RECENT FERTILITY AND ITS PROXIMATE DETERMINANTS IN 3 ASEAN COUNTRIES

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ABSTRACT

Cambodia, Indonesia and the Philippines are three out of the four Association of Southeast Asian Nations (ASEAN) countries whose fertility remained above replacement level. Within each country, fertility varies widely across socio-economic sub-groups, resulting mainly from differentials in age at marriage and contraceptive use. Low fertility has resulted in population ageing and labor shortage, giving rise to growing concerns. A better understanding of fertility dynamics is therefore needed to inform policy. This thesis seeks to analyze fertility differentials between Cambodia, Indonesia and the Philippines, and fertility differentials and factors affecting childbearing in each of the three countries. Data for this thesis are taken from the latest Demographic and Health Survey (DHS) in each country under study. DHS covered married women aged 15-49 and collected information on place of residence, couple's education, couple's work status, wealth index, women's household decision-making autonomy, and their attitude towards wife beating by husband. All these were used as predictors of the number of children ever born (CEB). This thesis also studies the association between socio-economic variables and the two main proximate determinants of fertility - age at first marriage and contraceptive use. Bongaarts' model was used to examine the effects of marriage postponement and contraceptive use on fertility. Results from Negative Binomial Regression analysis show that women employed in the non-agricultural sector and wealth index are inversely related to CEB in all three countries after controlling for other variables, women's age and duration of first marriage. Couple's education are negatively correlated with CEB in Cambodia and the Philippines. Disagreeing with wife beating led to fewer children among Indonesian women. The following variables correlate positively with CEB in the multivariate context, which are incongruent with findings from past studies: urbanization in the Philippines, husband's education and employment in

Indonesia. Delayed marriage and contraceptive use are the two most important proximate determinants of fertility in all three countries. The effects of socio-economic variables on childbearing are mainly mediated through these two variables, although there are some anomalies across sub-groups in each country. Family planning efforts differ widely across countries, and this has resulted in different level of contraceptive use. Within each country, the differential response to family planning program among socio-economic sub-groups has brought about wide variation in contraceptive use, and hence the fertility differentials. Findings from this thesis show that the fertility behavior in a fast changing world needs to be examined from new perspectives. Emphasis should now be placed on the opportunity costs of childbearing and childrearing, and the lack of childcare support for working women. There is also a need to have more refined composite indicators such as the role of men. One significant finding from this thesis is that the poor in all three countries tend to have more children than those who are better off, which may perpetuate the poverty cycle. Hence, it is necessary to step up the information, education and communication activities and to ensure equal access to contraceptive services to allow couples to plan childbearing accordingly.

ABSTRAK

Kemboja, Indonesia dan Filipina adalah tiga daripada empat negara ASEAN yang masih mempunyai fertiliti di atas paras penggantian. Di negara masing-masing, fertiliti berbeza dengan ketara di antara kumpulan sosio-ekonomi, yang disebabkan oleh perbezaan dalam umur perkahwinan dan penggunaan kontraseptif. Fertiliti yang rendah telah menyebabkan penuaan penduduk dan kekurangan tenaga kerja, dan aliran ini adalah amat membimbangkan. Maka, kefahaman yang lebih mendalam mengenai dinamik fertiliti adalah diperlukan untuk penggubalan dasar. Tesis ini bertujuan untuk menganalisa perbezaan fertiliti di antara Kemboja, Indonesia dan Filipina, dan juga perbezaan fertiliti serta faktor yang mempengaruhi tahap kelahiran di setiap negara. Data untuk tesis ini diperolehi dari DHS yang terkini di setiap negara dalam kajian ini. DHS meliputi wanita berkahwin dalam lingkungan umur 15-49 tahun dan mengumpul maklumat mengenai tempat kediaman, tahap pendidikan responden dan suami, status pekerjaan responden dan suami, indeks kekayaan, autonomi wanita dalam membuat keputusan rumah tangga, dan persepsi mereka terhadap justifikasi untuk suami memukul isteri. Semua variabel ini digunakan sebagai peramal bilangan anak yang dilahirkan. Tesis ini juga mengkaji hubungan antara variabel-variabel sosio-ekonomi dan dua penentu yang mempengaruhi fertiliti secara langsung - umur perkahwinan pertama dan penggunaan kontraseptif. Model Bongaarts digunakan untuk menilai kesan penangguhan perkahwinan dan penggunaan kontraseptif ke atas fertiliti. Hasil dari analisis Regresi Negatif Binomial menunjukkan bahawa wanita yang bekerja dalam sektor bukan pertanian dan indeks kekayaan mempunyai perkaitan songsang dengan bilangan anak yang dilahirkan di ketiga-tiga negara selepas mengambil kira variabel lain, umur wanita dan tempoh perkahwinan pertama. Tahap pendidikan responden dan suami mempunyai perkaitan negatif dengan bilangan anak di Kemboja dan Filipina. Wanita Indonesia yang

tidak setuju dengan keganasan rumah tangga mempunyai bilangan anak yang lebih kecil. Variabel-variabel berikut berkorelasi positif dengan bilangan anak yang dilahirkan dalam konteks multivariat, dan didapati bercanggah dengan keputusan yang diperolehi daripada kajian yang lepas: perbandaran di Filipina, tahap pendidikan dan pekerjaan suami di Indonesia. Kahwin lewat dan penggunaan kontraseptif merupakan dua penentu langsung yang paling penting di ketiga-tiga negara. Kebanyakan kesan variabel sosio-ekonomi ke atas tahap kelahiran adalah melalui kedua-dua penentu terhampir ini, walaupun terdapat beberapa kejanggalan antara sub-kumpulan di setiap negara. Usaha perancangan keluarga adalah berbeza di antara negara, dan ini telah menyebabkan tahap penggunaan kontraseptif yang berlainan. Di negara masing-masing, sambutan terhadap program perancangan keluarga yang berbeza di kalangan sub-kumpulan sosio-ekonomi telah membawa kepada perbezaan yang ketara dalam penggunaan kontraseptif, dan seterusnya perbezaan fertiliti. Penemuan dari tesis ini menunjukkan bahawa tingkah laku fertiliti dalam dunia yang berubah dengan pantas perlu dikaji dari perspektif yang baru. Penekanan kini harus diletakkan pada kos lepas untuk melahirkan anak dan pengasuhan anak, dan kekurangan sokongan pengasuhan anak bagi wanita yang bekerja. Petunjuk-petunjuk komposit yang lebih terperinci seperti peranan lelaki juga diperlukan. Satu penemuan yang signifikan dari tesis ini ialah golongan miskin di ketiga-tiga negara cenderung mempunyai bilangan anak yang lebih banyak daripada mereka yang kaya, yang boleh mengekalkan kitaran kemiskinan. Oleh itu, peningkatan aktiviti untuk menyebarkan maklumat, pendidikan dan komunikasi adalah diperlukan serta pemastian akses kepada perkhidmatan kontraseptif yang sama rata untuk membolehkan semua pasangan merancang kelahiran anak dengan sewajarnya.

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LIST OF SYMBOLS AND ABBREVIATIONS

Symbols

r	Ghe
α	Alpha
μ	Mu
ε	Epsilon
β	Beta
S.E.	Standard error

Abbreviations

ANOVA	One-way Analysis of Variance
ASEAN	Association of Southeast Asian Nations
ASFR	Age-Specific Fertility Rate
BKKBN	National Family Planning Coordinating Board
CB	Census Block
CDHS	Cambodia Demographic and Health Survey
CDR	Crude Death Rate
CEB	Children Ever Born
CPR	Contraceptive Prevalence Rate
DHS	Demographic and Health Surveys
EA	Enumeration Area
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
GDI	Gender-Related Development Index
GDP	Gross Domestic Product
GEM	Gender Empowerment Measure
GII	Gender Inequality Index
GNI	Gross National Income
HDI	Human Development Index
ICF	Inner City Fund
ICPD	International Conference on Population and Development
IDHS	Indonesia Demographic and Health Survey
IMR	Infant Mortality Rate
IPPA	Indonesian Planned Parenthood Association
IRR	Incidence Rate Ratio
KMO	Kaiser-Meyer-Olkin
MOH	Ministry of Health
MOP	Ministry of Planning
NDHS	Philippines National Demographic and Health Survey
NGO	Non-Governmental Organization
NIS	National Institute of Statistics
PCA	Principal Component Analysis

PoA	Program of Action
SMAM	Singulate Mean Age at Marriage
TF	Total Fecundity Rate
TFR	Total Fertility Rate
TM	Total Marital Fertility Rate
TN	Total Natural Marital Fertility Rate
UN	United Nations
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development

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CHAPTER 1: INTRODUCTION

The end of the Second World War witnessed a period of reconstruction accompanied by post war baby boom. The large number of babies born in the 1950s and 1960s set the momentum and trend of rising fertility in the following decades. Rapid population growth amidst economic recession in the 1960s gave rise to concern over the negative implications of rapid population growth on socio-economic development. Hence, many developing countries started to implement family planning programs in 1960s, with international assistance. Since then, the fertility level has been declining. Many developing countries, notably in Asia, have achieved below replacement level fertility in a relatively short period. Be that as it may, the world population has increased from 6 billion to a little more than 7 billion today in less than two decades. Asia is home to 60 percent of the world population, and hence it is important to have a better knowledge of the changing fertility behavior in Asia as it would have significant impact on world population growth, which is projected to increase to 9 billion or even 11 billion in 50 years. The growth momentum of the global population remains considerable, and it would put great pressure on the natural resources to support such a big population. In view of the gravity of the problem, the United Nations (UN) has set revitalizing family planning as the main theme for the celebration of World Population Day in 2013, to bring down the fertility in countries where the level is still high. Hence, fertility research should continue to be accorded high priority, for the global community to monitor the growth of the world population. The lessons from Southeast Asia can be applied to other regions where the fertility level is still very high, as in the case of Africa. This study aims to shed some light on factors affecting the divergence in fertility transition among three Southeast Asian countries, namely Cambodia, Indonesia and the Philippines, which have very different religious and socio-cultural settings.

1.1 Country Profiles

1.1.1 Cambodia

Cambodia is an agricultural country situated in Southeast Asia, with a total land area of 181,035 square kilometers. The population of Cambodia increased by more than 69 percent from 9.1 million in 1990 to 15.4 million in 2014, despite the deceleration in the rate of population growth from 3.3 percent in 1990 to 1.8 percent in 2014. According to the UN Economic and Social Commission for Asia and the Pacific (ESCAP), Cambodia is the least urbanized country in Southeast Asia, with the level of urbanization increasing from 15.5 percent in 1990 to 20.5 percent in 2014, or an increase of about 1.7 million urban population (ESCAP, 2014a). The 2014 Cambodian Demographic and Health Survey (DHS) reported a population density of 75 per square kilometer, and the average household size was 4.7 (National Institute of Statistics, Directorate General for Health & ICF International, 2015). The population of Phnom Penh, the capital and largest city in the country, was 1.6 million in 2011 (UN Statistics Division, 2015).

The Khmer form 90 percent of the Cambodia's total population, along with the minority ethnic groups of Cham (or Khmer Muslim), Chinese, Vietnamese, Indian, Thai and others. Khmer is also the official language of the country. Most Cambodians are Buddhist, with Muslim and Christian as the minorities (National Institute of Statistics, Directorate General for Health & ICF International, 2015).

Cambodia emerged from decades of civil war and economic stagnation in the early 1990s to begin its socio-economic transformation. The World Bank classified Cambodia as a low income country (World Bank, 2015a), and the UN classified her as a medium human development country, with a Human Development Index (HDI)[1] of 0.584 in 2013 (UN Development Programme, 2014). Among the three countries in this study, Cambodia has the lowest Gross Domestic Product (GDP) per capita (USD 1,006.84) and Gross National Income (GNI) per capita (USD 950.00) at current price of US Dollars in 2013 (World Bank, 2015b). Cambodia also has the highest percentage of the population living below poverty line, with 18.6 percent living on less than USD 1.25 a day in 2009 (ESCAP, 2014a).

Improvements in health services and standard of living in Cambodia have led to reduction in mortality, resulting in longer life expectancy. Between 1990 and 2014, the crude death rate (CDR) has decreased from 12.4 per thousand population to 6.0 per thousand population, while infant mortality rate (IMR) has fallen from 85.6 per thousand live births to 38.4 per thousand live births (ESCAP, 2014b; World Bank, 2015b). Consequent upon mortality decline, life expectancy among the Cambodian males and females has improved from 54.2 years and 57.2 years in 1990-95 to 69.4 years and 74.9 years respectively in 2014 (ESCAP, 2012; 2014b). Following the launching of the family planning program, the total fertility rate (TFR) has fallen by 50 percent from 5.6 children per woman in 1990 to 2.8 in 2014. However, the fertility level in Cambodia is still one of the highest in Southeast Asia (ESCAP, 2014a).

[1] HDI refers to a composite index measuring average achievement in three basic dimensions of human development, which include a long and healthy life, knowledge and a decent standard of living.

The combined gross enrolment rate for secondary education in Cambodia had increased from 28.2 percent in 1991 to 45.0 percent in 2008, while the combined tertiary gross enrolment rate had improved tremendously from 0.6 percent in 1990 to 15.8 percent in 2011. The much improved enrolment rate in secondary and tertiary education has been accompanied by reduction in gender inequality in education, with the ratio of female to male improving from 0.54 in 1998 to 0.85 in 2008 at the secondary level, and from 0.21 in 1993 to 0.61 in 2011 at the tertiary level (World Bank, 2015b).

Socio-economic development has brought significant changes in the occupational structure. As of 2013, a total of 8.6 million workers in Cambodia were employed in various sectors. The labor force participation rate in the country had increased from 80.1 percent in 1990 to 82.5 percent in 2013 (World Bank, 2015b). Over the past few decades, the employment structure has gradually shifted from agricultural to industrial and services sectors. The proportion of workers in the agricultural sector had declined from 73.7 percent in 2000 to 51.0 percent in 2012. More Cambodian joined the industrial sector as the percent of total employment in industry have increased from 8.4 percent to 18.6 percent, while the employment in services have increased from 17.9 percent to 30.4 percent between 2000 and 2012 (World Bank, 2015b).

While female labor force participation rate had improved slightly from 76.8 percent in 1990 to 78.8 percent in 2013, their share of labor force had declined slightly from 51.2 percent to 49.9 percent during the same period. In 2012, 52.8 percent of the Cambodian working women were in the agricultural sector, 18.1 percent in the industrial sector and 29.1 percent in the services sector (World Bank, 2015b).

Cambodian women have limited rights to participate equally as men in social and political spheres. High rate of illiteracy is probably one of the main reasons for the prevalence of gender-based violence in the country. Since 2001, in keeping with the recommendations of the Committee on the Elimination of Discrimination against Women, gender equality efforts to improve the condition for women, with the strengthening of women empowerment programs by the national women's ministry and council, have made significant progress (The Cambodian National Council for Women, 2015). As of 2013, Cambodia was ranked 105 out of 152 countries in Gender Inequality Index (GII),[2] with a score of 0.505, the second highest in Southeast Asia, after Laos (0.534) (UN Development Programme, 2014).

In Cambodia, family planning services and modern contraceptive methods became available in 1991, under a program funded and managed by international non-government organizations (Walston, 2005). The scale of the program at its initial stage was small and insufficient to raise public awareness of these services. Soon after the 1994 International Conference on Population and Development (ICPD) in Cairo, the Royal Government of Cambodia received support from the United Nations Population Fund (UNFPA) to implement its own family planning program, with the introduction of services at health centers, family planning education, and training of public health sector personnel (Walston, 2005). In the same year, the family planning program was incorporated into the National Reproductive Health Program under the supervision of the Maternal and Child Health department of the Cambodian Ministry of Health (MOH), making the program a priority intervention in the country's health strategy (Sreytouch, 2010). The endorsement of Birth Spacing Policy for Cambodia by the MOH has given the much

[2] GII is used to measure women's disadvantage based on three dimensions: the reproductive health (measured by maternal mortality ratio and the adolescent fertility rate), women empowerment (measured by the share of parliamentary seats held by each sex and by secondary and higher education attainment levels) and women's participation in the work force. A high value indicates high inequality between women and men.

needed impetus to the provision and use of a variety of family planning services in health centers across Cambodia (Walston, 2005). The MOH has attempted to promote a full range of contraceptive methods, and most have become widely available in the urban areas. The family planning program was pronounced as a priority strategy in the first set of goals to be developed by the National Health Strategic Plan 2008-2015 (Sreytouch, 2010).

1.1.2 Indonesia

Indonesia consists of approximately 17,000 islands, with a total land area of about 1.9 million square kilometers. The country is administratively divided into 33 provinces, and each province is subdivided into districts, municipalities, sub-districts and villages (Badan Pusat Statistik & Macro International, 2008). There are about 300 ethnic groups in Indonesia, with Javanese and Sundanese each making up about 45 percent and 14 percent of the total population. Each ethnic group has its own dialect, but Bahasa Indonesia is the official language of the country. Although Indonesian population is predominantly Muslim (making up about 88 percent of the total population), other religions such as Christianity, Buddhism and Hinduism are formally recognized by Indonesian government (Expat Web Site Association Jakarta Indonesia, 2015).

Indonesia is the fourth most populous country and largest Muslim state in the world. The population of Indonesia had increased from 178.6 million in 1990 to 252.8 million in 2014, and this makes up almost 40 percent of the population in Southeast Asia (ESCAP, 2014a). The population of Indonesia is widely scattered across the islands and provinces. The island of Java and the neighboring islands of Madura and Bali are homes to 59 percent of the country's population, despite covering only 7 percent of Indonesia's total land area,

making Java as one of the most densely populated island in the world. In contrast, vast areas of other parts in the country such as Papua and Sulawesi have low population density. Jakarta, the capital city of Indonesia, has a population of 10.2 million in 2011 (Expat Web Site Association Jakarta Indonesia, 2015).

Over the past three decades, socio-economic progress and the successful implementation of national family planning program have led to the slower population growth in Indonesia. The annual rate of population growth has declined from 1.8 percent to 1.2 percent between 1990 and 2014, and the urbanization level has increased significantly from 30.6 percent to 53.0 percent during the same period (ESCAP, 2014a).

Indonesia has adopted proactive measures to stimulate economic development, eradicate poverty and alleviate unemployment. The country was classified as lower middle income country (World Bank, 2015a), with medium HDI of 0.684 in 2013 (UN Development Programme, 2014). Indonesia is also credited as one of the "rise of the South" countries that has made rapid advances over the past 20 years (ESCAP, 2012; UN Development Programme, 2013). The GDP per capita and GNI per capita at current price rose from USD 640.57 and USD 620.00 in 1990 to USD 3,475.25 and USD 3,580.00 respectively in 2013, and this is the highest among the three countries in this study (World Bank, 2015b). However, as of 2011, about 16.2 percent of the Indonesian population still lived on less than USD 1.25 a day (ESCAP, 2014a).

Indonesia introduced a new health paradigm in 1998 to emphasize on health promotion and prevention rather than on curative and rehabilitative services (World Health Organization, 2009). Since then, there has been significant decline in mortality and improvement in life expectancy. The CDR in Indonesia has been decreasing from 7.8 per

thousand population in 1990 to 6.2 per thousand population in 2014. During the same period, the IMR has declined from 62.0 per thousand live births to 24.7 per thousand live births (ESCAP, 2014b; World Bank, 2015b). Between 1990-95 and 2014, life expectancy among Indonesian males and females had increased from 61.5 years and 64.7 years to 69.0 years and 73.1 years respectively (ESCAP, 2012; 2014b). Indonesia's TFR has dropped from 3.1 children per woman in 1990 to 2.3 in 2014 (ESCAP, 2014a).

Female enrolment in school was relatively low up until 1980s, partly due to gender inequality in the country. Since then, Indonesian government has made considerable headway in providing education to all citizens. The amended Indonesian Constitution 1945 allowed all citizens to follow state-funded basic education program. Consequently, the educational attainment of Indonesians has risen significantly at all levels, more so among the females. Between 1990 and 2012, the combined gross enrolment rate for secondary education and tertiary education had increased from 47.3 percent and 8.5 percent to 82.5 percent and 31.5 percent respectively. Amidst educational improvement, the ratio of female to male secondary and tertiary enrolment had increased from 0.81 and 0.66 in 1993 to 1.03 at both levels in 2012 (World Bank, 2015b).

Since 1960s, the Indonesian economy has been expanding and undergoing structural transformation, shifting from agriculture to manufacturing and services. As of 2013, a total of 120.3 million workers in Indonesia were employed in various sectors. The labor force participation rate in the country had increased slightly from 65.5 percent in 1990 to 67.7 percent in 2013. The proportion of workers in the agricultural sector had declined from 55.9 percent in 1990 to 35.1 percent in 2012. Correspondingly, more Indonesian workers joined the industrial and services sectors, increasing from 13.7 percent and 30.2

percent to 21.7 percent and 43.2 percent respectively during the same period (World Bank, 2015b).

The rising level of education has led to greater female participation in the labor force in the modern sector. However, the overall female labor force participation rate in Indonesia rose only slightly from 50.2 percent in 1990 to 51.4 percent in 2013. Between 1990 and 2012, the proportion of employed women in the services and industrial sectors had increased from 31.1 percent and 12.4 percent to 49.5 percent and 16.0 percent respectively, with a corresponding decrease in the agricultural sector from 56.3 percent to 34.5 percent (World Bank, 2015b).

Women have equal rights as men under the Indonesian law. However, in practice, while household duties and childrearing are seen to be women's responsibility, most households are headed by the males and women have limited access to their rights in the society. Discrimination against women is even made into law by local authorities in the less developed provinces (Nazeer, 2013). With a GII score of 0.500, Indonesia was ranked 103 out of 152 countries in terms of gender equality (UN Development Programme, 2014).

The family planning activities were first carried out by the Indonesian Planned Parenthood Association (IPPA) in 1957, a non-governmental organization (NGO) under the management of the International Planned Parenthood Federation (Badan Pusat Statistik & Macro International, 2008). IPPA has been supplying contraceptive services to women through a group of private clinics in urban areas (Hull, 2007). In 1968, the Indonesian government launched the national family planning program to slow down the rate of population growth. The Family Planning Institute was established in the same

year, which was restructured as Badan Kordinasi Keluarga Berencana Negara (BKKBN - which means National Family Planning Coordinating Board) in 1970 (Badan Pusat Statistik et al., 2013). The basis for family planning was modified to suit local conditions because of cultural and religious sensitivities and has been adjusted within the context of increasing family wealth through fertility reduction (Herartri, 2005). Since 1970, the Indonesian government has been strongly committed to promote and implement family planning activities with the involvement of religious and community leaders. For the next 30 years, the family planning program was successful in improving family welfare and lowering fertility rate (Badan Pusat Statistik & Macro International, 2008). In 1999, the family planning program was privatized as part of the processes of decentralization of the governance system. The reformed system was expected to improve family welfare by mobilizing the public to participate in family planning programs (Badan Pusat Statistik & Macro International, 2008). However, as BKKBN no longer has authority over regional governments on family planning at the local level, the decentralization policy has changed the management of family planning program and resulted in the stagnation of contraceptive use (Rahayu, Utomo & McDonald, 2009).

1.1.3 Philippines

The Philippines comprises more than 7,100 islands, with a total land area of over 300,000 square kilometers. The country has 17 administrative regions in three divisions, namely Luzon, Visayas and Mindanao. In 2014, the population of the Philippines stood at 100.1 million, an increase of 62 percent from 61.9 million in 1990. However, the annual population growth rate has declined slightly from 2.5 percent in 1990 to 1.7 percent in 2014 (ESCAP, 2014a). More than half of the population resides in Luzon Island, and about 20 percent of the national population is in metropolitan Manila, where

the national capital is located. With a population density of 322.4 persons per square kilometer in 2012, the Philippines is the second most densely populated country in the Association of Southeast Asian Nations (ASEAN) region, behind Singapore. Between 1990 and 2013, the urbanization level has increased from 48.6 percent to 49.4 percent (ESCAP, 2012; 2013).

The Philippines' governmental structure is based on the local government units. The provinces make up the major administrative structure, and these are subdivided into cities, municipalities and barangays. The regions are homogenous within and heterogeneous across with respect to vernacular language, ethnicity, socio-cultural traits, economic activities and other characteristics.

Tagalog and Cebuano are the two main ethnic groups in the Philippines. English is the official language used in the government, education and business, but most citizens speak a variety of native languages that are unintelligible to the others. Whilst Roman Catholic is the dominant religion in the country, religious freedom is guaranteed by the Constitution of the Philippines (National Statistics Office [Philippines] & ICF Macro, 2009).

Philippines was classified as a lower middle income country by the World Bank (World Bank, 2015a), and a medium human development category, with a HDI of 0.660 in 2013 (UN Development Programme, 2014). The GDP per capita and GNI per capita (at current price) increased from USD 715.30 and USD 720.00 to USD 2,765.08 and USD 3,270.00 respectively between 1990 and 2013 (World Bank, 2015b). In 2009, about 18.4 percent of the Filipinos lived on less than USD 1.25 a day (ESCAP, 2014a), and the incidence of poverty is much higher in the rural areas as compared to the urban areas.

The health status of the Philippines has shown significant improvement, with the CDR and IMR decreasing from 6.6 per thousand population and 41.1 per thousand live births in 1990 to 6.0 and 20.5 respectively in 2014 (ESCAP, 2014b; World Bank, 2015b). Consequent upon mortality decline, life expectancy of Filipino males and females rose from 62.8 years and 68.5 years in 1990-95 to 65.5 years and 72.4 years respectively in 2014 (ESCAP, 2012; 2014b). The maternal mortality rate in the Philippines at 120 per 100,000 births in 2013 is much lower than that of Cambodia (170) and Indonesia (190) (ESCAP, 2014b), but considerably higher than that of Singapore and Malaysia. Currently, the fertility level in the Philippines is the highest in the ASEAN region, although it has declined from 4.3 to 3.0 children per woman between 1990 and 2014 (ESCAP, 2014a).

The combined gross enrolment rate for secondary and tertiary education in the Philippines had increased from 72.0 percent and 24.6 percent in 1990 to 84.6 percent and 28.2 percent respectively in 2009. The female advantage over the male in secondary and tertiary enrolment has been diminishing since the 1970s, but women still fared better than men, with women outnumbering men by 108 to 100 at the secondary school and 124 to 100 at the tertiary level in 2009 (World Bank, 2015b).

