FERTILITY LEVELS AND DIFFERENTIALS IN MALAYSIA

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FACULTY OF ECONOMICS AND ADMINISTRATION

UNIVERSITY OF MALAYA

ACADEMIC SESSION

2019/2020

EIA 3005: GRADUATION EXERCISE

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SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE

OF BACHELOR OF ECONOMICS

ACADEMIC SESSION

2019/2020

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ACKNOWLEDGEMENTS

First and foremost, I would like to express my deep and sincere gratitude to my research supervisor, Dr. Lai Siow Li, whose patience and consistent guidance, support, understanding and comments that have made this a better thesis. Without her able guidance, this thesis would not have been possible. Special thanks to the National Population and Family Development Board, Kuala Lumpur for giving me the permission to use and analyze the 2014 Malaysian Population and Family Survey data. I would also like to thank Department of Statistics, Malaysia for collecting, interpreting and disseminating the latest and real time statistics information of Malaysia. Next, my sincere thanks to the Faculty of Economics and Administration of University of Malaya for initiating this course, which gave me the opportunity to carry out this research. I would also like to thank my friends and family who supported me and offered deep insight into the study. Finally, my appreciation goes to all the people who have supported me to complete the research work directly or indirectly.

ABSTRACT

The main objective of this paper is to examine the fertility differentials among women by selected socio-economic and demographic variables in Malaysia. Over the past 40 years, the fertility level in Malaysia has declined considerably due to social and economic changes and has been below the replacement level of 2.1 children since 2013. The problem of population aging in Malaysia rises due to the increasing people's life expectancy and declining fertility rates. It is critical for Malaysian policymakers to have a deeper understanding of the factors influencing fertility behavior. The fifth series of the Malaysian Population and Family Survey (MPFS-5) collected in 2014 is used as the main data source. Bivariate analysis is conducted on a sample of 5,146 women to determine how fertility varies with selected socio-economic and demographic factors such as women's age, stratum, state, ethnicity, the highest education level of women, age at first marriage, the current employment status of women and the status of family planning. Moreover, this paper examines the significant relationship between these variables and the difference in the number of children ever born by women. This study found that all of the selected factors have a significant effect on fertility differentials in Malaysia. In brief, fertility patterns are different across socio-demographic subgroups and over time.

Keywords: fertility, differentials, Malaysia, socio-economic, demographic

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LIST OF ABBREVIATIONS

ASFR	Age-Specific Fertility Rate
CBR	Crude Birth Rate
CEB	Children Ever Born
CFR	Cohort Fertility Rate
CPR	Contraceptive Prevalence Rate
CWR	Child-Women Ratio
DOS	Singapore Department of Statistics
DOSM	Department of Statistics, Malaysia
EB	Enumeration Block
GDP	Gross Domestic Product
GFR	General Fertility Rate
GRR	Gross Reproduction Rate
IMR	Infant Mortality Rate
LFPR	Labor Force Participation Rate
LQ	Living Quarter
MPFS	Malaysian Population and Family Survey
MPFS-5	The Fifth Malaysian Population and Family Survey
NGHS	National Growth and Health Study
NHSF	National Household Sampling Frame
NPFDB	National Population and Family Development Board
NRR	Net Reproduction Rate
PAS	Pan-Malaysian Islamic Party
TFR	Total Fertility Rate
UN	United Nations
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Background of The Study

Malaysia is a multi-racial and multi-religious country. It is also the third wealthiest country in Southeast Asia, with a Gross Domestic Product (GDP) per capita of US$11,373.2, outranked only by Singapore (US$64,581.9) and Brunei (US$31,628.3) (World Bank, 2019). More than half of the population is Malay, with large minorities Chinese, Indians, and other indigenous peoples. The population of Malaysia in 2019 was estimated at 32.6 million, comprises of 29.4 million citizens and 3.2 million non-citizens. Malays and other indigenous peoples accounted for 69.3 percent of the total population, the Chinese accounted for 22.8 percent, and Indians accounted for 6.9 percent (DOSM, 2019).

Since gaining independence in 1957, all socio-economic measures of the welfare of the population in Malaysia have undergone fundamental changes. For instance, significant growth in per capita income, substantial progress in poverty eradication, and structural transformation. According to the World Bank (2019), the overall level of urbanization in Malaysia was 33.0 percent in 1970 and reached 76.0 percent in 2018. In recent years, educational opportunities at all levels have also increased, and the female labor force participation rate (LFPR) is growing at a faster pace, from 44.6 percent in 1999 to 55.2 percent in 2018 (DOSM, 2019). Meanwhile, the female tertiary school enrollment rate in Malaysia has increased by more than half, from 22.8 percent in 1999 to 49.9 percent in 2018 (World Bank, 2019). Besides, the age at first marriage has been increasing substantially with time. The continuous improvement of women's education and the increase in women's participation in the labor market have had a significant impact on marriage postponement. In Malaysia, the mean age at first marriage of women rose from 18.8 years old to 25.7 years old between 1974 and 2010 (United Nations, 2013).

Over the past 40s, the fertility level in Malaysia has declined considerably due to social and economic changes. The demographic transition that occurred in Malaysia is very similar to the demographic trends of many Asian countries. It includes a decline in fertility rates and infant mortality rates (IMR). Singapore, neighboring country Malaysia, has transitioned from a high fertility rate to a low fertility rate and even reached below-replacement fertility rate in 1977, which seems to herald an

identical trend in Malaysia (Call et al., 2008). In 2018, Singapore's total fertility rate (TFR) was only 1.1 children per woman, a drop from 3.1 children per woman in 1970 (World Bank, 2019).

In Malaysia, the national TFR fell from 4.9 children per woman in 1970 to 1.8 children per woman in 2018, which are the lowest ever recorded since the establishment of Malaysia in 1963 (DOSM, 2019). The TFR per woman between the ages of 15 and 49 years old has declined not uniformly across all states, rural-urban, and socio-economic groups and has been below the replacement level of 2.1 children per woman since 2013. This implies that the Malaysian population growth rate is declining because the average number of babies born per woman throughout her period of fertility is not enough to replace herself and her partner. If the fertility trend continues, it will eventually lead to an aging and declining population, which has happened and first affected most countries in Europe and East Asia.

The rapid socio-economic changes that continue to reduce fertility rates appear to be inevitable. The Malaysian government has taken on a more enlightened attitude in executing the population policy in comparison to the past. Their effort in implementing population policy and population plans may be affected by the shortage of the labor force since the 1980s. Moreover, experience in nations with low fertility rates and even below-replacement fertility suggested that policies that have implemented to sustain fertility often prove to be futile (Tey, 2002). In 1982, Dr. Mahathir Mohamad, former prime minister of Malaysia, presented the goal of 70 million population, and an Ad-hoc Committee on Population Issues was then set, which recommended a slowdown in fertility decline to reach the targeted population by the year 2100. With the current decline in fertility rate, the target of 70 million populace by the year 2100 may not be accomplished (Abdullah, 1993).

In recent years, the primary focus of the government on population programs has been aimed at strengthening family development in the family sector. Besides, the development of human capital has also been highly valued to ensure a high standard population, emphasizing that the quality of the population is more important than the quantity. Family planning services are presently given as a fundamental piece of reproductive health services.

1.2 Problem Statement

Over the past few decades, the fertility pattern in the world has undergone tremendous changes with the process of social modernization. Globally, the fertility rate in 2017 was only about 2.4 children per woman, suggesting that the worldwide fertility rate has dropped by approximately half in the past 50 years (World Bank, 2019). Many factors are contributing to this fertility trend, such as the increase in women's age at first marriage and female LFPR, as well as the improvement of women's education level. Coupled with these factors, improvements in health conditions and a general decline in the mortality rate have led to a fall in fertility rate. Fertility is the primary determinant of the population growth and the population structure of a country. Therefore, analyze the risk factors related to low fertility and proffer administrations to address those at risk is critical.

The outcomes of low fertility rates at both the national and family levels vary depends on when and how low fertility is achieved. Currently, some Asian nations with low-fertility populations are experiencing socio-economic outcomes such as declining population density and projected labor shortages. Besides that, the low fertility rate is one of the demographic factors that contribute to the issue of population aging (Donaldson and McNicoll, 2012). The proportion of the population aged 65 years old or above is significantly more substantial in the nation with below-replacement fertility as compared to the high fertility nation.

For instance, Japan, the first nation in Asia completed the demographic transition from high to low fertility rate, is today the world's oldest population nation. Based on the study of Jack (2016), Japan's elderly (aged 65 years old or above) accounted for 26.0 percent of the total population in 2014 and was expected to increase up to 38.8 percent by 2050. Population aging is an issue in many low-fertility nations, including China. More than 30 years of China's one-child policy have distorted the demographic structure of China. Although the government is relaxing restrictions and attempting to urge citizens to produce more children, it is estimated that by 2050 there will be 487 million citizens aged 65 years old or above, makes up for approximately 35 percent of the total population in China (Dehua, 2018).

Population aging can hinder economic growth because it will, in general, reduce national LFPRs as well as saving rates, which have caused concern about the slowdown in future financial development (Bloom, Canning, and Fink, 2008).

Furthermore, it is often assumed that elderly citizens constitute heavy burdens, such as social support and medicinal services. The rapid development of the process leading to low fertility has not given the low fertility nations adequate time to fully prepare for the issues related to population aging. For instance, Singapore, one of the aging nations, is confronting the issue of rising national spending on social security for the elderly, a reduction in workforce, and an increasing burden of giving care for more and more elderly citizens (Donaldson and McNicoll, 2012). As a result of the low LFPR and increased government consumption, the problem of population aging will eventually have a significant impact on national planning and service delivery.

In Malaysia, the proportion of the population aged 65 years old or above rose from 3.3 percent in 1970 to 6.7 percent in 2019, while the proportion of the population aged under 15 years old dropped from 44.5 percent in 1970 to only 23.3 percent in 2019 (DOSM, 2019). According to the description of the World Health Organization (WHO) (2011), the aging population occurs when the proportion of the population aged 65 years old or older has exceeded 7 percent of the total population. There is no doubt that Malaysia is at present confronting the possibility of an aging population. According to DOSM (2017), the recent statistics even predict that Malaysia will account for almost the same proportion of the young population (18.6 percent) and the older population (14.5 percent) in 2040. Until then, there will be on average three older adults in every twenty citizens. The problem of population aging in Malaysia has increased with an increasing life expectancy of the people and also declining fertility rates. The TFR in Malaysia has dropped from 4.9 children per woman in 1970 to 1.8 children in 2018, while the life expectancy at birth in 2019 was 74.5 years in Malaysia, up from 61.6 years in 1970 (DOSM, 2019). The increase in life expectancy is attributed mainly to significant improvements in the health care system and quality of life.

Many expressed concerns about the potential economic and social impact of the global population aging, especially its consequences on economic development, health care system financing, as well as the accessibility of public funds. The general effect of population aging on economic can be seen in Asia, whose national has profited from having an enormous size of the working-age population to promote provincial productivity and development. Nevertheless, in the coming decades, the contribution of young Asians to the region's economic growth may fall sharply as Asia's demographics are facing a reversal and will soon become the oldest region in the world (Khazanah Research Institute, 2015). Furthermore, the theory of economic

growth points out that steady national economic growth is impossible when its population is aging. Steady growth can only be achieved if the age structure of the population remains the same. Therefore, if Malaysia is not fully prepared for a society that is about to become aging, it will burden the entire government.

In brief, it can be summarized that the below-replacement fertility levels can one day cause severe population consequence if left unaddressed. The fertility level can be a good indicator of future population growth or decline. Thus, this paper chooses Malaysia as the country for the investigation to examine the relationship between fertility level and each selected socio-economic and demographic variable and to gain a deeper understanding of the country's demographic scenario.

1.3 Research Questions

1. What are the recent fertility trends in Malaysia?
2. How does fertility differ among women by selected socio-economic and demographic variables in Malaysia?
3. Which variables are significant in explaining fertility differentials in Malaysia?

1.4 Research Objectives

1. To analyze recent fertility trends in Malaysia.
2. To examine the fertility differentials among women by selected socio-economic and demographic variables in Malaysia.
3. To determine socio-economic and demographic variables that are significant in explaining fertility differentials in Malaysia.

1.5 Contribution and Importance of Study

The most important sign of the social transformation of the latter-day is likely to be the aging of the population. It has a profound and lasting impact on all areas of society, including both the labor market and the financial market. Globally, the proportion of the population aged 60 years old or above is expected to increase to 22.0 percent by 2050, which is almost double the 12.0 percent in 2015 (WHO, 2018). The proceeded drop in fertility rates and increased life expectancy are the major factors leading to the aging of the world's population. There are many studies on the declining fertility rate in developed countries, but there are only a few for developing countries. Nowadays, the rate of population aging in most developing nations is significantly quicker than happened in developed nations before. Malaysia is at present confronting the possibility of an aging population and is expected to become an aging nation by 2035 (Hamid et al., 2018). As fertility continues to decline and the population is aging, Malaysian policymakers must increase fertility rates to avoid the insufficiency of labor that is deleterious to national economic development. Therefore, this paper is aimed to study the factors affecting fertility levels and differential in Malaysia. The effect of selected socio-economic and demographic variables on the fertility level will also be discussed in this paper.

1.6 Scope of Research

In demography, fertility is defined as the output of reproduction, instead of the childbearing ability. This study examines the fertility levels and differentials in Malaysia based on selected socio-economic and demographic variables. The analysis of the TFR and the age-specific fertility rate (ASFR) will cover the period up to 2018. Since the published data from civil registration are commonly constrained to the classification of fertility rates by ethnicity and state, data from the Fifth Malaysian Population and Family Survey (MPFS-5) undertaken by the National Population and Family Development Board (NPFDB) in 2014 will be used to analyze socio-economic and demographic fertility differentials. The key factors that explain the fertility differentials in this paper are women's age, stratum, state, ethnicity, the highest education level of women, the current employment status of women, women's age at first marriage, and the status of family planning.

1.7 Structure of Report

This study includes five chapters starting with the introduction that discusses background information, recent demographic trends, and the main interest of the study. Research questions and objectives are also described in the first chapter. It is followed by Chapter 2 that presents the theoretical framework and major theories of the study as well as the literature on the role of selected socio-economic and demographic variables in determining the dependent variable of this study- the number of children ever born (CEB). The type of the study and the selection of methods used in the study, such as the data collection methods and techniques used to analyze data are explained in Chapter 3. Next, the findings of this research are presented in Chapter 4 by using tables and graphs to make it easier to understand. Finally, Chapter 5 draws some conclusions, limitations, and policy implications of the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter begins with the measurement of fertility, followed by the theoretical framework and major theories on fertility differentials including the classical theory of cost for having children, Becker's neoclassical theory, and the ideational theory of fertility. Factors affecting fertility differentials in Malaysia and other countries including women's age, stratum, state, ethnicity, the highest education level of women, the current employment status of women, age at first marriage as well as the status of family planning will be discussed.

