

CHAPTER 3

METHODOLOGY

This chapter reviews the scope of the study and the sampling methodology. A short discussion on the enrolment of students in the science and arts streams in Negeri Sembilan is made, followed by a discussion on the shortcomings of this research. The final section discusses the method of analysis of data collected.

3.1 Scope of study.

This study examines only form four students in Negeri Sembilan. Form four students are selected because of their fresh start at the upper-secondary level. The decisions they make at the beginning of the year to enter the science or arts stream have not been affected yet by the set curriculum nor the new subject matter offered to them in Form four. The only criterion that puts them in a particular stream is their

PMR results³². The decisions they make at this point about what they would like to do in the future after form five have little to do with upper-secondary schooling. Moreover, all through standard one to form three all the students follow the same curriculum with no particular emphasis on the sciences or the arts that could bias their decision about further education. In this sense their decisions are affected primarily by factors that fall within the psychological (or individual), social (or familial), and economic dimensions.

Most studies select students at the final year of the lower or upper secondary education (form three, five or six levels). However, at these levels, especially form five and six, it is more likely that self selection would already have taken place (see Chew et al., 1990). Those who only complete (or do not complete) lower-secondary education and leave school have little opportunity to further their education. Most of them enter the labour force. On the other hand, those who

³² After the PMR (*Penilaian Menengah Rendah* or Lower Secondary Assessment Examination), students are placed into the science or the arts stream on the basis of their PMR results. Selection into the science stream is based on science and mathematics results of the students. Students in the science stream will be allowed to change to the arts stream if so desired. However, students in the arts stream are not allowed to change to the science stream because of their poorer performance in science and mathematics. Students from all ethnic groups are given a free choice based on the above criteria. Despite the encouragement of the teachers and the incentives given by the government to encourage students, especially *Bumiputera* students, to enter the science stream, many *Bumiputera* students still opt to enter the arts stream; see Wang B.C. (1977).

enroll in form four still face a choice whether to pursue further education or not to do so. Zulkifli Manaf and Chew (1995) found that 40.8 percent of form five students would pursue further education immediately while 53.1 percent would seek employment³³. There is, however, at present no study of the intentions of students in form four. Such information would be important since it would still be possible at this stage to influence the actual decisions of the students. In particular, if we can identify the factors that would increase the likelihood of continuing into further education and into science education, steps could be taken to ensure that a larger proportion of students would pursue further education particularly in the sciences.

The population under study consists of form four students drawn from public secondary schools in Negeri Sembilan. Although this study is a representation of education in Malaysia, the sample of students drawn for this study is confined to Negeri Sembilan alone. This is due to time and financial constraints.

The first part of this study will examine the aspirations or desired professions of the students by

³³ Chew et al. (eds.), *Education and Work: Aspirations of Malaysian Secondary Students*, Kuala Lumpur: Faculty of Education, University of Malaya, 1995.

gender as well as by ethnicity. The choice of professions in relation to the science and arts field will be looked at. The choice of profession will have a bearing on the decision to continue or not to continue into further education. The latter constitutes the central purpose of this study. In particular, the factors that influence the decision to further or not to further one's education will be examined. Understanding the factors which influence the student's decision to further his/her education will enable policy makers to influence and move students in the desired directions in terms of their educational choices. Understanding these factors is important since Vision 2020 calls for further development of high-level manpower. The idea is to see how to encourage students to further their education to meet the needs and challenges of Vision 2020.

In line with the above objective, the study also examines the factors that influence students' choices between the science (and technical) and the arts fields. This is important in view of the government's emphasis on the development of scientific and technical manpower.

3.2 Sampling

In the absence of a listing of students, a random sample of schools was taken after stratifying all public secondary schools in the state by urban-rural location and the three major streams (science and technical, arts, and vocational). There were, in 1994, a total of 10,503 form four students in Negeri Sembilan - 8,972 in the academic streams, 291 in the technical stream and 1,240 in the vocational stream (Table 3.1). Among the students in the academic streams, about 21 percent were enrolled in the science and technical stream (Table 3.2). Table 3.3 gives the enrolment of form four students in Negeri Sembilan according to gender, ethnic group and academic stream (science and arts streams). It should be noted that detailed breakdown by gender and ethnicity were not available for the vocational, technical and some rural/FELDA (Federal Land Development Authority) schools at the time of survey.