In 2013, a total of 42.3 million workers were employed in various sectors. However, it is worth noting that the labor force participation rate among Filipino has remained practically unchanged since 1990, at about 65.0 percent. The Philippines economy has undergone significant structural changes, with a shift away from agriculture. The proportion of agricultural workers fell from 45.2 percent in 1990 to 32.2 percent in 2012, with a corresponding increase in the proportion of services workers from 39.7 percent to 52.5 percent during the same period, while the proportion of industrial workers had remained at about 15 percent (World Bank, 2015b).

As of 2013, Filipino women made up 39.6 percent of the labor force, a slight increase from 36.5 percent in 1990, on the back of an increase in female labor force participation rate, from 47.9 percent to 51.1 percent during this period. In 2012, more than two thirds of the Filipino working women were in the services sector, and about a quarter and one in ten worked in the agricultural and industrial sectors respectively (World Bank, 2015b). The ratio of estimated female to male earned income for the Philippines is 0.60, much higher than that in Malaysia (0.43) and Indonesia (0.42) (Hausmann et al., 2014).

The Philippines is a major exporter of laborers. An estimated nine million Filipinos, representing 10 percent of the total population, work abroad as maids, construction workers, seamen and professionals, sending home nearly USD 19 billion a year (My Sinchew, 2011). Between April and September 2014, women made up 50.5 percent of 2.3 million overseas Filipino workers, and more than half (54.6 percent) of the female overseas workers were aged between 25 to 34 years (Philippine Statistics Authority, 2015).

With a GII of 0.406, the Philippines was ranked 78 out of 152 countries in terms of gender equality, and they fared much better off than Laos (0.534), Cambodia (0.505), Indonesia (0.500) and Myanmar (0.430) (UN Development Programme, 2014). In 2012, Filipino women held 22.1 percent of the seats in the national parliament, as compared to about 18.0 percent each in Cambodia and Indonesia (UN Development Programme, 2013).

The family planning movement in the Philippines was initiated by NGOs prior to the Second World War. The growing awareness of the consequences of high fertility rate and rapid population growth in the 1960s prompted the Philippines government to adopt the national policy to reduce the population growth through the national family planning program. In 1968, the government started to implement the family planning program, utilizing the existing health infrastructure, such as rural health units, maternal and child health care centers and clinics in rural areas, government and private hospitals. International agencies also provided technical and financial assistance for the implementation of the family planning program (Herrin, 2007). The official family planning program was established by the Republic Act 6365 in 1971, with the setting up of the Commission on Population – a national agency in charge of population. Family planning clinics were set up by the Department of Health, especially in rural areas as a strategy to reduce population growth. However, the implementation of the family planning program in the Philippines encountered opposition from the Catholic Church over the use of contraceptive methods and sterilization. The government's commitment to fertility reduction was reversed in 1986 when the political influence of the leaders of the Catholic Church hierarchy reached its peak (Herrin, 2007). The Church's opposition has been a major impediment to the implementation of family planning program in the Philippines, and this partly explains the relatively low family planning efforts[3] and high fertility as compared to its neighboring countries.

[3] Family planning efforts were measured by an index comprises four items: policy activities, service activities, evaluation, and contraceptive methods accessibility.

The efforts of the national public family planning programs and the relative effects of family planning activities were captured by the family planning efforts index. The index is measured through four components, including policy and stage-setting activities, service and service-related activities, recordkeeping and evaluation, and availability and accessibility of fertility control methods (Ross & Smith, 2010). Among the three countries in this study, Indonesia scored the highest in family planning efforts and contraceptive use (Table 1.1). The family planning effort in the Philippines was found to be lower than that of Cambodia although the latter had only initiated family planning program much later, and this was reflected in the contraceptive prevalence rate.[4]

Table 1.1: Contraceptive prevalence rate and family planning efforts score by country

Country	CPR (base year)	CPR (latest)	Family Planning Efforts Score (2009)
Cambodia	12.6 (1995)	56.3 (2014)	55.8
Indonesia	8.6 (1973)	61.9 (2012)	59.9
Philippines	36.2 (1978)	55.1 (2013)	29.8

Note: CPR means contraceptive prevalence rate.
Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014); Ross & Smith (2010); UN (2012).

1.2 Fertility Trends and Patterns in Cambodia, Indonesia and the Philippines

1.2.1 Total Fertility Rate (TFR)

Over the past five decades, Cambodia, Indonesia and the Philippines have experienced substantial fertility decline. These three countries had high fertility in the 1960s and 1970s with a TFR of between 5 and 7 children per woman (Figure 1.1). While Cambodia recorded the highest fertility of 7 children per woman among the three countries in 1962,

[4] Contraceptive prevalence rate is the proportion of women in the reproductive age group who are using (or whose partner is using) a contraceptive method at a given point in time.

it has experienced a much more rapid fertility transition, to reach 2.7 in 2014. Indonesia has always had the lowest fertility among the three countries since 1970s, with 2.6 children per woman in 2011. Since the mid-1990s, fertility in the Philippines has gone below 4 children per woman, to reach 3.0 in 2012. In general, fertility rates in Cambodia, Indonesia and the Philippines had dropped by 61.4 percent (1962-2014), 45.8 percent (1973-2011) and 49.2 percent (1968-2012) respectively.

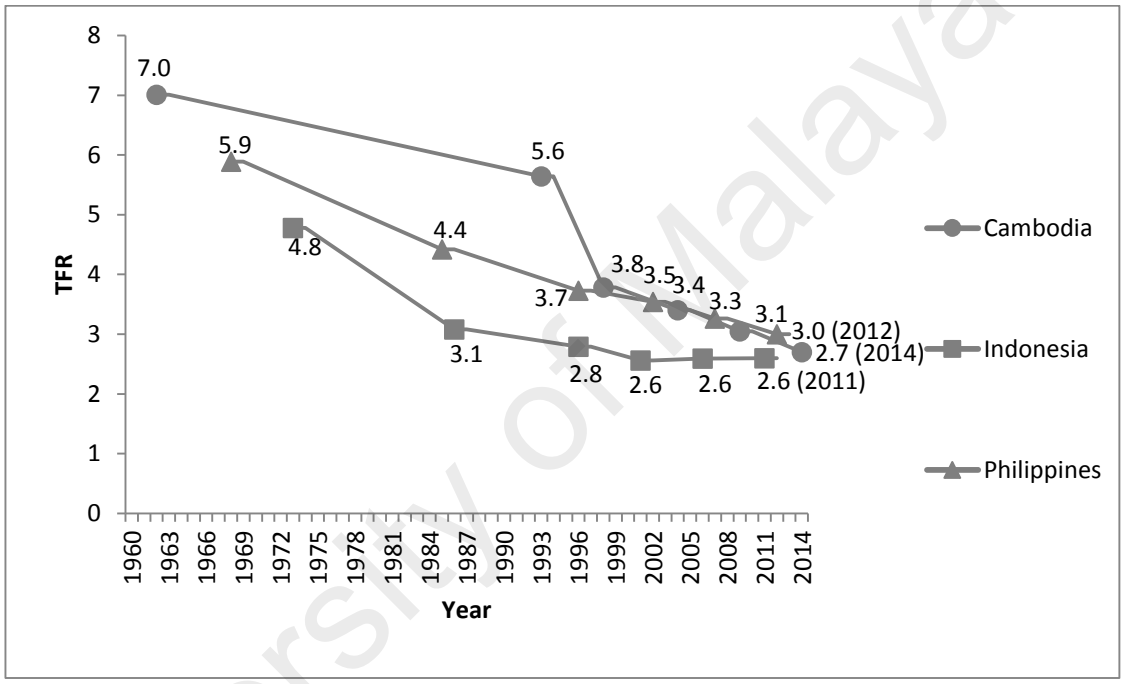

Figure 1.1: TFR by country, various years

Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014); UN (2013b).

1.2.2 Age-Specific Fertility Rate (ASFR)

Fertility decline in Cambodia, Indonesia and the Philippines had occurred among women of all reproductive age groups, as reflected by the declining age-specific fertility rate (ASFR) since 1960s (see Figure 1.2 to Figure 1.4). Filipino women in every age group have more children than Cambodian and Indonesian women, except for women aged 15-29 years. The largest fertility decline between 1960s and 2010s occurred in age

group 40-44 for Cambodia, and in age group 45-49 for Indonesia and the Philippines, decreasing by more than 60 percent over 50 years period for all three countries (Figure 1.5). Of the three countries, Cambodian women experienced the largest fertility decline for all age groups, except for women aged 15-19 years. On the other hand, Indonesian women experienced the largest decline in adolescent fertility (births among women aged 15-19), and there was a slight increase in adolescent births in the Philippines between 1968 and 2012.

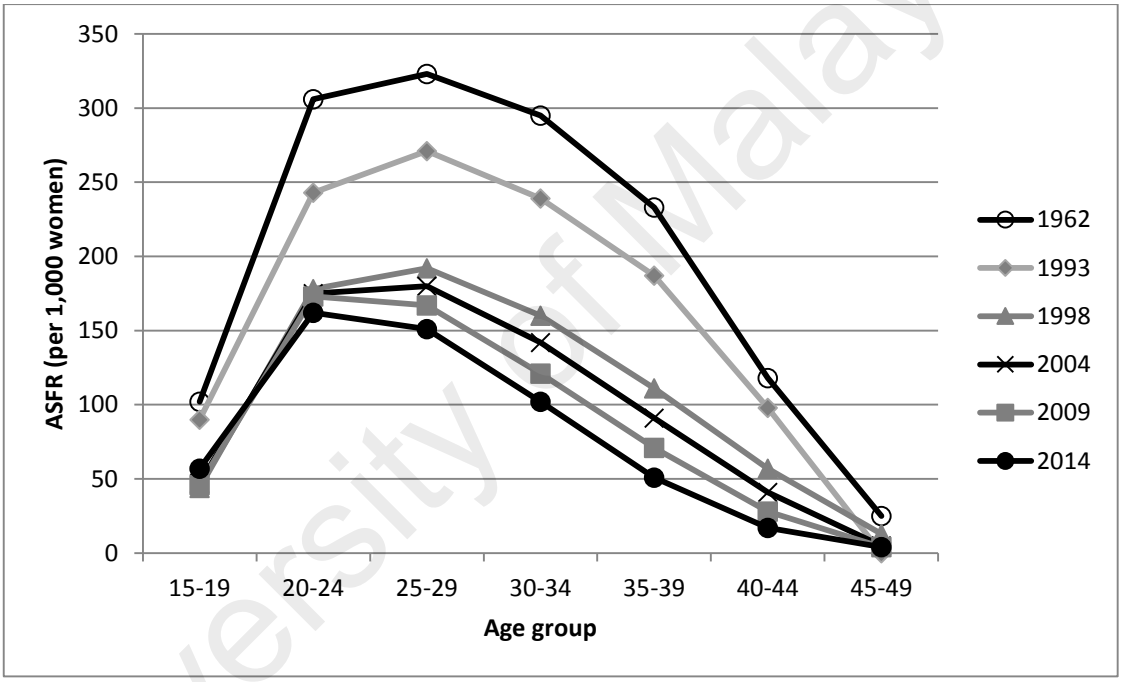

Figure 1.2: ASFR, Cambodia, various years

Source: Cambodia DHS (2015); UN (2013b).

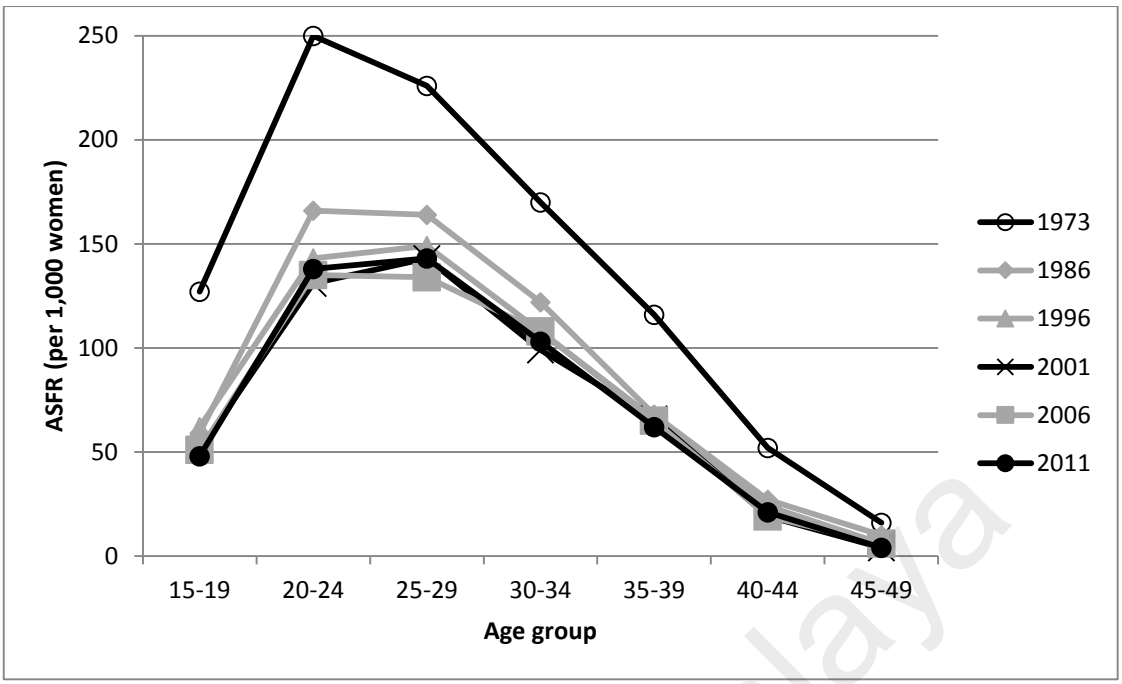

Figure 1.3: ASFR, Indonesia, various years

Sources: Indonesia DHS (2013); UN (2013b).

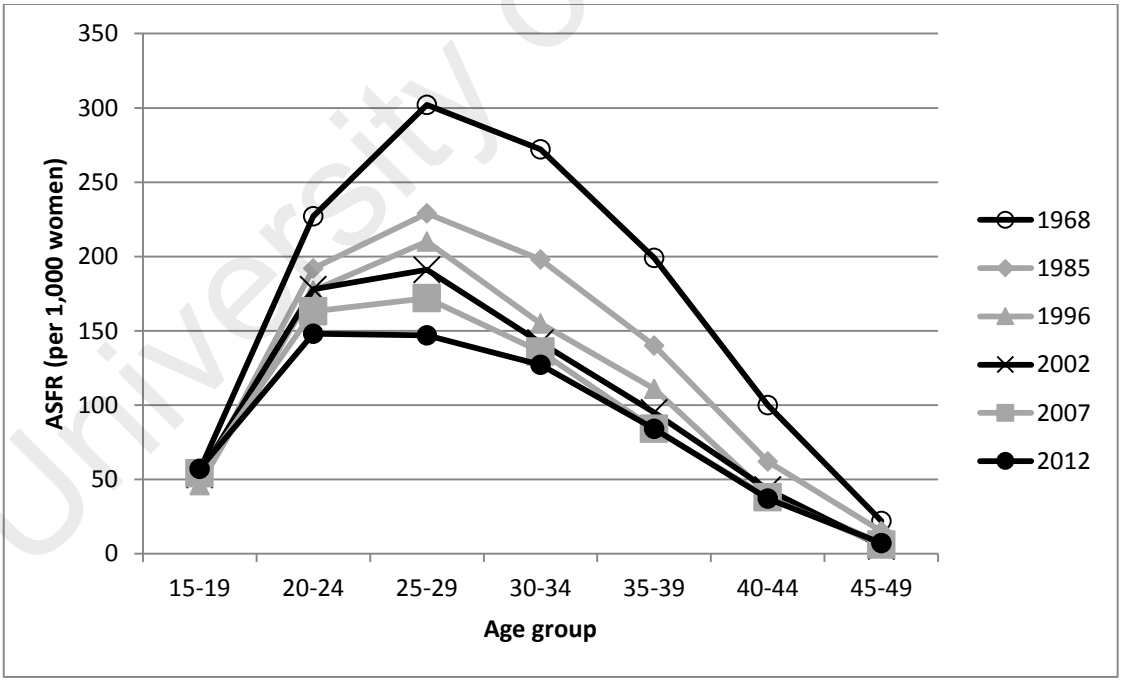

Figure 1.4: ASFR, Philippines, various years

Sources: Philippines DHS (2014); UN (2013b).

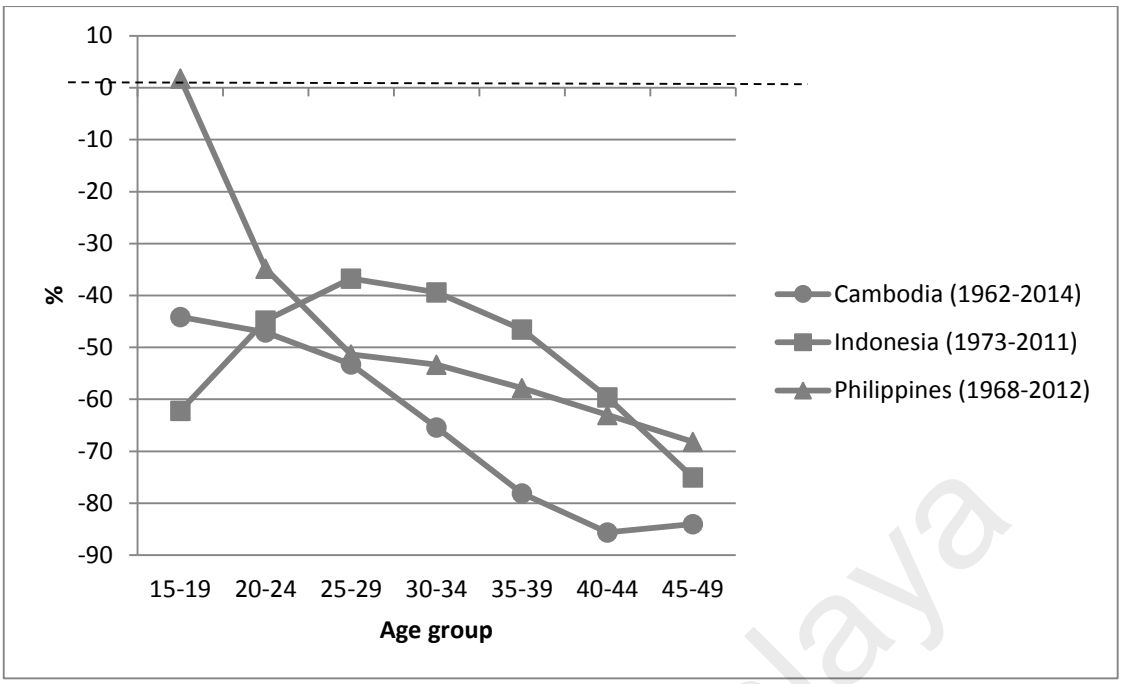

Figure 1.5: Percentage change in ASFR by country, various years

Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014); UN (2013b).

1.3 Trends in the Main Proximate Determinants of Fertility

The fertility level of a population is directly affected by age at marriage and contraceptive use. The effects of these two proximate determinants[5] on fertility as shown in numerous past research will be discussed in more detail in Chapter 2. While abortion and breastfeeding also contributed to fertility reduction, their effects are much less pronounced (Bongaarts, 1978; 1982). Moreover, reliable data on the two less important proximate determinants are unavailable. Hence, this sub-section focuses on the trends in age at marriage and contraceptive use.

[5] Proximate determinants refer to the factors that affecting fertility directly, such as contraceptive use, age at marriage, abortion, breastfeeding and sterility, which also known as intermediate variables.

1.3.1 Age at Marriage

Marriage marks the beginning of childbearing and hence the age at marriage determines the duration of exposure to childbirth. Among the three countries in this study, Cambodian women married earliest, with a mean age at marriage of 22 years in 2010 (Figure 1.6). The singulate mean age at marriage (SMAM)[6] for Indonesian women had increased from 19.3 years in 1971 to 22.3 years in 2010. Filipino women consistently married later than the Cambodian and Indonesian counterparts. On average, women in the Philippines married at 24.4 years in 2007, up from 22.8 years in 1970.

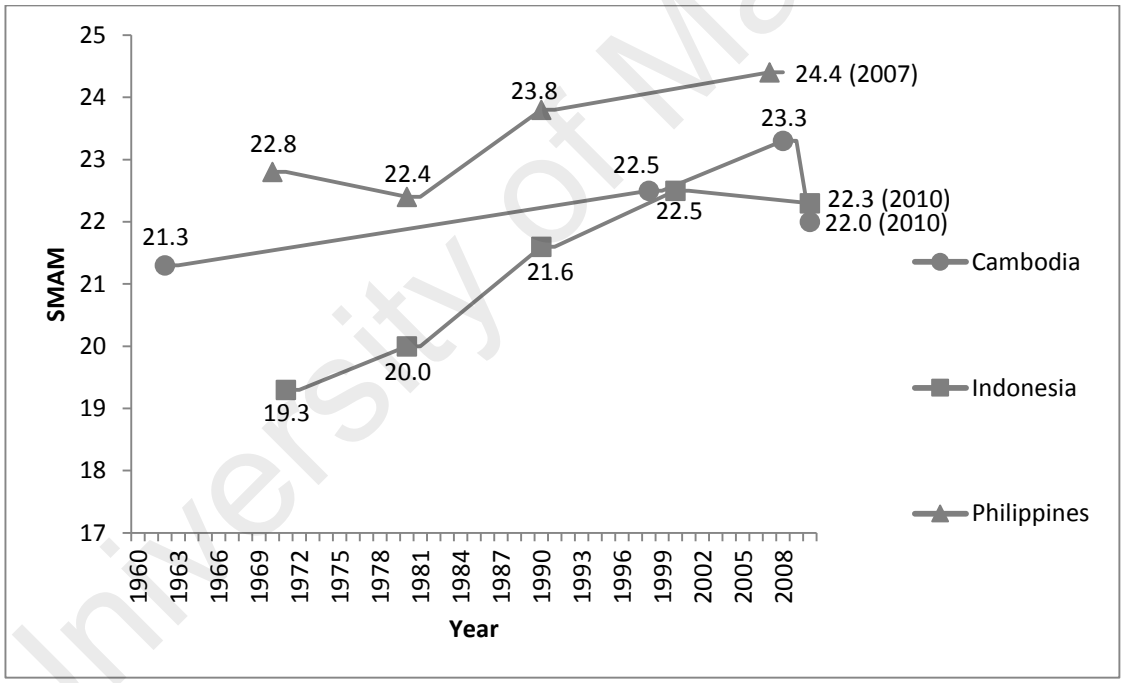

Figure 1.6: SMAM by country, various years

Source: UN (2013c).

[6] The SMAM is the average length of single life (in years) among those who marry before age 50.

1.3.2 Contraceptive Use

The governments of Indonesia and the Philippines have launched the national family planning program in the early 1970s to slow down the rate of population growth and to improve reproductive health and family wellbeing. Although Cambodia only started the national family planning program in 1994, the widespread use of contraceptive methods since then has quickly caught up, and resulted in the rapid decline in fertility. In all three countries, contraceptive use allows married women to space and terminate childbearing at an earlier age.

At the national level, Cambodia had experienced the most remarkable increase in contraceptive use since the implementation of national family planning program in 1994. The prevalence rate for any contraceptive method and modern method shot up from 12.6 percent and 6.9 percent in 1995 to 56.3 percent and 38.8 percent respectively in 2014 (Figure 1.7). The contraceptive prevalence rate in Indonesia had increased from 8.6 percent in 1973 to 61.9 percent in 2012, and majority of the contraceptive users were using a modern method. The Indonesia family planning program was acclaimed as a success story (Rahayu, Utomo & McDonald, 2009; Hayes, 2010). However, the policy of decentralization implemented since 2004 has brought about the leveling off in the use of modern contraceptive method. In the Philippines, the increase in contraceptive use was much more modest as compared to the other two countries, rising from 36.2 percent in 1978 to 55.1 percent in 2013. Moreover, a substantial proportion of the Filipino contraceptive users have relied on traditional method.

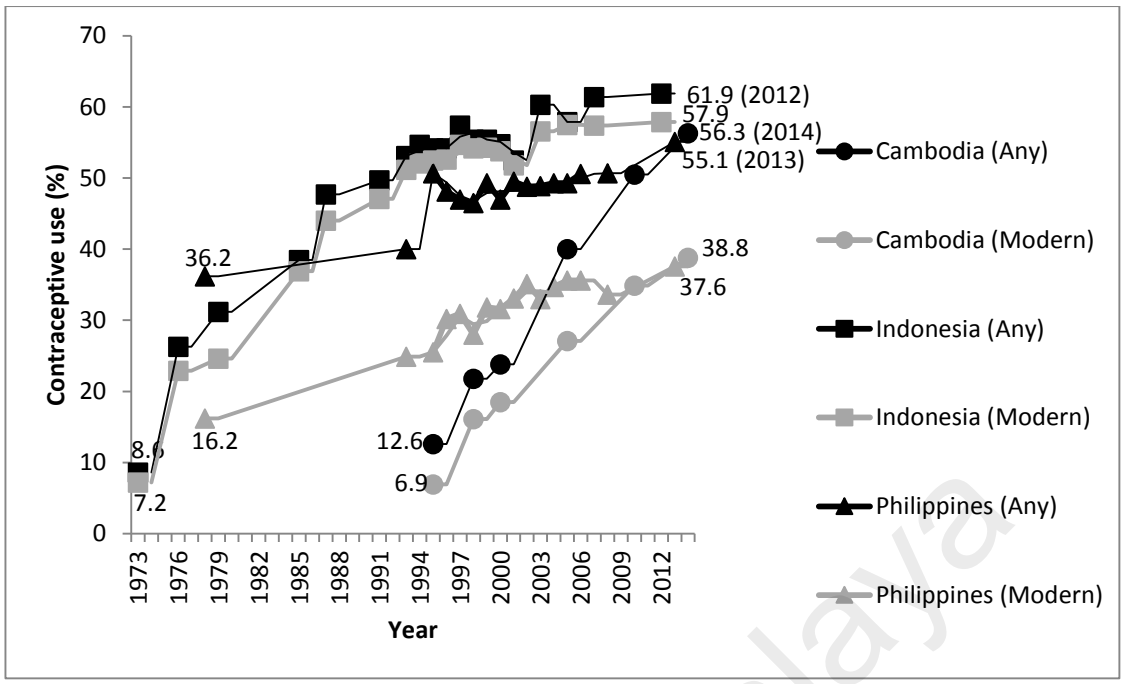

Figure 1.7: Contraceptive use by methods, according to country, various years

Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014); UN (2012).