2.2 Fertility Measures

The term fertility can be described as the output of a population in children's actual bearing. Fertility is a complex social phenomenon, and therefore it is hard to measure. In terms of live births, there are several statistical indicators of fertility. These indicators are straightforward, complex, and contrasting in their effectiveness. They also have different features and are applied in various circumstances. These indicators include general fertility rate (GFR), ASFR, TFR, the cohort fertility rate (CFR), gross reproduction rate (GRR), net reproduction rate (NRR), crude birth rate (CBR), CEB as well as the child-women ratio (CWR).

One of the fertility measurements used in this study is the TFR, which is the most commonly utilized standard indicator for calculating a population's period of fertility. It is a period indicator, determined according to the same period variables. According to Lu Lei (2012), the standard demographic definition of the TFR is the number of children born to a hypothetical birth cohort of women during their reproductive life span period (from age 15 to age 50), assuming that all the women live to the end of their reproductive and has undergone the ASFRs of the year in question.

To date, many demographic studies on the TFR have been carried out. For instance, in studies by Bogue, Arriaga, and Anderton (1993), Bongaarts and Feeney (1998), and Ní Bhrolcháin (2007). The pros and cons of the TFR as a fertility measurement were now known to researchers and demographers. The TFR was widely used in the population projection of a country, and it was used to measure and

compare period fertility over time and across regions in demographic analysis. According to D'Addio and D'Ercole (2005), the variations in TFRs are greater than those of CFRs; however, due to its broader availability and in light of the fact that it allows people to track the latest changes, it is frequently used in international comparisons.

In addition, the ASFR was applied in the analysis of this study. ASFRs refers to the total births in the calendar year to women in a specified age or age group per 1,000 women in that age group, as defined by the United Nations (UN) Population Division. It eliminates the distortions that can be triggered by changes in the population age structure, thereby removing one of the shortcomings of a single population-wide fertility rate (Sobotka, 2003). ASFRs allow for an examination of the childbearing pattern based on women's age and the study of shifts in the childbirth timing. For instance, comparisons between successive years can suggest that women are delaying childbearing and the initiation of family formation.

Moreover, CEB, which measures the mean number of children born alive to a woman in an age group was also used in this paper. According to the UN Population Division, CEB measuring fertility relies primarily on the period of accouchement age, and the timing of births due to the potential family size for younger women is uncertain as they are at the primary stage of family formation. The measure of childlessness and completed family size would be the number of children by older women. Hence, in this study, women's age is used as one of the essential variables to determine fertility and is classified into five-year age groups in order to have a clearer insight on childlessness and the completed family size of a woman.

2.3 Theoretical Framework and Major Theories on Fertility

Population size was greatly affected by fertility compared with migration and mortality (Gietel-Basten, Casterline, & Choe, 2018). Different development status of countries has different fertility trends over time. For instance, fertility rates in developed countries have tended to be low for years, and most of them at extremely low fertility rates, with total fertility lesser than 1.3 children per woman (Kohler, Billari, & Ortega, 2002). In addition, the situation of low fertility rates has also happened in developing countries, and there will be less difficult for most countries to achieve replacement-level fertility (2.1 children per woman) and eventually dropped from that level (Abbasi-Shavazi & Gubhaju, 2014).

Even though there were numerous recent researches on low fertility, knowledge on low fertility is still very limited, and many factors of post-transitional fertility have not been identified (Wilson, 2011). Social science researchers have suggested distinct theories for lowest-low fertility levels or a decrease of fertility to below-replacement levels. Some believed that successful family planning services were the primary supporter of the fall in fertility rates in developing countries (Seltzer, 2002; Goldin and Katz, 2002). There is no question that population development programs have led to a considerable decline in fertility, but there were also many behavioral and social factors involved (Majumder & Ram, 2015).

Most of the researches that have been done in Malaysia was conducted using cross-sectional data (Ying, 1992; Govindasamy & DaVanzo, 1992; Rasul, 2008). Ying (1992) criticized that analysis with cross-sectional data on fertility will provide invalid result due to linkages between fertility and socio-economic variables are unfixed and varies in different period. She suggested the appropriate analysis method would be time series analysis and this led to several studies that had been done in recent adopting time series analysis for analyzing the fertility rate in Malaysia (Poo, Liew, & Bakar, 2007; Lau & Hamzah, 2015; Subramaniam, Loganathan, & Devadason, 2015; Siah & Lee, 2015). However, their studies were concentrated on the effects of economic determinants on fertility and excluded non-economic determinants such as the status of family planning, ethnicity, and place of residence. On the other hand, studies by Kuznets (1975), Hsing and Rios (1995), and Tabata (2003) adopted a non-linear regression between fertility rate and economic growth.

At present, couples would prefer to have a smaller family size so that they and their children can live a better life. From the perspective of classical economists, they suggested that children are pricey, and there are two types of costs incurred for having children, which are indirect or opportunity costs and direct cost (Easterlin, 1968). Nauck (2007) explained that the indirect or opportunity costs for having children refer to income losses that related to motherhood due to women sacrificing their work opportunities to better care for their children. On the other hand, direct costs include not only the living expenses but also the psychological and emotional costs incurred for raising a child. The economic theory suggested that fertility will only increase when costs reduced due to socio-economic factors or parental resources. However, the predictions will become more uncertain when socio-economic factors alter economic resources and costs together (Hoorens et al., 2011).

Becker (1960) proposed a brilliant concept, the quantity-quality model, which explains the trade-off between quality and quantity of children. The trade-off occurred is due to the expanding marginal cost of quality (child outcome) regard to quantity (number of children). In neoclassical's viewpoint, Becker pointed out a different school of thought and focused on relative prices and income instead of preferences. He suggested that the primary cause for the fall in fertility is due to the adverse consequences of higher prices for having a child. The higher price of children, on the other hand, is due to the higher salary of the woman, which has a more significant impact than the positive impact of increased income on demand for children (Hondroyiannis, 2010).

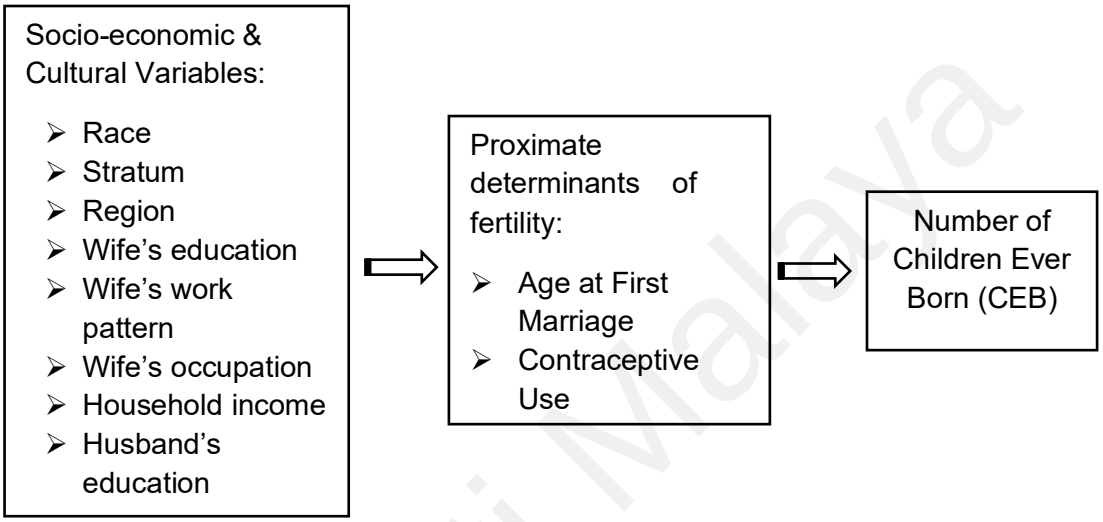
Pommeret and Smith (2005) adopted the neoclassical paradigm to explain that rates of growth are related to production risks, and both would influence decisions on household fertility in a precarious economic situation. Their analysis further explained the preceding researches by Becker (1960, 1981, 1992), Sah (1991), and Cigno (1998) and examined how economic changes and demographic determinants influence family fertility decisions by including the effect of economic ambiguity. For the first time, unbalanced total panel data for 27 European nations from 1960 to 2005 were used. Angrist, Lavy, and Schlosser (2010) proposed that the most quantity-quality trade-off emerges from a contradictory correlation between family size and the highest level of education. In the analysis of child-quality or child-quantity trade-off, they used quasi-experimental variation. They noted that because of people's desires for a mixed sibling-sex population, like racial disparities and twin births, resulted in no proof of a trade-off between quantity and quality.

Looking at ideational theory, it inclined towards subjective determinants, such as human mindset and beliefs towards family and lifestyle, rather than material quality. The ideational theory pointed out that cultural values are the essential determinant of fertility. On some occasions, cultural values that were encouraging high fertility might partially be affected by socio-economic adjustments. In other situations, the influx of ideas separated from socio-economic adjustments can cause cultural values that shaped the fertility attitude to change hasty (Brinton, 2017).

Figure 2.1 below shows the theoretical framework used by Tey (2002), which compiles the main determinants of fertility differentials in Peninsular Malaysia. Tey claimed that many social-economic and cultural (represented by ethnicity) variables are strongly related and are complexly influence fertility behavior. He verified the sharp disparities between race, stratum, educational attainments, occupation of

women, income level, and other socio-economic variables. In addition, Tey's research has studied the relative significance of the shifting marital structure and contraception usage in influencing the rates of the fertility of the various social classes in Peninsular Malaysia.

Figure 2.1 Conceptual Framework on Determinant of Fertility



Sources: Tey (2002)

2.4 Factors Explaining Fertility Differential

2.4.1 Age of Women

Age is the single largest factor affecting the fertility of a woman as the risk of pregnancy complications rises with age (George & Kamath, 2010). From the age of 35 years old, the risk of fetal abortion and chromosomal abnormalities has increased considerably. Pregnancies in older women have raised the risk of pregnancy complications such as gestational diabetes, cesarean section, placenta previa, and stillbirth (Schmidt et al., 2011). Delbaere, Verbiest, and Tydén (2020) stated that the chance for women to conceive decreases with their age. For women aged below 30 years old, the chance of becoming pregnant within one year was 85 percent. At the age of 30 years old, the probability of conceiving within one-year declined to 75 percent, and there was only 66 percent of chance at the age of 35 years old and 44 percent at the age of 40 years old.

According to Committee on Gynecologic Practice (2014), women's fecundity tends to decline during their fourth decade of life, and at the ages of 35 years old, subfertility becomes more pronounced (Maheshwari et al., 2008). Therefore, the traditional definition of delayed childbearing was the pregnancy of women aged 35 years old and above (Johnson et al., 2012). The decline in women's fecundity is mainly caused by the oocyte atresia and is endangered before the onset of perimenopausal menstrual irregularities. Age is the best surrogate indicator for oocyte quality (Committee on Gynecologic Practice, 2015), although men and women generally consider that health and fitness to be an ideal marker of fertility (Daniluk, Koert, & Cheung, 2012).

The tendency towards delaying the birth of the first child to the age at which women fecundity is low has raised the occurrence of age-related infertilities (ESHRE, 2005). In India, the number of older women visiting fertility clinics for treatment was growing (George & Kamath, 2010). Delbaere, Verbiest, and Tydén (2020) proposed that delayed childbearing was a major problem in reproductive medicine as increased age has a huge effect on both natural and assisted reproductive conception. Nowadays, the education level and knowledge of younger women have been considerably higher than older ones, with the improvement in education and gender inequality has been dramatically reduced. However, there is still a lack of information about the significance of women's age concerning fertility, even among highly educated populations.

2.4.2 Stratum

The place of residence profoundly influenced the determinants of fertility. Different places of residence in Malaysia have drastic differences in socio-economic structures. According to Tey (2002), Malaysia's TFR was lowest in the urban areas, which are the Federal Territory of Kuala Lumpur and Pulau Pinang. However, Malay dominant states, such as Kelantan and Terengganu, which have a lower rate of urbanization, shown the highest TFRs. At the same time, research done by NPFDB (2016) showed that women's fertility rate in the urban regions was lower than that in rural regions, with CEB's difference of 0.5 children per woman in 2014. This difference was likely due to the entry of urban women into the labor market, as the proportion of working women in urban regions was much larger than in rural regions.

In Malaysia, people who live in urban or town areas rose from 51 percent in 1991 to about 73 percent in 2014 due to rural-urban migration and the transformation of semi-urban to urban areas (World Health Organization, 2014). Jensen and Ahlburg (2004) claimed that if the migration from rural areas to town areas resulted in fertility reduction, we would assume that this is aligned with norms-based assumptions, as fertility declines due to migrants adapt to the predominant characteristics of the destinations; and socio-economic factors, as fertility declines due to opportunity costs and female LFPRs. Hence, migration can alter fertility level through adaptation, disruption, and selection.

In Vietnam, the fertility rates in urban areas have achieved an extremely low level of 1.5 children per woman. The drastic urban-rural fertility differentials were also observed in Nepal, where low urban fertility at replacement level of 2.1, whereas high rural fertility of 4.4 children per woman (Gubhaju, 2007). On the contrary, the fertility differences between urban and rural areas in China have been reduced since 1978, but it remains significant. In 2008, China's TFRs were 1.2 children per woman in urban regions and 1.7 children per woman in rural regions. In China, the difference in fertility rates between urban and rural populations has not changed significantly since the early 1990s. If the urban-rural fertility differential remained static, it suggests that urban expansion will further lead to a fall in China's fertility (Guo et al., 2012).

Smaller places have a bigger proportion of married people, and childbearing is directly associated with marriage. Hence, Hank (2002) stated that the high fertility rate and the higher probability of family formation in rural areas or suburban areas were due to the over-representation of the married community. Furthermore, Michielin (2004) suggested that town and urban areas have higher opportunity costs for having children compared with rural areas. The urban lifestyle offers more options for leisure and work. The differences in urban-rural fertility could also be explained by cultural variation. Past studies have proven that rural living people retain traditional mindset and living behaviors that inclined towards larger family size and favors for extended families (Heaton, Lichter, & Amoateng, 1989; Snyder, Brown, & Condo, 2004; Snyder, 2006). There was a family-orientated subculture that exists in the rural area and small-town community (Lesthaeghe & Neels, 2002).

Another study by Alemayehu, Haidar, and Habte (2010) explained that the leading causes for the fertility gap between urban and rural populations were that urban living women are more prompt to adopt family planning and experience postponement of age at marriage than a rural living woman. Other feasible arguments

forwarded in some of the past researches for urban-rural fertility differentials are rural living women breastfeed comparably longer periods than urban living women (Ersado, Habtu, & Yohannes, 2019). Ahmad et al. (2012) also suggested that urban living young people are more knowledgeable in the family planning method than rural living young people.

2.4.3 State

According to Fotheringham, Brunsdon, and Charlton (2002), spatial heterogeneity referred to a dynamic mechanism over geographical locations, where identical socio-economic or demographic characteristics may have different fertility levels due to different locations. Populations at nearby locations have a higher tendency to reveal identical fertility levels, after taking into account of life course and fertility-associated decisions such as family size, family planning, childbearing, age at marriage and education (Wang & Chi, 2017). Hence, couples tend to learn from their neighbors and which will affect their fertility attitude.