In this study, ten schools were selected - 5 urban and 5 rural. The 5 urban schools are located in Seremban (the state capital) and its surrounding districts. The rural schools are located in the districts of Rembau, Tampin, Rantau and Nilai. The next

step involved taking a proportionate number of classes of form four students from different streams in each of the selected schools. Within these classes, a proportionate sample of students, according to ethnicity, were taken (where possible). A total of 500 students were taken from three streams (science and technical, arts, and vocational)³⁴. Only 455 responded to the questionnaires. The students were selected by classes and were not stratified by sex.

In Malaysia, enrolment of students in the arts stream is very much higher as compared to the science stream. The statistical report from the Ministry of Education gives a breakdown of the enrolment of students in form six, i.e. students who enrolled in form six after their SPM examination (Table 3.4). There were 6,088 boys and 5,549 girls enrolled in the science stream, while there were 13,260 boys and 30,108 girls enrolled in the arts stream. This gives a total of 11,637 (21 percent) in the science stream and 43,368 (79 percent) in the arts stream. Likewise in Negeri Sembilan, the total number of science students enrolled

³⁴ With the Integrated Secondary School Curriculum (KBSM : *Kurikulum Bersepadu Sekolah Menengah*), the students in the Science and Arts Stream are allowed to register for elective subjects in the different subject groups. Thus, although there are 3 major streams, there exist numerous combinations of subjects (see Appendix 3.1 for more details on the KBSM subject groupings).

in form six is 442 (20 percent) while 1,810 enrolled in the arts stream (80 percent) (Table 3.1).

Table 3.1 : Enrolment of Students in Upper-secondary schools in Negeri Sembilan according to gender and stream (1994).

Stream	Form Four		Form Five		Form Six	
	Boys	Girls	Boys	Girls	Boys	Girls
Academic	3903	5069	3809	4922	230	212 (science)
Technical	170	121	179	121	491	1319 (arts)
Vocational	850	390	842	382	36	38
Total	4923	5580	4830	5425	757	1569
Total no. in the Form	10503		10255		2326	

Source : Social Statistics Bulletin, Department of Statistics, Malaysia (1994), table 3.9 and 3.10, pp 127 & 129.

Table 3.2 : Enrolment of Students in Form Four according to Stream in Negeri Sembilan (1994).

Stream	Form Four
Science & Technical	1910
Arts	7225
Vocational	1218
Total	10354

- Note: 1. The figures here are taken from the actual number of the present form four students who registered for the SPM examination in 1995.
 2. The total here differs slightly from table 3.2, probably due to some students who left the state or discontinued schooling at the end of 1995.

Source : *Sijil Pelajaran Malaysia 1995 : Analisis Keputusan Peperiksaan, Unit Penilaian dan Peperiksaan, Jabatan Pendidikan Negeri Sembilan Darul Khusus*

Table 3.3 : Enrolment of Form Four Students in Negeri Sembilan according to gender, ethnic group and stream (1994)

Stream	MB	MG	CB	CG	IB	IG	OB	OG	Total
Science	359	393	277	257	80	61	7	14	1448 (20%)
Arts	1307	2028	605	1173	350	449	14	16	5942 (80%)
Total	1666	2421	882	1430	430	510	21	30	7390

Total: Boys = 2999 (40.6 %), Girls = 4391 (59.4 %)

- Note: 1. Vocational and Technical students and some academic (rural/Felda) schools are excluded because detailed data of these schools were not available at the time of survey.
 2. M = Malay, C = Chinese, I = Indian, O = Other, B = Boys, G = Girls.

Source: The Department of Education (Statistics Department), Negeri Sembilan. Raw Data (1994), print-out.

**Table 3.4 : Enrolment of Students in Upper-Secondary Schools in Malaysia (1994)
according to Gender and Stream.**

Stream	Form Four		Form Five		Form Six	
	Boys	Girls	Boys	Girls	Boys	Girls
Academic	84 790	106 752	88 463	108 755	6088	5549(science)
Technical	1469	1032	1634	1039	13 260	30 108 (arts)
Vocational	11406	4065	10 738	3949	137	242
Total	97 665	111 849	100 835	113 743	-	-
					19 585	35 899

Source : Social Statistics Bulletin, Department of Statistics, Malaysia (1994),
table 3.9 and 3.10, pp 127 & 129.