1.4 Statement of Research Problem

Fertility rate has been declining in almost every country in Asia (World Bank, 2015b). Socio-economic development and modernization have led to smaller desired family size. Past fertility research had dealt mainly with fertility differentials and the determinants of fertility within each country. While some cross-country analyses have also been carried out, most of these were confined to socio-economic factors affecting fertility, and few have dealt with both socio-economic factors and proximate determinants in cross-country comparison (Costello & Casterline, 2002; Poch, 2004; Angeles, Guilkey & Mroz, 2005; Nisa, 2007; Kim et al., 2009; Sreytouch, 2010; Bayer, 2011).

The launching of family planning program since 1970s in many countries allowed couples to limit the number of children and space childbearing, and has contributed significantly to the global fertility decline (World Bank, 2007; Astbury-Ward, 2009). Nevertheless, the strength of program varies across countries. In Cambodia, the active family planning program initiated since 1994 has resulted in rapid fertility reduction. It is noticed that the slowing down in fertility decline in Indonesia over the past 10 years is related to a change of family planning policy with the decentralization of service delivery which resulted in the stagnation of contraceptive prevalence rate. Strong family planning programs have resulted in low fertility in Cambodia and Indonesia, but opposition from the Roman Catholic Church to the use of contraception and low family planning efforts have resulted in relatively high fertility in the Philippines. It is also important to note that socio-economic changes in the past century could have facilitated fertility transition in these three countries. Besides, fertility level is closely related to the age at which women enter marriage because it determines the duration of women's exposure to the risk of pregnancy. Major studies revealed that marriage postponement is significant in lowering fertility level (David, Chin & Herradura, 1998; Mturi & Hinde, 2001; Prachuabmoh, 2002; Lofstedt et al., 2005; Gubhaju, 2007; Jones, 2007).

It is imperative to examine the forces behind the fertility transition in Cambodia, Indonesia and the Philippines to support the planning of effective national population program in each country, which can also serve as examples for others. Wide fertility differentials across sub-groups of population perpetuate disparity between the poor and the rich because poor families tend to have more children, making it more difficult for them to invest on children's education and health care, which affects upward mobility. On the other hand, low rates of fertility can lead to ageing and labor shortage issues, giving rise to growing concerns. Hence, this study aims to provide a better insight into

related demographic, social, economic and other issues that explain fertility transition and differentials across these three ASEAN countries to provide some insights for population situation analysis for monitoring the population trends.

1.5 Research Questions

Fertility reduction is taking place at different pace in different countries and socio-economic settings, and it has many consequences. The questions to be addressed in this study are:

1. How do family size, age at first marriage and contraceptive use differ among currently married women in Cambodia, Indonesia and the Philippines?
2. How do socio-economic and women empowerment variables influence childbearing among currently married women in Cambodia, Indonesia and the Philippines?
3. What are the roles of age at first marriage and contraceptive use in mediating the relationship between childbearing and socio-economic, and women empowerment variables in Cambodia, Indonesia and the Philippines?
4. Which proximate determinant has the largest fertility-inhibiting effect in Cambodia, Indonesia and the Philippines?

1.6 Research Objectives

This study seeks to analyze the effects of direct and indirect factors affecting fertility in Cambodia, Indonesia and the Philippines. The specific objectives of this study are:

1. To analyze the patterns of childbearing, age at first marriage and contraceptive use of currently married women across different sub-groups of the population,
2. To examine the influence of socio-economic and women empowerment variables on childbearing in Cambodia, Indonesia and the Philippines,
3. To determine the roles of age at first marriage and contraceptive use in mediating the relationship between childbearing and socio-economic, and women empowerment variables in Cambodia, Indonesia and the Philippines, and
4. To estimate the effects of four main proximate determinants and identify the order of influence of these determinants on fertility in Cambodia, Indonesia and the Philippines.

1.7 Research Hypotheses

Corresponding to the research objectives, the following hypotheses are considered:

Hypothesis 1: Each selected socio-economic and women empowerment variable is a significant predictor of childbearing.

Hypothesis 2a: Age at first marriage influences the relationship between childbearing and socio-economic variable.

Hypotheses 2b-g: Contraceptive use influences the relationships between childbearing and socio-economic, and women empowerment variables.

Hypothesis 3: Marriage postponement and contraceptive use are the most important proximate determinants of fertility.

1.8 Scope of Study

This thesis presents the patterns of childbearing, age at first marriage and contraceptive use across different age groups, socio-economic and women empowerment sub-groups among currently married women aged 15-49 years in Cambodia, Indonesia and the Philippines using data from the latest round of DHS. Besides, this research also examines the effects of socio-economic and women empowerment factors on childbearing, and the influence of intermediate variables in mediating the relationship between socio-economic, women empowerment variables and childbearing. To this end, this thesis looks into the relative importance and contribution of delayed marriage and contraceptive use on fertility reduction in each country.

1.9 Research Significance

During the 1960s and 1970s, reducing fertility was seen as a necessary component of national development and poverty eradication. However, in more recent years, below replacement level fertility has given rise to concern of population ageing and the emergence of labor shortage. A comprehensive analysis of the fertility trends and patterns is needed to provide the necessary inputs for making population projections to be used in development planning. A better understanding of the fertility behavior is imperative for the formulation of policies and implementation of programs to serve the reproductive health needs of the different target groups to improve their wellbeing through planned parenthood.

Cambodia, Indonesia and the Philippines represent three out of the four ASEAN countries whose fertility rate is still above replacement level. Fertility transitions in these three countries, therefore, play major roles in setting the fertility level in ASEAN region as a whole in the future. These three countries differ in terms of religion, cultural norms, pace and level of fertility transition, as well as family planning efforts, which will make it interesting for a comparative study.

While there have been numerous research at macro level (Mason, 1997; Eberstadt, 2001; Caldwell & Caldwell, 2003; Lee, 2003; Bryant, 2007) or micro level concerning fertility decline (Bratti, 2003; Dharmalingam, Navaneetham & Morgan, 2005; White et al., 2008; Martin-Garcia, 2009; Bbaale & Mpuga, 2011), there is still a lack of research that examines fertility decline at both micro and macro levels, especially across countries and sub-groups of populations within each country. Unlike past research that focused on socio-economic determinants, proximate determinants or family planning efforts separately, this study will fill in the gap by examining simultaneously the relationship between socio-economic factors and intermediate variables and family planning efforts with fertility, comparing within and across these three ASEAN countries.

This study will contribute to the literature on fertility analysis using Negative Binomial Regression rather than the conventional multiple regression in building the models for fertility analysis. Detailed evaluation on the effects of both direct and indirect factors on fertility will be carried out in this research. Besides, this study is designed to examine the relationship between socio-economic factors and intermediate variables with fertility by comparing across sub-groups of the population. Women empowerment will also be measured from different dimensions besides the conventional variables of education and employment. Effectiveness of family planning programs in lowering the fertility will be

examined, and it is hoped that this research will provide some inputs for policy makers in high fertility countries to lay emphasis on family planning in resource allocation.

1.10 Organization of the Thesis

This thesis is organized into 5 chapters. Chapter 1 explains the social settings in Cambodia, Indonesia and the Philippines, research questions and objectives to be achieved in this study, and the significance and scope of this study. Chapter 2 provides a review of research on the effects of socio-economic and women empowerment factors on fertility and the proximate determinants of fertility in the three countries in this study and other parts of the world. Chapter 3 discusses the data sources, methodology and research framework for analyzing the effects of socio-economic and women empowerment factors on fertility and the proximate determinants of fertility, with reference to findings from past research. The statistical techniques will also be described in Chapter 3. Chapter 4 presents the results and discussion of the findings. This chapter includes a short description on the profile of the respondents, levels and trends of the main study variables, and the analysis of data to test all the hypotheses. Chapter 5 concludes the thesis with a discussion of the likely future course of fertility in the three countries, followed by a discussion on the implications of the findings, some recommendations for policy and research, and the limitations and contributions of this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Research on the determinants of fertility proliferated with the availability of data from the World Fertility Survey in many countries in the 1970s, and the DHS in more than 90 countries since the 1980s. However, most studies have dealt with the socio-economic correlates of fertility or the proximate determinants. Little research has examined concurrently both the direct and indirect determinants of fertility across countries.

This chapter begins with the definition and measurement of fertility, followed by a discussion on the theories of fertility proposed by renowned scholars and researchers. This is followed by a review of past research on socio-economic and proximate determinants of fertility in Asia and other parts of the world.

2.2 Definition and Measurement of Fertility

Fertility is defined as the production of a live birth (Mosley, 2006). The different measures are based on various sources of data, which include: (i) vital registration systems, (ii) censuses, and (iii) nationally representative sample surveys. The indicators of fertility that are commonly used (Becker, 2003; Mosley, 2006) are:

(a) Children ever born, a cohort measure obtained from population censuses and household surveys and it refers to the total number of children a woman has ever given birth to (including those having died since birth) at different age as at the time of the census or the survey;

(b) Crude birth rate refers to the number of live births per 1,000 population in a given year;

(c) Age-specific fertility rate (ASFR) refers to the number of births per year per 1,000 women of a specific age group;

(d) Total fertility rate (TFR), a period measure that refers to the average number of children a woman will have by the time she ended childbearing if she were to pass through all her childbearing years conforming to the ASFR of a given year;

(e) General fertility rate refers to the number of live births per 1,000 women of reproductive ages in a given year;

(f) Gross reproduction rate refers to the average number of daughters expected to be born alive to a hypothetical cohort of women (usually 1,000) if no one dies during childbearing years and if the same schedule of age-specific rates is applied throughout the childbearing years;

(g) Net reproduction rate refers to the average number of daughters expected to be born alive to a hypothetical cohort of women (usually 1,000) if the same schedule of age-specific fertility and mortality rates applied throughout the childbearing years;

(h) Marital fertility rate refers to the number of marital births per 1,000 married women of reproductive ages;

(i) Age-specific marital fertility rate refers to the number of marital births per 1,000 married women of a specific age group;

(j) General marital fertility rate refers to the number of births per 1,000 married women of reproductive ages;

(k) Birth interval refers to time between successive live births;

(l) Parity progression ratio refers to the probability that a woman has another birth, given that she already had a certain number of births; and

(m) Child-woman ratio is the number of children under age 5 per 1,000 women of reproductive ages in a given year.

In this study, the cohort measure of children ever born among currently married women aged 15-49 will be used as the main indicator of fertility in Cambodia, Indonesia and the Philippines.

2.3 Major Theories of Fertility

Various fertility theories have been formulated by demographers, sociologists and economists in explaining the fertility behavior. This section presents an overview of classical demographic transition theory, and various economic and sociological theories to explain fertility behavior at both macro and micro levels.

2.3.1 Demographic Transition Theory

Demographic transition theory is one of the earliest demographic theories in social demography that explains behavioral change in reproduction due to global modernization. The theory describes the transition of mortality and fertility from higher to lower levels in different societies over time. The theory was propounded by a group of researchers at the Office of Population Research in Princeton based on the prior work on 'The Future Population of Europe and the Soviet Union', published in 1944 on behalf of the League of Nations (Moore, 1945; Notestein, 1945; Kirk, 1946; Lorimer, 1946; Kirk, 1996). The demographic transition model represented a classification of populations differentiated by various combinations of fertility and mortality (Kirk, 1996). Thompson (1929) classified the world's countries into three main categories based on the different rates of

population growth. Subsequently, in 1934, Landry (1987) delineated global population growth into three phases: the primitive, intermediate and contemporary stages.

Since the early twentieth century, a change from high to low levels of fertility and mortality in various parts of the world indicated the demographic transition had taken place globally (Hall, 1972; Caldwell, 1976; Kim, 1994; Kirk, 1996; Bloom & Williamson, 1998; Bongaarts & Bulatao, 1999; Bongaarts, 2003; Ogden & Hall, 2004; Galor, 2005; Srnivasan, 2011; Galor, 2012). The typical demographic transition model can be explained through four stages (Hall, 1972; Malmberg & Sommestad, 2000; McCarthy, 2001; Rueter, 2003; Rabah, 2011; Barcelona Field Studies Centre, 2013). The four stages are (Hall, 1972): (i) High birth and death rates with stable or slow population growth, (ii) High birth rate and declining death rate with accelerating population growth, (iii) Declining birth rate and low death rate with less accelerating population growth, and (iv) Low birth and death rates with steady population. However, some researchers added a fifth phase as the fertility level in a few developed countries had gone below the sub-replacement level, resulting in shrinking population size (Chesnais, 1990; Kim, 1994; Srnivasan, 2011), as in the case of Germany and Japan (World Bank, 2015b).

The demographic transition model has been regarded as a universal concept that can be applied to every country. It shows the starting point for the study of demographic change, and it allows cross-country comparisons globally. With this model, demographers can make predictions of future changes in population structure, and policies can be formulated to deal with these changes. However, the model has several limitations. For instance, it has neglected the effects of government roles and migration shock on the population trend; and the emergence of Stage 5 in contemporary studies was not dealt with in the original model. The accuracy of model application on current

societies with different socio-economic and cultural settings may be questionable, because all stages proposed in the model were based on past events. In addition, it also failed to consider the effects of other happenings, such as HIV/AIDS, natural disasters, the role of women and female education that will affect death rates and birth rates significantly. Hirschman and Guest (1990) pointed out that the classical demographic transition theory is an adequate model provided that high fertility societies are compared with low fertility societies. Not every country will eventually undergo all stages or at the same rates, and hence the applicability of this model in modern world is debatable.

2.3.2 Economic Perspectives of Fertility

2.3.2.1 Leibenstein Theory 1957

Leibenstein (1957) was the first economist to propound the economic theory of fertility. He explained that the study of fertility should not be centered on children of any birth order and why the first two children are wanted. In fact, his key interest was the shift of parents' behavior from two children to three, and three to four, and four to five. His theory concentrated on the utilities and disutilities that were influenced by mortality rate, per capita income, and occupational structure. He assumed that an additional child is wanted based on three types of utility:

(i) consumption utility, the child is wanted for personal interest and pleasure to the parents;

(ii) work or income utility, the child is wanted for work participation and contribute to family income; and

(iii) security utility, the child is wanted as a potential source of security, particularly old age security.

The decision to have an additional child was also subjected to the costs relating to having the additional child. The two types of disutilities of having an additional child were:

(i) direct costs, the expenses on basic needs in raising the child; and

(ii) indirect costs, the opportunities and wages foregone in raising the child.

Leibenstein recognized some pitfalls in his previous framework regarding the relationship between disutility, income and number of children. He then suggested that the economic theories of fertility should focus on large fertility differences and the turning points between utility and disutility of having an additional children rather than fertility trends (Leibenstein, 1974).

2.3.2.2 Becker's Economic Analysis of Fertility (1960)

According to Becker (1960), children should be treated as consumption goods that provide utility, and the demand for children is comparable to the demand for consumer goods. A couple's desire to have children was influenced by the relative price of children and household income. Parents with higher income will spend more on consumption goods, including children, to increase their utility. However, this was subjected to the net costs of children. Parents are keen to spend more on a child if they attain higher utility from the additional cost spent on that child, which is known as higher quality child. For instance, if children have the potential to contribute to household income by assisting in the family businesses or working as laborers in the marketplace and carrying out daily household chores, and the net cost of children is reduced, there will be an increase in the demand for children. However, if household's real income is held constant; an increase in the relative price of children will lower the demand for children as couples will find

other alternatives to substitute their satisfactions on children. Therefore, Becker supported the importance of price effect over income effect as higher income families wanted higher quality children.

2.3.2.3 Caldwell's Wealth Flows Theory (1976)

Caldwell (1976) propounded the concept of net flow of economic advantages, either from children to parent or from parent to children. In primitive societies where children played an important role in income-related activities, net wealth mainly flows upward from children to parents, and individual satisfactions are subjected to corporate welfares. Since every additional child increases parents' wealth in terms of social and political interests and old age security, traditional parents will opt to have as many children as possible. On the other hand, parents are expected to support their children's economic welfares (such as education and childcare expenses) as wealth flows downward in modern societies. Although pleasure can be attained from children and parenting, modern parents desire fewer children because children no longer play their traditional roles in income-related activities, and every additional child incurs additional expenditure. Nevertheless, couples' reproductive behavior is not solely dependent on the opportunity costs, as there are other forces that may influence fertility choices, such as society norms and personal intention.

Kaplan and Bock (2001) found two deficiencies in Caldwell's theory on intergenerational wealth flows. They argued that the theoretical foundations for the determination of household wealth flows were not well identified in the theory. Besides, the data used do not support a strict explanation of the wealth flows hypothesis, as downward wealth flows was found in traditional high fertility populations in micro-level

and longitudinal studies, while the theory was supported practically in national and cross-sectional studies that relied on proxy measures and informant reports.

2.3.3 Sociological Perspectives

The usefulness of an economic theory on fertility has increasingly been criticized with regard to its accuracy, with which testable hypotheses are derived from underlying assumptions. The mathematical formulations of these theories leads to their simplification by considering various restrictive assumptions that may vitiate a model's explanatory power (Turchi, 1975). In addition, the economic theories, preoccupied with the benefits and costs of having children, have failed to address the social correlates of fertility differentials and overlooked the different cultural characteristics across countries, which may have important impacts on fertility behavior.

Blake (1968) argued that Becker's (1960) framework based on solely economic analysis in explaining family size preferences failed to clarify the relationship between income and the ideal family size, as it disregarded the sociological factors that drive couples' reproductive enthusiasm. According to Blake, Becker's economic analysis had neglected four main social contexts of reproduction: (i) equating children with consumer goods, (ii) focusing on the 'consuming' as opposed to the 'producing' role of parents with regard to children, (iii) misconception of child costs, and (iv) pitfalls in the analysis of the utilities related to having children.

Freedman (1963) argued that the social institutions in each society have their own cultural norms which affect the reproductive behavior, especially in the less developed countries, and suggested that decision-making on reproduction and family size was fundamental for couples and the entire society where they belonged to. Generally, couples' decision on the level of fertility was influenced by the socio-cultural norms within each society, with respect to marriage, timing of intercourse and abortion. He further argued that family size norm established in each society will significantly affect couples' reproductive decision, due to the direct and indirect social advantages and consequences established by each society related to the number of children they have. Therefore, couples' decision on the ideal number of children they want to have is highly associated with the family size norms in each community. Freedman (1975) went on to recommend a framework for the sociological analysis of fertility, explaining the environmental, social and economic structures, and family planning program in developing the social norms about family size and intermediate variables, which subsequently affect the level of fertility.

The Coleman's Boat theory introduced by Coleman (1986) has portrayed the interaction between macro and micro factors that underlie their causal relation. This sociological framework has been extensively used in various fields of study, including demography. For instance, a recent paper by Billari (2015) has applied Coleman's model in explaining the population change in two stages. The first (or discovery) stage is macro-oriented and commensurate with the core of demography or novel evidence at the national level, such as age specific rates. The second (or explanation) stage develops accounts of demographic change and examines how the action and interaction of individuals generate what is brought to light in the first stage, which grounds the prediction of demographic change.

In fertility studies, the macro-micro interactions have been explored through the study of fertility preferences and intentions. The theory of planned behavior applied to fertility decisions as proposed by Ajzen (1991) emphasized that human's desire to have a child was steered by three types of considerations, including behavioral, normative and control beliefs. Behavioral beliefs link to the formation of a favorable or unfavorable attitude toward having a child. Normative beliefs include the perceived expectations, behaviors and motivations which result in subjective norm pertaining to having a child. Control beliefs are related to the perceived presence of factors that can affect a person's ability to have a child. In general, background factors such as individual, demographic and societal variables will influence the intention to have a child through these three beliefs, and both intention and actual control over having a child will subsequently affect the actual behavior of having or not having a child (Ajzen & Klobas, 2013).

2.4 Factors Affecting Fertility

The effects of the socio-economic variables are far from uniform across population, and should be examined in the socio-cultural and political context. In most fertility research, the most common independent variables include educational attainment, place of residence, women's work, family income or wealth, and other socio-cultural and psychological variables such as value of children, status of women, family system, and economic optimism (Shi, 1990; Mturi & Hinde, 2001; Bratti, 2003; Hull, 2003; El-Ghannam, 2005; Bollen, Glanville & Stecklov, 2007; Gubhaju, 2007; Veron et al., 2008). Macro level studies on fertility would include the impact of family planning program and the role of contraceptive use in reducing fertility. The relevance of selected socio-economic variables on fertility is discussed below. This section focuses on a review of literature on fertility analysis in relation to selected socio-economic factors, women

empowerment, and proximate determinants of fertility. This is followed by an overview of the past research on marriage trend and contraceptive use.

2.4.1 Socio-Economic Factors

2.4.1.1 Place of Residence

Fertility behavior is directly associated with place of residence (Andorka, 1978; Findley, 1980; Li & Wang, 1994). Urbanization has brought significant changes in family planning behavior and social structures that influence fertility. Fertility differentials between urban and rural areas are generally due to socio-economic structures, including educational level, labor force participation, income, age at marriage, and access to health care and family planning services.

Previous research found that the mean number of births to rural women was significantly higher than that of urban women (Watkins, 1987; Bhat & Zavier, 2005; Gubhaju, 2007; Jones, 2007; Veron et al., 2008). Many studies have shown that urban fertility was lower than rural fertility in most Asia countries. In an analysis of urban-rural differentials in fertility, Gubhaju (2007) found that the largest urban-rural fertility differential in Asia was observed in Nepal (2.3 children), followed by Pakistan (1.7 children) and the Philippines (1.3 children). Besides women's education, urbanization was the main factor in explaining fertility decline in Bangladesh and India around the year 2000, as urban women had at least 0.7 birth fewer than their rural counterparts (Veron et al., 2008). Islam (2009) also found that older rural Bangladeshi women tended to have more children than their urban counterparts due to early marriage. In Ghana, White et al. (2008) showed that on average, fertility of urban women was 11 percent

lower than that of rural women, and the strong effect of urbanization remained after controlling for the effects of age, cohort, union status and education. Rural fertility was also much higher than the urban fertility in Ethiopia, with a difference of 3.6 children, and this is much larger than the African average of 2.0 children (Tadesse & Headey, 2012).

However, a number of studies found that urban women have more children than rural women. Zarate (1967) revealed that couples in the most rapidly growing large urban cities of Mexico preferred higher level of fertility than in the less rapidly growing areas, probably due to improvement in life prospects, especially among urban males, and also the significant influx of migrants from areas of higher fertility to those rapidly growing areas. A study on 19 urban and rural non-Western countries showed that the fertility level was not necessarily higher in rural as compared to urban areas (Robinson, 1963).

2.4.1.2 Female Education

Rising female education has been the primary cause of fertility reduction in many countries. Higher educated women tend to have fewer children because of the higher opportunity cost. The cost of having children increases with educational level, and hence results in a downward revision of desired family size, which brings about a reduction in actual family size. Numerous studies reported women's educational attainment exerted a negative impact on fertility (Shi, 1990; Martin, 1995; Mturi & Hinde, 2001; Gubhaju, 2007; Jones, 2007; Skirbekk, 2008). Watkins (1987) asserted that the impact of women's educational level on fertility was generally greater than wealth and partner's occupation. Education and literacy improvement accelerates modernization, and thus lead to the preference for fewer children (Freedman, 1965).

In rural Peru, women with at least 5 years of education tended to have fewer children than those with no education (Angeles, Guilkey & Mroz, 2005). In Asia, fertility decline in Bangladesh, India, Nepal and Pakistan since 2000 were largely due to improvement in women's education, and the latest fertility rate among uneducated women was much higher than those with high education in all countries under study: 3.6 versus 2.2 in Bangladesh, 3.6 versus 2.2 in India, 3.9 versus 1.8 in Nepal, and 5.7 versus 3.6 in Pakistan (Veron et al., 2008). In Africa, Mturi and Hinde (2001) noted that the fertility rate for uneducated Tanzanian women was 1.6 births higher than those who have completed primary education.

2.4.1.3 Female Employment

Female employment promotes small family norm and the desire for fewer children as it provides various alternative types of satisfaction compared to having large number of children (Blake, 1979). Opportunity costs of childbearing were much higher among working women as compared to non-working women. These opportunity costs include forgone wages while out of the labor force in order to take care of their children, along with the loss of skill development that can affect wage rates upon re-entry into the labor force (Rindfuss et al., 2007), job insecurity among the young or inflexible work practices which are often incompatible with childrearing (Basten, 2013). Paid childcare that costs below women's wage rate is expected to reduce opportunity costs.

Education has resulted in greater women participation in the labor force. Jones (2007) observed a rapid growth in the number of secondary and tertiary educated women have been followed by a significant rise in the employment rate among Pacific Asia women. Many studies have found that female labor force participation is negatively correlated

with fertility (Blake, 1979; Hull, 2003; Engelhardt, Kogel & Prskawetz, 2004; Jones, 2007). Kalwij (2000) found that when educational attainment was held constant, female working status was the main determinant of number of children in households in Netherlands, where working women planned to have children later in life and have fewer children compared to non-working women. Jones (2007) perceived that conflict between employment and family responsibilities was one of the major reasons that lowered desires for more children among married couples in Pacific Asia.

While Engelhardt, Kogel and Prskawetz (2004) found negative correlation between women's employment and fertility in France, women's employment did not seem to hamper family formation in West Germany, Italy, Sweden, United Kingdom and United States between 1960 and 2000. A study on rural China found that the pattern of women's employment has generally no significant influence on women's fertility behavior, as reflected by the non-linear relationships between fertility and women's income and education and cultural influences (Li, Feldman & Zhu, 1997). Data showed negative correlation between fertility and female participation rate in the Organization for Economic Co-operation and Development countries during the 1970s and 1980s; but the relationship had become positive by the late 1980s, and this could well be explained by the emergence of high and persistent unemployment rates (Ahn & Mira, 2002). Beguy (2009) found that greater female labor force participation was not the main cause for fertility decline in Dakar (an urban city in Senegal), and a greater number of working women will probably not impinge on fertility trends, unless gender-specific roles change significantly. However, certain factors were not examined in Beguy's study (2009), especially factors that are expected to affect reproductive behavior, such as income and contraceptive use, which may explain the paradox of the relationship between female employment and fertility.