Kulu (2013) proposed two contesting explanations concerning spatial fertility variation, which are compositional and contextual. The contextual hypothesis referred to determinants that correlated to an immediate living situation are essential, whereas the compositional hypothesis states that different levels of fertility due to different environments are simply caused by different humans live in different arrangements. Tey (2002) found that in 1998, Malay-dominant states such as Kelantan and Terengganu exhibited the highest TFRs in Malaysia. Both states were ruled by the Pan-Malaysian Islamic Party (PAS), which is an Islamic fundamentalist party. On the other hand, states with less Malay-centric such as Pulau Penang and Federal Territory of Kuala Lumpur exhibited the lowest TFRs.

In India, fertility outcomes and patterns vary widely across geographical locations. The Northern part of India exhibited high fertility outcomes, whereas Southern India exhibited below replacement level fertility (Guilmoto & Rajan, 2002). Most areas in Kerala and Tamil Nadu have shown a situation where the CWR was far lesser than half of those estimated at North India (Guilmoto & Rajan, 2001). Using a fixed-effect panel regression, Dreze and Murthi (2001) also found that geographical determinants had a significant effect on the differences in fertility level, after taking control for other covariates, showing a high fertility level in the Northern area and low fertility level in Southern area of India.

In Kerala, advancement in the health care sector and broader accessibility of educational institutions for women were acted as the main driving force for decreasing fertility level. Looking at Tamil Nadu, the decline in fertility level was caused by the implementation of various family planning methods, increased use of media, and social movements by backward groups (Guilmoto & Rajan, 2005). However, Vithayathil (2013) after analyzed National Growth and Health Study (NGHS) data, argued that the decrease in fertility in these two states was largely due to the high percentage of female sterilization and delayed childbearing after marriage.

On the other hand, Chatterjee (2019) used data from the 2011 Indian Census and found that West Bengal, located in Eastern India, displayed the lowest fertility level among other states in India due to the high dependence on traditional contraception methods. Using Multilevel regression for Bihar and Uttar Pradesh, Malay and Sanjay (2012) stated that 54.0 percent and 45.0 percent of the respective variations in TFRs were caused by district and state-level variations, after taking control of other determinants. The vast differences in fertility levels were primarily due to the vast diversity in social, cultural, political, economic, and kinship behaviors across different geographical locations (Bose, 2007; Alagarajan & Kulkarni, 2008; Dharmalingam, Rajan, & Morgan, 2014).

Lamidi (2015) proposed that living in areas with higher education opportunities for women, higher female LFPRs, and higher proportions of women with higher decision power in health care, women were more inclined towards the adoption of modern contraceptives. The variations of women on health care decisions were strongly related to social-economic status, the adoption of modern contraceptives, and other determinants of modern contraceptives. Spoorenberg and Dommaraju (2012) pointed out that geographical variations are essential for a few reasons. Firstly, if the current phenomena continue, the high fertility areas will continue to produce high fertility outcomes. James (2011) noticed that this would lead to political instability and social turbulence in the area.

2.4.4 Ethnicity

Different ethnic groups have different speeds of fertility transformation. Tey (2002) used regression analysis from 1957 to 1997, and the results showed that the TFRs for Malays decreased at a rate of about 1.1 percent annually, as compared to about 3.0 percent for Chinese and Indian. The ethnic fertility differentials increased

between 1977 and 1987 due to a rise in Malays' fertility rate, but the difference became less obvious in the 1990s when there was a downtrend in Malay fertility. Morgan et al. (2002) suggested that Muslims incline give births to more children than other religions. In addition, Roudi-Fahmi, May, and Lynch (2013) stated that the average fertility rate in Muslim countries was 2.4 children per woman, which was steadily higher than the world average fertility rate. It was proven that religion is an essential element in affecting fertility rate (Heaton, 2011).

Tey (2002) found that race-based fertility differentials are affected by religion, economic, socio-cultural, and political determinants. Malays are inclined towards early marriage and seldom adopting modern contraception due to the stronghold on Islamic belief. However, the religious factors that were preventing a decline in fertility rate have become less significant, which can be viewed in the rapid decline in TFRs in numerous Islamic nations. For instance, Bangladesh (with a TFR of 2.1 children per woman), Indonesia (2.3), Brunei (1.9), Iran (2.1), as well as Muslim communities in Singapore and Thailand that experiencing below-replacement fertility rates (World Bank, 2019).

The differences in fertility transformation lead to a substantial difference in the level of population aging between different ethnicity (Tey et al., 2015). Furthermore, Tey, Ng, and Yew (2012) found that Malays have the highest percentage of breastfeeding their children at 93.0 percent, followed by Indian at 83.1 percent, and the Chinese have the lowest percentage at 52.5 percent. In their survey, approximately 33.0 percent of Malays continued breastfeeding their youngest children, while there is only approximately 8.0 percent of Indians and 4.0 percent of Chinese were continued to breastfeeding.

Jones (2012) claimed that the difference of fertility based on ethnicity was also significant in Singapore, with Malays have achieved higher fertility rates as compared to the Chinese, which was below average. This difference was mainly contributed by the extremely low fertility rate of the Chinese Singaporeans in 2009, with a TFR of only 1.1 children per woman. Besides, the study of Morgan et al. (2002) revealed that in four Asian countries, which are Malaysia, Thailand, Phillippines, and India, Muslims are showed to have more children, prefer for larger family size, and reluctant to use contraception even they are not interested in having additional children.

2.4.5 Highest educational level of women

Since the 20th century, the rates of college enrolment were identical regardless of gender, and a small proportion of higher-educated women have never been married (Goldin, Katz, & Kuziemko, 2006). For women who were born during the last 20 years of the nineteenth century, 30 percent of the tertiary-educated women remained single at age 50 years old, which is a quadruple of women without tertiary education (Goldin, 2004). Goldin (2004) proposed that women with tertiary educational attainment tend to delay their age of first marriage compared with lesser-educated women. The age of first marriage for tertiary-educated women has been increased compared with those who completed their studies in the late 1960s.

The advancement of higher learning education has caused the tertiary education enrolment rates in Malaysia increased from 9.7 percent in the 1970s to 19.1 percent in 2000 and up to 38.04 percent in 2018 (World Bank, 2019). An increase in the highest educational achievement of a woman has resulted in an increased in the mean age of first marriage and an increase in non-marriage, which have been identified as the major determinants of fertility in Malaysia (Tey, Ng, & Yew, 2012). According to NPFDB (1996), only about 18.4 percent of tertiary-educated women had five or more children, as compared to more than 50.0 percent among those without attended tertiary education institutions. The differences in educational attainments lead to the different ages of marriage, and childbearing contributes to fertility differentials in Malaysia.

Research done by Tang and Tey (2017) had also shown that an increase in female education has led to a decline in fertility rate. They claimed that a higher level of education would give females a better career prospect. At the same time, they will have more aspiration in career development and financial ability, together with higher opportunity costs for having children due to an increase in financial tension and job difficulties caused by babysitting their children. These factors will further cause a reduction in fertility.

Higher educational attainment was correlated to the postponement of marriage and reduction in family size, and it might be an indirect relationship (Kaplan & Lancaster, 2000). From an economic perspective, children were becoming more costly, through rising educational rates, woman' opportunity costs, declined child mortality, and adjustment of labor markets. Besides, the current labor market demands skillset that only can be acquired through formal education, pushing parents

to invest more in education for producing higher-quality children (Snopkowski et al., 2016).

Moreover, a study by Aminul and Sayem (2009) found that education will alter one's perspective towards life and the horizon to acquire a new mindset. It inspires one to oppose the traditional barriers formally as well as provides other life options instead of giving birth immediately after marriage. However, the effect of the educational attainment of husbands on the number of CEB is minor, taking control of the educational attainment of a wife. Cleland (2002) also concluded that the educational attainment of the wife has more impact on fertility.

Jones (2012) stated that increasing females' educational attainment has greatly reduced the fertility rate in Southeast Asia, including Singapore. High educational attainment of the female in some western and northern European nations, New Zealand, Australia, and the United States were not the barrier for them to reaching close to the replacement level of fertility currently. Instead, the rapid development of tertiary institutions in the West and East Asian played a critical role. It shortened the duration in which family and community can adapt to the new opportunities and challenges encountered by the female in the areas. The conflicts between the greater opportunities offered by their higher educational attainment and family raising are the main concerns among educated females.

Nevertheless, some researchers suggested that higher-educated females and males will distribute housework equally and spend lesser time on chores compared with less-educated couples (Bianchi et al., 2000; Kravdal, 2002). The task allocation of housework among educated couples extends to the expectations of sharing childbearing responsibilities. If the childbearing duty decreases among higher-educated females, they will increase their preference for having more children (Torr & Short, 2004).

2.4.6 Current employment status of women

The downward trend of fertility rate was mainly attributed to the increase in female labor force participation (Siah & Lee, 2015). Cheng (2011) and Tey (2007) suggested that female labor force participation and financial independence of females will further increase their age of first marriage, thereby lowering the probability of having children. Matysiak and Vignoli (2008) proved that the participation of females

in the workforce is adversely associated with fertility rate, showing a trade-off between working and child care and the effect will reduce over time. The impacts of female involvement in the labor market depend on the socio-cultural, institutional factors, and country welfare.

Past researches by Jemain and Ghani (2003), as well as Tey (2007), had also shown that the participation of females in the labor force and fertility rate is negatively correlated. Rica and Ferrero (2003) and Cruces and Galiani (2007) proposed a 'role incompatibility hypothesis', which explained the negative relationship between female labor force participation and fertility is mainly due to difficulties in maintaining a balance between parenting duties and work. Besides, Hondroyiannis (2010) stated that there is a trade-off between female labor force participation and childcare due to limited time. If a female allocates a bigger portion of her time at work, she will reduce the time allocated for childcare as the opportunity cost of children has risen. Thus, female labor force participation increased, fertility decisions decreased.

Looking at Neoclassical economic theory of fertility proposed by Nobel Prize winner Gary Becker, he predicted a negative or countercyclical association between female employment and fertility level (Becker, 1960; Becker & Lewis, 1973; Grant et al., 2004). According to his concept, an employed woman has more opportunities and more financial ability, which could stimulate an increase in fertility rate, but it comes together with a substantial opportunity cost for childbearing, which discouraging fertility. Time allocated for childcare will affect the present income directly and diminish future income by slowing down career development: the better the career prospect for females, the higher the opportunity cost for childbearing (Hoorens et al., 2011).

Over the last 30 years, some European countries with low fertility rates have implemented family-friendly policies to assists women with children working, which promoted fertility (Hoem, 2005; Sobotka, 2013). However, Asian countries have no implement family-friendly policies, or their schemes are less attractive, and hence the effects were minor. The failure of family policy in Asia and Southern Europe could be traced back to their stronghold on the patriarchal family system (Abbasi-Shavazi & Gubhaju, 2014). As a result, employed women were assigned to greater family duties as they have to take care of work and the family.

Last but not least, Abdullah and Bakar (2011) used the Granger Causality Test and suggested that female labor force participation Granger Causes fertility rate in Malaysia. However, the effect of the rise in female labor force participation on the fertility rate in Malaysia was non-significant.

2.4.7 Status of family planning

The most feasible way of controlling birth or reducing fertility was through family planning programs (Seltzer, 2002). Family planning programs were implemented to raise the awareness of contraception and helping interested couples to speed up the use of contraception. Most family planning programs not only to promote contraception knowledge but to increase the awareness of family planning engaging in the pros of small family size and postponement of marriage. Goldin and Katz (2000) presented a direct and straightforward framework that illustrates the advancement in contraceptive technology can bring positive changes in career prospects, marriage timing, and age at first birth.

According to research conducted in rural Peru by Najafi-Sharjabad (2011), it showed that contraceptive preference is highly associated with urban, economic status, cultural beliefs, and life experiences. Sisouphanthong et al. (2000) and Retherford and Thapa (2003) found that there were considerable variations in fertility levels between urban and rural regions as urban women were more willing to use contraceptives than rural women. On the other hand, Alemayehu, Haidar, and Habte (2010) suggested that family planning has a significant effect on fertility in urban but minor in rural regions. This is because urban female tends to have higher educational attainment and more access to contraceptive knowledge to avoid or delay pregnancy.

For most people, religion may have great social, economic, and political significance and therefore has a crucial role in encouraging acceptance or generating opposition to contraception (Pearce, 2001). In Nepal, it has been found that the mean number of CEB to Muslim married women between the ages of 15 and 49 years old was higher than their Hindu counterparts (Adhikari, 2010). Besides, the awareness of family planning methods was high, but a fewer portion of females was adopting these methods and even less adoption rate in modern contraceptives (Bbaale & Mpuga, 2011). It was shown that the adoption rate of contraceptives is positively related to the educational levels of both males and females. Furthermore, the study of Haque and Sayem (2009) showed that females familiar with family planning before marriage would have a higher mean age of giving birth.

2.4.8 Age at first marriage

Critical elements leading to fertility reduction include an increase in mean age at first marriage of women. Tey (2007) demonstrated that, in general, the increase in the mean age at first marriage of women was the result of higher educational attainment and higher participation of females in the workforce. He also suggested that the delay in age at first marriage will further lead to postponement of birth. In addition, Jemain and Ghani (2003) illustrated that an upward trend of mean age at first marriage of females started from the 1980s; it happened when more females are enrolled in tertiary education and an increase in female workers.

According to Bakar and Abdullah (2007), age at first marriage of females can be used to indicate the exposure to the danger of pregnancy and childbearing. Early marriage will have a bigger probability of getting pregnant. Jones (2012) pointed out that many women in Singapore are keen to get married, but many determinants prohibit them from realizing their goals. He addressed the development of education, especially for females and the development of the labor market, that inclined to open more opportunities for women in the traditional career that favors males, and granted female financial independence. On the other hand, Gietel-Basten, Lutz, and Scherbov (2013) claimed that the main determinants for the postponement of marriage and childbearing in Southeast Asian countries are economic uncertainty.

Caldwell (2005) also suggested an upward trend of female marriage age in Asia, which could be categorized into two patterns. The first pattern was a continued and striking increase in age at marriage, together in some counties by an increase in age of non-marriage, particularly Southeast and East Asia. The second pattern was an adverse increase from a lower point, which applies to most of South Asia. Sri Lanka exhibits the first pattern, whereas Bangladesh exhibits the second pattern.

2.5 Summary of Literature Review

Researchers in the social sciences have proposed different theories for lowest-low fertility levels or a decrease of fertility to below-replacement levels. The classical economic theory suggested that children are costly, fertility will only increase when costs reduced due to socio-economic factors or parental resources. While the Neoclassical Theory of Becker stated that the leading cause for the drop in fertility

was related to the model of quantity-quality. The ideational theory, on the other hand, suggested that cultural values are the most important determinant of fertility.

Several socio-economic and demographic factors have greatly influenced the determinant of fertility. First, age is the biggest factor affecting women 's fertility, because women 's chance of conception decreases with age and increases the incidence of age-related infertilities. Second, the migration from rural regions to urban regions leads to a reduction in fertility through adaptation, disruption, and selection. The high fertility rate in rural areas could be attributed to the married community's over-representation. Besides, rural people tend to maintain the conventional mindset and living behaviors that inclined towards larger family size and favor for extended families.

