the students to choose from a variety of programs but also from different types of institution. It is logical to think that, for the same program, a student would prefer to study in a university than to study in a college. Among the private universities, the students again have a choice of either a local university or a foreign branch campus. Variable FOBRH and LOUNI are used to capture this effect.

Most competition between the PHEIs takes the form of product differentiation. For example the credential of a program may originate from local university or foreign university (especially with the 3 + 0 programs). To see the effect of this on the tuition fees, variable UKDEG and AUSDEG are included. In this study, the foreign universities are divided into British university and Australian university.
Even within the same foreign credential, fee may again differ according to the ranking of the university. For this variable RANK is included.

Another form of product differentiation is the MSC and ISO 9000 status of the PHEIs that are popularly used in their advertising campaign as benchmark for quality. If the students associate quality with the status awarded to the institution, one can expect them to be willing to pay higher fee for a program offered by the institute.

Along with the MSC status comes, among other things, advantages such as tax exemption for purchase of IT equipments and no restriction on recruitment of expatriates. Colleges with MSC status are therefore associated with having more foreign lecturers and better equipped computer facilities. (MSC, Malaysia, 1997)

Colleges with the ISO award have quality management system that gives assurance to the customers (students) that the quality they receive will be as what they expect. ISO 9001 and ISO 9002 are nearly similar except the latter is a subset of the former. ISO 9001 is named “Quality System – Model for quality assurance in design/ development, production, installation and servicing.” ISO9002 is named “Quality System – Model for quality assurance in production, installation and servicing.” (ISO Easy).

As the PHEIs are established during different era in history (see chapter one) variable AGE tries to capture the effect of years of establishment on their tuition fees.
One would expect the fee of a program to be related to the duration of the program. However, the programs offered by the private colleges are all the same – 3 years. According to the research done by Tan (Tan 2002) students prefer fast and intensive program. The private colleges are sensitive to the desire of the students and their programs are done in or compressed into 3 years. However the duration of engineering program in most of the private universities is 4 years. The duration of a program is not included in the model because it was found to be highly correlated with the variable, ENG. To control for the effect of program duration on the fee, the fee of these programs are pre adjusted as if the programs have 3 years duration.

An additional variable, ADVANCE, is added to account for the availability of post-graduate study in the PHEIs for the student to further their study after obtaining their degree in the same vacinity.

3.4.2. SOURCE OF DATA

The data used in this study are mainly sourced from the brochures collected from and the advertisements published by the various PHEIs. Some background about the PHEIs are extracted from write-ups in the education guide (Wencom and Challenger Concept). Some descriptive information such as the course content of a program is obtained from course counselors of various PHEIs.

The data is cross-sectional that is for year 2002. For each program offered starting this year, data were collected on tuition fee, type of program (as categorized in 3.2.2), duration of the program and the credentials awarded. For credentials awarded by foreign universities, the country of origin (British or Australia) and the ranking of the university are also ascertained. Information collected
concerning the institute offering each of the programs are the type (as categorized in 3.2.1), the age and the status (MSC or ISO9000). Question whether the institute offers post-graduate program is also ascertained.

The post-graduate study considered in this study is Master in Business Administration (MBA). The reason is that MBA program allowed entry to students with any basic degree. (according to the course counselors at various institutes). Therefore institute with MBA program would be considered to have provide their student with the opportunity to further their study in the same vicinity.

The status of the institutions is as at 1 June 2002. No distinctions are made between the different series of ISO awards whether it is ISO 9001 or ISO 9002. No distinctions are made also on the certifying bodies whether it is Sirim Malaysia or Independent European Certification Limited (I.E.L.). PHEIs with any of the ISO series certified by any certifying body are categorized as having ISO 9000 status.

The British universities ranking is taken from The Times Good University Guide. The Australian universities ranking is taken from Asiaweek, Asia's Best Universities by country.

In this study, the tuition fee of a program is taken as the fee charged to a full-time student. It is the total fee for the whole program if one-time payment is made. As some PHEIs give discount if one-time payment is made, the fee taken is after the discount. The tuition fees exclude the fee payable

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for the foundation program or any other programs needed before the student can proceed with the degree program.

The age of a PHEI is taken as 1 January 2002 and the year of establishment is regarded as 1 year.

3.5. ESTIMATION TECHNIQUES

Assuming that the disturbances \((U_i)\) in equation (1.8) fulfill all classical assumption of a linear regression model and the predetermined variables are all on the right hand side, the OLS method can be applied to estimate the coefficients.

Several tests were carried out to ascertain that the classical assumptions needed to run OLS regression are not violated. For the detection of multicollinearity, zero-order correlation coefficients among the regressors were used. As the data employed in this study is cross sectional, the problem of heteroscedasticity is suspected. The White's general heteroscedasticity test with and without cross-term was used for the detection of this problem.

There is no direct test available to ascertain whether all relevant variables have been included. Misspecifications can arise because of attributes not included in the estimation or incorrect functional form.

The White's test indicates that the data is flawed with the problem of heteroscedasticity. To carry on using OLS estimators would bring some undesirable consequences. First the estimators for the coefficients would be, though still unbiased, inefficient. Secondly, the estimators for the variances
of the coefficients are biased. Therefore any conclusions drawn may be misleading. To solve this problem White's Heteroscedasticity-Consistent Standard Errors and Covariance was used to provide correct estimates of the variances in the presence of heteroscedasticity of the unknown form. Even though the OLS estimates for the coefficients do not change, t and F test can be conducted accurately.

In the overall model run with the entire sample, age of the PHEI is used as the only quantitative variable while the type of program in terms of field of study, type of institute, type of award, status of the institute, availability of post graduate study and ranking of partner university are used qualitative variables. The type-of-institute variables, in the form of dummies (LOUNI and FOBRH), are included in the overall model in an effort to control for the market structure effect.

Instead of introducing interaction terms in the overall model, two institute specific models were fitted to two different categories of institute (private college and private university). Relevant explanatory quantitative and qualitative variables were used for each model. No separate model were fitted for branch camps, instead it was put in the same group with the local university as private universities. This grouping is however consistent with the grouping method used by the Ministry of Education.

For the private colleges model, the equation 1.8 is modified to produce the following model:

\[ P_i = a + b_1T_i + b_2ENG_i + b_3ARTDSN_i + b_4BUSIT_i + b_5ENGIT_i + b_6UKDEG_i + b_7USDEG_i + b_8ISO_i + b_9MSC_i + b_{10}ADVANCE_i + b_{11}RANK_i + c_1AGE_i + U_i \]

(1.9)
Variables LOBRH and LOUNI are omitted because they are not relevant in this model where all the PHEIs investigated are private colleges.

For the private university model, the equation 1.8 is modified to produce the following model:

\[ P_i = a + b_1T_i + b_2ENG_i + b_3BUSIT_i + b_4ENGIT_i + b_5FOBRH_i + b_6UKDEG_i + b_7AUSDEG_i + b_8MSC_i + c_1AGE_i + U_i \]

(2.0)

Variable ARTDSN is not included because none of the private universities investigated offer program related to art and design. Variable LOUNI is omitted as it is the base category for the factor of types of institute. Variable ISO is omitted because none of the private universities are awarded with any ISO certification. Variable RANK is not include because all the private universities offer post graduate study. As there are only two foreign branches investigated whereby both are ranked first ten in their respective countries, the factor of ranking becomes not relevant.