2.4.1.4 Income

Higher educated women are more likely than less educated women to be engaged in the more lucrative occupation, and hence higher opportunity cost of having children. This has strengthened women's financial independence and changed their values, attitudes and aspirations. In contrast, women from economically disadvantaged family background tended to marry earlier than those from richer families, and this has directly resulted in fertility differentials between the income groups (South & Crowder, 2000; Snyder, Brown & Condo, 2004).

Income has been found to have significant effects on fertility. An increase in income indicates improvement in the standard of living, which may encourage couples to increase their demand on material goods, including children. However, higher household income may lower the demand for children as couples place more importance in producing children with higher quality rather than number of children, and this is known as the 'quality-quantity tradeoff' (Becker, 1981; Costello & Casterline, 2002). Becker (1981) had developed a framework to describe the demand for children as comparable to the demand for consumer goods, based on the direct utility attained from children, relative price and income of having children, and parents' expectation or net income obtained from children. While still looking from the economic perspective, Easterlin's model (1975) was based on the unconventional concept of 'shifting preferences' (such as material desires) which changed rationally as a function of the income and prices to influence fertility behavior. He hypothesized that with economic development, each consecutive generation will undergo a consecutively better parental standard of living which leads to a systematic alteration in preferences (Easterlin, 1975; Easterlin, 1978).

Unlike other economic theories, Easterlin argued that any economic theory of fertility should incorporate the changing preferences for practical purposes.

El-Ghannam (2005) found that the mean number of children in low-income countries was almost three times more than that of high-income countries, mainly due to the higher labor force participation and economic status among women in the latter. Aarssen's fertility-selection hypothesis (2005) in industrialized and wealthy countries showed that wealth, public welfare programs, universal health care and medical technologies, and women empowerment have resulted in lower fertility in these countries. Jones and Tertilt (2006) found a strong inverse relationship between income and fertility for five-year birth cohorts of women between 1826-30 and 1956-60. In Ghana and Peru, Bollen, Glanville and Stecklov (2007) noted that permanent income exerted a strong negative impact on fertility, and they concluded that the study on fertility must also consider the latent quality of permanent income in order for this variable to take effect. Several studies on Asian countries also revealed a negative correlation between income and fertility (Boulier, 1982; Borg, 1989; Rosenzweig, 1990; Bloom, Canning & Malaney, 2000).

However, there are studies that challenged the conventional negative relationship between income and fertility. Simon (1969; 1977) showed a positive relationship between income and fertility over the business cyclical changes in industrial countries, where couples in high income countries are expected to desire higher fertility, as shown by the noticeable rise in number of children at the highest socio-economic levels. Using the 1960 Census data of the United States, Kunz (1965) proved that couples with a higher relative income are able to lead the same lifestyle and would have extra capital to support more children, controlling for age, education and occupation. Micevska and Zak (2002) perceived that the evolution of the market-oriented economies that occurred in Central

and Eastern Europe and the former Soviet Union in the 1990s had caused significant decline in real income and fertility, which challenged the robust inverse relationship between income and fertility that has been well established. Buhler (2004) also confirmed that additional income generated by activities such as additional employment among Russian households have resulted higher fertility.

2.4.1.5 Husband's Variables (Education and Employment)

Many studies have found that husbands also played an important role in reproductive decision-making. In traditional societies, husband typically is the breadwinner of the family, and has greater say in decision-making, including childbearing. Men's dominance over reproductive choices is alleged to be one of the major causes for postponing the inception of fertility transition (Caldwell & Caldwell, 1987; Caldwell, Orubuloye & Caldwell, 1992). For instance, fertility decline in Ghana, a country where reproductive decisions are dominated by men, was brought about by changes in men's fertility desires (DeRose & Ezeh, 2005). In the Philippines, men's fertility preferences posed as a barrier to family planning (Biddlecom, Casterline & Perez, 1997), and this indicates the importance of husband's characteristics in explaining fertility transition.

Improvement in education is a global phenomenon, and educational improvement for both men and women is negatively correlated with fertility. Some researchers argued that the influence of men's education over reproductive decisions is greater than that of the women. For instance, a study carried out in Zimbabwe revealed that husband's education had a strong negative effect on the number of children ever born, and wife's education had only a modest negative effect (Adamchak & Mbizvo, 1994). DeRose and Ezeh (2005) also found similar effect in Ghana, where husband's education emerged as a strong

determinant on his and his wife's fertility intentions, but wife's education has only little effect, and thus the lower fertility in the country was highly correlated with men's declining fertility desires. However, Yang (1993) reported that American wife's education exerted negative and significant impact on fertility, the effect of husband's education, on the other hand, was positive but insignificant. The positive effect of husband's education on fertility was also found in Bangladesh (Miah, 1993). The inconsistent findings indicate the importance to include the effects of both husband's and wife's education in fertility research.

Husband's occupation and income have been found to have a bearing on the reproductive behavior. For instance, Indian women whose husbands participated in agricultural activities and held laborer positions with low income were more likely to give birth to more children (Jamal & Siddiqui, 2013). Another study on the Chinese immigrants in the United States found that fertility behavior was influenced by husband's school enrollment, employment and income, although the effects are generally weaker than the same characteristics of his wife (Ren, 2008). However, Yang (1993) found no significant differences in the effects of husband's and wife's occupation and work status on American fertility.

2.4.2 Women Empowerment

The Program of Action (PoA) adopted at the ICPD held in 1994 had devoted a full chapter to underscore the importance of gender equality, equity and women empowerment. The PoA recognized five elements that formed women empowerment, which include: (i) women's sense of self-worth, (ii) their rights to have and to decide on choices, (iii) their rights to have access to opportunities and resources, (iv) their rights to

have the dominance to manage their own lives (both within and outside the home), and (v) their ability to influence the direction of social change to generate a more just social and economic order, at both national and international levels. Many researchers have used women's age at marriage, their opportunities for education and employment to determine women's empowerment. However, some researchers disputed the use of these measures due to the confounding influence of each context in laying out parameter related to social-economic aspects, and will only be one of the solutions because of the limitation of measurement (Balk, 1994; Morgan & Niraula, 1995; Mason & Smith, 1999; Sathar & Kazi, 2000; Bloom, Wypij & Gupta, 2001; Malhotra, Schuler & Boender, 2002).

Women's empowerment and status of women are intangible constructs that cannot be measured directly. In the Human Development Report, gender gaps and inequalities are measured using Gender-related Development Index (GDI) and Gender Empowerment Measure (GEM) at the country level. GDI is measured through adjustment on HDI by gender inequalities on life-expectancy, education and incomes; while GEM considered women representation in political and economic power. At the sub-national level, there is no information for the constructions of GDI and GEM. Klasen (2006) pointed out some limitations of GDI and GEM measurements on gender disparities and proposed that empowerment indicators such as decision-making at the household level could be used to disaggregate GEM at individual level. According to Malhotra, Schuler and Boender (2002), domestic decision-making is one of the most used indicators of empowerment in most empirical studies at sub-national level.

Women empowerment has been shown to exert considerable impact on reproductive behavior. Caldwell (1982) asserted that apart from upwards "wealth flows", women's disadvantage was among the main reasons for the high fertility in patriarchal extended families. Studies have shown that women with higher empowerment tend to delay marriage, have access to information on family planning, and resort to greater use of contraceptive methods, which allow them to limit their number of children (Jejeebhoy, 1995; 1996).

Past studies have used various indicators to study different aspects of women empowerment. Using data collected from Pakistan, India, Malaysia, Thailand and the Philippines, Mason (1998) measured women empowerment based on six-item scale indicator that measures women's role in household economic decisions. By using the same data, Mason and Smith (2000) have expanded the framework to include different types of indicators, such as family-size decisions, freedom of movement, and fear of husband's anger and ever hit by husband. Studies by Jejeebhoy (2000) and Santhra, Callum and Jejeebhoy (2001) on India and Pakistan used six indicators to measure women empowerment, including decision-making on household spending and children, freedom of movement, freedom from threat, and access to economic resources. Roy and Niranjan (2004) considered household decision-making, mobility and access to economic resources as the crucial aspects of women empowerment, while Gupta and Yesudian (2006) added another dimension on attitudes toward domestic violence to measure women empowerment in India. Allendorf (2007) disaggregated women's empowerment into four areas: (i) own health care, (ii) making large household purchases, (iii) making daily household purchases, and (iv) visiting family/friends. Haque and co-researchers (2011) attempted to construct women empowerment index based on three dimensions: economic decision-making, household decision-making and physical movement.

Many studies have found an inverse relationship between women empowerment and fertility (Cain, Khanam & Nahar, 1979; Dyson & Moore, 1983; Basu, 1992; Jejeebhoy, 1995; Sathar, Callum & Jejeebhoy, 2001; Al-Riyami & Afifi, 2003; Hakim, Salway & Mumtaz, 2003; Gudbrandsen, 2013). A study on five Asian countries including India, Malaysia, Pakistan, Philippines and Thailand found that women with relatively higher decision-making power and greater freedom of movement have lower fertility and less desire for future children (Mason & Smith, 1999). In Iran, Chavoshi, Abbasi-Shavazi and McDonald (2004) found holding constant other socio-economic and demographic factors, women who enjoyed freedom from threat of husband were likely to have lower fertility than those who feared or beaten by husband. Omani women with greater freedom of movement were more likely to have fewer children, and women with greater decision-making power were more likely to give birth at an older age and have longer birth intervals (Al-Riyami & Afifi, 2003).

While the inverse relationship between women's status and fertility is well established, some empirical studies have shown otherwise. Sankar Saikia, Steele and Dasvarma (2001) found that despite the high level of female autonomy in a strong matrilineal kinship system, women in northeast India recorded the highest fertility in the country because high women autonomy tends to promote high fertility in a strong traditional society and pronatalist environment. A study on four Asian countries including India, Malaysia, Philippines and Thailand found that women's autonomy was not an important determinant of fertility for Muslim and non-Muslim women, and the pronatalist behavior among Muslim women is not indicative of the general tendency of Muslim women to have lower status than non-Muslim women (Morgan et al., 2002). Amin and Lloyd (2002) also proved that neither gender mechanisms nor changes in women's opportunities appear to have contributed to declining fertility in Bangladesh and Egypt. In Nepal, women's

power in decision-making is positively correlated with the number of children (Acharya et al., 2010). Upadhyay and Karasek (2010) also found that women with greater empowerment were more likely than their less empowered counterparts to have more children than they desired in Namibia.

2.4.3 Proximate Determinants and Fertility

Many studies revealed that socio-economic development such as widespread education and women employment have been the major causes for fertility reduction (Mauldin, Berelson & Sykes, 1978; Forste & Tienda, 1996; Mason, 2001; El-Ghannam, 2005; Jones, 2007; Nisa, 2007; Haque & Sayem, 2009; Tey, Ng & Yew, 2012). However, these factors can only affect fertility through the proximate determinants. Davis and Blake (1956) were the first to introduce the concept of proximate determinants, which included 11 variables: (i) age of entry into sexual unions, (ii) permanent celibacy, (iii) amount of reproductive period spent after or between unions, (iv) voluntary abstinence, (v) involuntary abstinence, (vi) coital frequency, (vii) fecundity or infecundity (as affected by involuntary causes), (viii) use or non-use of contraception, (ix) fecundity or infecundity (as affected by voluntary causes), (x) fetal mortality from involuntary causes, and (xi) fetal mortality from voluntary causes. In 1978, Bongaarts reclassified these variables into four main determinants which accounted for 96 percent of the variations in fertility in a multi-country and multi-culture population study. The four main proximate determinants of fertility are: (i) delayed marriage or non-marriage (the intercourse variable in the original Davis-Blake model), (ii) contraceptive use (conception variables within marriage), (iii) post-partum infecundability (gestation variable, mainly through breastfeeding), and (iv) induced abortion (gestation variable). Of the four determinants,

rising age at marriage and contraceptive use are by far the more significant ones in bringing about continuing fertility decline in the developing countries since the 1960s.

This sub-section focuses discussion on the two most important proximate determinants of fertility, which are age at marriage and contraceptive use. These two factors are often referred as the driving factors of the different demographic regimes in many past studies (Coale, 1984; Poston Jr., 1986; Ross et al., 1986; Feeney et al., 1989; Kaufman, 1993; Tu, 1995; Zhang, 2004; Koc, Hancioglu & Cavlin, 2008; Tey, Ng & Yew, 2012; Das, Das & Thi Ngoc Lan, 2013).

2.4.3.1 Changing Marriage Patterns

Marriage is a fundamental social system that significantly influences family formation and structure. Fertility level is strongly affected by the age at which women enter marriage as it determines the duration of women's exposure to the risk of pregnancy. Bongaarts (1978; 1982) found that women's age at first marriage is one of the main proximate determinants of fertility. Early marriage will increase the length of exposure to reproduction, resulting in more children without use of effective contraception.

Marriage pattern is affected by the social characteristics, economic conditions, customs, traditions, cultures and values practiced in a population. In traditional societies, women usually marry early due to traditional norms and cultures, poverty, weak enforcement of law, and contemporary pressures (United Nations Children's Fund, 2001). Men typically act as the sole breadwinners to support household expenditures, while women are responsible for household chores. Hence, women traditionally have little autonomy within the family, including decision-making on childbearing. However, with

modernization and economic development, women are exposed to greater opportunities of education and employment, and this enhances their empowerment and role in decision-making. In most East Asian countries, including China, Korea, Japan, Hong Kong, and Taiwan, where traditional households are mostly dominated by men in the past, women are now enjoying a greater independence (Choe, Westley & Retherford, 2002).

Women with higher educational attainment are capable to hold higher position in the labor market and earn higher income, and this subsequently leads to marriage postponement and delayed childbearing. Past studies supported the effect of employment on rising age at marriage (Amin & Al-Bassusi, 2004; International Labour Office, 2004; Jones, 2007). Singh and Samara (1996) described female labor force participation as one of the major factors in affecting women's age at first marriage. Jones (2007) found that both marriage postponement and sharp fertility decline have taken place due to an increase in female education and employment, as higher female labor force participation has led to a sharp rise in age at marriage, especially in Japan and Singapore. In the Philippines, David, Chin and Herradura (1998) found that western Visayas working women tended to delay marriage.

Financially independent women tend to delay marriage and this subsequently influences reproductive choices. Delayed marriage exerts negative impact on fertility due to shorter duration of exposure to the risk of childbearing. Jones (2007) found that delayed marriage reduces fertility, especially in countries where premarital childbearing is not socially and culturally accepted. Cleland (2001) identified marriage postponement as one of the main reasons of fertility decline. Gubhaju (2007) also found that rising age at first marriage is among the main causes of fertility decline in Sri Lanka and Thailand. Manda and Meyer (2005) explained that the declining trend in teenage marriage and that

increasing women's educational level in sub-Saharan Africa has been accompanied by rising age at marriage, which directly reduces fertility rate. The UN Population Division marriage data (2013c) showed that South African women had one of the highest mean age at first marriage in the world (subjected to some upward bias due to cultural factors), and this marital trends contributed to the comparatively low fertility of the country in a continent characterized by high fertility. Jones (2010) found that below replacement level fertility in East and Southeast Asia countries has been the result of delayed and non-marriage.

2.4.3.2 Family Planning Efforts and Role of Contraceptive Use

In 1916, the first birth control clinic was launched in New York by combining the population control and women's empowerment movements into the family planning movement (World Health Organization, 2012). National policies to spread family planning to large populations have commenced in the mid-1960s and currently being implemented in most developing countries (Ross & Smith, 2010; World Health Organization, 2012). However, these family planning programs differ markedly in terms of strength, coverage and the nature of their outreach (Ross & Smith, 2010).

The first framework to measure the strength of family planning programs was proposed by Lapham and Mauldin in 1972, and modified in 1982. This research was replicated in 1989, 1994, 1999, 2004, 2009, and 2014, generating indices to determine program inputs for analyzing fertility change and increased contraceptive use (Mauldin et al., 1995; Ross & Mauldin, 1996; Ross & Stover, 2001; Ross & Smith, 2010). The 2009 survey carried out by Ross and Smith (2010) in 81 countries based on the instrument developed by Ross and Cooper-Arnold in 2000 showed that the average program effort

index has been improving slowly over the years. The Asian region had the highest score due to strong program efforts in China, Bangladesh, Sri Lanka, Indonesia, Malaysia, Cambodia, Vietnam and Nepal (each country with total scores of above 55 out of 100). Nevertheless, the family planning effort varies widely within region. For instance, the Philippines and Myanmar had the lowest scores in family planning efforts among the Asian countries, both scoring less than 30.

Family planning programs have had a major and distinctive effect on fertility level in many countries (Bongaarts & Sinding, 2009). Family planning has contributed to the improvement in quality of life, and opportunities for women including education and employment which have resulted in fertility decline (United States Agency for International Development, 2009). Gubhaju (2006) noted that successful implementation of national family planning program is one of the main causes of significant fertility decline in Indonesia and Bangladesh. In Thailand, the national family planning program has been recognized as a major force in the significant fertility reduction that has taken place since the mid-1960s (Rosenfield et al., 1982). Angeles, Guilkey and Mroz (2005) compared the fertility in rural Peru both pre- and post-endorsement of Peru National Family Planning Program, and found that the program facilitated the fertility reduction after the program was enacted in 1985. In Egypt, wider use of contraception has been the leading cause in fertility decline (Moreland, 2006). Access to family planning services and increased contraceptive use significantly lowered the cumulative fertility by about half children for women aged less than 30 in Ethiopia (Portner, Beegle & Christiaensen, 2011).

Promoting greater use of contraceptive methods has been the key family planning strategies, and increased contraceptive use has been one of the major proximate determinants of fertility. While the contraception was first known in 1300 B.C. (Li & Lo, 2005), modern contraceptive methods have only a short history and it has been dominated by the oral contraceptive pill, which became publicly available since 1960 (Glasier, 2002). Contraceptive use has been increasing steadily since 1970 and is now rather widespread in many parts of the world (UN, 2006; Astbury-Ward, 2009). The global contraceptive prevalence rate was estimated to have risen from 58 percent in 1990 to 60 percent in 2000 and to 63 percent in 2010 (World Bank, 2015b).

Contraceptive use has been the main cause of fertility reduction in many countries. Studies have found that differences in contraceptive prevalence rate explained more than 90 percent of the variation in fertility among the developing countries, and thus contraception is the most important proximate determinant of fertility (Robey, Rutstein & Morris, 1992; 1993). Curtis and Diamond (1995) found a strong relationship between contraceptive prevalence rate and TFR among currently married women. Over the past three decades, the use of modern contraceptive methods has increased appreciably in the developing countries, leading to fertility decline (Moreland, Smith & Sharma, 2010). In Bangladesh, contraceptive use has emerged as the main fertility-reducing factor as the national family planning program has registered remarkable achievement, with the contraceptive prevalence rate increasing sharply from 7.7 percent in 1975 to 45.0 percent in 1993-94 (Islam, Mamun & Bairagi, 1998), and further to 61.0 percent in 2011 (World Bank, 2015b). An earlier study found that among the three major determinants, namely family planning programs, economic development and women's status, contraceptive use explained 75 percent of the fertility decline in Indonesia between 1982 and 1987 (Gertler & Molyneaux, 1994). The rapid rise in contraceptive use from 18.0 percent to 61.0

percent between 1976 and 2007 had resulted in the continuing fertility decline in Indonesia in the past 40 years (Rahayu, Utomo & McDonald, 2009). Noble and Potts (1996) concluded that access to contraceptive services and female sterilization are among the major factors that contributed to the rapid decline in family size in South Korea and Cuba. In Nepal, Balal (2009) found that fertility reduction was almost entirely due to the decline in rural fertility rate, caused primarily by the increase use of modern contraceptive methods in rural areas.

Socio-economic development has brought significant changes in preferred family size, resulting in fertility reduction with widespread contraceptive use. Significant urban-rural differentials in contraceptive use have been found in several societies. Costello and Casterline (2002) found that inaccessibility to family planning services remains a major barrier to contraceptive use in the remote rural areas in the Philippines. A study in Midwestern United States also found significant urban-rural differences in contraceptive use, as those living in urban areas may avail themselves to contraception to postpone having children (Hartlage et al., 2001). Nevertheless, with improvement in transport and communication, inaccessibility to family planning services may no longer be a major deterrent to contraceptive use among rural populations.

Female education has a very strong impact on contraceptive use, and this directly affects the fertility level. Bbaale and Mpuga (2011) found that female education, particularly at the secondary and post-secondary levels, increases the likelihood of using contraception and reduces fertility rate in Uganda. A study conducted in the urban slums of Pakistan found that higher female educational level was related with higher contraceptive use and fewer children (Sarmad, Akhtar & Manzoor, 2007). Another study carried out in Pakistan among rural married women also found that higher level of

education was accompanied by higher level of contraceptive use, and subsequently led to lower fertility (Ilyas et al., 2011). However, multivariate analysis was not carried out in these three studies, and the net effect of female education on contraceptive use cannot be ascertained without controlling the confounding variables.

Couples from richer families are more likely to use a contraceptive method because they are able to afford the cost of family planning services, and thus lead to fertility reduction. Bagheri and Nikbakhesh (2010) found that both maternal literacy and family income had a strong effect on the use of modern contraceptive method. In Russia, women with middle income were more likely than women in the lower income group to have used the pills (Regushevskaya et al., 2009). Agha (2000) also showed that low income is a deterrent to the use of modern contraceptive method in Pakistan, and this explains the relatively high fertility as compared to its neighboring countries. Nonetheless, effective family planning programs can boost contraceptive use regardless of income level and country's level of development, as in the case of Bangladesh and Cambodia.

Improving the status of women has been perceived as one of the facilitating factors to enhance reproductive and sexual health, facilitated by the use of contraceptive methods. Greater gender equality and women's autonomy may increase contraceptive use due to greater women's participation in decision-making (Hakim, Salway & Mumtaz, 2003). Past research on Asian countries supported the positive impact of women's empowerment on contraceptive use (Morgan & Niraula, 1995; Gwako, 1997; Malhotra, Schuler & Boender, 2002) and lower fertility (Dyson & Moore, 1983; Balk, 1994). Studies carried out in Togo and Mexico found positive impact of women's participation in paid employment and financial autonomy on contraceptive use for limiting or spacing births (Gage, 1995; Nazar-Beutelspacher et al., 1999). Govindasamy and Malhotra (1996)

found that freedom of mobility and autonomy in family planning decisions, along with education, urbanization, age, marital duration, and socio-economic status were all significant factors in determining contraceptive use in Egypt, and the reproductive characteristic of women's position has a strong connection with the non-reproductive dimensions. Two different studies carried out in rural Bangladesh concluded that women's participation in income generating activities and microcredit programs had empowered them, resulting in increased contraceptive use and lower fertility (Amin, Hill & Li, 1995; Schuler, Hashemi & Riley, 1997).

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter describes the research methodology used for this study. It begins with a description on data sources, followed by the conceptual framework for fertility analysis. A brief description of the study variables and statistical data analysis techniques will be presented next.

3.2 Data Sources

Data for this study were obtained from the DHS. Since 1984, more than 260 DHS were conducted in over 90 countries (Measure DHS, 2011). The surveys provide rich data on topics related to socio-economic and demographic background, marriage, fertility regulation, women's status, domestic violence and various aspects of health and family life that are relevant for the evaluation of family planning and public health programs. Detailed and updated information on demographic and public health in Cambodia, Indonesia and the Philippines, the three countries in this study, were collected in the surveys, as shown in Table 3.1.

Table 3.1: Topics covered in latest surveys

Topics	2014 Cambodia DHS	2012 Indonesia DHS	2013 Philippines DHS
Socio-economic and demographic variables (e.g. age, wealth index, place of residence, women's educational level and work status)	√	√	√
Marital status, age at marriage and sexual activity	√	√	√
Knowledge and ever/current use of contraception	√	√	√
Reproductive history	√	√	√
Fertility level (number of children ever born) and fertility preference	√	√	√
Pregnancy, postnatal care and breastfeeding initiation	√	√	√
Infant and child mortality	√	√	√
Adult and maternal mortality	√	√	-
Maternal and child health	√	√	√
Nutritional status of children and women	√	√	√
Knowledge, attitudes and behaviors related to HIV/AIDS	√	√	√
Other health issues	√	√	√
Women's status and empowerment	√	√	√
Domestic violence	√	-	√

Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014).

This study is based on all currently married women aged 15 to 49 years in the three countries under study, including those who were cohabitating. The latest survey available in Cambodia, Indonesia and the Philippines will be used for comparative analysis. Table 3.2 shows the number of respondents in each survey.

Table 3.2: Sample size by survey

	2014 Cambodia DHS	2012 Indonesia DHS	2013 Philippines DHS
Number of households interviewed	15,825	43,852	14,804
Number of women interviewed	17,578	45,607	16,155
Number of currently married women	11,668	32,706	9,866

Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014).

The DHS conducted in each country is a nationally representative survey designed to gather information on fertility, family planning and topics relating to demographic and health conditions in the country. The following sub-sections describe the organization of the survey for the latest DHS in Cambodia, Indonesia and the Philippines.

3.2.1 The 2014 Cambodia Demographic and Health Survey (2014 CDHS)

The Cambodia Demographic and Health Survey (CDHS) was first conducted in 2000 by the National Institute of Statistics (NIS) of the Ministry of Planning (MOP) and the MOH. The second CDHS was jointly conducted by the National Institute of Public Health in 2005, and the 2010 and 2014 CDHS were jointly conducted by the Directorate General for Health of the MOH and the NIS of the MOP. The latest survey was carried out between June and December 2014. The 2014 CDHS was funded by the United States Agency for International Development (USAID), Australia-Department of Foreign Affairs and Trade, UNFPA, United Nations Children's Fund, Japan International Cooperation Agency, Korea International Cooperation Agency, and the Health Sector Support Program-Second Phase, with technical assistance from Inner City Fund (ICF) International.