Furthermore, due to the vast heterogeneity of personal, cultural, political, economic, and kinship behaviors, geographical determinant has a major impact on the fertility level discrepancy. In Malaysia, Malay-dominant states appear to have a lower urbanization level and higher TFRs. Also, religion is an essential element in affecting fertility rate. Malays are inclined towards early marriage and seldom adopting modern contraception due to a stronghold on Islamic belief. The mean age of marriage of Malay women was also lower as compared to Chinese and Indian.

A female's educational attainment will also alter the fertility rate. Woman with tertiary educational attainment tends to delay their age at first marriage. The higher level of education will provide the woman with better career opportunities along with higher opportunity costs for having children, which will also lead to a reduction in fertility. Besides that, female labor force participation and financial independence of females will further increase the age of first marriage of women resulting in a lower likelihood of having children. There is a trade-off between female labor force participation and child care due to limited time and difficulties in maintaining the balance between parenting duties and work. The delay in the mean age at first marriage will further lead to postponement of birth.

Lastly, family planning impacts fertility dramatically. Most family planning programs not only promoting contraception knowledge but also raise awareness of family planning engaging in the pros of small family size and postponement of marriage. Contraceptive technology development will bring positive changes in career prospects, marriage timing, and age at first birth. Females that adopted family planning before marriage will tend to adopt it after marriage, which will lead to a decline in the number of CEB per woman.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter focuses on the research methods used in this study. First of all, the data sources, sampling frame, as well as the design of the data, will be introduced. It then followed by the research framework for the study of fertility differentials and a brief overview of the research variables. Lastly, the techniques used for analyzing data will be presented.

3.2 Data Source

This study used secondary data, which are the Time Series Vital Statistics Malaysia and the MPFS-5 collected in 2014. In this study, the data analysis and findings will derive from the results of these two data sources. Using vital statistics data gathered from the Department of Statistics Malaysia (DOSM) from the year 1970 to 2019, the fertility patterns, including TFRs and ASFRs for each population subgroups, are presented.

Nevertheless, the data on Vital Statistics Malaysia is usually limited to ethnicity and state tabulation of the TFR and ASFR. A more comprehensive study on socio-economic and demographic fertility differentials is only possible through data from 2014 MPFS, which provides more detailed information for obtaining fertility differentials among population subgroups in Malaysia. MPFS is a serial study undertaken by the NPFDB for every ten years starting in 1974. The primary purpose of the MPFS-5 is to provide the time-series data associated with socio-economic and demographic information, particularly the relationship between family, society, and reproductive health, further as its connection with development.

Sampling selection of the 2014 MPFS depended on the National Household Sampling Frame (NHSF), which includes the enumeration blocks (EBs) used in the 2010 Population and Housing Census and the EB that has been categorized by urban and rural regions (NPFDB, 2016). Based on the definition stated in the 2010 Population and Housing Census, EB is a geographically planned fieldwork with clear boundaries, with 80 to 120 living quarters (LQs) per EB. The 2014 MPFS study secured urban and rural regions, including remote areas with included families housed in residential units only and exclude those staying in institutional dwellings

such as hotels, hostels, hospitals, jails, old folks' homes, and welfare homes (NPFDB, 2016).

The two-stage stratified sampling design was utilized in the 2014 MPFS survey, where Malaysian states as the first strata as well as urban and rural areas as the second strata for all Malaysian states. At the same time, sample selection was carried out in two phrases, EB was selected as the sampling unit of the first stage using the method of probability proportional to size (NPFDB, 2016). At the subsequent phrase, the sample of LQs was chosen from the selected EBs utilizing a systematic approach by generating a random number and specifying a sampling interval so that every EB would have the same likelihood of being chosen. Thusly, 2,889 EBs and 23,112 LQs were chosen (NPFDB, 2016). Of the 23,112 LQs visited, however, only 19,791 were classified as eligible for interviews, and only 13,856 of them were successfully interviewed. Consequently, information from 14,156 households was obtained.

A personal interview was conducted to collect data. The selected LQs were interviewed to gather information. A total of 6 types of the questionnaire were used in 2014 MPFS, including MPFS 50, MPFS 51, MPFS 52, MPFS 53, MPFS 54, and MPFS 55. There are various contents and subjects in each category of the questionnaire. The areas of coverage include population, LQs, and family, family arrangement, family life, social contact, women, and employment as well as reproduction and reproductive wellbeing. There are five categories of target groups, namely ever-married women aged 15 to 59 years old; ever-married men aged 15 to 59 years old; never married teenagers aged 13 to 24 years old; seniors aged 60 years old and over, and singles aged 25 to 49 years old.

MPFS 51 is the module for ever-married women aged 15 to 59 years old and was used as the information for analysis of this study. This questionnaire includes records of the respondent's socio-demographic background information, work history, pregnancy history, the decision on fertility and breastfeeding, family health practices, the care of the elderly, infertility, and the use of family planning methods (NPFDB, 2016). Of the 14,156 households surveyed, interviews were held for 7,644 ever-married women between the ages of 15 and 59 years old. Table 3.1 shows the distribution of samples by state.

Table 3.1 Sample Size of the 2014 Malaysian Population and Family Survey According to State

State	No. of selected EBs	No. of selected LQs	No. of LQs eligible	No. of LQs interviewed	No. of households	No. of Respondents in MPFS 51
Johor	352	2,816	2,443	1,645	1,658	976
Kedah	211	1,688	1,424	980	994	627
Kelantan	144	1,152	983	802	810	481
Melaka	126	1,008	863	698	744	394
N. Sembilan	126	1,008	936	700	704	380
Pahang	149	1,192	1,040	863	869	484
Pulau Pinang	196	1,568	1,315	680	695	291
Perak	268	2,144	1,933	1,188	1,195	538
Perlis	43	344	312	224	224	141
Selangor	454	3,632	3,076	1,924	2,009	898
Terengganu	96	768	670	455	462	267
Sabah	211	1,688	1,370	1,095	1,114	601
Sarawak	244	1,952	1,621	1,268	1,293	910
F.T Kuala Lumpur	203	1,624	1,342	972	1,008	406
F.T Labuan	43	344	297	228	238	154
F.T Putrajaya	23	184	166	134	139	96
Total	**2,889**	**23,112**	**19,791**	**13,856**	**14,156**	**7,644**

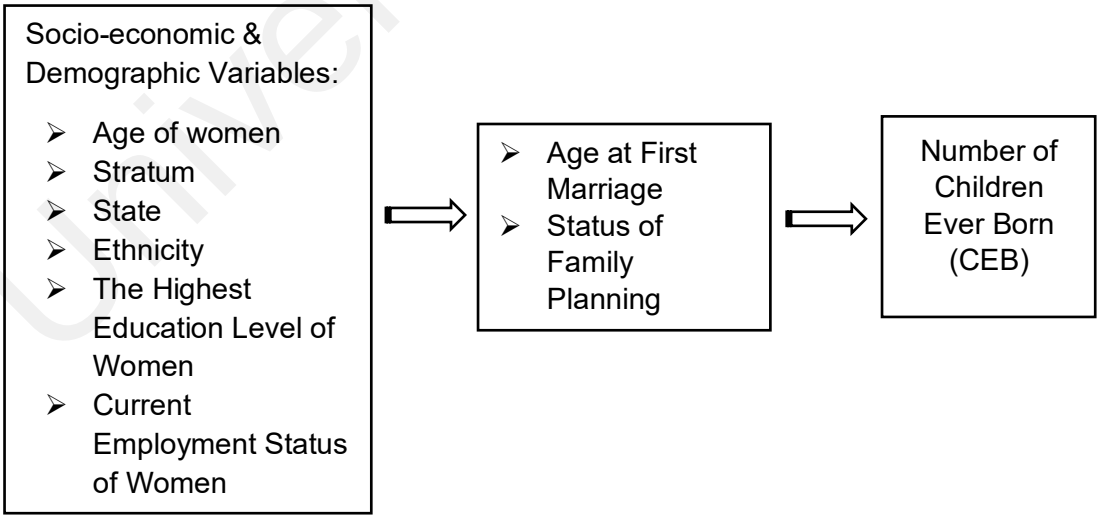
Source: MPFS (2014)

3.3 Research Framework

In this paper, the research framework used to analyze the fertility differentials have been modified from a past framework by Tey (2002), as illustrated in Figure 3.1. Tey proposed that race, stratum, region, wife's education, wife's work pattern, wife's occupation, age at first marriage, household income, husband's education level, and the use of contraceptives as the essential variables in analyzing the fertility behavior of women in various socio-economic and ethnic groups.

Part of the variables used in the past framework will be modified and covered in this current study framework to examine the fertility differentials in Malaysia. Figure 3.1 below indicates the framework for the study. Socio-economic and demographic variables are inter-related in explaining fertility differentials. For example, women's age at first marriage is directly related to the highest educational level of women, the current employment status of women, urbanization or stratum, and ethnicity. Also, the status of family planning is linked to women's educational level, stratum, ethnicity, as well as women's occupation. This paper explores the effect of women's age, stratum, state, ethnicity, the highest education level of women, the current employment status of women, age at first marriage of women, and the status of family planning on CEB.

Figure 3.1 Research Framework



3.4 Study Variables

The dependent variable in this study is the number of CEB among currently married women aged 15 to 49 years old. According to the principles and recommendations of the United States for 2008 Population and Housing Censuses Revision 2, the number of children born alive, also known as lifetime fertility which includes all children born alive and excluding fetal deaths. It is helpful for the study of childbearing momentum as well as the average family size among population subgroups. The mean number of CEB to women measures an actual age cohort's childbearing experience and demonstrates present and past fertility behavior. In this way, CEB enables data to be generalized and also provides the basis for further study.

The demographic and socio-economic variables used as independent variables are women's age, stratum, state, ethnicity, the highest educational level of women, the current employment status of women, the age at first marriage as well as the status of family planning. All of the selected independent variables were categorical variables except the age at first marriage was a numerical variable. Age of women is recorded into six groups, which are women's age below 25 years old, 25 to 29 years old, 30 to 34 years old, 35 to 39 years old, 40 to 44 years old, and 45 to 49 years old. Since the analysis is confined to women aged 15 to 49 years old, women under the age of 15 years old are excluded.

Stratum is categorized as urban and rural areas. The concept and interpretation of the urban and rural areas used are identical to those established by the 2010 Malaysian Population and Housing Census. The urban area is described as "Gazetted regions with their neighboring built-up areas, which had a total population of at least 10,000 or the special development region that can be recognized, which a population of not fewer than 10,000 with not less than 60 percent of the population (aged 15 years and over) were involved in non-agricultural activities". On the other hand, rural area refers to all other gazetted regions with fewer than 10,000 inhabitants and the non-gazetted regions.

Similarly, ethnicity, as one of the categorical independent variables, is initially classified into five categories which are Malay, other Bumiputera, Chinese, Indian, and Others. The main groups of other Bumiputera include Kadazan/Dusun, Murut, Bajau, Iban, Bidayuh, and Melanau. As the Malays are also indigenous to Malaysia, the ethnic group Malays were merged with other Bumiputera and named as "Bumiputera". Besides that, as the number of respondents from the ethnic group

“Others” is rather small, respondents from this category have been excluded. Hence, this study is limited to three major ethnic groups, which are Malay, Chinese, and Indian. Malaysia consists of sixteen states (including three federal territories): Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Pulau Pinang, Perak, Perlis, Selangor, Terengganu, Sabah, Sarawak, F.T Kuala Lumpur, F.T Labuan, and F.T Putrajaya. Different states tend to have different rates of urbanization and fertility behavior.

At first, there are seven categories under the highest educational level of women, which are no schooling, primary, lower secondary, upper secondary, pre-university, tertiary, and others. Due to the limited number of respondents, the categories of no schooling or primary education were group into one group, and the category “others” have been excluded. Lower secondary, upper secondary, and pre-university is also classified into one category. After all the reorganizations, the highest educational level of women is classified into three categories, which are primary education or no schooling, secondary or pre-university education, and tertiary education.

Other than that, the current employment status of women are categorized as currently working and not working. According to NPFDB (2016), the modern family planning method includes the pill, condom, intrauterine device, injection, tubal ligation, implant, emergency contraceptive pill, vaginal ring, hormone patch, and vasectomy. In contrast, the non-modern method includes withdrawal, traditional, rhythm method, abstinence, breastfeeding, and other non-modern methods. Status of family planning is divided into two categories, which are currently not using and currently using family planning. Age at first marriage is a numerical independent variable used in this study.

Table 3.2 listed all categories for each variable used in this study. Data were analyzed using the Microsoft Excel Office 2019 and Statistical Package for Social Science (IBM SPSS Statistics) software version 25.

Table 3.2 Study Variables

Variable		Category
Dependent Variable	Children Ever Born (CEB)	
Independent Variable	Age Group	Below 25 years old
		25-29 years old
		30-34 years old
		35-39 years old
		40-44 years old
		45-49 years old
	Stratum	Urban area
		Rural area
	State	Johor
		Kedah
		Kelantan
		Melaka
		Negeri Sembilan
		Pahang
		Pulau Pinang
		Perak
		Perlis
		Selangor
		Terengganu
		Sabah
		Sarawak
		Kuala Lumpur
		Labuan
		Putrajaya
	Ethnicity	Bumiputera
		Chinese
		Indian
	Highest Educational Level of Women	Primary or No schooling
		Secondary or Pre-university
		Tertiary
	Current Employment Status of Women	Currently working
		Not working
	Status of Family Planning	Currently not using family planning
		Currently using family planning
	Age at First Marriage	

Source: MPFS (2014)

3.5 Data Analysis Techniques

The analysis is confined to women who are currently married aged 15 to 49 years old (n = 5146). To demonstrate the differentials in fertility, both univariate and bivariate analyses have been carried out. At first, the univariate or descriptive analysis that involves only one variable was used to identify the frequency and percentage distribution of respondents based on socio-demographic features.

Next, the effects of selected independent variables on the number of CEB among currently married women aged 15 to 49 years old will be analyzed using bivariate analysis. For the bivariate analysis, the compare means and scatter plots were used. Furthermore, the one-sample Kolmogorov-Smirnov Test is conducted to determine if the number of CEB is normally distributed. The null (H_0) and alternative (H_1) hypotheses testing for the test are as follows:

H_0: The number of CEB among currently married women aged 15 to 49 years old are normally distributed.

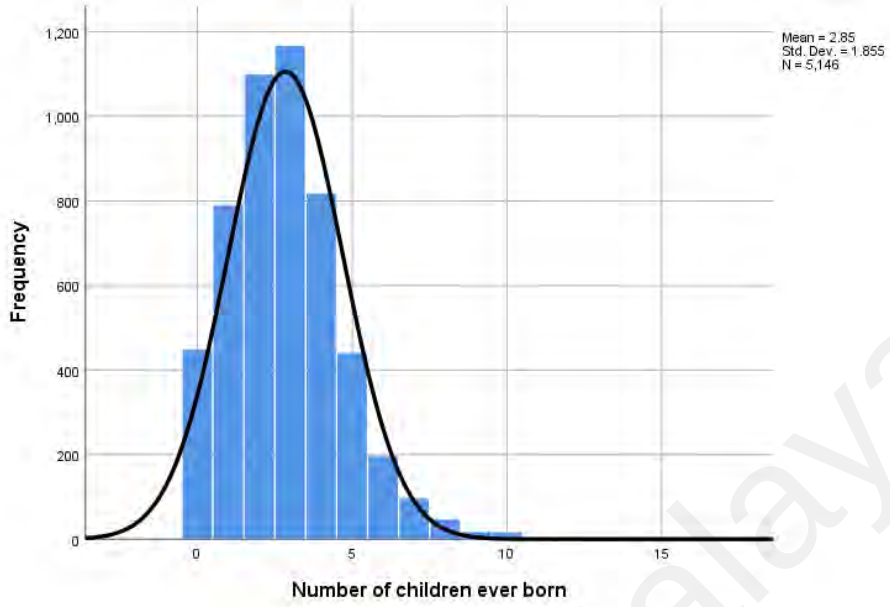
H_1: The number of CEB among currently married women aged 15 to 49 years old are not normally distributed.