3.3 The Survey and Limitations of the Study

3.3.1 The Survey

A questionnaire survey³⁵ was undertaken at the end of the school year in October 1994. The questionnaire administered to the form four students raised the following information:

1. Student's personal characteristics such as age, sex, ethnicity
2. Family background such as parents' occupation, parents' education, number of siblings in the family, family income;

³⁵ See Appendix 3.2 and 3.3 for the questionnaire used (bilingual).

3. Student's study environment such as the availability of a study room, parental encouragement, influence, parents' hopes and wishes, relationship with his teacher, class enrolment, extra tuition;
4. School factors such as the type of school attended, UPSR³⁶, PMR³⁷ and secondary school grades;
5. Student's further study plans and educational choices;
6. Student's labour market perceptions which covers the student's desired sector of employment, his aspirations and earnings expectations with 11 years of schooling, after graduation and at the age of 26; and
7. Student's views and motivations, that is, why he/she wishes to continue or discontinue his education.

³⁶ At the end of six years of primary education, pupils from all language media schools sit for the *Ujian Penilaian Sekolah Rendah* (UPSR, that is the Primary School Assessment Test). The aim of this public examination is to evaluate the pupils' mastery of basic skills in reading, writing and arithmetic.

³⁷ At the end of lower-secondary education, pupils sit for the public lower-secondary Assessment Exam (PMR).

3.3.2 Limitations of study

Several limitations and problems were encountered as follows:

1. Coding and classification of certain factors such as occupations of the parents posed some problems because not all the respondents were able to give accurate descriptions of their parents' occupation. Moreover, some occupations found in the vocabulary of rural students are not listed in the Dictionary of Occupations. Therefore when such cases arose, the classifications closest to those stated were taken.
2. Prior to the survey proper, a pilot survey was conducted on a class of form four students in Rembau (a small rural town in Negeri Sembilan). Although some weaknesses were found in the questionnaire and amended, there were still some flaws in the final questionnaire such as the structure of the sentences which were not easily understood by the students.
3. Although the study is a representation of education in Malaysia, only the schools in Negeri Sembilan were covered. Seremban was

used to represent urban schools in Malaysia and the rest to represent the rural schools. This is due to financial and manpower constraints.

4. Lastly, the survey was conducted in October 1994. The students from this survey have now completed their examination and are either working or studying at higher institutions of learning. It would be ideal if this group of students is studied again to analyze their actual decisions and their actual labour market involvement; and make a comparison with this study. However this is beyond the scope of the present study.

3.4 Methodology for Analysis of Data

3.4.1 The data

Based on Marceau's (OECD, 1979) model, the independent variables (the determinants) are categorized into four groups. Under each group, only the particular factors stated are taken into account in this study. However there are two aspects of analysis. The first section is to examine the factors by crosstabulations.

This part will involve both the quantitative (gender, ethnicity, parents' occupations, parents' education, family size, school grades, location of school, streams, expected earnings and family income) and qualitative (motivations, parents' encouragement and expectations, greatest influence) factors. The second section will examine the quantitative factors by taking maximum likelihood estimates based on the model given in Figure 3.1 .

1. Psychological or individual:

gender, race, aspirations and motivations.

2. Social or familial:

parents' occupation, parents' education, parents' encouragement and expectations, greatest influence, number of siblings(family size).

3. Structural or Institutional:

PMR , UPSR and Form four grades, location of school, streams;

4. Economic or financial:

expected earnings , family income.