Detailed description of the sample selection and the modules for the DHS in Cambodia, Indonesia and the Philippines are taken from the published reports and reproduced in Appendix A.

3.2.2 The 2012 Indonesia Demographic and Health Survey (2012 IDHS)

The 2012 Indonesia Demographic and Health Survey (IDHS) was the seventh nationally representative survey conducted from May to July 2012. The survey was conducted by Statistics Indonesia (also known as Badan Pusat Statistik) in collaboration with BKKBN and MOH, and partially funded by the Government of Indonesia. The survey received technical assistance from ICF International, and was sponsored by USAID through Measure DHS program.

3.2.3 The 2013 Philippines National Demographic and Health Survey (2013 NDHS)

The 2013 Philippines National Demographic and Health Survey (NDHS) was conducted by the National Statistical Office of the Philippines between August and September 2013. This was the tenth in a series of similar surveys conducted in the country. Since 1993, five of these surveys (1993, 1998, 2003, 2008, and 2013) were conducted as part of the international Measure DHS program, technically assisted by ICF International and funded by USAID through Measure DHS program.

3.3 Conceptual Framework

The model of fertility analysis used in this study is based on the framework introduced by Davis and Blake in 1956 (Davis & Blake, 1956). Davis and Blake proposed that social, economic and cultural factors can only influence fertility through one or more of the 11 intermediate variables. Bongaarts (1978; 1982) modified Davis-Blake framework and regrouped the variables into four broad categories of intermediate variables: marriage (proportion married), contraception, post-partum infecundability (as measured by

breastfeeding), and induced abortion. The effects of indirect factors, which include socio-economic, cultural and environmental factors on fertility are mediated through these proximate determinants. Using data from 41 developed and developing countries with diverse historical and contemporary populations, Bongaarts (1978; 1982) found that the four major intermediate variables accounted for 96 percent of the variations in the fertility across populations. Bongaarts' model that quantifies the fertility-inhibiting effects of each main proximate determinant has been widely used in many fertility studies (Palloni, 1984; Warren et al., 1992; Stover, 1998; Visaria, 1999; Moses & Kayizzi, 2007; Amin & Teerawichitchainan, 2009; Tey, Ng & Yew, 2012). The effects of indirect factors on fertility are mediated through the intermediate variables, as shown in Figure 3.1.

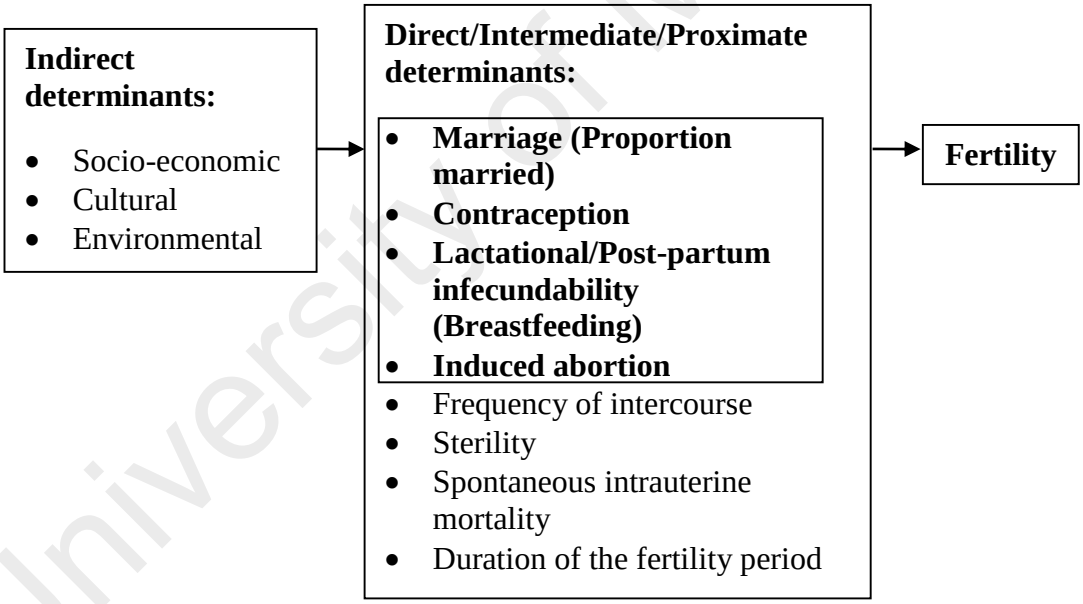

Figure 3.1: Bongaarts' framework for fertility analysis

Sources: Bongaarts (1978; 1982).

3.4 Study Variables

3.4.1 Dependent Variables

The commonly used fertility measures are crude birth rate and TFR, and these period rates are generally obtained from vital registration. TFR is a period measure that refers to the number of children a woman would produce in her life time subject to prevailing birth and death rates. Household surveys generally collect information on the number of children ever born by women. The number of children ever born is a cohort measure that indicates the cumulative number of children born to women as at time of the survey. This variable is useful for examining the momentum of childbearing and average family size across sub-groups of population.

The number of children ever born among currently married women aged 15-49 years will be used as the main dependent variable in this thesis. As the number of children ever born is a cumulative measure that increases with age and duration of first marriage, it is necessary to control for differences in these two variables in comparing the fertility levels across country and sub-groups of the populations.

3.4.2 Indirect/Independent Variables

3.4.2.1 Socio-Economic Variables

A number of socio-economic variables will be used as independent variables or indirect determinants of fertility. Current place of residence is categorized as urban and rural location. Although childhood place of residence would be an appropriate

independent variable in explaining the number of children ever born, information was not available in the three countries under study. Respondents and their husbands who had never been to school are grouped with those with primary schooling, as the former comprised only a very small proportion of the respondents. Respondents and their partners are involved in a wide variety of occupations. However, as the number of employees in some occupations is rather small, women and their husbands in this study are grouped as not working, working in the agricultural sector and working in the non-agricultural sector. The economic status of the household is measured in terms of the wealth index and the variable is divided into quintiles. The wealth index is created by allocating a weight to each household asset through Principal Component Analysis (PCA). Assets are evaluated based on household ownership of durable goods, dwelling characteristics, and other characteristics associated to the household's socio-economic status.

3.4.2.2 Women Empowerment Variables

In this study, measures of women's empowerment were constructed using PCA. Cronbach Reliability Test based on the combination of a set of measurable variables, such as women's participation in household decision-making and justification for wife beating by husband were carried out to corroborate the reliability of each of the components constructed. Detailed description on the construction of women's empowerment is shown in Appendix B.

(a) Household decision-making autonomy

The roles of women in household decision-making varied across countries. Information pertaining to women's roles in decision-making within the household in each of the country is shown in Table 3.3.

Table 3.3: Roles of women in decision-making

Aspects of decision-making	2014 CDHS	2012 IDHS	2013 NDHS
Own health care	√	√	√
Making large household purchases	√	√	√
Making household purchases for daily needs	-	-	√
Visits to family or relatives	√	√	√

Sources: Cambodia DHS (2015); Indonesia DHS (2013); Philippines DHS (2014).

The decision makers for each of the above mentioned aspects are initially grouped into six categories as below:

(a) Respondent alone

(b) Respondent and husband

(c) Respondent and other person

(d) Husband alone

(e) Someone else

(f) Other

A dichotomous variable is created for each of these aspects to measure whether a woman is involved in the decision-making, with a code of "1" if she is involved in decision-making and a code of "0" if she is not involved in the decision-making (Acharya et al., 2010). This component consists of 3 items in 2014 CDHS, 3 items in 2012 IDHS and 4 items in 2013 NDHS. Hence, the value ranges from 0 to 3 in Cambodia and Indonesia and 0 to 4 in the Philippines. Since the number of variables on women's autonomy varied across countries, mean index will be constructed, with a value ranging

from 0 to 1 in each country. Women who scored 0 are classified as “No” autonomy, those who scored 1 are grouped as "Full" autonomy, and those with values that fall within this range are deemed to have "Some" autonomy. Higher value indicates women are actively involved in household decision-making, and this indicates higher empowerment.

(b) Attitude towards wife beating by husband

The surveys collected information on women’s perception on the grounds that justify wife beating. Women in societies that are strongly against wife beating are deemed to have higher status than those from societies that condone wife beating by husband. Respondents were asked to answer “Yes” or “No” to each of the following five circumstances regarding wife beating justification:

(a) if she goes out without telling him

(b) if she neglects the children

(c) if she argues with him

(d) if she refuses to have sex with him

(e) if she burns the food

Respondents who answered “Yes” to each of the justification is coded as “0” as they accept the behavior and those who responded “No” is coded as “1” as they do not think that it is acceptable for husband to beat the wife. The index ranges from 0 to 5. Women who scored between 0 and 1 are grouped under “Low” disagreement, between 2 to 3 are grouped under “Moderate” disagreement, and between 4 to 5 are grouped under “High” disagreement towards wife beating. Women with higher score suggest that they are against domestic violence listed above, indicating higher gender-equitable attitudes (Nanda, Schuler & Lenzi, 2013), and therefore women possess higher status in their societies.

3.4.2.3 Summary of Independent Variables

A total of eight independent variables were used in this study. Table 3.4 shows the coding for each independent variable.

Table 3.4: Summary of independent variables and their codes

Variables	Definition and abbreviation	Codes
x_1	Place of residence (PLACE)	1 = Urban 2 = Rural
x_2	Women's educational level (WOMENEDU)	1 = No schooling/Primary 2 = Secondary 3 = Tertiary
x_3	Husband's educational level (HUSBANDEDU)	1 = No schooling/Primary 2 = Secondary 3 = Tertiary
x_4	Women's work status (WOMENWORK)	1 = Not working 2 = Agricultural sector 3 = Non-agricultural sector
x_5	Husband's work status (HUSBANDWORK)	1 = Not working 2 = Agricultural sector 3 = Non-agricultural sector
x_6	Wealth index (WEALTH)	1 = Poorest 2 = Poorer 3 = Middle 4 = Richer 5 = Richest
x_7	Household decision-making autonomy (DECISION)	1 = No autonomy 2 = Some autonomy 3 = Full autonomy
x_8	Attitude towards wife beating by husband (BEATING)	1 = Low disagreement 2 = Moderate disagreement 3 = High disagreement

3.4.3 Intermediate Variables

Socio-economic factors can only affect childbearing through the intermediate variables (Davis & Blake, 1956; Bongaarts, 1978; 1982). In 1984, Bongaarts and co-researchers (Bongaarts, Frank & Lesthaeghe, 1984) regrouped the proximate determinants into two categories that will lead to future enhancing or reducing trends in fertility, which are:

(a) Fertility-enhancing trends: shortening of breastfeeding and post-partum abstinence; decline in pathological sterility.

(b) Fertility-reducing trends: rise in age at first marriage; higher prevalence and effectiveness of contraception.

The main focus of this study will be on age at marriage and contraceptive use (measured by contraceptive prevalence rate - percent of married women in the reproductive age group currently using a contraceptive method). These two variables are by far the most important proximate determinants of fertility.

3.5 Research Framework

The research framework used in this study has been derived and modified from Bongaarts' framework, as shown in Figure 3.2. It is to be mentioned that current socio-economic status such as current place of residence, current work status and current wealth index may not be appropriate independent variables in explaining age at first marriage due to the time lag. On the other hand, contraceptive use cannot be used to explain the differentials in the number of children ever born at the individual level due to the inverse causation, as high parity women are much more likely than low parity women to use a method. Hence, taken at face value, one may come to the wrong conclusion that contraceptive use results in large family size! However, it is possible to assess the impact of contraceptive use on childbearing using group data, as the sub-groups that have a higher contraceptive prevalence rate are likely to have fewer children. For instance, one may show the association between level of contraceptive use and mean number of children ever born across countries or educational categories within country.

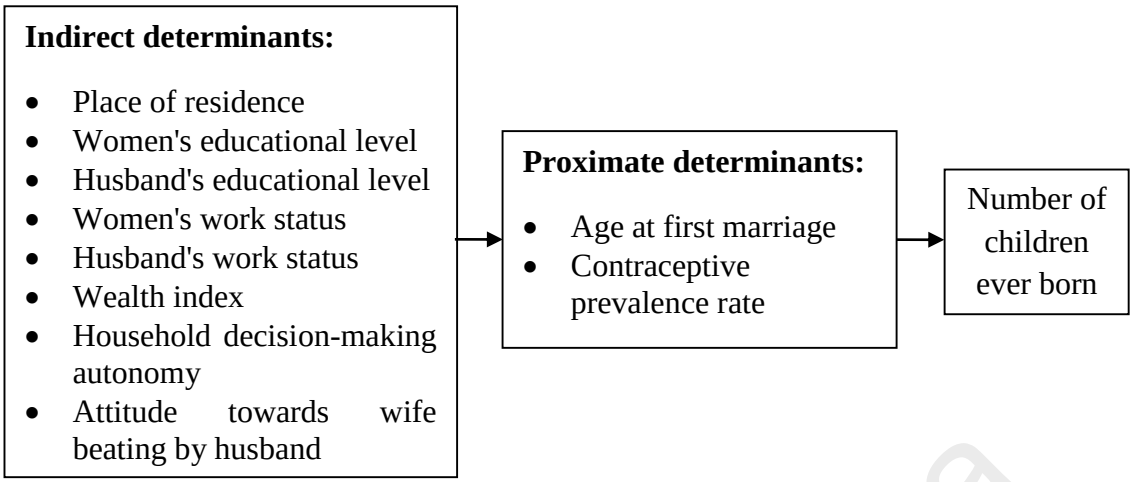

Figure 3.2: Research framework

3.6 Data Analysis Techniques

3.6.1 Negative Binomial Regression Analysis

The effects of selected socio-economic and women empowerment factors on number of children ever born will be analyzed using bivariate and multivariate techniques. The number of children ever born is a count variable with a limited range, and therefore multiple linear regression is not that appropriate. Alternatively, statistical techniques that are less stringent on the normality assumptions may be more appropriate in analyzing the number of children ever born. Poisson Regression and Negative Binomial Regression models are the appropriate techniques for analyzing count data (Signorini, 1991; Winkelmann & Zimmermann, 1995; Hilbe, 2011). However, the application of Poisson Regression requires the assumption of equidispersion (response variance is equivalent to the mean) to be met, while Negative Binomial Regression is preferred when overdispersion (response variance is greater than the mean) exists in the data (Hilbe, 2011). Hence, Lagrange Multiplier test is used to determine whether the data should be modeled as Poisson or Negative Binomial. Based on the null hypothesis of equidispersion,

Lagrange Multiplier test examines the significance of two alternative hypotheses, which are overdispersion and underdispersion (response variance is smaller than the mean) (IBM Corporation, 2012).

Table 3.5 shows that the alternative hypothesis of overdispersion is significant when the number of children ever born is regressed against each independent variable for each of the three countries. This suggests that Negative Binomial model is a more appropriate technique over Poisson model. Table 3.6 also shows a higher variance than mean number of children ever born, and hence Negative Binomial technique was used for the multivariate analysis.

Table 3.5: Lagrange Multiplier test on overdispersion/underdispersion for Cambodia, Indonesia and the Philippines data

	2014 CDHS		2012 IDHS		2013 NDHS	
	Sig. (under-)	Sig. (over-)	Sig. (under-)	Sig. (over-)	Sig. (under-)	Sig. (over-)
Place of residence	1.000	0.000	1.000	0.000	1.000	0.000
Women's educational level	1.000	0.000	1.000	0.000	1.000	0.000
Husband's educational level	1.000	0.000	1.000	0.000	1.000	0.000
Women's work status	1.000	0.000	1.000	0.000	1.000	0.000
Husband's work status	1.000	0.000	1.000	0.000	1.000	0.000
Wealth index	1.000	0.000	1.000	0.000	1.000	0.000
Household decision-making autonomy	1.000	0.000	1.000	0.000	1.000	0.000
Attitude towards wife beating by husband	1.000	0.000	1.000	0.000	1.000	0.000

Notes:
under- means underdispersion.
over- means overdispersion.
Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

Table 3.6: Variance and mean number of children ever born in Cambodia, Indonesia and the Philippines

	2014 CDHS	2012 IDHS	2013 NDHS
Mean	2.6	2.4	3.0
Variance	3.5	2.9	4.8

Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

Negative Binomial Regression is a better alternative to Poisson Regression when the assumption of equidispersion is not met (Allison, 1999; Agresti, 2002). It is used to model information on counts of various kinds, particularly in situations where there is no natural denominator, and thus no upper bound on how large an observed count can be. It can overcome the issue of overdispersion by including a dispersion parameter to accommodate the unobserved heterogeneity in the count data. Application of this method requires large sample size because the parameters of the model are estimated through Maximum Likelihood estimation. The function is as follow.

$$f(y \mid x) = \frac{\Gamma\left(y + \alpha^{-1}\right)}{y!\Gamma\left(\alpha^{-1}\right)}\left(\frac{\alpha^{-1}}{\alpha^{-1}+\mu}\right)^{\alpha^{-1}}\left(\frac{\mu}{\alpha^{-1}+\mu}\right)^{y} \quad (1)$$

where

x = independent variables/predictors;

y = dependent variable/the number of occurrences (number of children ever born);

μ = mean;

α = dispersion parameter (the extent of overdispersion); and

r = gamma distributed function.

Negative Binomial Regression can be considered as a generalization of Poisson Regression and assumes that the conditional mean is not only determined by the predictors, but also a heterogeneity component (denoted by epsilon (ε)) to overcome overdispersion. With a Poisson distributed dependent variable and gamma-distributed model error, this method is also known as the Poisson-Gamma Model (Lord, Washington & Ivan, 2005). The model equation for Negative Binomial distributed number of children ever born with log of the mean is expressed as below:

$$\ln E(y_i) = \ln(\mu_i) = \beta_0 + \sum_{j=1}^{K}\beta_j x_{ji} + \alpha_i \quad (2)$$

where μ is the mean number of children ever born, x_{ji} is the j^{th} predictor of the i^{th} woman, β_0 is the intercept term, β_j represent measures of effects or coefficients of the predictors, and α is the dispersion coefficient. Exponentiations of both sides give the mean number of children ever born as below:

$$\mu = \exp(\beta_0 + \sum_{j=1}^{K} \beta_j x_{ji} + \alpha_i) \quad (3)$$

Negative Binomial Regression analysis provides several useful outputs for analysis. The Likelihood Ratio Chi-square test is used to examine the significance of each factor in explaining the dependent variable. The incidence rate ratio (IRR) measures the difference in the exponentiated expected log-count of one level compared with another for each factor. It is then used to calculate the computed means for the categories of each variable. The statistical significance of the difference is then analyzed using Wald Chi-square test. The predictor variables and their respective reference groups (with Code 1) are shown in Table 3.7.

Table 3.7: Predictor variables and the reference group used in the Negative Binomial Regression analysis

Predictor variables	Reference group
Place of residence	Urban
Women's educational level	No schooling/Primary
Husband's educational level	No schooling/Primary
Women's work status	Not working
Husband's work status	Not working
Wealth index	Poorest
Household decision-making autonomy	No autonomy
Attitude towards wife beating by husband	Low disagreement

In general, interaction terms are necessary in statistical model building. However, Hilbe (2011) argued that while the interaction term is very important in regression models, it is not particularly essential in count models.

3.6.2 Summary Statistics and Scatter Plots

Summary statistics such as the mean values and percentage distributions are used to examine the differences in age at marriage and contraceptive use across the categories of selected variables. The mediating effects of intermediate variables are presented in scatter plots.

3.6.3 Bongaarts' Model for Estimating the Fertility-Inhibiting Effects of the Proximate Determinants

The TFR of a population is a function of the total fecundity rate (TF); index of marriage, index of contraception, index of post-partum infecundability, and index of abortion (Bongaarts, 1978; 1982). Bongaarts' formulae which have been widely used by many authors are shown below:

$$TFR = C_m \times C_c \times C_i \times C_a \times TF \quad (4)$$

$$TM = C_c \times C_i \times C_a \times TF \quad (5)$$

$$TN = C_i \times TF \quad (6)$$

where

TFR is the total fertility rate;

TM is the total marital fertility rate;

TN is the total natural marital fertility rate;

TF is the total fecundity rate, which was estimated at 15.3 based on Bongaarts' analysis of a large number of historical populations; and

C_m, C_c, C_i and C_a are the indices of marriage, contraception, post-partum infecundability, and induced abortion respectively.

The indices take the value between 0 and 1. The index takes the value of 0 if fertility-inhibition is complete. If there is no fertility-inhibiting effect of a given proximate determinant, the index will take the value of 1. The following sub-section shows the estimation of the four indices of proximate determinants.

3.6.3.1 Index of Marriage (C_m)

Later age at marriage is associated with higher inhibiting effect on fertility. The index of marriage equals to 0 if all women aged 15-49 years are single (presumably no intercourse takes place), and 1 if all of them are married. The formula is shown as below.

$$C_m = \frac{TFR}{TM} = \frac{\sum m(a)g(a)}{\sum g(a)} \quad (7)$$

where m(a) is the age-specific proportion of married women at age a, g(a) is the age-specific marital fertility rate at age a, and TM is the total marital fertility rate. Data on TFR and ASFR are needed for estimating the index of marriage. Age-specific marital fertility is computed by dividing the ASFR with the proportion currently married among women in the specific age groups.

3.6.3.2 Index of Contraception (C_c)

Higher contraceptive use is associated with a higher inhibiting effect on fertility. The index of contraception equals 0 if all married women aged 15-49 years using a fully effective contraceptive method, and 1 if all of them are not using contraception. The formula is shown as below.

$$C_c = 1 - 1.08 \times u \times e \quad (8)$$

where u is the proportion of married women aged 15-49 using a contraceptive method, and e is the average use effectiveness of contraception. The e value for each contraceptive method suggested by Bongaarts is shown in Table 3.8. The coefficient 1.08 is a sterility correction factor that represents an adjustment for the fact that women do not use contraception if they know that they are sterile.

Table 3.8: Average use effectiveness of contraception

Contraceptive method	Estimated use effectiveness (e)
Sterilization	1.00
IUD	0.95
Pill	0.90
Other	0.70

Source: Bongaarts (1982).

3.6.3.3 Index of Post-partum Infecundability (C_i)

Duration of breastfeeding and post-partum abstinence in the population exert a depressing effect on fertility, by postponing the resumption of menstruation and pregnancy respectively. A lower value of index of post-partum infecundability represents a higher fertility-inhibiting effect. The formula is shown as below.

$$C_i = \frac{20}{(18.5 + i)} \quad (9)$$

where i is the mean duration of post-partum infecundability in months caused by breastfeeding or post-partum abstinence. Since the direct estimate of i is not available, the approximate value of i can be obtained from the duration of breastfeeding, B, with the following equation:

$$i = 1.753 \exp (0.1396 \times B - 0.001872 \times B^2) \quad (10)$$

The average birth interval is about 20 months if no breastfeeding and post-partum abstinence are practiced, which is the summation of:

(i) 1.5 months of minimum post-partum anovulation,

(ii) 7.5 months of waiting time to conception,

(iii)2 months of time added by spontaneous intrauterine mortality, and

(iv)9 months for a full term pregnancy (Moses & Kayizzi, 2007).

If married women breastfeed their children and practicing post-partum abstinence, the average birth interval is the summation of:

(i) 18.5 months (7.5 + 2 + 9 months), and

(ii) the duration of post-partum infecundability (Bongaarts & Potter, 1983).

3.6.3.4 Index of Induced Abortion (C_a)

The index of induced abortion is defined as the ratio of TFR to the estimated TFR without induced abortion. The higher the total abortion rate among married women, the lower the index of induced abortion, and the larger the fertility-inhibiting effect. The formula is shown as below.

$$C_a = \frac{TFR}{TFR + 0.4 \times (1 + u) \times TA} \tag{11}$$

where u is the contraceptive prevalence rate, and TA is the total abortion rate among married women.

Abortion is legal for any reason in Cambodia, legal exception to save the life of a woman in Indonesia and the Philippines, and is allowed in case of rape or incest in Indonesia (UN, 2013a). As of 2005, an annual abortion ratio of 8.43 abortions per 1,000 women and 8.98 per 100 live births were observed in Cambodia (Fetters & Samandari, 2009). It is estimated that about 37 abortions occurred annually for every 1,000 Indonesian women in the reproductive age group, which is much higher than that of Asia as a whole in 2000 (Sedgh & Ball, 2008). In the Philippines, abortion is not permitted unless saving the life of a woman on the ground of necessity, and therefore reliable statistics on abortion in the Philippines is not available. The abortion rate is required to calculate the index of induced abortion. The DHS for the three countries do not provide data on the total abortion rate. Hence, the index of induced abortion is estimated as the residue.

3.6.3.5 Relative Contributions of Each Proximate Determinant of Fertility

Figure 3.3 summarizes the relationship between the fertility-inhibiting effects of intermediate variables and various measures of fertility. Each measure indicates the proportionate reduction in fertility attributed by each proximate determinant. The index of marriage gives the proportion by which TFR is smaller than total marital fertility rate (TM) due to marriage pattern. The indices of contraception and induced abortion indicate the proportion by which TM is smaller than total natural marital fertility rate (TN) due to the level and effectiveness of contraceptive use and induced abortion. The index of post-partum infecundability represents the proportion by which TN is smaller than TF as a result of lactational infecundability.