If Ho is true, it can be concluded that the number of CEB among currently married women aged 15 to 49 years old are normally distributed. The results of the one-sample Kolmogorov-Smirnov Test on the number of CEB are illustrated in Table 3.3 below. Since the p-value (0.000) is smaller than 0.05, reject H_0, and we can conclude that the number of CEB among currently married women aged 15 to 49 years old are not normally distributed.

Table 3.3 Normality Test

	Kolmogorov-Smirnov[a]		
	Statistic	**df**	**Sig.**
Number of children ever born among currently married women aged 15-49 years	0.148	5146	0.000

Figure 3.2 Histogram of the Number of Children Ever Born



Based on the histogram of CEB above, the number of CEB is not normally distributed, given that it is positively skewed. Most of the CEB concentrates at the lower end of the distribution. Since the number of CEB is not normally distributed, the analyses use non-parametric tests. The Mann-Whitney U test and Kruskal-Wallis H test are used to test whether there is a difference in the number of CEB by each selected categorical independent variable. The Null (H_0) and alternative (H_1) hypotheses for these two tests are similar and are stated as follow:

> *H_0: There is no difference in the number of CEB among currently married women aged 15 to 49 years old by the categories of the selected socio-economic and demographic variables.*
>
> *H_1: There is a difference in the number of CEB among currently married women aged 15 to 49 years old by the categories of the selected socio-economic and demographic variables.*

If Ho is true, it can be concluded that there is no difference in the number of CEB among currently married women aged 15 to 49 years old by the selected categorical independent variable.

On the other hand, the relationship between numerical independent variables such as age at first marriage and the dependent variable is tested by using Spearman's Rho Correlations test. The null (H_0) and alternative (H_1) hypotheses testing for the test are as follows:

H_0: There is no relationship between the number of CEB among currently married women aged 15 to 49 years old and the selected numerical independent variable.

H_1: There is no relationship between the number of CEB among currently married women aged 15 to 49 years old and the selected numerical independent variable.

If Ho is true, it can be concluded that there is no relationship between the number of CEB among currently married women aged 15 to 49 years old and the selected numerical independent variable.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter begins with an analysis of the fertility differentials patterns in Malaysia from the year 1970 to 2018. The data from 1970 to 2019 Vital Statistics Malaysia will be used in this section. This is followed by a description of the respondents' profile of the MPFS-5 obtained from the NPFDB. The impacts of selected socio-economic and demographic variables on the mean number of CEB among population subgroups were then investigated by using compare mean and scatter plots. Lastly, the Mann-Whitney U test, Kruskal-Wallis H test, and Spearman's Rho Correlations test will be used to test the significant association between the number of CEB and the selected variables.

4.2 The Trend of Fertility Differentials in Malaysia

Over the past decades, Malaysia has undergone a significant decline in fertility. The national TFR fell from 6.2 children per woman in 1958 to 1.8 children per woman in 2018, which are the lowest ever recorded. Figure 1.1 shows the overall TFR and the TFRs by three major ethnic groups in Malaysia from the year 2000 to 2018. It can be found that the TFRs for all three major ethnic groups in Malaysia have declined over the past nineteen years, but the TFR of Bumiputera was consistently above the replacement level. Meanwhile, the rates for Chinese and Indians have been below the replacement level.

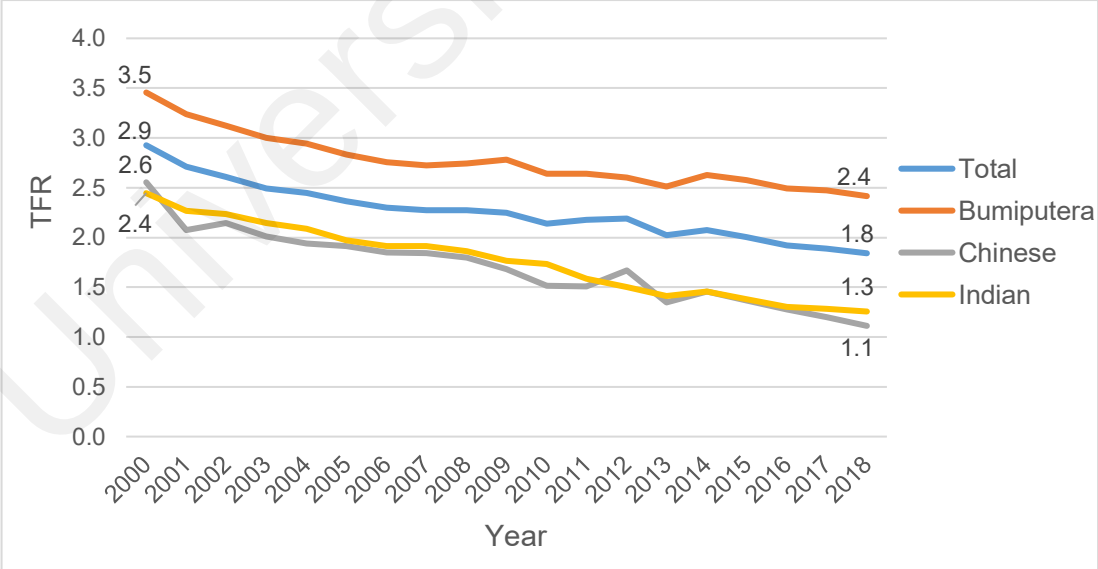
In 2018, Bumiputera recorded the highest TFR among three major ethnic groups, with 2.4 children per woman, followed by 1.3 children per woman for Indians. On the other hand, the Chinese recorded the lowest rate of 1.1 children per woman. The TFR of Chinese has dropped by more than half as compared with 2.6 children per woman in 2000. It can also be observed that the rate for Chinese has declined most quickly among the three major ethnic groups in Malaysia. The Chinese community's TFR has fallen by about 57.7 percent, Indians have fallen by 45.8 percent, and the Malays have fallen by 31.4 percent from 2000 to 2018. The pattern of childbearing differs across ethnic groups over time.

In Malaysia, the rates of fertility have dropped across all reproductive age groups. This can further be illustrated by the decreasing ASFR since 1970, as shown

in Figure 4.2 below. According to Figure 4.2, women aged 25 to 29 years old had the highest ASFRs between 1970 and 2000 as compared to other age groups. This condition, however, shifted between 2000 and 2018, when there were the highest ASFRs among women aged 30 to 34 years old.

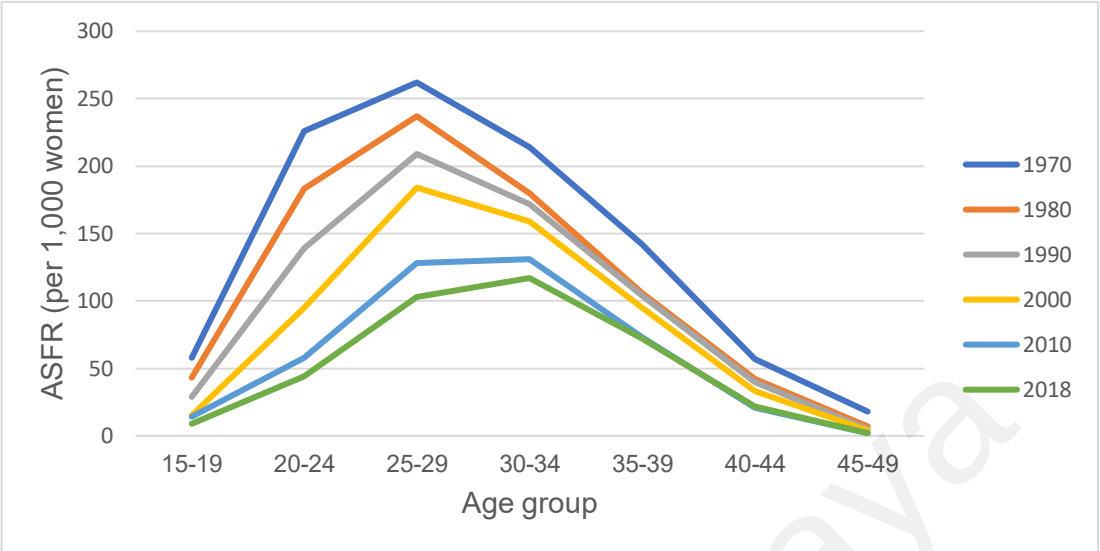
Figure 4.3 presents the ASFRs by the three major ethnic groups in Malaysia for the year 2018. In 2018, the fertility rate among the Bumiputera was still considerably higher than that of the non-Bumiputera across each reproductive age group of women. The fertility rate among Chinese and Indian women between the ages of 30 to 34 years old was much lower than that of the Bumiputera, with 82 per thousand women and 92 per thousand women respectively, but that of the Bumiputera in the same age group has remained very high at 148 births per thousand women. The most significant decline in fertility level between 1970 and 2018 occurred in the 45 to 49 years old age group, which fell by approximately 88.9 percent during the 49 years (see Figure 4.4). This was followed by the drop in adolescent fertility (births among women aged 15 to 19 years old) and a decline in the age group of 20 to 24 years old, with 84.5 percent and 80.5 percent, respectively.

Figure 4.1 TFR by Ethnic Group in Malaysia from the Year 2000 to 2018



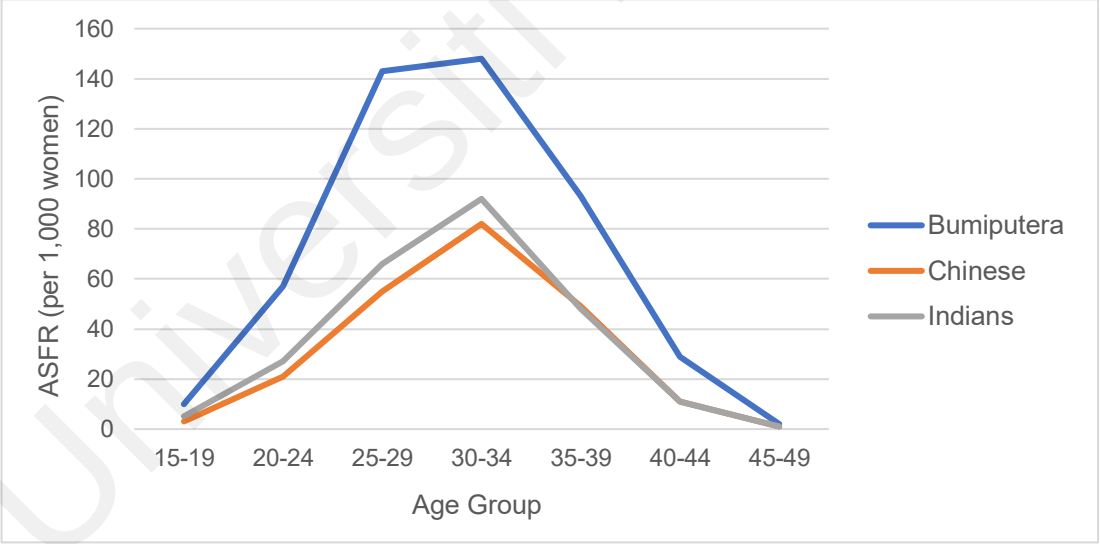
Sources: DOSM (2000-2018)

Figure 4.2 ASFR in Malaysia from the Year 1970 to 2018



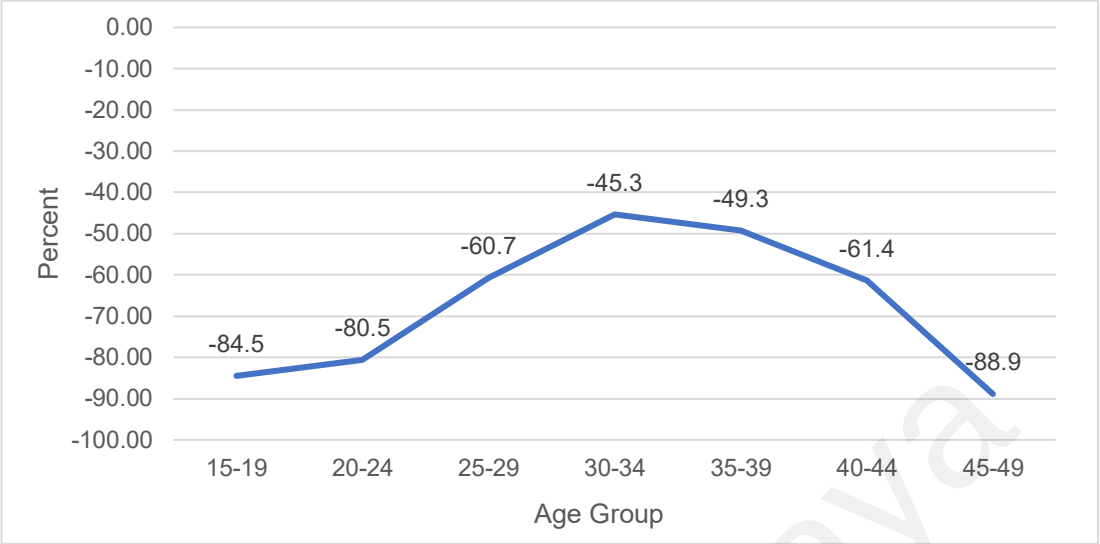
Sources: DOSM (1970-2018)

Figure 4.3 ASFR by Ethnic Group in 2018



Sources: DOSM (2018)

Figure 4.4 Percentage Change in ASFR from the Year 1970 to 2018



Sources: DOSM (1970-2018)

4.3 Profile of Respondents

The socio-economic and demographic profile of respondents of MPFS-5 is presented in Table 4.1. In total, 5146 of currently married women aged 15 to 49 years old were included in this study. Women aged below 25 years old only accounted for 7.1 percent of the total sample. About 14.3 percent of the respondents were from the age group of 25 to 29 years old, 19.3 percent of them aged 30 to 34 years old, 18.7 percent aged 35 to 39 years old, 19.6 percent aged 40 to 44 years old, and about a fifth (20.9 percent) of them were aged 45 to 49 years old.

A large proportion of the women resided in urban areas (63.1 percent), and 36.9 percent were from rural areas. Out of the 16 states, most of the women were from Johor, Selangor, and Sarawak. Johor and Selangor had the same proportion of respondents at 12.5 percent, respectively, while the women who came from Sarawak accounted for 12.2 percent. Meanwhile, less than 5.0 percent of the respondents who came from Melaka, Negeri Sembilan, Pulau Pinang, Perlis, Terengganu, F.T Labuan, and F.T Putrajaya, which are 4.9 percent, 4.4 percent, 3.9 percent, 1.8 percent, 3.3 percent, 2.3 percent, and 1.5 percent respectively.