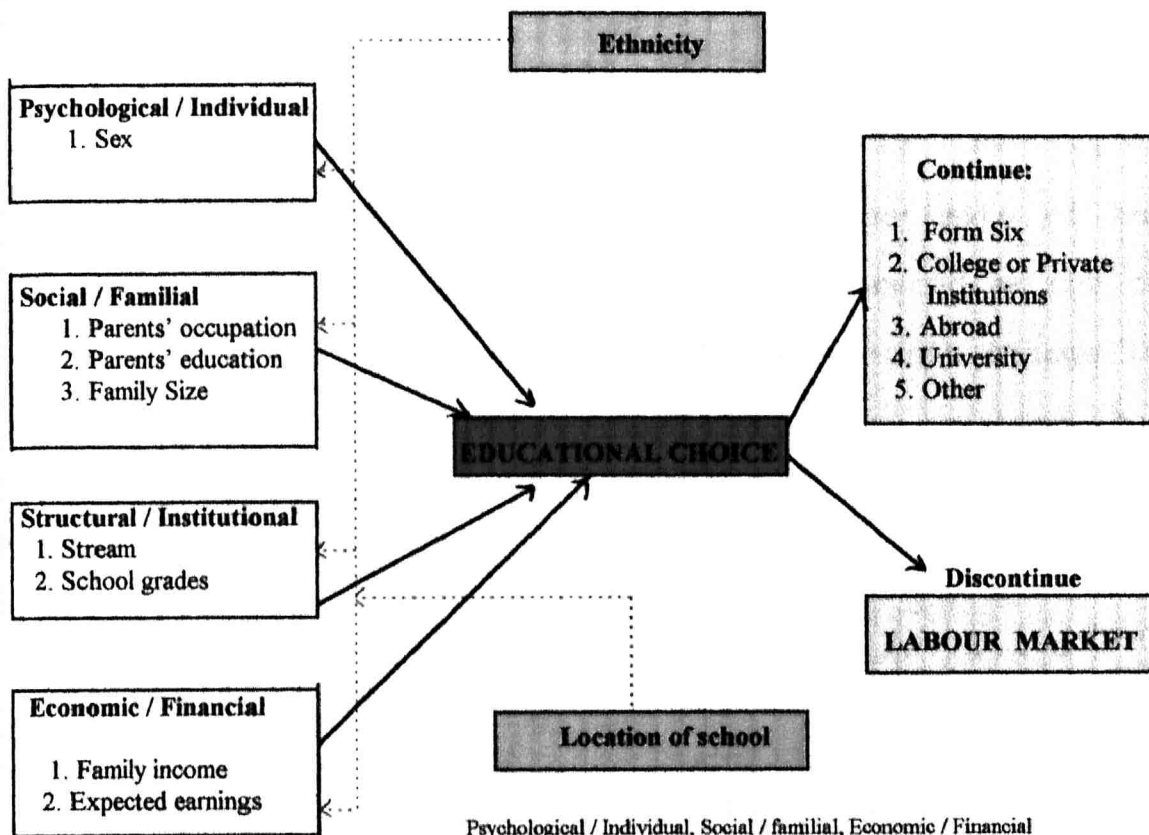
3.4.2 Data Analysis

The educational decisions or choices of the students and their reasons, their aspirations, motivations and influences will be examined by using descriptive statistics. The data will be compared and explained by using cross-tabulations and percentages. Next, estimates of a choice model will be taken. It will be done by means of maximum likelihood (logit model) of the choice model.

Figure 3.1 shows the hypothesized relationships among the determinants in the choice model. Estimates of the choice model is taken by means of maximum likelihood (logit model) due to the nature of the dependent variable (continue or not continue) which is dichotomous. This technique ensures predicted probabilities within the 0 - 1 interval and asymptotic efficiency and consistency of the resulting parameters. This means specifying a logit transformation:

$$\ln \frac{P}{1 - P} = \sum \beta_i x_i$$

Figure 3.1 : Determinants of Educational Choice.



Psychological / Individual, Social / familial, Economic / Financial and Structural Institutional factors are major direct influence of Educational Choice (indicated by the dark arrows). Ethnicity and location of school also influence the 4 major groups, (indicated by the dotted arrows).

in which,

$$P = \frac{1}{1 + e^{\sum \beta_i x_i}},$$

where P is the probability of the decision to continue, x_i is the i th element of the vector of all the independent variables and β_i is the regression coefficient of the log of the odds estimate of the i^{th} independent variable. It can be interpreted as the change in the log odds associated with a one-unit change in the independent variable. The logistic equation can be written in terms of odds as

$$\frac{P}{1 - P} = e^{\beta_1} e^{\beta_2 x_2} \dots e^{\beta_n x_n}$$

The e raised to the power β_i is the factor by which the odds change when the i^{th} independent variable increases by one unit. When β_i is positive this factor will be greater than 1, which means that the odds are increased; if β_i is negative the factor will be less than 1, which means the odds are decreased, and when it is 0, the factor equals 1, which leaves the odds unchanged.