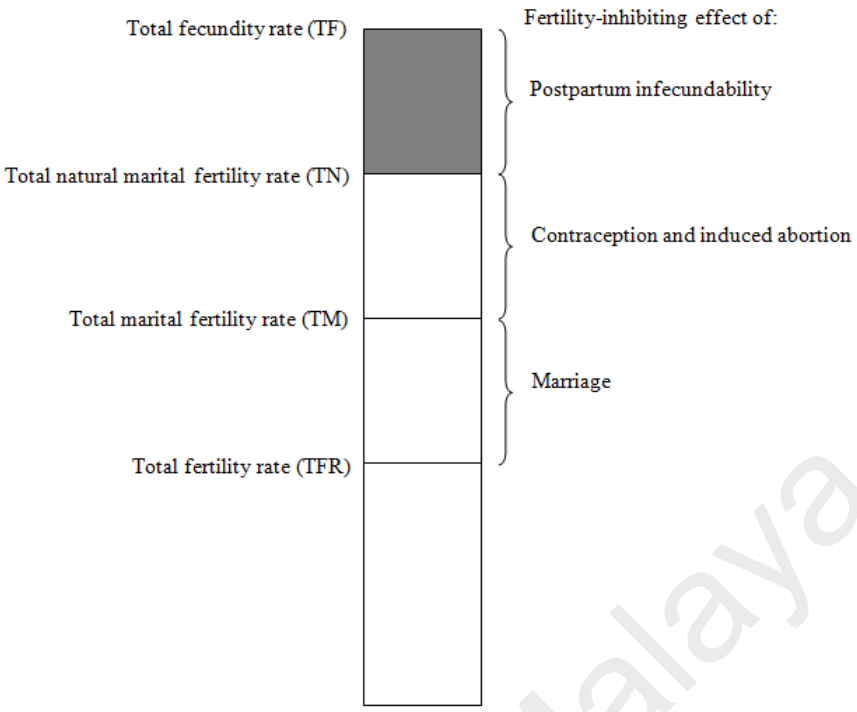

Figure 3.3: The fertility-inhibiting effects of proximate determinants and various measures of fertility

Sources: Bongaarts (1978; 1982).

The precision and consistency of the estimated fertility-inhibiting effects of the proximate determinants of fertility was affected by the total fecundity value that was found to vary between 13 and 17 births per woman. For comparative purposes, the assumed total fecundity value was taken based on the average fecundity rate of 15.3 in the developed and developing countries (Bongaarts, 1978; 1982).

The indices of the fertility-reducing effects of the proximate determinants can be used to determine the relative contribution of each of the variable to the fertility reduction. The magnitude of the total inhibiting effect contributed by each proximate determinant is prorated by the proportion of the logarithm of each index to the sum of logarithms of all indices (Odimegwu & Zerai, 1996). After natural log transformation, the transformed Bongaarts' model is as follow.

$$\ln(TF) - \ln(TFR) = \ln(C_m) + \ln(C_c) + \ln(C_i) + \ln(C_a) \quad (12)$$

The proportional contribution of each proximate determinant to the reduction of fertility from the TF to the TFR is calculated based on the following formula:

$$C_x = \frac{100 * \ln(C_x)}{\ln(C_m) + \ln(C_c) + \ln(C_i) + \ln(C_a)} \quad (13)$$

where C_x is the index of marriage, contraception, post-partum infecundability or induced abortion. This formula yields the proportion contributed by each proximate determinant to the reduction of fertility.

The proportional contribution of each variable obtained determines the ranking of the proximate determinants based on the fertility-reducing effects. The concept of prorating the total fertility-inhibiting effect by the logarithm of each index has been widely used in past research (Wang et al., 1987a; Bahobeshi & Zohry, 1995; Odimegwu & Zerai, 1996; Islam, Mamun & Bairagi, 1998; Letamo & Letamo, 2001-02; Islam, Islam & Chakraborty, 2002; Maseribane, 2003; Nath & Mazumder, 2005; Islam, Dorvlo & Al-Qasmi, 2011).

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter begins with a description of the profile of respondents of the latest DHS conducted in Cambodia (2014), Indonesia (2012) and the Philippines (2013). This is followed by an analysis of the levels and patterns of number of children ever born, age at first marriage and contraceptive use among currently married women aged 15-49 years in each country.

The determinants of number of children ever born in Cambodia, Indonesia and the Philippines were examined using Negative Binomial Regression analysis, controlling for age and duration of first marriage in the multivariate context. The effects of selected socio-economic factors on mean number of children ever born for sub-groups of the population were examined using scatter plots.

The relative importance of each proximate determinant based on the fertility-inhibiting index estimated from Bongaarts' model were tested in the last sub-section. The sequence of influence and relative contribution of these proximate determinants on fertility were discussed.

4.2 Profile of Respondents

The age distribution of respondents for each country is shown in Table 4.1. In total, 11,668 Cambodian, 32,706 Indonesian and 9,866 Filipino married women were included in this study. In each of the countries, women aged 15-19 made up only 3.0 to 4.0 percent

of the total sample. The proportion in the remaining six age groups ranges from 11.0 to 22.0 percent.

Table 4.1: Percentage distribution of respondents by age group for each country

	Cambodia		Indonesia		Philippines	
	%	***n***	**%**	***n***	**%**	***n***
Number of currently married women		11,668		32,706		9,866
Age group						
15-19 years	4.0	466	3.0	969	3.2	319
20-24 years	15.0	1,743	11.4	3,739	12.6	1,247
25-29 years	19.2	2,241	18.4	6,002	15.7	1,551
30-34 years	22.0	2,567	19.2	6,286	18.8	1,853
35-39 years	13.0	1,519	19.0	6,203	17.6	1,733
40-44 years	14.1	1,647	15.9	5,218	16.7	1,648
45-49 years	12.7	1,485	13.1	4,289	15.4	1,515

Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

Table 4.2 shows the percentage distribution of respondents by selected socio-economic variables for each country. In Indonesia and the Philippines, over 40.0 percent of the currently married women were from the urban areas, as compared to only 28.5 percent of the Cambodian women. More than half of the currently married women in Cambodia had primary education or no schooling (65.9 percent), while nearly half of the respondents in Indonesia (48.3 percent) and the Philippines (46.2 percent) had secondary education. The proportion of tertiary educated women is highest in the Philippines (29.6 percent), followed by Indonesia (11.4 percent), and only 3.3 percent of the Cambodian women. More than 60.0 percent of the Indonesian and Filipino women were married to men who have at least secondary education, as compared to only 47.5 percent in Cambodia. About 82.0 percent of the Cambodian women were employed, with 38.3 percent and 43.5 percent engaged in the agricultural and non-agricultural sectors respectively. In Indonesia and the Philippines, about 40.0 percent of the currently married women were not working, while nearly half worked in the non-agricultural sector. About half of the Cambodian women were married to men who worked in the non-agricultural sector (52.4 percent),

and about seven out of every ten Indonesian and Filipino women were married to men who were engaged in the non-agricultural sector. The number of currently married women by family wealth index is quite evenly distributed across three countries.

Table 4.2: Percentage distribution of respondents by selected socio-economic variables for each country

	Cambodia		Indonesia		Philippines	
	%	*n*	%	*n*	%	*n*
Place of residence						
Urban	28.5	3,330	46.7	15,268	42.7	4,216
Rural	71.5	8,338	53.3	17,438	57.3	5,650
Women's educational level						
No schooling/Primary	65.9	7,690	40.3	13,173	24.2	2,391
Secondary	30.8	3,588	48.3	15,802	46.2	4,554
Tertiary	3.3	390	11.4	3,731	29.6	2,921
Husband's educational level						
No schooling/Primary	52.5	6,108	37.6	12,255	30.9	3,042
Secondary	40.4	4,693	50.9	16,585	40.5	3,990
Tertiary	7.1	830	11.5	3,765	28.6	2,820
Women's work status						
Not working	18.2	2,116	36.4	11,891	39.1	3,855
Agricultural sector	38.3	4,453	15.7	5,119	11.9	1,171
Non-agricultural sector	43.5	5,064	47.9	15,653	49.0	4,831
Husband's work status						
Not working	0.6	72	2.2	710	1.2	119
Agricultural sector	47.0	5,439	26.7	8,736	31.7	3,118
Non-agricultural sector	52.4	6,052	71.1	23,201	67.1	6,602
Wealth index						
Poorest	18.8	2,190	25.0	8,191	23.7	2,335
Poorer	18.7	2,180	20.6	6,722	20.8	2,054
Middle	16.6	1,942	18.8	6,148	19.9	1,960
Richer	19.4	2,267	18.3	5,994	18.7	1,846
Richest	26.5	3,089	17.3	5,651	16.9	1,671

Note: Missing values are excluded from the calculations.
Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

The percentage distribution of respondents by selected women empowerment variables for each country is shown in Table 4.3. In this study, women empowerment was measured by involvement in household decision-making and disagreement with wife beating. The proportion of currently married women with high level of women empowerment was significantly higher among the Filipino, about 93.0 percent for each of the two indicators, as compared to the Indonesian (over 70.0 percent for both variables) and Cambodian (86.4 percent for household decision-making autonomy and 59.8 percent for disagreement towards wife beating).

Table 4.3: Percentage distribution of respondents by selected women empowerment variables for each country

	Cambodia		Indonesia		Philippines	
	%	*n*	%	*n*	%	*n*
Household decision-making autonomy						
No autonomy	1.4	159	6.1	1,993	2.3	228
Some autonomy	12.2	1,424	22.3	7,278	4.7	459
Full autonomy	86.4	10,079	71.6	23,320	93.0	9,157
Attitude towards wife beating by husband						
Low disagreement	12.7	1,411	4.0	1,252	1.1	103
Moderate disagreement	27.5	3,047	19.2	5,962	5.3	519
High disagreement	59.8	6,636	76.8	23,844	93.6	9,161

Note: Missing values are excluded from the calculations.
Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

In each of the three countries, only 12.0 to 14.0 percent of the total sample were married for 25 years or more, while around 19.0 to 24.0 percent were married less than five years (Table 4.4). Majority of the respondents in each country under study married after age 20. The contraceptive prevalence rate ranges from 53.9 percent in the Philippines to 55.7 percent in Cambodia and 59.8 percent in Indonesia.

Table 4.4: Percentage distribution of respondents by duration of first marriage, age at first marriage and contraceptive use for each country

	Cambodia		Indonesia		Philippines	
	%	*n*	%	*n*	%	*n*
Duration of first marriage						
0-4 years	24.1	2,807	19.6	6,412	19.4	1,919
5-9 years	19.7	2,301	18.5	6,071	21.3	2,100
10-14 years	17.3	2,022	18.6	6,077	19.1	1,885
15-19 years	13.0	1,522	16.0	5,226	15.4	1,522
20-24 years	13.5	1,575	13.3	4,345	13.2	1,301
25-29 years	9.1	1,059	8.8	2,875	9.2	906
30+ years	3.3	382	5.2	1,700	2.4	233
Age at first marriage						
<18 years	29.2	3,409	30.1	9,832	21.9	2,164
18-20 years	34.0	3,971	29.2	9,559	30.7	3,024
21 years and above	36.8	4,288	40.7	13,315	47.4	4,678
Contraceptive use						
Not using	44.3	5,169	40.2	13,160	46.1	4,553
Using a contraceptive method	55.7	6,499	59.8	19,546	53.9	5,313

Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

4.3 Differentials in Children Ever Born

Figure 4.1 shows the mean number of children ever born of currently married women aged 15-49 years and the completed family size by country. On average, Filipino women have 3.0 children and Cambodian women have 2.6 children, while Indonesian women have 2.4 children. The mean number of children in Cambodia had declined from 3.9 in 2000 to 2.6 in 2014. The mean number of children in Indonesia and the Philippines declined more gradually, a reduction of 29.4 percent (1 child) and 18.9 percent (0.7 children) respectively over a relatively long period of time (25 years in Indonesia and 20 years in the Philippines). The reduction in completed family size as measured by the number of children among married women aged 45-49 has been much more pronounced among Cambodian women as compared to the Indonesian and Filipino counterparts. The mean completed family size in Cambodia remained the highest at 4.5 as compared to 4.4 in the Philippines and 3.7 in Indonesia. These figures suggest that the more rapid decline

in fertility in Cambodia as compared to Indonesia and the Philippines were occurring among the younger women, who have yet to complete their childbearing.

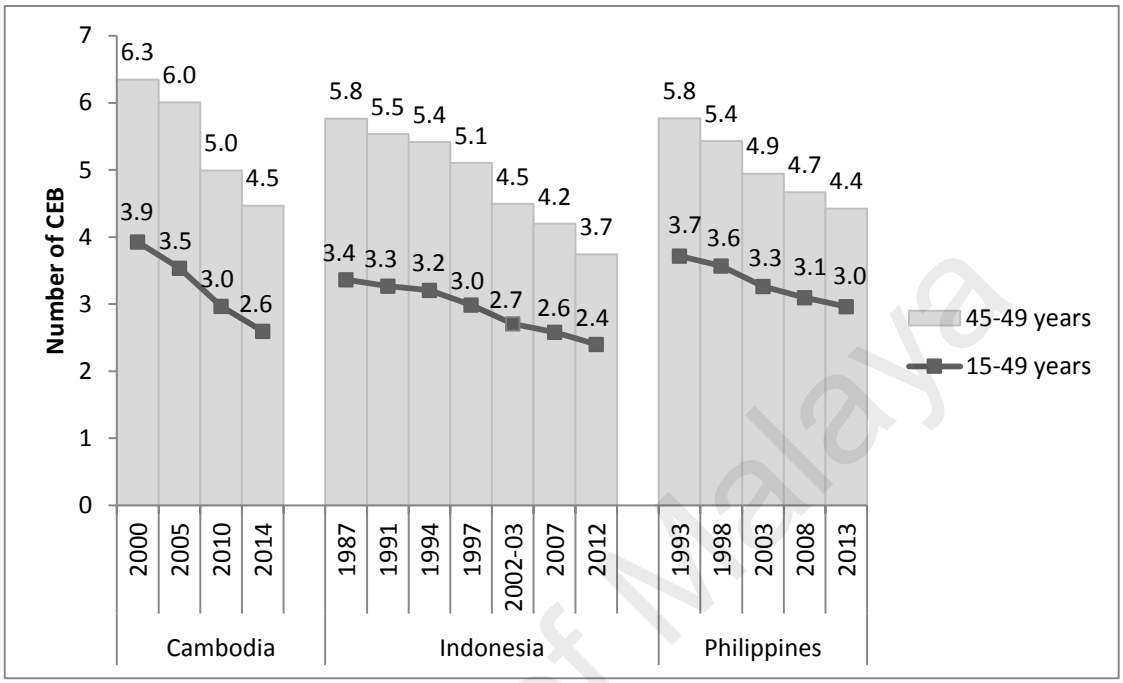

Figure 4.1: Mean number of children ever born and completed family size of currently married women by country, various years

Note: CEB means children ever born.
Sources: Constructed with data from various years of CDHS, IDHS and NDHS.

The mean number of children born to currently married women by age group in each country for various years is shown in Figure 4.2. The difference in mean number of children among married women aged 15-19 in all three countries remained practically unchanged over the last one (the Philippines) to two and a half (Indonesia) decades. The mean number of children of married women aged 20-29 had declined from about 2 children in all three countries to 1.4, 1.4 and 1.8 children in Cambodia, Indonesia and the Philippines respectively. On average, married women in the Philippines have about 3 children in their 30s, as compared to 2.8 and 2.5 among their counterparts in Cambodia and Indonesia respectively. Recent surveys showed that married women in their 40s in Cambodia and the Philippines each had 4.2 children as compared to 3.5 in Indonesia.

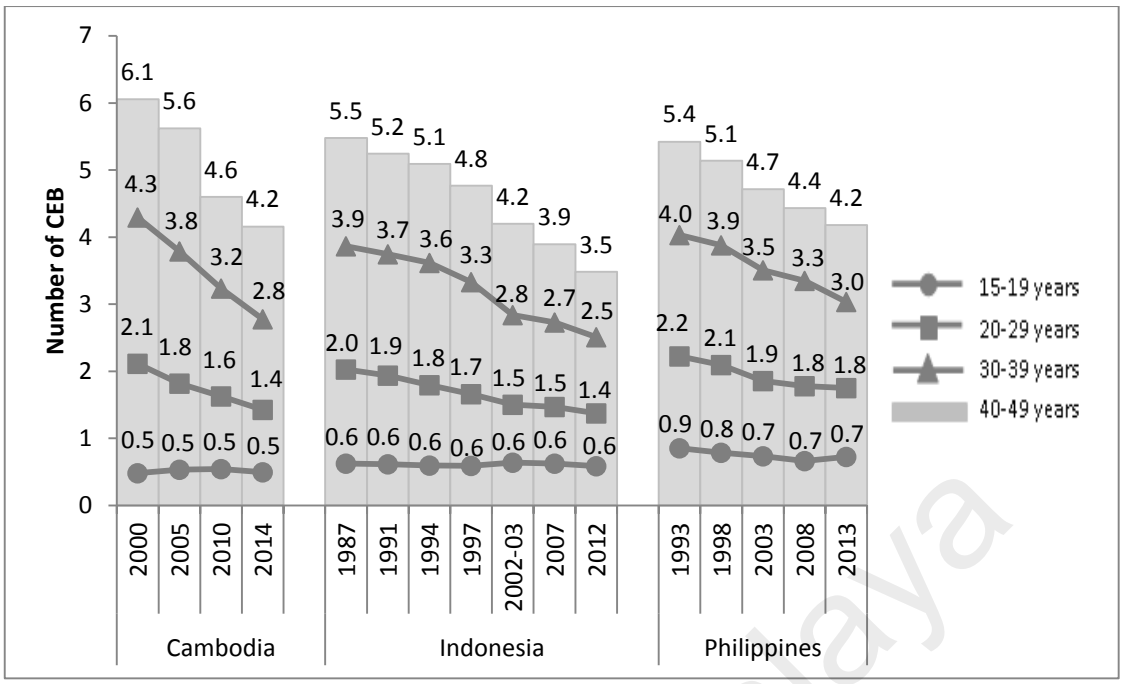

Figure 4.2: Mean number of children ever born of currently married women by age group, various years

Note: CEB means children ever born.
Sources: Constructed with data from various years of CDHS, IDHS and NDHS.

4.4 Differentials in Intermediate Variables

Socio-economic factors can only affect childbearing through the intermediate variables. Marriage and contraceptive use have been found to be among the most important intermediate variables that resulted in the reduction in the number of children ever born (Coale, 1984; Poston Jr., 1986; Ross et al., 1986; Feeney et al., 1989; Kaufman, 1993; Tu, 1995; Zhang, 2004; Tey, Ng & Yew, 2012; Das, Das & Thi Ngoc Lan, 2013). Hence, an analysis and discussion of the patterns and differentials in mean age at first marriage and contraceptive use is in order.

4.4.1 Differentials in Age at First Marriage

The mean age at first marriage in the three countries in this study has increased over time (Figure 4.3). In 2014, Cambodian women married at the youngest age of 19.9 years on the average, a slight increase from 19.7 years in 2010. Over the period between 1987 and 2012, the mean age at marriage for Indonesian women had increased from 17.6 years to 20.1 years. In the Philippines, the mean age at marriage of women had gone up from 20.4 years in 1993 to 21.0 years in 2013.

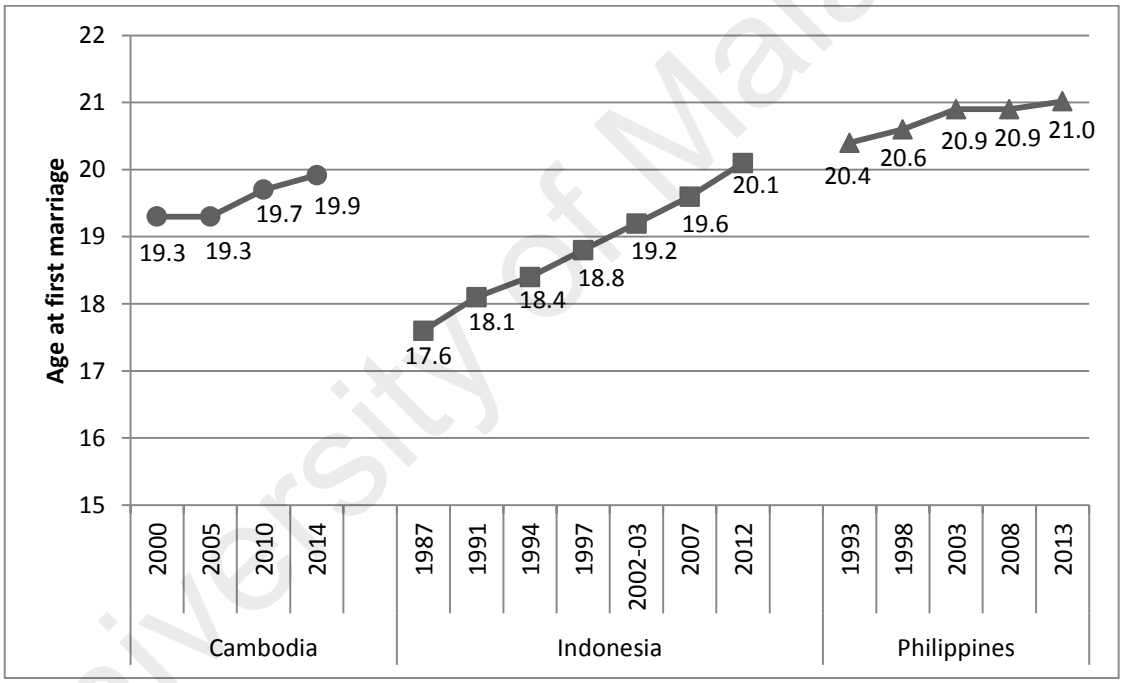

Figure 4.3: Mean age at first marriage of currently married women for each country, various years

Sources: Constructed with data from various years of CDHS, IDHS and NDHS.

Table 4.5 shows the differences in mean age at first marriage by selected socio-economic and women empowerment variables according to country. Urban women were more likely to postpone marriage as compared to the rural women, and this was true in all the three countries. Filipino women tended to marry later than their counterparts in

Cambodia and Indonesia regardless of place of residence. The urban-rural differential in mean age at first marriage was most pronounced among the Indonesian women (1.9 years), followed by the Filipino (1.0 year) and the Cambodian (0.9 year).

Many studies found that education is the main factor behind delayed marriage (Martin, 1995; Bankole & Singh, 1998; Mturi & Hinde, 2001; Bratti, 2003; Gubhaju, 2007). The main conclusions from these studies are that besides the longer schooling duration, better educated women tended to be more independent and also place higher priority on career advancement rather than marriage and childbearing. Some studies also found that better educated women have greater difficulty in finding a compatible life partner, especially as women are now out-performing men academically (Krueger, 1998; Sugden, 2009; Tey, Ng & Yew, 2012). In all the three countries, women with tertiary education tended to marry latest (above 23 years), followed by those with secondary education (about 20 years) and those with primary or no education (below 20 years). The differences in mean age at first marriage between tertiary educated women and those with primary or no education was most pronounced among Indonesian women (6.3 years) as compared to the Filipino (4.5 years) and the Cambodian (3.6 years). Women's age at first marriage also increases with their husbands' educational level. The pattern of mean age at first marriage by husband's educational level was rather similar to that of women' education.

Past research found that women's education expands their job opportunities and results in higher labor force participation rate, which in turn affects childbearing as the opportunity cost for children is much higher for working women (Podhisita et al., 1990; Jones, 2007; Rindfuss et al., 2007). The results show that for all the three countries, women working in the non-agricultural sector married later than non-working women and those working in the agricultural sector. Women working in the non-agricultural sector

have higher education and entered marriage upon completion of schooling, and this had a direct effect on childbearing. Among working women, differences in mean age at first marriage between women engaged in the agricultural sector and those working in the non-agricultural sector was much more pronounced among the Filipino (2.3 years) and Indonesian (2.2 years) as compared to the Cambodian (0.9 year). The pattern in the mean age at first marriage by their husbands' work status was rather similar to that of women's work status in all three countries.

Mean age at first marriage increased monotonically across the wealth quintiles. Filipino women were more likely to marry later as compared to their Cambodian and Indonesian counterparts across all wealth quintiles, with the exception of the poorest families. The poorest-richest differential in mean age at first marriage was most pronounced among the Filipino (4.1 years), followed by the Indonesian (3.3 years) and the Cambodian (1.1 years).

The more empowered women (in terms of household decision-making autonomy and disagreement towards wife beating) were more likely to marry later as compared to those who had low level of empowerment in Indonesia and the Philippines, but age at first marriage was inversely related to women's decision-making power in Cambodia. In the Philippines, women who had high level of autonomy in household decision-making were found to marry 0.9 year later than those who had low level of decision making power; and in Indonesia, women who disagreed with wife beating married 1.4 years later than those who agreed as compared to 0.5 year in Cambodia.

Table 4.5: Mean age at first marriage of currently married women by selected variables for each country

	Cambodia	Indonesia	Philippines
All married women	19.9	20.1	21.0
Place of residence			
Urban	20.6	21.1	21.6
Rural	19.7	19.2	20.6
Women's educational level			
No schooling/Primary	19.6	18.1	19.0
Secondary	20.3	20.7	20.5
Tertiary	23.2	24.4	23.5
Husband's educational level			
No schooling/Primary	19.5	18.4	19.4
Secondary	20.1	20.6	20.9
Tertiary	21.8	23.3	23.0
Women's work status			
Not working	20.0	19.9	20.5
Agricultural sector	19.4	18.5	19.5
Non-agricultural sector	20.3	20.7	21.8
Husband's work status			
Not working	19.8	19.3	20.7
Agricultural sector	19.4	18.8	19.7
Non-agricultural sector	20.3	20.5	21.7
Wealth index			
Poorest	19.5	18.8	19.2
Poorer	19.5	19.4	20.3
Middle	19.7	20.0	20.9
Richer	19.9	20.7	22.1
Richest	20.6	22.1	23.3
Household decision-making autonomy			
No autonomy	20.8	19.9	20.2
Some autonomy	19.9	19.7	20.7
Full autonomy	19.9	20.2	21.1
Attitude towards wife beating by husband			
Low disagreement	19.6	18.9	20.4
Moderate disagreement	19.7	19.5	19.8
High disagreement	20.1	20.3	21.1

Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

4.4.2 Differentials in Contraceptive Use

Recent surveys showed that the use of any contraceptive method was highest among Indonesian (59.8 percent), followed by the Cambodian (55.7 percent) and the Filipino (53.9 percent) (Figure 4.4). However, it is to be noted that the rate of increase in contraceptive prevalence in recent years has been the most rapid in Cambodia, as family planning program was launched as recently as 1994. Between 2000 and 2014, the contraceptive prevalence rate in Cambodia had increased more than two-fold, from 21.7 percent to 55.7 percent. Contraceptive use has always been highest in Indonesia, with the prevalence rate of any contraceptive method hovering around 51.4 percent to 59.8 percent between 1987 and 2012. The use of any contraceptive method in the Philippines has also increased from 39.8 percent in 1993 to 53.9 percent in 2013.