In terms of ethnicity, more than three-quarters of the currently married women were Bumiputera (83.0 percent). Among others, 10.2 percent were Chinese, and only 6.8 percent were Indian. The majority of the respondents had at least a secondary or pre-university educational level (67.1 percent), followed by tertiary educational level

(20.7 percent), and about 12.2 percent had a primary education level or no schooling. Across the current employment status of women, nearly half of the currently married women were employed (45.4 percent).

Confining the study to currently married and non-pregnant women, approximately 74.4 percent of them were currently using a family planning method, and only 25.6 percent were not using any form of family planning (traditional or modern method) at the time of the survey in 2014. Referring to age at first marriage variable, about 24.7 percent of women reported their age at first marriage to be 26 years old and above. Most of the women were married between the ages of 22 to 25 years old (36.3 percent), whereas a relatively small percentage of women were married at age below 18 years old (9.3 percent). The remaining 29.7 percent of women were married between the ages of 18 to 21 years old.

Table 4.1 Profile of the 2014 Malaysian Population and Family Survey Respondents

Variable	Category	Frequency	Valid Percent
Age Group	Below 25 years old	367	7.1
	25-29 years old	738	14.3
	30-34 years old	992	19.3
	35-39 years old	963	18.7
	40-44 years old	1,010	19.6
	45-49 years old	1,076	20.9
Stratum	Urban	3,248	63.1
	Rural	1,898	36.9
State	Johor	645	12.5
	Kedah	409	7.9
	Kelantan	302	5.9
	Melaka	254	4.9
	Negeri Sembilan	224	4.4
	Pahang	336	6.5
	Pulau Pinang	202	3.9
	Perak	355	6.9
	Perlis	95	1.8
	Selangor	642	12.5
	Terengganu	169	3.3
	Sabah	425	8.3
	Sarawak	626	12.2
	F.T Kuala Lumpur	267	5.2
	F.T Labuan	118	2.3
	F.T Putrajaya	77	1.5
Ethnicity	Bumiputera	4,271	83.0
	Chinese	526	10.2
	Indian	349	6.8
The Highest Educational Level of Women	Primary or no schooling	627	12.2
	Secondary or pre-university	3,454	67.1
	Tertiary	1,065	20.7
Current Employment Status of Women	Currently working	2,338	45.4
	Not working	2,808	54.6
Status of Family Planning	Currently using family planning	2,719	74.4
	Currently not using family planning	935	25.6
Age at First Marriage	Below 18 years old	476	9.3
	18-21 years old	1,524	29.7
	22-25 years old	1,866	36.3
	26 years old and above	1,271	24.7

4.4 Differentials in the Number of CEB by Selected Socio-economic and Demographic Factors in Malaysia

Table 4.2 is a simple tabulation of the data shows that the number of CEB by currently married women aged 15 to 49 years old and 45 to 49 years old ranged from 0 children to 5 or more children. As a whole, approximately 8.7 percent of currently married women aged 15 to 49 years old had no children at the time of the survey. Besides, approximately 15.4 percent of them had only one child, 21.4 percent had two children, 22.7 percent had three children, 15.9 percent had four children, and 16.0 percent had at least five children.

A measure of childlessness and completed family size would be given by the number of CEB by older mothers (aged 45 to 49 years old). Among the 5,146 currently married women aged 15 to 49 years old, 1,076 were between the ages of 45 and 49 years old. The frequency and percentage distribution among currently married women aged 45 to 49 years old by the number of CEB are shown in the right-hand side of Table 4.2 below, with 22.5 percent of them having two or fewer children. In total, almost eight in ten women who were aged 45 and above had already given birth to at least three children. Only about 4.37 percent of them were remained childless at the time of the survey. About 22.21 percent had three children, 23.33 percent had four children, and 31.97 percent had five or more children.

Table 4.2 Frequency and Percentage Distributions Among Currently Married Women Aged 15 to 49 Years Old and 45 to 49 Years Old by Number of Children Ever Born

No. of CEB	Currently Married Women Aged 15 to 49 Years Old			Currently Married Women Aged 45 to 49 Years Old		
	Frequency	Valid Percent	Cumu-lative Percent	Frequency	Valid Percent	Cumu-lative Percent
0	448	8.7	8.7	47	4.4	4.4
1	790	15.4	24.1	55	5.1	9.5
2	1,099	21.4	45.4	140	13.0	22.5
3	1,167	22.7	68.1	239	22.2	44.7
4	817	15.9	84.0	251	23.3	68.0
5+	825	16.0	100.0	344	32.0	100.0
Total	5,146	100.0		1,076	100.0	

In this study, differentials in the mean number of CEB by various socio-economic and demographic variables will be examined across women's age groups, as shown in Table 4.3 below. In the 2014 MPFS, the mean number of CEB to all currently married women aged 15 to 49 years old were 2.9 children. As expected, the mean number of CEB has been increasing across the reproductive age groups of women, from 1.1 children among those who were aged below 25 years old to 3.9 children among the age group of 45 to 49 years old. The difference in the mean number of CEB has widened for the first three age groups (the age group of under 25 years old to the age group of 30 to 34 years old) and then narrowed in the following age groups.

In terms of strata, the mean number of CEB of urban women in this sample was 2.7 children, while the mean number of CEB of rural women was 3.1 children. Women living in urban regions have a relatively smaller size of the family relative to rural women, and this was real for each age group of women. This can be justified by the fact that urban women were more likely to obtain long-term education, and they were more likely to be employed due to the relatively more facilities and opportunities for education and employment in urban areas. Generally, the urban-rural differential in the mean number of CEB has been increased with age group. The largest urban-rural differential in the mean number of CEB was found among aged 40 to 44 years old (0.7 children), followed by aged 45 to 49 years old (0.5 children).

Regarding the 16 states in Malaysia, Kelantan was the state with the largest family size, at average, 3.6 children, followed by Terengganu, Sabah, Pahang, Melaka, and Kedah. On the other hand, F.T Putrajaya was the state with the smallest family size at 2.3 children on average. Kelantan, Terengganu, and Pahang are geographically located in the east coast region of Peninsular Malaysia, and the states made up of a large proportion of Malays. In Malaysia, all Malays are Muslims, and Islamic teaching is commonly seen as a pro-natalist. Thus, the relatively large number of CEB in the east coast region can be primarily due to cultural and religious contexts that promote early marriage and large family size. In terms of the mean completed family size among women aged 45 to 49 years old, Kelantan was the only state with more than five children on average, while F.T Kuala Lumpur was the only state with an average family size of fewer than three children. The smallest mean completed family size in F.T Kuala Lumpur can be attributed to the high level of urbanization, where Kuala Lumpur is the largest city in Malaysia with a 100.0 percent level in urbanization.

For ethnicity, the largest ethnic group, the Bumiputera, had the highest overall mean number of CEB at 2.9 children, followed by Chinese (2.5 children) and Indian (2.4 children). Interestingly, although Chinese' TFRs and ASFRs have always been lower than that of the Indian over the past few decades as mentioned in section 4.3, the overall mean number of CEB among currently married Indian women aged 15 to 49 years old in 2014 MPFS-5 was lower than that of the Chinese. This was true across reproductive age groups of women, except for the age group of 30 to 34 years old and 40 to 44 years old. In addition, it can be observed that many Chinese women already had relatively large family size at a younger age as compared to the other two ethnic groups. On the opposite, Bumiputera women were more likely to expand their family size at an older age. The highest mean number of CEB was 4.1 children who achieved by Bumiputera women aged 45 to 49 years old, and the lowest mean number of CEB was 0.8 children who achieved by Indian women aged under 25 years old.

The highest education level obtained by women provides a significant gap in family size distribution. The 2014 MPFS reveals that women with at least tertiary education levels have the smallest overall mean number of CEB of only 2.1 children. This is followed by those with a secondary or pre-university education level with 2.9 children on average and those with a primary education level or no schooling with 3.7 children on average. Among the higher educated women, the opportunity cost of childbearing is relatively higher than women with less education. They seem to be more likely to remain childless or to postpone their childbirth to a later age in order to concentrate on their profession. As expected, women with at least tertiary education levels also have the smallest mean completed family size. According to women's reproductive age groups, the most considerable difference in the mean number of CEB between each educational category was observed among women aged 30 to 34 years old with primary education or no schooling, and those with tertiary education level, with a difference of 1.5 children.

Available evidence indicates that females who were engaged in economic activities or being employed tend to delay their marriage and have smaller family size than non-working women (Jemain and Ghani, 2003; Rica and Ferrero, 2003; Cruces and Galiani, 2007; Tey, 2007; and Cheng, 2011). The 2014 MPFS shows that the overall mean number of CEB to women who were currently working was lower as compared to those who were not working, with 2.7 children and 3.0 children correspondingly. This situation was real within each age group. The mean number of CEB was varied considerably from the age group of under 25 years old to the age

group of 35 to 39 years old, and this is partly due to the reluctance of the working women to allow early family responsibilities to interfere with their working life. Nevertheless, the difference in the mean completed family size among currently working women aged 45 to 49 years old and non-working women are not very large, with a difference of approximately 0.4 children per woman.

Analyzing the mean number of CEB by mean age at first marriage, Bakar and Abdullah (2007) found that the mean number of CEB has dropped according to age at first marriage. The finding based on the 2014 MPFS-5 data is consistent with the findings of Bakar and Abdullah (2007). The mean number of CEB decreased monotonically across age at first marriage of women, and this is even true within each women's reproductive age group. The most considerable difference in the mean number of CEB was occurred among the reproductive age group of 40 to 44 years old, with a difference of 2.5 children between women who were married at age below 18 years old and women married at the ages of 26 years old or above. The mean number of CEB is inversely related to the mean age at first marriage.

The mean age at first marriage is also directly related to urbanization, ethnicity, the highest educational level obtained by women, and the current employment status of women (see Figure 4.5 to 4.8). Figure 4.5 shows that rural women in the sample generally married earlier and had more children than urban women. On average, rural women entered married 1.4 years earlier than urban women and had 0.4 more children than their urban counterparts. According to strata, the higher the rate of urbanization, the older the age at first marriage of women, and the fewer the number of CEB. Referring to ethnicity, on average, the mean age at first marriage varies from 22.6 years old among Bumiputera women to 24.7 years old among Chinese women, as shown in Figure 4.6. Although the mean number of CEB of Chinese women were not the lowest among the three major ethnic groups in Malaysia, they were most likely to delay marriage as compared to Bumiputera and Indian women.

In addition, the highest education level obtained by women is the primary factor behind delayed marriage (see Figure 4.7). Women who achieved at least tertiary education level tend to marry latest at 25.3 years old on average, followed by those with secondary or pre-university education level (22.6 years old on average) and those with primary education level or no schooling (20.3 years old on average). Some research had suggested that women with higher academic qualifications face greater difficulties in finding a matching life partner, notably when women are now surpassing men in academic terms (Sugden, 2009; Tey, Ng & Yew, 2012). This will,

in turn, contribute to the relatively small family size and a high likelihood that better-educated women would become childless. In general, women with high academic qualifications are more likely to become involved in economic activities. The current employment status of women also tends to influence age at first marriage of women (see Figure 4.8). Women who were currently working were married 1.5 years later than those who are not working.

The differences in the status of family planning and mean number of CEB by selected socio-economic and demographic variables: stratum, ethnicity, the highest educational level of women, and the current employment status of women, are shown in Figures 4.9 to 4.12. Figure 4.9 illustrates that contraceptive prevalence rates (CPRs) among rural women and urban women are very close, at 74.5 percent and 74.4 percent, respectively. This reveals that the differences in CPR between rural and urban women may not be the leading cause of the significant urban-rural differential in fertility behavior. Looking into the ethnicity variable, data show that about 83.3 percent of the Chinese women were currently using the family planning method, 76.3 percent for the Indian women, but few Bumiputera women did so (73.2 percent) (see Figure 4.10). This can be attributed to the high proportion of Malays in the Bumiputera ethnic group, who rarely use modern contraceptive methods due to the stronghold of the Islamic faith.

Figure 4.11 shows the CPR and the mean number of CEB of women in the sample across the educational levels. The proportion of women using any form of contraception was highest among those with tertiary education level (77.6 percent), followed by those with primary education level or no schooling (76.6 percent) and secondary or pre-university education level (73.2 percent). Even though, better-educated women had significantly fewer mean number of CEB than lesser educated women, the CPR among women with primary education level or no schooling was higher than that of those with secondary or pre-university education level. More interestingly, women who were currently working were less likely than non-working women to use any form of the contraceptive method (see Figure 4.12). The CPR among non-working women in the sample was 2.7 percent higher than that of working women. Therefore, the negative relationship between the mean number of CEB and the CPR is only the case across ethnic groups. In the case of ethnicity, the higher the percentage of women who were currently using at least one family planning method (regardless of the traditional contraceptive method or modern contraceptive method), the fewer the mean number of CEB.

Table 4.3 Mean Number of Children Ever Born by Selected Socio-economic and Demographic Variables

Variable	Category	Overall	<25	25-29	30-34	35-39	40-44	45-49
All		2.9	1.1	1.5	2.4	3.1	3.6	3.9
Stratum	Urban	2.7	1.0	1.4	2.3	3.1	3.3	3.7
	Rural	3.1	1.1	1.6	2.6	3.3	4.0	4.2
State	Johor	2.7	1.0	1.5	2.4	2.9	3.1	3.6
	Kedah	2.9	0.9	1.5	2.4	3.2	3.3	3.9
	Kelantan	3.6	1.2	1.6	2.5	3.8	4.5	5.4
	Melaka	2.9	0.6	1.0	2.6	3.1	3.5	4.0
	Negeri Sembilan	2.8	0.9	1.6	2.2	2.8	3.9	3.6
	Pahang	3.1	1.0	1.4	2.3	3.3	4.7	4.3
	Pulau Pinang	2.7	0.3	1.4	2.2	2.8	3.1	3.0
	Perak	2.8	0.9	1.5	2.2	3.1	3.3	3.7
	Perlis	2.7	1.4	1.0	2.1	3.4	3.4	3.9
	Selangor	2.7	0.7	1.4	2.1	2.9	3.5	3.7
	Terengganu	3.3	0.9	1.3	2.6	3.8	4.5	4.8
	Sabah	3.2	1.3	1.9	2.9	3.9	4.0	4.2
	Sarawak	2.8	1.2	1.7	2.9	2.8	3.6	3.7
	F.T Kuala Lumpur	2.3	1.0	1.1	1.8	3.0	3.2	2.9
	F.T Labuan	2.6	0.9	1.9	2.1	3.1	3.6	4.0
	F.T Putrajaya	2.3	0.0	1.4	2.0	3.1	3.4	3.7
Ethnicity	Bumiputera	2.9	1.1	1.5	2.4	3.3	3.8	4.1
	Chinese	2.5	1.4	2.1	2.0	2.5	2.6	3.0
	Indian	2.4	0.8	1.4	2.2	2.4	3.3	3.0
The Highest Educational Level of Women	Primary or No Schooling	3.7	1.3	1.9	3.4	3.6	4.2	4.2
	Secondary or Pre-university	2.9	1.1	1.7	2.5	3.2	3.6	3.8
	Tertiary	2.1	0.6	1.0	1.9	2.7	3.2	3.4
Current Employment Status of Women	Currently working	2.7	0.8	1.2	2.1	2.8	3.4	3.7
	Not working	3.0	1.1	1.7	2.7	3.5	3.8	4.1
Age at First Marriage	Below 18 years old	3.9	1.7	2.6	3.7	4.3	5.1	5.0
	18-21 years old	3.3	1.0	2.1	2.9	3.7	4.1	4.5
	22-25 years old	2.8	0.5	1.4	2.5	3.3	3.6	3.9
	26 years old and above	2.0	0.0	0.7	1.5	2.0	2.6	2.8

Figure 4.5: Mean Age at First Marriage and Mean Number of Children Ever Born by Stratum

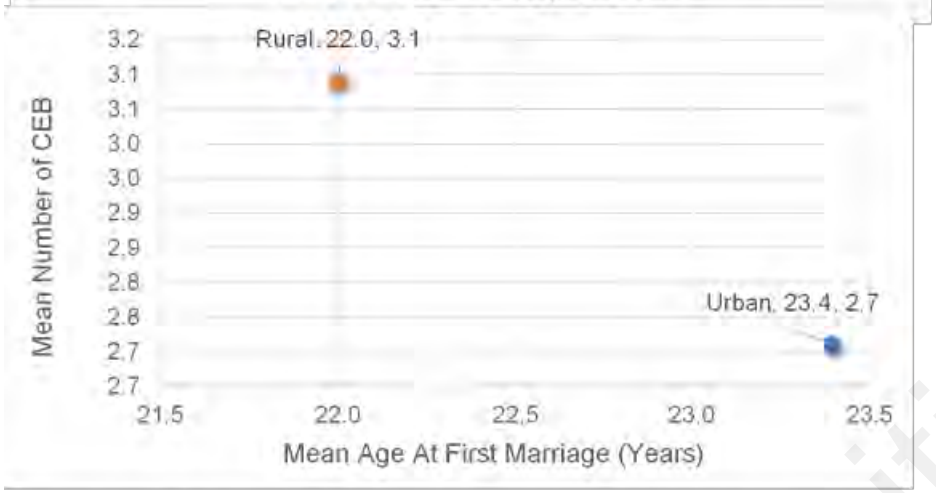


Figure 4.6: Mean Age at First Marriage and Mean Number of Children Ever Born by Ethnic Groups

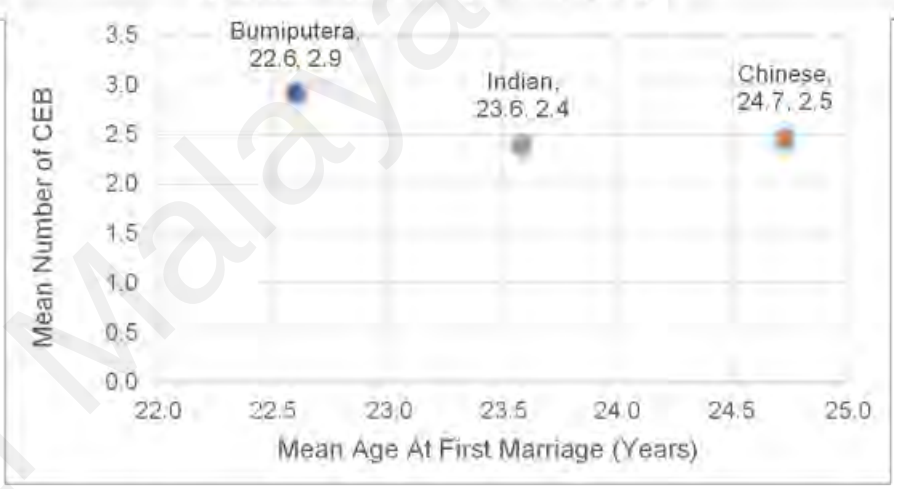


Figure 4.7: Mean Age at First Marriage and Mean Number of Children Ever Born by the Highest Educational Level of Women

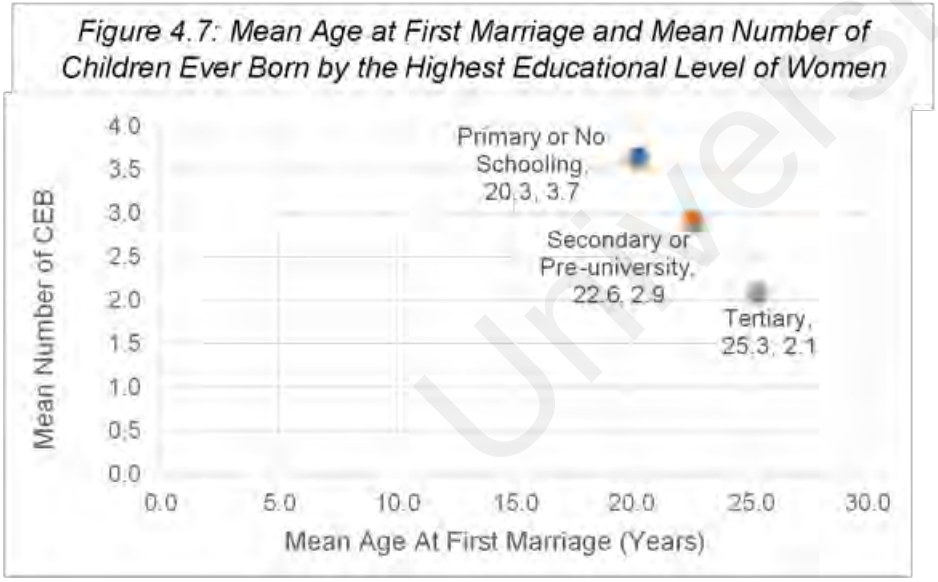


Figure 4.8: Mean Age at First Marriage and Mean Number of Children Ever Born by the Current Employment Status of Women

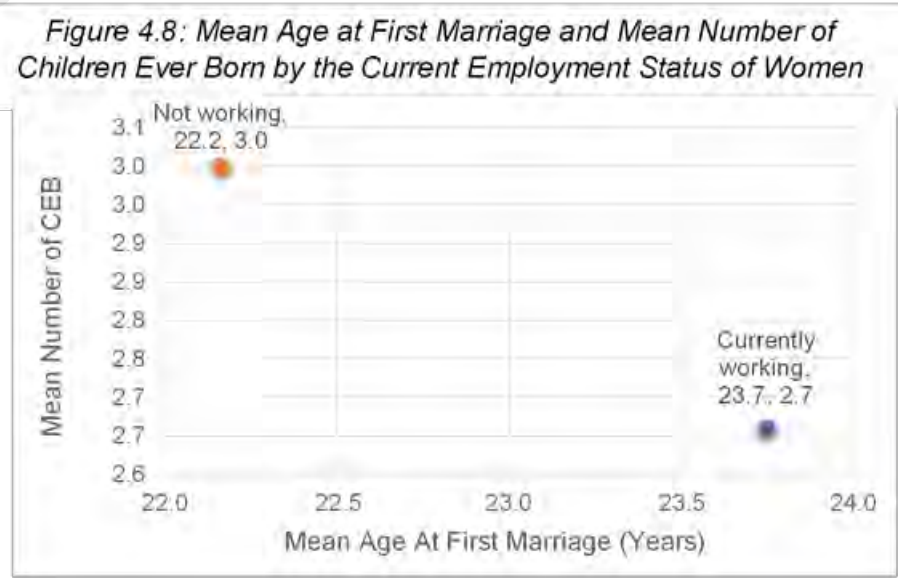


Figure 4.9: Contraceptive Prevalence Rate and Mean Number of Children Ever Born by Stratum

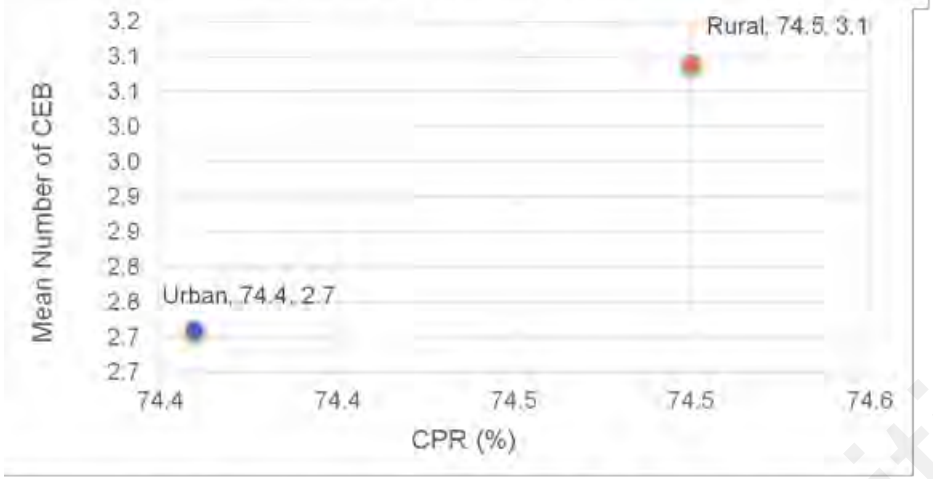


Figure 4.10: Contraceptive Prevalence Rate and Mean Number of Children Ever Born by Ethnic Groups

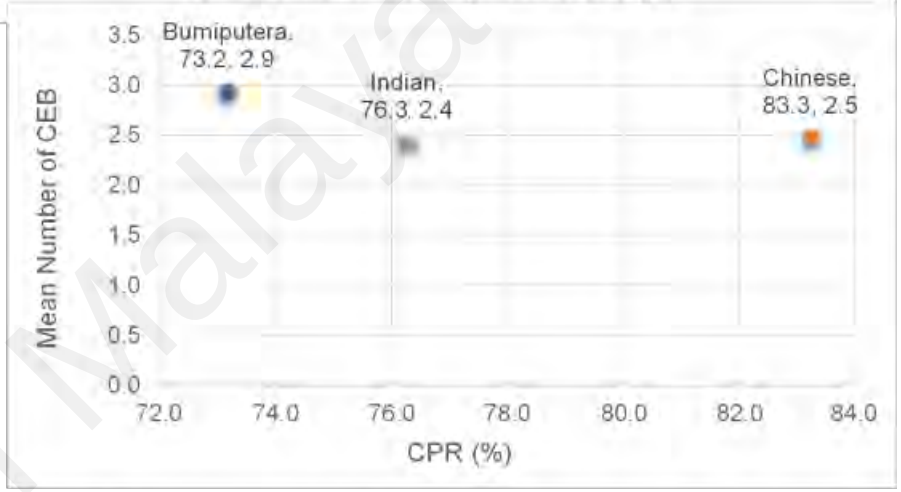


Figure 4.11: Contraceptive Prevalence Rate and Mean Number of Children Ever Born by the Highest Educational Level of Women

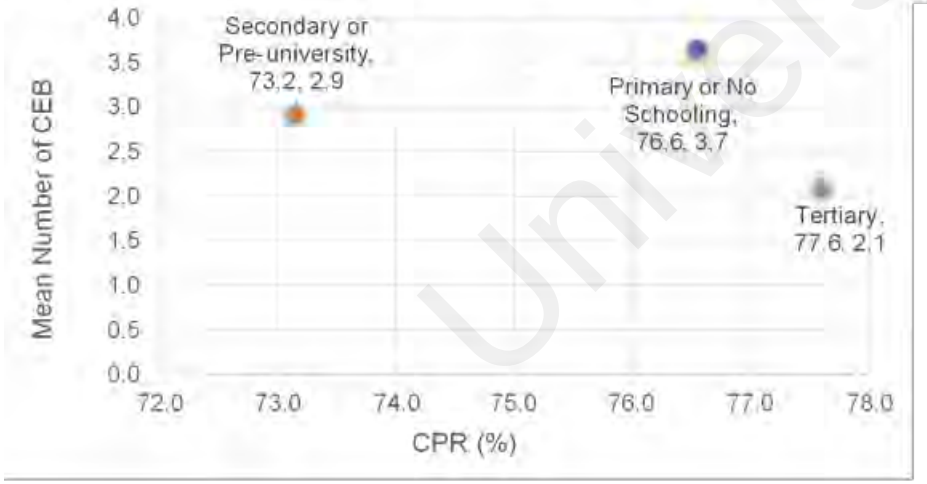
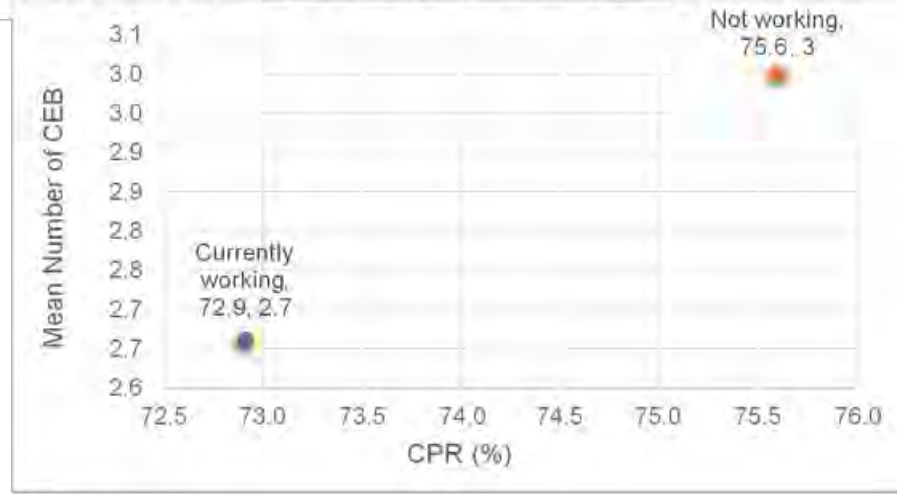


Figure 4.12: Contraceptive Prevalence Rate and Mean Number of Children Ever Born by the Current Employment Status of Women



4.5 Testing for the Significance of Fertility Differentials by Selected Socio-economic and Demographic Variables in Malaysia

4.5.1 Mann-Whitney U test

The Mann-Whitney U test can be used when two independent and randomly selected samples are at least ordinal test. Hence, it was used to test the significance of differences in the number of CEB by selected socio-economic and demographic variables that comprise of two independent categories. These variables are stratum and the current employment status of women among currently married women aged 15 to 49 years old in the sample. The null (H_0) and alternative (H_1) hypotheses testing for the Mann-Whitney U Test are as follows:

H_0: There is no difference in the number of CEB among currently married women aged 15 to 49 years old by the two categories of the selected socio-economic and demographic variables.

H_1: There is a difference in the number of CEB among currently married women aged 15 to 49 years old by the two categories of the selected socio-economic and demographic variables.

The results of the Mann-Whitney U test are illustrated in Table 4.4 below. Since the p-values for both variables are not greater than a significance level of 0.05, the null hypothesis is rejected, and we can conclude that there is a difference in the number of CEB among currently married women aged 15 to 49 years old by stratum and current employment status variables.