Majority of the contraceptive users in Indonesia used a modern method, mainly the injectables. In Cambodia and the Philippines, while the proportion of married women using a modern contraceptive method has shown a steady increase over the years, a sizeable proportion of currently married Cambodian and Filipino women still relied on traditional method.

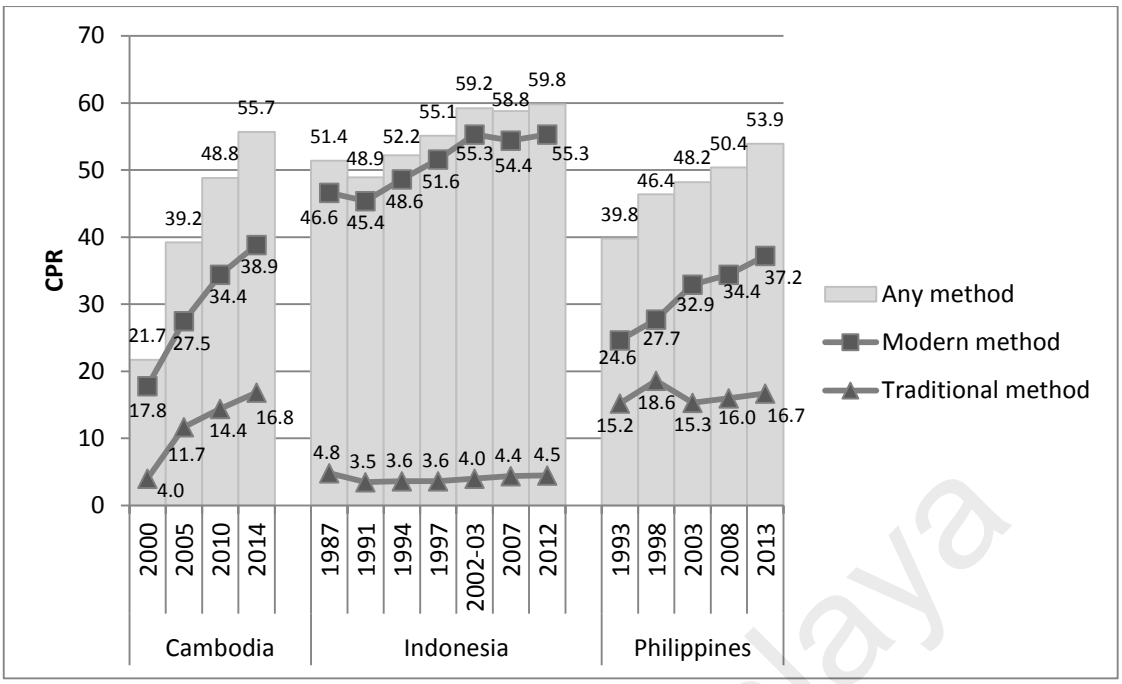

Figure 4.4: Contraceptive prevalence rate for each country, various years

Note: CPR means contraceptive prevalence rate.
Sources: Constructed with data from various years of CDHS, IDHS and NDHS.

Table 4.6 shows the percentage distribution of currently married women using a contraceptive method by selected variables in each of the three countries. Costello and Casterline (2002) found that family planning services were more accessible in the urban areas than in the rural areas, and this explains partly the urban-rural differentials in contraceptive prevalence rate. Contrary to the general pattern of urban-rural differentials in contraceptive use, the 2012 Indonesian survey showed that rural women were more likely to use any and modern contraceptive methods as compared to the urban women. This indicates that the Indonesian family planning program, credited as a success story of the twentieth century, has spread to the rural areas. In the Philippines, the proportion using modern, traditional and any methods were relatively higher among the urban women as compared to that of the rural women. In Cambodia, contraceptive prevalence rate was higher among the urban women, but rural women were more likely to use a modern method as compared to their urban counterparts.

The percentage of women using any contraceptive method was highest among those with secondary education in all three countries. The use of modern contraceptive method was also highest among women with secondary education in Indonesia and the Philippines, but Cambodian women with primary or no education were more likely to use a modern method as compared to better educated women. Tertiary educated women were more likely to use a traditional method than their lesser educated counterparts, except for the Filipino. The pattern of use of any contraceptive method across husband's educational level was rather similar to that of the wife's education.

The contraceptive prevalence rate among women working in the non-agricultural sector was higher than that of those engaged in the agricultural sector and those who were not working, except for Indonesia. Interestingly, non-working Indonesian women were more likely to use a modern method or any method, as compared to working women. In Cambodia and the Philippines, the modern method was preferred by women working in the agricultural sector. Women engaged in the non-agricultural sector were more likely to use a traditional method as compared to those who were not working or working in the agricultural sector. In Cambodia and the Philippines, the use of any method across husband's work status was rather similar to that observed for women's employment groups, but the reverse was true in Indonesia.

Household income has a strong positive effect on contraceptive use (Agha, 2000; Regushevskaya et al., 2009; Bagheri & Nikbakhesh, 2010). Women from the wealthier families were more likely to use a contraceptive method as compared to those from the poorest families in all three countries. Within each country, the proportion using a modern method was highest among women from the middle wealth families in the Philippines, and from the poorer families in Cambodia and Indonesia. In terms of

traditional method, the prevalence rates were higher among women from the richest families in Cambodia and Indonesia, while Filipino women from the middle wealth families were more likely to use a traditional method.

The prevalence rates for any and modern contraceptive methods were highest among Cambodian and Filipino women who had full autonomy in household decision-making, and among Indonesian women who had some autonomy. The proportion of women with no autonomy in household decision-making using traditional method was highest in the Philippines, but lowest in Cambodia and Indonesia. In terms of attitude towards wife beating, the contraceptive prevalence of using any, modern and traditional methods were highest among women with low disagreement towards wife beating in the Philippines. In Cambodia and Indonesia, the proportion of women using any method was highest among those with moderate disagreement towards wife beating, but women from the high disagreement group were more likely to use a traditional method.

Table 4.6: Percentage distribution of currently married women using a contraceptive method by selected variables for each country

	Cambodia			Indonesia			Philippines		
	Any	Modern	Trad.	Any	Modern	Trad.	Any	Modern	Trad.
All married women	55.7	38.9	16.8	59.8	55.3	4.5	53.9	37.2	16.7
Place of residence									
Urban	56.5	33.5	23.0	59.6	53.8	5.8	56.0	37.8	18.2
Rural	55.4	41.0	14.4	59.9	56.6	3.3	52.2	36.7	15.5
Women's educational level									
No schooling/ Primary	55.1	40.6	14.5	58.2	55.5	2.7	48.6	33.1	15.6
Secondary	57.2	36.5	20.7	62.4	57.4	5.0	57.1	39.7	17.3
Tertiary	54.6	27.4	27.2	54.2	45.6	8.6	53.1	36.6	16.5
Husband's educational level									
No schooling/ Primary	54.2	40.8	13.4	59.5	56.7	2.8	51.0	35.7	15.3
Secondary	57.5	37.9	19.6	61.0	56.0	5.0	57.4	40.1	17.3
Tertiary	57.2	30.5	26.7	55.8	48.0	7.8	52.0	34.8	17.2
Women's work status									
Not working	47.7	33.7	14.0	61.9	58.2	3.7	51.7	35.1	16.5
Agricultural sector	55.5	42.7	12.8	58.8	55.6	3.2	53.5	39.3	14.3
Non-agricultural sector	59.1	37.7	21.4	58.4	53.0	5.4	55.6	38.3	17.3
Husband's work status									
Not working	41.7	23.6	18.1	37.7	35.2	2.5	44.6	32.8	11.8
Agricultural sector	56.0	42.9	13.1	58.9	55.7	3.2	51.7	36.6	15.1
Non-agricultural sector	55.7	35.5	20.2	60.8	55.8	5.0	55.1	37.6	17.5

Note: Trad. is the abbreviation for traditional method.
Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

Table 4.6, continued

	Cambodia			Indonesia			Philippines		
	Any	Modern	Trad.	Any	Modern	Trad.	Any	Modern	Trad.
Wealth index									
Poorest	52.2	40.6	11.6	55.5	52.5	3.0	47.0	31.4	15.5
Poorer	55.3	43.5	11.8	61.9	58.5	3.4	57.3	40.3	17.0
Middle	54.6	40.1	14.5	62.0	57.8	4.2	58.9	41.2	17.7
Richer	56.2	38.1	18.1	60.5	54.8	5.7	56.6	39.4	17.2
Richest	58.8	34.1	24.7	60.1	53.3	6.8	50.3	34.4	15.9
Household decision-making autonomy									
No autonomy	49.1	38.4	10.7	58.0	54.1	3.9	48.7	30.7	18.0
Some autonomy	54.1	34.7	19.4	60.0	55.9	4.1	45.1	32.7	12.4
Full autonomy	56.0	39.4	16.6	59.9	55.3	4.6	54.4	37.6	16.9
Attitude towards wife beating by husband									
Low disagreement	54.3	40.8	13.5	56.9	53.3	3.6	60.2	41.7	18.4
Moderate disagreement	57.0	40.7	16.3	61.1	57.4	3.7	49.1	36.4	12.7
High disagreement	55.9	37.5	18.4	60.2	55.4	4.8	54.2	37.3	16.9

Note: Trad. is the abbreviation for traditional method.
Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

The contraceptive method mix is an important factor in estimating the fertility-inhibiting effects of contraception because contraceptive use effectiveness differs rather widely between the modern methods and traditional methods. Table 4.7 shows the percentage distribution of currently married women by contraceptive method currently used in Cambodia, Indonesia and the Philippines. Pill and injectables were the most frequently used modern methods in Cambodia, making up 31.4 percent and 15.9 percent respectively of the total contraceptive users. In Indonesia, almost half of the contraceptive users used injectables (49.4 percent), followed by the pill users (22.9 percent). Among the modern contraceptive methods, pill was most preferred by the Filipino women, with

35.4 percent of them using this method, followed by sterilization (15.4 percent). Withdrawal method was the most used traditional method for all three countries. About one out of five contraceptive users in Cambodia and the Philippines used withdrawal method, as compared to only 4.0 percent of the Indonesian contraceptive users.

Table 4.7: Percentage distribution of currently married women using a contraception by contraceptive method currently used for each country

	Cambodia		Indonesia		Philippines	
	%	***n***	**%**	***n***	**%**	***n***
Total	100.0	6,499	100.0	19,546	100.0	5,313
Modern method						
Pill	31.4	2,036	22.9	4,480	35.4	1,879
IUD	8.0	518	6.4	1,244	6.6	349
Injectables	15.9	1,035	49.4	9,653	7.0	370
Condom (male and female)	4.2	273	2.7	522	3.4	180
Sterilization (male and female)	5.9	383	4.8	940	15.4	818
Implants/Norplant	4.3	278	6.2	1,221	0.1	3
Lactational amenorrhea method	0.1	8	0.1	17	0.8	44
Other modern method	0.0	3	0.0	3	0.5	27
Traditional method						
Periodic abstinence	5.7	372	2.6	507	9.4	501
Withdrawal	24.4	1,587	4.0	792	20.9	1,113
Other traditional method	0.1	6	0.9	167	0.5	29

Note: The "0.0" value was obtained due to the rounding off. It indicates the value is smaller than 1 but greater than 0.

Sources: Computed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

4.5 Hypotheses Testing

This sub-section examines the hypotheses stated in the Introduction chapter. The hypotheses are:

Hypothesis 1: Each selected socio-economic and women empowerment variable is a significant predictor of childbearing.

Hypothesis 2a: Age at first marriage influences the relationship between childbearing and socio-economic variable.

Hypotheses 2b-g: Contraceptive use influences the relationships between childbearing and socio-economic, and women empowerment variables.

Hypothesis 3: Marriage postponement and contraceptive use are the most important proximate determinants of fertility.

4.5.1 Hypothesis 1

The bivariate relationship between an independent variable and number of children ever born were examined first, followed by the effects of that variable net of other socio-economic variables, and finally adding the demographic controls (age and duration of first marriage) to ascertain the net effects of each of the variables. The individual and joint effects of all selected variables on the number of children ever born were examined using Negative Binomial Regression analysis. Likelihood Ratio Chi-square test was used for hypothesis testing to assess the significance of each variable in explaining the dependent variable, holding constant other socio-economic and demographic variables. A brief description on the independent variables used is shown in Table 4.8.

Table 4.8: Summary of independent variables, their codes and definition

Variables	Codes	Definition
PLACE (x_1) Place of residence was recoded into 2 categories.	1 = Urban 2 = Rural The reference group is urban.	x_{11}= 1 if PLACE = 1, 0 otherwise; x_{12}= 1 if PLACE = 2, 0 otherwise.
WOMENEDU (x_2) Women's educational level was recoded into 3 categories.	1 = No schooling/Primary 2 = Secondary 3 = Tertiary The reference group is no schooling/primary.	x_{21}= 1 if WOMENEDU = 1, 0 otherwise; x_{22}= 1 if WOMENEDU = 2, 0 otherwise; x_{23}= 1 if WOMENEDU = 3, 0 otherwise.
HUSBANDEDU (x_3) Husband's educational level was recoded into 3 categories.	1 = No schooling/Primary 2 = Secondary 3 = Tertiary The reference group is no schooling/primary.	x_{31}= 1 if HUSBANDEDU = 1, 0 otherwise; x_{32}= 1 if HUSBANDEDU = 2, 0 otherwise; x_{33}= 1 if HUSBANDEDU = 3, 0 otherwise.
WOMENWORK (x_4) Women's work status was recoded into 3 categories.	1 = Not working 2 = Agricultural sector 3 = Non-agricultural sector The reference group is not working.	x_{41} = 1 if WOMENWORK = 1, 0 otherwise; x_{42} = 1 if WOMENWORK = 2, 0 otherwise; x_{43} = 1 if WOMENWORK = 3, 0 otherwise.
HUSBANDWORK (x_5) Husband's work status was recoded into 3 categories.	1 = Not working 2 = Agricultural sector 3 = Non-agricultural sector The reference group is not working.	x_{51} = 1 if HUSBANDWORK = 1, 0 otherwise; x_{52} = 1 if HUSBANDWORK = 2, 0 otherwise; x_{53} = 1 if HUSBANDWORK = 3, 0 otherwise.
WEALTH (x_6) Wealth index was recoded into 5 categories.	1 = Poorest 2 = Poorer 3 = Middle 4 = Richer 5 = Richest The reference group is poorest.	x_{61} = 1 if WEALTH = 1, 0 otherwise; x_{62} = 1 if WEALTH = 2, 0 otherwise; x_{63} = 1 if WEALTH = 3, 0 otherwise; x_{64} = 1 if WEALTH = 4, 0 otherwise; x_{65} = 1 if WEALTH = 5, 0 otherwise.
DECISION (x_7) Household decision-making autonomy was recoded into 3 categories.	1 = No autonomy 2 = Some autonomy 3 = Full autonomy The reference group is no autonomy.	x_{71} = 1 if DECISION = 1, 0 otherwise; x_{72} = 1 if DECISION = 2, 0 otherwise; x_{73} = 1 if DECISION = 3, 0 otherwise.
BEATING (x_8) Attitude towards wife beating by husband was recoded into 3 categories.	1 = Low disagreement 2 = Moderate disagreement 3 = High disagreement The reference group is low disagreement.	x_{81} = 1 if BEATING = 1, 0 otherwise; x_{82} = 1 if BEATING = 2, 0 otherwise; x_{83} = 1 if BEATING = 3, 0 otherwise.

The model to be tested in each country is shown below:

$\mu = \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \alpha)$

where μ is the mean number of children ever born, β_0 is the intercept, β_1 to β_8 are regression coefficients, x_1 to x_8 are predictors, and α is the dispersion coefficient. The matrices for the regression coefficients and predictors are shown as below.

$\beta_1 = [\beta_{12}]'$ $\quad$ $x_1 = [x_{12}]'$
$\beta_2 = [\beta_{22}, \beta_{23}]'$ $\quad$ $x_2 = [x_{22}, x_{23}]'$
$\beta_3 = [\beta_{32}, \beta_{33}]'$ $\quad$ $x_3 = [x_{32}, x_{33}]'$
$\beta_4 = [\beta_{42}, \beta_{43}]'$ $\quad$ $x_4 = [x_{42}, x_{43}]'$
$\beta_5 = [\beta_{52}, \beta_{53}]'$ $\quad$ $x_5 = [x_{52}, x_{53}]'$
$\beta_6 = [\beta_{62}, \beta_{63}, \beta_{64}, \beta_{65}]'$ $\quad$ $x_6 = [x_{62}, x_{63}, x_{64}, x_{65}]'$
$\beta_7 = [\beta_{72}, \beta_{73}]'$ $\quad$ $x_7 = [x_{72}, x_{73}]'$
$\beta_8 = [\beta_{82}, \beta_{83}]'$ $\quad$ $x_8 = [x_{82}, x_{83}]'$

The hypothesis testing was carried out based on the results of the final model (Model 3). The null and alternative hypotheses for the first hypothesis testing are as follow:

H_0: $\beta_j = 0$

H_1: $\beta_j \neq 0$

where j = 1, 2, 3, 4, 5, 6, 7, 8

The null hypothesis is rejected if the *p*-value from the Likelihood Ratio Chi-square test is less than 0.05.

Variables that were found to be significant predictor of number of children ever born were further analyzed in terms of the differences in the IRR or exponentiated Negative Binomial coefficients [$\exp(\beta_j)$] and computed means number of children ever born across various sub-groups. Women in a particular study category were more likely to have more children than those in the reference category if IRR > 1, and more likely to have fewer children if IRR < 1, as compared to the reference group. The significance of the differential of one level compared to the reference category was tested using Wald Chi-square test at 0.05 level.

4.5.1.1 Negative Binomial Regression on Children Ever Born - Cambodia

The Likelihood Ratio Chi-square test shows that all variables are significant in predicting the number of children ever born in the bivariate and multivariate contexts (*p*-value < 0.05) (Table 4.9). However, place of residence, husband's work status and the two variables on women empowerment have become insignificant predictors of number of children ever born after further controlling for age and duration of first marriage. The results suggest that the null hypothesis is rejected for the independent variables of women's educational level, husband's educational level, women's work status, and wealth index, and thus these variables have significant individual effect on the number of children ever born, taking into account other independent variables and covariates in the model.

Table 4.9: Likelihood Ratio Chi-square test on the number of children ever born by each socio-economic and women empowerment variable for Cambodia

	Model 1			**Model 2**			**Model 3**		
	d.f.	Chi-Sq	*p*	d.f.	Chi-Sq	*p*	d.f.	Chi-Sq	*p*
PLACE	1	133.21	0.000	1	12.78	0.000	1	0.24	0.621
WOMENEDU	2	1,021.77	0.000	2	341.70	0.000	2	27.28	0.000
HUSBANDEDU	2	707.19	0.000	2	94.42	0.000	2	16.81	0.000
WOMENWORK	2	553.93	0.000	2	133.15	0.000	2	8.13	0.017
HUSBANDWORK	2	370.74	0.000	2	16.88	0.000	2	4.11	0.128
WEALTH	4	389.84	0.000	4	14.69	0.005	4	138.76	0.000
DECISION	2	15.16	0.001	2	16.04	0.000	2	0.56	0.755
BEATING	2	226.44	0.000	2	81.21	0.000	2	5.57	0.062

Notes:
Model 1 contained one independent variable.
Model 2 controlled for other independent variables in the model.
Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.
Sources: Computed with data from 2014 CDHS.

Table 4.10 shows the regression coefficients, standard error, *p*-value from the Wald test, IRR and computed mean number of children ever born by selected variables in Cambodia. The negative relationship between urbanization and number of children ever born observed in the bivariate analysis was reversed after holding other variables constant, but the relationship became insignificant after further controlling for age and duration of first marriage. The results suggest that place of residence have no significant effect in explaining the variation in the number of children ever born, after holding constant other socio-economic variables, age and duration of first marriage.

Women's education has an important negative impact on reproductive behavior in both bivariate and multivariate contexts, and the effect remained significant even after controlling for other variables and covariates. Nevertheless, the magnitude of differentials in Model 3 have become smaller after controlling for age and duration of first marriage, as compared to that in Models 1 and 2. This indicates that the educational impact on mean number of children ever born is largely due to shorter marital duration and the younger age structure among secondary and tertiary educated women (see Appendix Table C.1). The urban-rural children ever born differential at the bivariate level is likely to be attributed to the differences in educational attainment between urban and rural women because urban women tended to have higher education (see Appendix Table C.2), and higher educated women have fewer children.

The analysis found negative association between husband's education and number of children ever born, even after holding constant other socio-economic variables, including wife's education. Controlling for other variables and covariates, women whose husbands had secondary education have fewer children than those whose husbands with lesser education.

The differences in mean number of children ever born by work status of women were much smaller in the multivariate contexts, as compared to that observed at the bivariate level. Women working in the agricultural sector have more children than non-working women, even after holding other variables constant (Model 2). However, the relationship became insignificant after further controlling for age and duration of first marriage in Model 3. This suggests that women in the agricultural sector were the oldest and with the longest martial duration (see Appendix Table C.3). Women engaged in the non-agricultural sector have significantly fewer children than non-working women (Model 1), net of the effects of other variables and covariates (Model 3).

Women engaged in the non-agricultural sector had fewer children than non-working women, net of other socio-economic variables, age and duration of marriage. Similarly, women whose husbands worked in the non-agricultural sector have significantly fewer children than those whose husbands were not working, even after adjusting for other variables in Model 2. However, husband's employment has no significant effect in explaining the variation in the number of children ever born when other socio-economic variables and covariates were taken into account.

After controlling for other socio-economic variables, age and duration of first marriage, the mean number of children ever born differs significantly across all wealth quintiles. However, the magnitude of differentials would be smaller as compared to that observed in the bivariate analysis, with the poorest-richest differentials narrowing from 0.9 children in Model 1 to 0.5 in Model 3.

Women with some autonomy in household decision-making have significantly fewer children than their no autonomy counterparts when other socio-economic variables were held constant. However, there was no significant differential in the number of children ever born across the household decision-making autonomy groups after further adjusting for age and duration of first marriage in Model 3. Women with high disagreement towards wife beating had fewer children than those with low disagreement, at both bivariate and multivariate levels, but the differential became statistically insignificant after further controlling for age and duration of first marriage in Model 3.

Table 4.10: Negative binomial coefficients, standard error, Wald test, IRR, and computed mean number of children ever born of currently married women by selected variables for Cambodia

	Model 1					Model 2					Model 3				
	β	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**
Intercept	-					1.47					0.20				
α	-					0.06					0.00				
PLACE															
Urban (Ref.)	0.00			1.00	2.3	0.00			1.00	2.3	0.00			1.00	2.1
Rural	0.17	0.02	0.00	1.19*	2.7	-0.07	0.02	0.00	0.93*	2.2	-0.01	0.02	0.62	0.99	2.1
WOMENEDU															
No schooling/ Primary (Ref.)	0.00			1.00	3.0	0.00			1.00	2.9	0.00			1.00	2.2
Secondary	-0.42	0.01	0.00	0.66*	1.9	-0.29	0.02	0.00	0.75*	2.2	-0.08	0.02	0.00	0.92*	2.1
Tertiary	-0.78	0.05	0.00	0.46*	1.4	-0.53	0.05	0.00	0.59*	1.7	-0.14	0.05	0.01	0.87*	2.0
HUSBANDEDU															
No schooling/ Primary (Ref.)	0.00			1.00	3.0	0.00			1.00	2.5	0.00			1.00	2.2
Secondary	-0.29	0.01	0.00	0.75*	2.2	-0.14	0.02	0.00	0.87*	2.2	-0.06	0.01	0.00	0.94*	2.0
Tertiary	-0.59	0.03	0.00	0.55*	1.7	-0.23	0.04	0.00	0.79*	2.0	-0.06	0.03	0.09	0.94	2.0
WOMENWORK															
Not working (Ref.)	0.00			1.00	2.4	0.00			1.00	2.1	0.00			1.00	2.1
Agricultural sector	0.27	0.02	0.00	1.31*	3.1	0.20	0.02	0.00	1.22*	2.5	-0.02	0.02	0.21	0.98	2.1
Non-agricultural sector	-0.05	0.02	0.01	0.95*	2.2	0.02	0.02	0.34	1.02	2.1	-0.05	0.02	0.00	0.95*	2.0

Notes:

Model 1 contained one independent variable.

Model 2 controlled for other independent variables in the model.

Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.

* $p < 0.05$.

Sources: Computed with data from 2014 CDHS.

Table 4.10, continued

	Model 1					Model 2					Model 3				
	β	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**
HUSBANDWORK															
Not working (Ref.)	0.00			1.00	3.3	0.00			1.00	2.5	0.00			1.00	1.9
Agricultural sector	-0.10	0.08	0.18	0.90	2.9	-0.16	0.08	0.03	0.85*	2.2	0.14	0.07	0.05	1.15	2.2
Non-agricultural sector	-0.36	0.08	0.00	0.70*	2.3	-0.21	0.08	0.00	0.81*	2.1	0.13	0.07	0.05	1.14	2.2
WEALTH															
Poorest (Ref.)	0.00			1.00	3.1	0.00			1.00	2.3	0.00			1.00	2.4
Poorer	-0.11	0.02	0.00	0.90*	2.8	-0.06	0.02	0.01	0.95*	2.2	-0.11	0.02	0.00	0.90*	2.2
Middle	-0.18	0.02	0.00	0.83*	2.6	-0.05	0.02	0.02	0.95*	2.2	-0.18	0.02	0.00	0.84*	2.0
Richer	-0.23	0.02	0.00	0.79*	2.5	-0.01	0.02	0.63	0.99	2.3	-0.21	0.02	0.00	0.81*	2.0
Richest	-0.37	0.02	0.00	0.69*	2.2	0.02	0.03	0.58	1.02	2.3	-0.26	0.03	0.00	0.77*	1.9
DECISION															
No autonomy (Ref.)	0.00			1.00	2.6	0.00			1.00	2.4	0.00			1.00	2.1
Some autonomy	-0.06	0.06	0.31	0.94	2.4	-0.12	0.06	0.04	0.88*	2.1	0.01	0.06	0.92	1.01	2.1
Full autonomy	0.02	0.06	0.75	1.02	2.6	-0.05	0.06	0.44	0.96	2.3	0.02	0.05	0.73	1.02	2.1
BEATING															
Low disagreement (Ref.)	0.00			1.00	3.2	0.00			1.00	2.5	0.00			1.00	2.1
Moderate disagreement	-0.17	0.02	0.00	0.85*	2.7	-0.12	0.02	0.00	0.89*	2.2	0.00	0.02	0.87	1.00	2.1
High disagreement	-0.29	0.02	0.00	0.75*	2.4	-0.17	0.02	0.00	0.84*	2.1	-0.03	0.02	0.07	0.97	2.0

Notes:

Model 1 contained one independent variable.