Table 4.4 Results of the Mann-Whitney U Test

Variable	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Stratum	2742853.500	8019229.500	-6.705	0.000
Current employment status of women	2943336.500	5677627.500	-6.492	0.000

4.5.2 Spearman's Rho Correlations test

The Spearman's Rho Correlations test was used to test the correlation between the number of CEB and the age at first marriage among currently married women aged 15 to 49 years old in the sample. The null (H_0) and alternative (H_1) hypotheses testing for the Spearman's Rho Correlations test are as follows:

H_0: There is no association between the number of CEB and the age at first marriage among currently married women aged 15 to 49 years old

H_1: There is an association between the number of CEB and the age at first marriage among currently married women aged 15 to 49 years old

Table 4.5 below shows the results of the Spearman's Rho Correlations test. Since the p-value is less than a significance level of 0.05, the null hypothesis is rejected, and we can conclude that there is an association between the number of CEB and the age at first marriage among currently married women aged 15 to 49 years old. There is sufficient evidence to state that the number of CEB and the age at first marriage of women is negatively correlated as the correlation coefficient is a negative number.

Table 4.5 Results of the Spearman's Rho Correlations test

Variable		Number of children ever born	Age at first marriage
Number of children ever born	Correlation Coefficient	1.000	-.317**
	Sig. (2-tailed)	.	0.000
	N	5146	5137
Age at first marriage	Correlation Coefficient	-.317**	1.000
	Sig. (2-tailed)	0.000	.
	N	5137	5137

4.5.3 Kruskal-Wallis H Test

The Kruskal-Wallis H Test can be used when more than two independent and randomly selected samples are at least ordinal tests. In this paper, the Kruskal-Wallis H test was used to compare the selected socio-economic and demographic variables that comprise more than two independent categories, including age group, state, ethnicity, and the highest education level of women. The null (H_0) and alternative (H_1) hypotheses testing for the Kruskal-Wallis H Test are as follows:

> *H_0: There is no difference in the number of CEB among currently married women aged 15 to 49 years old by the several categories of the selected socio-economic and demographic variables.*
>
> *H_1: There is a difference in the number of CEB among currently married women aged 15 to 49 years old by the several categories of the selected socio-economic and demographic variables.*

Table 4.6 shows the results of the Kruskal-Wallis H Test. Since the p-values for all three variables are less than a significance level of 0.05 (p-value=0.000), the null hypothesis is rejected. Therefore, we can conclude that there is a significant difference in the number of CEB among currently married women aged 15 to 49 years old by the age group, state, ethnicity, and the highest education level of women.

Table 4.6 Results of the Kruskal-Wallis H Test

Variable	Kruskal-Wallis H	df	Asymp. Sig.
Age group	1525.117	5	0.000
State	100.567	15	0.000
Ethnicity	41.897	2	0.000
The highest education level of women	300.784	2	0.000

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter summarizes the important findings of the analyses and discusses the implications of fertility differentials in Malaysia. This is followed by some recommendations for future policy and a description of the limitations of the study.

5.2 Summary and Discussion

This study has examined fertility trends in Malaysia over the past few decades. It has shown a sustained decline in TFRs for all three major ethnic groups in Malaysia, which are Bumiputera, Chinese, and Indian. The TFRs for both Chinese and Indians have been below the replacement level since 2003 and 2004, respectively, but the rate for Bumiputera was consistently above the replacement-level fertility. The Bumiputera fertility rate was considerably higher than that of the non-Bumiputera over time, and this is even true at all reproductive age groups of women. The pronounced differentials of ethnicity in fertility can be traced primarily to disparities in socio-economic and demographic structures. The trend towards delay childbearing can be indicated by the change in the highest ASFR from the age group of 25 to 29 years old to the age group of 30 to 34 years old between 1970 and 2018. Besides, the findings showed that the fertility rates had declined considerably in the older age group 45 to 49 years old. In the planning of reproductive health programs, the fertility rate of older women is beneficial to improve the health and welfare of older mothers and their children.

Aside from fertility trends, using data from 2014 MPFS, this study has analyzed the fertility differentials among currently married women aged 15 to 49 years old in Malaysia by women's age, stratum, state, ethnicity, the highest educational level of women, the current employment status of women, age at first marriage, and the status of family planning. It has found that the most pronounced differential in the mean number of CEB among currently married women aged 15 to 49 years old was observed between the group of age at first marriage of women. In terms of the mean completed family size among women aged 45 to 49 years old, however, the difference between the states was the most obvious. On the other hand, the least pronounced differential in the mean number of CEB has occurred across the current employment

status of women, which is true for women aged 15 to 49 years old and women aged 45 to 49 years old. Non-parametric tests such as Mann Whitney U test, Spearman's Rho Correlations test, and Kruskal-Wallis H test were conducted to test the significance of fertility differentials by selected socio-economic and demographic variables. The results from this study found that all socio-economic and demographic variables, age group, stratum, state, ethnicity, the highest educational level of women, age at first marriage and the current employment status of women, have significant effects on the number of CEB among currently married women aged 15 to 49 years old in Malaysia.

Based on the outcome of compare mean bivariate analysis, the mean number of CEB has been increasing across the reproductive age groups of women. However, the pace of increment in the number of CEB has been relatively slow after the age group of 30 to 34 years old. With this result, it is assumed that this is partly due to the fact that women's fecundity to decline from age 35 years old and decreases more rapidly after the age of 40 years old. This is consistent with the study proposed by Maheshwari et al. (2008). In addition to the fecundity of women, another reason could be that the desire of women to have a child declines with age and decreases as they actually have children. Furthermore, fertility differential is significant across the states in this study which is consistent with the earlier researches (Bose, 2007; Alagarajan & Kulkarni, 2008; Dharmalingam, Rajan, & Morgan, 2014) that the vast differences in fertility level were due primarily to the diversity of social, cultural, political, economic and relative behaviors in different geographical locations. The finding shows that Malay-dominant states such as Kelantan and Terengganu exhibited the most extensive family size. On the opposite, F.T Putrajaya and F.T Kuala Lumpur, which are more urbanized, have the smallest mean completed family size. It is identical to the study of Tey (2002).

The analysis on stratum in this study shows that the women live in the rural areas tend to have a considerably larger family size than do those in urban areas, which entirely matched with the prior studies (Tey, 2002; Hank, 2002; Gubhaju, 2007; Guo et al., 2012). In general, the differentials in the number of CEB between urban and rural women have increased with age group. This indicates that women in urban areas were more likely to stop giving birth at a younger age than their rural counterparts. Moreover, the analysis of scatter plots showed that the status of family planning was not the cause of the significant urban-rural difference in family size due to the very close rate of contraceptive use between urban and rural women. However, this result is different from the research conducted by Alemayehu, Haidar, and Habte

(2010). Alemayehu, Haidar, and Habte pointed out that the main cause of urban-rural difference was that women living in urban regions are more prompt to adopt family planning. The findings of this study indicate that the family planning services have impregnated urban as well as rural regions, allowing women living in rural regions just as likely as their urban counterparts to adopt contraception to restrict their childbearing. As rural women in the sample generally married earlier than urban women, the significant urban-rural difference in the number of CEB is at least partly the result of differences in age at first marriage.

Comparing within the ethnic groups in Malaysia, the results demonstrated that the overall mean number of CEB among Bumiputera women was substantially higher than that of the Chinese and Indian women. Tey (2002) and Morgan et al. (2002) stated that Malays tend to get married early and seldom adopting contraception as compared to other ethnic groups due to a stronghold on Islamic belief. It is totally matching with the results of this study. Moreover, although the TFRs and ASFRs of Chinese women have been lower than that of the Indian women in recent decades, the overall mean number of CEB of Indian women in the sample was lower than that of the Chinese women. On the one hand, Chinese women have the largest mean age at first marriage and the highest CPR across ethnic groups. Interestingly, although the mean age at first marriage of Chinese women was the oldest, in contrast with the other two ethnic groups, many Chinese women already had comparatively large family size at a younger age, especially before the age of 30 years old, while Bumiputera women were more likely to expand their family size at an older age.

Education is one of the most critical factors in explaining the variation in fertility behavior as it exerts a significant adverse effect on the number of CEB across women's reproductive age groups in the sample. As expected, the increase in the highest educational attainment of women caused an increase in the mean age of first marriage which has led to a reduction in family size, similar to the outcomes obtained in previous studies (Kaplan and Lancaster, 2000; Goldin, 2004; Jones, 2012; Tey, Ng, & Yew, 2012; Tang and Tey, 2017). Better educated women tend to be more knowledgeable, better informed, more willing to work outside their home setting, and conscious of their and their children's wellbeing, all of which are inversely related to their desire to have more children.

Scatter plot analysis of CPRs across women's education levels reveals interesting patterns. Although the better-educated women had significantly fewer mean number of CEB than lesser educated women, the CPR among women with

primary education level or no schooling was higher than that of those with secondary or pre-university education level. On the other hand, tertiary education has the highest rate of contraceptive use. The results on CPRs between primary education or no schooling women and secondary education or pre-university education women opposed to the study proposed by Adhikari (2010). The possible explanation could be that women with primary education or no schooling were more likely to get married at a young age and to use contraceptives when they meet or surpass the desired number of children they intend to have. Conversely, women with at least tertiary education are most likely to adopt contraception to postpone their childbirth to a later age in order to focus on their profession.

Moreover, the current employment status of women is described as a significant variable in explaining the differentials in fertility, which contradicts the analysis of Abdullah and Bakar (2011) that there is an insignificant relationship between women's employment status and fertility. The results from this paper revealed that women who are currently working appear to have a smaller family size and delay marriage relative to women who were not working, and this is true at all reproductive age group of women. This is in line with the classical economic theory of fertility, in which fertility will increase only when direct and indirect costs incurred for raising a child are reduced. The opportunity cost of childbearing for working women is rather high as they are unable to work to better care for their children. Besides, the attractiveness and efficiency of implemented family-friendly policies or their schemes were poor in Asian countries (Abbasi-Shavazi & Gubhaju, 2014). Another interesting discovery from this research was that the CPR among non-working women in the sample was higher than that of working women. This indicates that non-working women also tend to use any form of contraception to restrict the number of children they can have. Hence, this suggests that there is no relationship between the use of contraceptives and the current employment status of women in determining women's fertility behavior.

The mean number of CEB decreased monotonically along with the increment of women's age at first marriage, which implied that women who married early were likely to have a larger family size than their counterparts. This result is the same as the outcomes of Abdul Jemain and Ghani (2003), Bakar and Abdullah (2007), and Jones (2012). Delayed marriage provides women with more flexibility to pursue their profession and thereby boost their personal and family wellbeing. Not only does early marriage indicates a woman's joining a sexual union and start giving birth, but it can also be a significant indicator of the status of a woman, as the older the wife is when

she gets married, the more likely that she has completed school or worked before, and more opportunities for her to develop a more equitable relationship with her spouse

Age at first marriage of a woman is strongly associated with contact with urbanization, ethnicity, current employment status of women, and the highest education level of women. By comparing the mean age at first marriage among these four variables, the results revealed that urban women, Chinese women, better-educated women as well as working women were more likely to have delayed marriage. In this study, the mean age at first marriage varied from 20.3 years old to 25.3 years old, which can be observed between women with primary education or no schooling and those with tertiary education. Referring to the scatter plot analysis of the CPR, it has found that the negative relationship between the mean number of CEB and the CPR is only the case across ethnic groups.

In a nutshell, the fertility rates among all major ethnic groups in Malaysia have continued to decline sharply over the past decade while the below-replacement fertility rates achieved in Malaysia have left national with the problem of rapid population aging. The most significant differential in the overall mean number of CEB was observed between the group of age at first marriage of women, whereas the categories of the current employment status of women have the smallest difference in the mean number of CEB. In recent years, the growth of higher learning education in Malaysia and the increase in women's access to education has fuelled the fertility gap. On the other hand, the lack of urban-rural differentials in fertility was primarily due to the effective introduction and expansion of family planning services in both urban and rural regions. Analysis of the 2014 MPFS data reveals that all of the selected socio-economic and demographic variables significantly affect the fertility behavior of currently married women aged 15 to 49 years old in Malaysia.

5.3 Recommendations of Study

As the proposed population and family development programs must take into account the monitored demographic trends and changes, policymakers need to have a deeper understanding of the nature of fertility as well as the factors that affect fertility behavior. The continuing decline in fertility has raised concerns over labor shortages as well as the inadequacy of the current social protection system to accommodate a rapidly aging population. Some vital policy recommendations can be drawn from the

results of this paper in order to cope with the rapid structural changes in Malaysia's society, such as establishing an aging-friendly healthcare system, providing more employment opportunity for the elderly, re-visit the population policy to slow down the fertility declines and promoting more empirical research in Malaysia.

The rapid urbanization process and shrinking family size have led to the erosion of family and social support for the elderly. At present, health care policies such as the growing privatization of health services are also do not extend beyond the scope of retirement, which gradually leaves the elderly behind. In the near future, the rapidly growing elderly population will put significant pressure on the national medical system, the Malaysian government must establish an aging-friendly healthcare system that focuses on prevention rather than expensive hospital care. In addition to constructing and improving health care centers, more geriatricians should be trained.

Given that the cost of living is projected to rise in the following years, the public and private sectors should find the solutions by providing more employment opportunities for the elderly. It is generally agreed that allowing healthy and experienced older workers to stay longer in the workforce is the most feasible way to address the fiscal challenges associated with population aging. This is mainly due to encouraging longer careers among senior citizens would generate more private resources for retirement and provide the government with more income tax revenues. At the same time, owing to older employees' expertise and experience, they can be valuable to organizations and younger colleagues.

Moreover, the culture of many companies in Malaysia remains unfriendly to the employee who prioritizes family over corporate responsibility, which makes women more reluctant to have children that may threaten their career prospects. The government should review the population policies and seek for solutions in order to allow women in the labor force to combine their work with the role of maternity, which could, in turn, slow down the fertility declines in Malaysia. Apart from that, financial support such as tax rebates for childbirth should be increased, and support services such as nurseries should be given at the workplace.

Lastly, identifying the best way of tackling the challenges of population aging will take investment in the more empirical study. More empirical research from various perspectives needs to be promoted in order to have reliable findings that can directly be translated into detailed and coherent policies and social strategies that will meet not only the needs of today's aging adults but also the future of all Malaysians.

5.4 Limitations of Study

This research is subject to some limitations. First of all, this study is constrained by data availability. In this study, the secondary data from the 2014 MPFS was used to analyze fertility differentials in Malaysia. The 2014 MPFS is the latest series of surveys carried out by the NPFDB every ten years since 1974. Hence, all analyses in this paper can only be performed based on data collected in 2014. In the past five years, many demographic and socio-economic changes may have occurred.

Furthermore, due to the cross-sectional design of the study, this study can only identify characteristics that exist in the population and provide proof of a statistical association between selected independent variables and the number of CEB, but not the causality. It can only be used to infer possible relationships and collect preliminary data to support further experimentation. Therefore, non-parametric tests were used to test the significance of the relationship between variables.

Last but not least, since the number of CEB includes the number of children born up to a specific point within the reproductive years of a woman, it is plagued by truncation and censorship issues. Consideration should be given to other possible significant errors in the collected information on the number of CEBs. This is because women are likely to miss out on some of their children they gave birth to, especially children who reside in other communities and who have passed away.

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