Model 2 controlled for other independent variables in the model.

Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.

* $p < 0.05$.

Sources: Computed with data from 2014 CDHS.

4.5.1.2 Negative Binomial Regression on Children Ever Born - Indonesia

At the bivariate level, all selected variables have significant effects on the number of children ever born (p-value < 0.05), except household decision-making autonomy (Table 4.11). While both women empowerment variables were insignificant in affecting the number of children ever born in the multivariate context, disagreement with wife beating has become significant after further adjusting for the covariates in Model 3. Place of residence and women's educational level became insignificant predictors of number of children ever born after controlling for other variables and covariates. Based on the statistical tests, the null hypothesis is rejected for husband's educational level, women's work status, husband's work status, wealth index, and attitude towards wife beating by husband, and it can be concluded that these variables have significant independent effect on the number of children ever born, holding other independent variables and covariates constant.

Table 4.11: Likelihood Ratio Chi-square test on the number of children ever born by each socio-economic and women empowerment variable for Indonesia

	Model 1			Model 2			Model 3		
	d.f.	Chi-Sq	*p*	d.f.	Chi-Sq	*p*	d.f.	Chi-Sq	*p*
PLACE	1	265.15	0.000	1	11.69	0.001	1	0.56	0.454
WOMENEDU	2	2,419.70	0.000	2	1,114.91	0.000	2	2.10	0.349
HUSBANDEDU	2	1,237.59	0.000	2	100.80	0.000	2	62.15	0.000
WOMENWORK	2	496.82	0.000	2	57.79	0.000	2	86.53	0.000
HUSBANDWORK	2	661.29	0.000	2	80.54	0.000	2	13.61	0.001
WEALTH	4	661.09	0.000	4	73.67	0.000	4	693.24	0.000
DECISION	2	2.72	0.257	2	5.49	0.064	2	1.30	0.521
BEATING	2	40.71	0.000	2	4.10	0.129	2	21.92	0.000

Notes:
Model 1 contained one independent variable.
Model 2 controlled for other independent variables in the model.
Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.
Sources: Computed with data from 2012 IDHS.

Table 4.12 shows the regression coefficients, standard error, *p*-value from the Wald test, IRR and computed mean number of children ever born for the Indonesian women in this study. The negative relationship between urbanization and number of children ever born at the bivariate level became positive after holding constant other variables. Nevertheless, the urban-rural difference became insignificant once age and duration of first marriage were further controlled. This indicates that place of residence had no significant independent effect in explaining the differences in the number of children ever born when urban and rural Indonesian women have the same economic settings, age and duration of first marriage.

The analysis found negative correlation between women's education and number of children ever born, even after holding constant other socio-economic variables. However, further adjustment for age and duration of first marriage, the educational differentials in number of children ever born became insignificant.

Controlling for other socio-economic variables, age and duration of first marriage, the negative relationship between husband's education and number of children ever born observed at the bivariate level became positive - women whose husbands had tertiary education had more children than those with primary or no education. This suggests that the smaller mean number of children ever born among women with tertiary educated husbands at the bivariate level is due to the younger age structure and shorter marital duration (see Appendix Table C.4).

Working women have significantly higher mean number of children ever born than those who were not working after controlling for other socio-economic variables in Model 2. However, the reverse is true after further standardizing for age and duration of first marriage in Model 3 - working women have significantly fewer children than non-working women. In contrast, women whose husbands were currently working in agricultural and non-agricultural sectors have significantly more children than those women whose husbands who were not working after controlling for other variables and covariates.

The mean number of children ever born was found to be negatively related to wealth quintiles at both bivariate and multivariate levels, but the poorest-richest differential in the mean number of children ever born became statistically insignificant when other socio-economic variables were held constant. After further controlling for age and duration of first marriage in Model 3, women from wealthier families would have fewer children than the poorer ones.

There was no significant differential in the number of children ever born across the categories of household decision-making autonomy at both bivariate and multivariate levels. The smaller family size among women with high disagreement towards domestic violence than their low disagreement counterparts observed in the bivariate analysis remained significant even after controlling for other socio-economic variables and covariates. Nevertheless, differential in the number of children ever born between these two groups would be reduced to only 0.1 children in Model 3 as compared to 0.3 children in Model 1.

Table 4.12: Negative binomial coefficients, standard error, Wald test, IRR, and computed mean number of children ever born of currently married women by selected variables for Indonesia

	Model 1					Model 2					Model 3				
	β	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**
Intercept	-					1.23					0.21				
α	-					0.03					0.00				
PLACE															
Urban (Ref.)	0.00			1.00	2.2	0.00			1.00	2.4	0.00			1.00	2.2
Rural	0.13	0.01	0.00	1.13*	2.5	-0.03	0.01	0.00	0.97*	2.3	-0.01	0.01	0.45	0.99	2.2
WOMENEDU															
No schooling/ Primary (Ref.)	0.00			1.00	2.9	0.00			1.00	3.0	0.00			1.00	2.2
Secondary	-0.33	0.01	0.00	0.72*	2.1	-0.27	0.01	0.00	0.76*	2.3	0.01	0.01	0.16	1.01	2.2
Tertiary	-0.50	0.01	0.00	0.61*	1.8	-0.49	0.02	0.00	0.61*	1.9	0.01	0.02	0.68	1.01	2.2
HUSBANDEDU															
No schooling/ Primary (Ref.)	0.00			1.00	2.8	0.00			1.00	2.4	0.00			1.00	2.0
Secondary	-0.26	0.01	0.00	0.77*	2.2	-0.08	0.01	0.00	0.92*	2.2	0.06	0.01	0.00	1.06*	2.2
Tertiary	-0.32	0.01	0.00	0.73*	2.0	0.00	0.02	0.85	1.00	2.4	0.12	0.02	0.00	1.12*	2.3
WOMENWORK															
Not working (Ref.)	0.00			1.00	2.3	0.00			1.00	2.3	0.00			1.00	2.3
Agricultural sector	0.23	0.01	0.00	1.26*	2.9	0.09	0.01	0.00	1.09*	2.5	-0.07	0.01	0.00	0.94*	2.1
Non-agricultural sector	0.01	0.01	0.24	1.01	2.3	0.04	0.01	0.00	1.04*	2.4	-0.08	0.01	0.00	0.93*	2.1

Notes:

Model 1 contained one independent variable.

Model 2 controlled for other independent variables in the model.

Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.

* $p < 0.05$.

Sources: Computed with data from 2012 IDHS.

Table 4.12, continued

	Model 1					Model 2					Model 3				
	β	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**
HUSBANDWORK															
Not working (Ref.)	0.00			1.00	2.7	0.00			1.00	2.5	0.00			1.00	2.1
Agricultural sector	0.04	0.03	0.14	1.04	2.8	-0.04	0.03	0.10	0.96	2.4	0.08	0.03	0.00	1.09*	2.2
Non-agricultural sector	-0.18	0.03	0.00	0.84*	2.2	-0.12	0.03	0.00	0.88*	2.2	0.06	0.02	0.01	1.06*	2.2
WEALTH															
Poorest (Ref.)	0.00			1.00	2.8	0.00			1.00	2.5	0.00			1.00	2.7
Poorer	-0.15	0.01	0.00	0.86*	2.4	-0.07	0.01	0.00	0.93*	2.3	-0.19	0.01	0.00	0.83*	2.2
Middle	-0.20	0.01	0.00	0.82*	2.3	-0.06	0.01	0.00	0.94*	2.3	-0.24	0.01	0.00	0.79*	2.1
Richer	-0.24	0.01	0.00	0.78*	2.2	-0.06	0.01	0.00	0.94*	2.3	-0.28	0.01	0.00	0.75*	2.0
Richest	-0.25	0.01	0.00	0.78*	2.2	0.00	0.01	0.91	1.00	2.5	-0.31	0.01	0.00	0.73*	2.0
DECISION															
No autonomy (Ref.)	0.00			1.00	2.5	0.00			1.00	2.4	0.00			1.00	2.2
Some autonomy	-0.02	0.02	0.19	0.98	2.4	-0.01	0.02	0.63	0.99	2.3	-0.01	0.02	0.45	0.99	2.2
Full autonomy	-0.03	0.02	0.10	0.97	2.4	0.01	0.02	0.42	1.01	2.4	0.00	0.02	0.84	1.00	2.2
BEATING															
Low disagreement (Ref.)	0.00			1.00	2.7	0.00			1.00	2.4	0.00			1.00	2.2
Moderate disagreement	-0.11	0.02	0.00	0.90*	2.4	-0.04	0.02	0.04	0.96*	2.3	-0.03	0.02	0.19	0.98	2.2
High disagreement	-0.12	0.02	0.00	0.88*	2.4	-0.03	0.02	0.09	0.97	2.3	-0.06	0.02	0.00	0.94*	2.1

Notes:

Model 1 contained one independent variable.

Model 2 controlled for other independent variables in the model.

Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.

* $p < 0.05$.

Sources: Computed with data from 2012 IDHS.

4.5.1.3 Negative Binomial Regression on Children Ever Born - The Philippines

At the bivariate level, all the selected socio-economic variables have significant effects on the number of children ever born (p-value < 0.05) (Table 4.13). Place of residence and disagreement with wife beating were the only two insignificant predictors of number of children ever born when other socio-economic variables were held constant. However, further controlling for age and duration of first marriage, place of residence became a significant predictor of number of children ever born. The two variables on women empowerment and husband's work status became insignificant when age and duration of first marriage were held constant. The results suggest that the null hypothesis is rejected for place of residence, women's educational level, husband's educational level, women's work status, and wealth index, suggesting that these variables had significant independent effect on the number of children ever born, after controlling for other socio-economic variables and covariates.

Table 4.13: Likelihood Ratio Chi-square test on the number of children ever born by each socio-economic and women empowerment variable for the Philippines

	Model 1			Model 2			Model 3		
	d.f.	Chi-Sq	*p*	d.f.	Chi-Sq	*p*	d.f.	Chi-Sq	*p*
PLACE	1	161.45	0.000	1	1.98	0.159	1	8.03	0.005
WOMENEDU	2	1,275.14	0.000	2	287.67	0.000	2	7.28	0.026
HUSBANDEDU	2	1,062.38	0.000	2	85.32	0.000	2	6.14	0.046
WOMENWORK	2	380.13	0.000	2	76.07	0.000	2	28.22	0.000
HUSBANDWORK	2	544.52	0.000	2	10.68	0.005	2	0.36	0.835
WEALTH	4	972.98	0.000	4	86.26	0.000	4	422.00	0.000
DECISION	2	53.96	0.000	2	51.41	0.000	2	2.03	0.362
BEATING	2	38.01	0.000	2	2.55	0.279	2	1.07	0.586

Notes:
Model 1 contained one independent variable.
Model 2 controlled for other independent variables in the model.
Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.
Sources: Computed with data from 2013 NDHS.

Table 4.14 shows the regression coefficients, standard error, *p*-value from the Wald test, IRR and computed mean number of children ever born across the categories of independent variables in the Philippines. The negative relationship between urbanization and number of children ever born observed at the bivariate level would be reversed after controlling for other variables and covariates. This may be explained by the fact that rural women tended to married for a longer duration as compared to the urban women (see Appendix Table C.5).

The negative association between women's educational attainment and mean number of children ever born was found in both bivariate and multivariate analyses. The difference in mean number of children ever born was most pronounced between women with tertiary education and those with primary or no education, with a difference of 1.1 children after holding other socio-economic variables constant, down from 2.1 at the bivariate level. The differential in mean number of children ever born between these two educational groups would be reduced to only 0.1 children after adjusting for all other variables and covariates in the model. Clearly the educational effect on fertility is largely attributable to difference in age and marital duration or age at marriage.

The mean number of children ever born was inversely related to husband's educational level in both bivariate and multivariate analyses. However, the difference in mean number of children ever born between women whose husbands had tertiary education and those whose husbands had primary education or no schooling became insignificant after further controlling for age and duration of first marriage, as shown in Model 3.

Working Filipino women have more children than non-working women, after controlling for other socio-economic variables. However, the reverse would be true when age and duration of first marriage were further controlled in Model 3. There was no significant differential in the number of children ever born across husband's employment groups in the multivariate context.

Women from poor families have more children than those from the richer families, and the differentials remained significant even holding other variables and covariates constant (Models 2 and 3). The difference in mean number of children ever born among women from the poorest and richest segments would have increased to 1.3 children after further controlling for age and duration of first marriage in Model 3, from 0.7 children observed in the multivariate model without the covariates (Model 2).

Filipino women with full autonomy in household decision-making have more children than those with no autonomy, and this was true at both bivariate and multivariate levels. However, Model 3 shows that there was no differential in the mean number of children ever born among women of different autonomy level, after controlling for age and duration of first marriage. On the other hand, the significant negative effect of attitude towards wife beating factor on mean number of children ever born at the bivariate level became insignificant once other socio-economic variables and the covariates were held constant.

Table 4.14: Negative binomial coefficients, standard error, Wald test, IRR, and computed mean number of children ever born of currently married women by selected variables for the Philippines

	Model 1					Model 2					Model 3				
	β	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**
Intercept	-					1.37					0.68				
α	-					0.10					0.00				
PLACE															
Urban (Ref.)	0.00			1.00	2.6	0.00			1.00	2.7	0.00			1.00	2.6
Rural	0.19	0.01	0.00	1.21*	3.2	-0.02	0.02	0.16	0.98	2.7	-0.04	0.01	0.01	0.96*	2.5
WOMENEDU															
No schooling/ Primary (Ref.)	0.00			1.00	4.2	0.00			1.00	3.3	0.00			1.00	2.6
Secondary	-0.39	0.02	0.00	0.67*	2.8	-0.23	0.02	0.00	0.79*	2.6	-0.02	0.02	0.24	0.98	2.6
Tertiary	-0.68	0.02	0.00	0.51*	2.1	-0.40	0.02	0.00	0.67*	2.2	-0.06	0.02	0.01	0.94*	2.5
HUSBANDEDU															
No schooling/ Primary (Ref.)	0.00			1.00	4.0	0.00			1.00	3.0	0.00			1.00	2.6
Secondary	-0.37	0.02	0.00	0.69*	2.7	-0.15	0.02	0.00	0.86*	2.6	-0.04	0.02	0.01	0.96*	2.5
Tertiary	-0.58	0.02	0.00	0.56*	2.2	-0.18	0.02	0.00	0.83*	2.5	-0.03	0.02	0.15	0.97	2.5
WOMENWORK															
Not working (Ref.)	0.00			1.00	2.8	0.00			1.00	2.5	0.00			1.00	2.6
Agricultural sector	0.39	0.02	0.00	1.48*	4.2	0.17	0.02	0.00	1.19*	2.9	-0.04	0.02	0.02	0.96*	2.5
Non-agricultural sector	-0.02	0.02	0.16	0.98	2.8	0.09	0.02	0.00	1.10*	2.7	-0.07	0.01	0.00	0.93*	2.5

Notes:

Model 1 contained one independent variable.

Model 2 controlled for other independent variables in the model.

Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.

* $p < 0.05$.

Sources: Computed with data from 2013 NDHS.

Table 4.14, continued

	Model 1					Model 2					Model 3				
	β	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**	**β**	**S.E.**	***p***	**exp(β) [IRR]**	**μ**
HUSBANDWORK															
Not working (Ref.)	0.00			1.00	2.4	0.00			1.00	2.6	0.00			1.00	2.5
Agricultural sector	0.43	0.07	0.00	1.54*	3.7	0.10	0.07	0.12	1.11	2.8	0.04	0.06	0.55	1.04	2.6
Non-agricultural sector	0.08	0.07	0.26	1.08	2.6	0.05	0.07	0.45	1.05	2.7	0.04	0.06	0.56	1.04	2.6
WEALTH															
Poorest (Ref.)	0.00			1.00	4.0	0.00			1.00	3.1	0.00			1.00	3.3
Poorer	-0.21	0.02	0.00	0.81*	3.2	-0.06	0.02	0.00	0.94*	2.9	-0.13	0.02	0.00	0.88*	2.9
Middle	-0.35	0.02	0.00	0.70*	2.8	-0.12	0.02	0.00	0.88*	2.7	-0.27	0.02	0.00	0.76*	2.5
Richer	-0.53	0.02	0.00	0.59*	2.3	-0.22	0.03	0.00	0.80*	2.5	-0.40	0.02	0.00	0.67*	2.2
Richest	-0.61	0.02	0.00	0.54*	2.1	-0.23	0.03	0.00	0.80*	2.4	-0.48	0.03	0.00	0.62*	2.0
DECISION															
No autonomy (Ref.)	0.00			1.00	2.7	0.00			1.00	2.7	0.00			1.00	2.5
Some autonomy	-0.15	0.06	0.02	0.86*	2.3	-0.12	0.06	0.04	0.89*	2.4	-0.02	0.05	0.74	0.98	2.5
Full autonomy	0.11	0.05	0.02	1.12*	3.0	0.11	0.05	0.02	1.12*	3.0	0.02	0.04	0.55	1.02	2.6
BEATING															
Low disagreement (Ref.)	0.00			1.00	3.7	0.00			1.00	2.8	0.00			1.00	2.6
Moderate disagreement	-0.08	0.07	0.29	0.93	3.4	-0.07	0.07	0.33	0.94	2.7	-0.03	0.06	0.63	0.97	2.5
High disagreement	-0.24	0.07	0.00	0.79*	2.9	-0.09	0.06	0.15	0.92	2.6	-0.04	0.05	0.41	0.96	2.5

Notes:

Model 1 contained one independent variable.

Model 2 controlled for other independent variables in the model.

Model 3 controlled for other independent variables in the model, adjusted for age and duration of first marriage.

* $p < 0.05$.

Sources: Computed with data from 2013 NDHS.

4.5.1.4 Discussion and Summary

Generally, mean number of children ever born is influenced by socio-economic variables in all the three countries in this study, consistent with findings from past studies. However, the effects are not uniform across countries. Studies in Bangladesh, India, Nepal, Pakistan and the Philippines have found negative relationship between urbanization and childbearing (Gubhaju, 2007; Veron et al., 2008; Islam, 2009). In this study, the significant urban-rural children ever born differentials in Cambodia and Indonesia at the bivariate level became insignificant after holding other variables and covariates constant. Rural Filipino would have 0.1 children fewer than urban women after controlling for other variables, age and duration of first marriage, although urban women were found to have fewer children than their rural counterparts at the bivariate level. This is because rural women in the Philippines were married longer than their urban counterparts (see Appendix Table C.5).

Women's education has been found to be a strong predictor of childbearing in many countries (Shapiro, 1996; Mturi & Hinde, 2001; Bratti, 2003; Gubhaju, 2006; Jones, 2007), and its importance is vindicated in this study. The negative association between women's education and mean number of children ever born remains significant even after adjusting for other variables for all three countries. However, in Indonesia, women's education does not provide significant differential in the number of children ever born once other socio-economic variables and covariates are held constant. Filipino women have the most number of children across all educational categories, even after controlling for other socio-economic variables, age and duration of first marriage.

Controlling for other socio-economic variables, age and duration of first marriage, the negative effect of husband's education on mean number of children ever born remained moderately in Cambodia and the Philippines. Indonesian women whose husbands have tertiary education were more likely to have more children than those whose husbands have primary or no education once other socio-economic variables and the covariates are held constant. This can be attributed to the younger age structure and shorter marital duration among Indonesian women who married better educated husbands compared to their counterparts who married primary or non-educated husbands (see Appendix Table C.4).

The mean number of children ever born was highest among women who were engaged in the agricultural sector after controlling for other socio-economic variables. However, working women in both agricultural and non-agricultural sectors had fewer children than non-working women when age and duration of first marriage were further controlled in Indonesia and the Philippines, and Cambodian women engaged in the non-agricultural sector have significantly fewer children than their non-working counterparts. The results are consistent with the past studies which found smaller family size among working women than non-working women (Engelhardt, Kogel & Prskawetz, 2004; Gubhaju, 2007; Jones, 2007).

In terms of husband's work status, while the factor was not significant in affecting the number of children ever born in Cambodia and the Philippines, contradictory pattern as in the case of women's work status can be observed in Indonesia. Indonesian women married to husbands who were currently working have more children than those whose husbands who were not working, after controlling for other variables and covariates.

The findings from this study corroborate with previous research that provide ample evidence of the negative relationship between household income and demand for children (Boulier, 1982; Borg, 1989; Rosenzweig, 1990; Bloom, Canning & Malaney, 2000; Aarssen, 2005; El-Ghannam, 2005; Jones & Tertilt, 2006; Bollen, Glanville & Stecklov, 2007), and higher level of household wealth was related to lower fertility (Weerasinghe & Parr, 2002; Akpa & Ikpotokin, 2012; Namubiru, 2014). This can be explained by the reformulated economic theory of fertility by Becker and Barro (1988), in which rising income was related to higher opportunity cost of childbearing, resulting in the desire for fewer children. In this study, the differences in mean number of children ever born across wealth quintiles remained significant, even after controlling for all other factors and covariates. For instance, the differential in number of children ever born between the poorest-richest would have reduced from 0.9 to 0.5 in Cambodia, 1.9 to 1.3 in the Philippines, but increased from 0.6 to 0.7 in Indonesia at the bivariate level and the multivariate level (with covariates) respectively.

Many studies have found the negative relationship between women empowerment indicators and childbearing (Cain, Khanam & Nahar, 1979; Dyson & Moore, 1983; Basu, 1992; Jejeebhoy, 1995; Sathar, Callum & Jejeebhoy, 2001; Al-Riyami & Afifi, 2003; Hakim, Salway & Mumtaz, 2003; Gudbrandsen, 2013). A previous study concluded that women with higher autonomy in household decision-making are expected to have fewer children (Mason & Smith, 1999). However, a study in Odisha, India found that married scheduled caste women aged 15-49 years with higher decision-making power have higher number of children ever born because women with low standard of living occasionally make decisions without improving their assertion to control reproduction (Das & Tarai, 2011). In this study, household decision-making autonomy was found to be associated with larger family size in the Philippines, but the relationship became insignificant after

further controlling for age and duration of first marriage. Decision-making power had no effect on the mean number of children ever born at both bivariate and multivariate levels in Cambodia and Indonesia. On the other hand, disagreement with wife beating was negatively correlated with mean number of children ever born in all three countries at the bivariate level, but the relationship was found insignificant after controlling for other socio-economic variables and covariates in Cambodia and the Philippines.

To sum up, Table 4.15 shows the results of the hypothesis testing in the multivariate context (controlling for age and duration of first marriage). There were five significant predictors of number of children ever born in Indonesia and the Philippines, and four in Cambodia. Place of residence, husband's work status and women empowerment indicators were insignificant in predicting the number of children ever born in Cambodia, net of other socio-economic variables, age and duration of first marriage. Place of residence, women's educational level and household decision-making autonomy were insignificant predictors of the number of children ever born in Indonesia, net of other socio-economic variables and covariates. Women empowerment indicators and husband's work status had no effects in predicting the number of children ever born among the Filipino, net of other socio-economic variables and covariates.

Variables that were not supported in the hypothesis testing were not significant predictors of the number of children ever born in each country. In Cambodia, women's and their husband's education, household wealth and women employed in the non-agricultural or modern sector were negatively related to the mean number of children ever born. In Indonesia, working women, those from the wealthier families and those with high disagreement towards wife beating have fewer children than non-working women, those from the poorer families and those who condoned wife beating. However,

husband's education and employment were positively correlated with the number of children. In the Philippines, with the exception of place of residence, women's and their husband's education, women's employment and wealth index were negatively correlated with the mean number of children ever born in the multivariate context.

Table 4.15: Summary of first hypothesis testing for each country

	Cambodia	**Indonesia**	**Philippines**
PLACE	Do not reject H_0 (Not significant)	Do not reject H_0 (Not significant)	Reject H_0 (Significant)
WOMENEDU	Reject H_0 (Significant)	Do not reject H_0 (Not significant)	Reject H_0 (Significant)
HUSBANDEDU	Reject H_0 (Significant)	Reject H_0 (Significant)	Reject H_0 (Significant)
WOMENWORK	Reject H_0 (Significant)	Reject H_0 (Significant)	Reject H_0 (Significant)
HUSBANDWORK	Do not reject H_0 (Not significant)	Reject H_0 (Significant)	Do not reject H_0 (Not significant)
WEALTH	Reject H_0 (Significant)	Reject H_0 (Significant)	Reject H_0 (Significant)
DECISION	Do not reject H_0 (Not significant)	Do not reject H_0 (Not significant)	Do not reject H_0 (Not significant)
BEATING	Do not reject H_0 (Not significant)	Reject H_0 (Significant)	Do not reject H_0 (Not significant)

4.5.2 Hypothesis 2

This sub-section focuses on the effects of intermediate variables on childbearing for selected socio-economic groups. The results presented in scatter plots will be used for hypothesis testing.

4.5.2.1 Mean Age at First Marriage

Socio-economic variables influence childbearing behavior through the intermediate variables, also known as proximate determinants. Age at marriage and contraceptive use have been found to be the main proximate determinants of fertility in many populations.

However, the extent to which age at marriage affects the childbearing behavior varies for different socio-economic sub-groups. This sub-section examines the effect of delayed marriage in explaining the childbearing differentials by educational level.

(a) Hypothesis Testing 2a

Age at first marriage influences the relationship between childbearing and women's educational level. The null and alternative hypotheses are as follow:

H_0: Age at first marriage does not influence the relationship between childbearing and women's educational level

H_1: Age at first marriage influences the relationship between childbearing and women's educational level

Marriage postponement due to women's pursuit of higher education has resulted in delayed and reduced childbearing. Figure 4.5 shows that secondary and tertiary educated women entered marriage much later than lesser educated women, and subsequently have fewer children. The result is consistent with that reported in many studies (Shapiro, 1996; Bankole & Singh, 1998; Mturi & Hinde, 2001; Bratti, 2003; Manda & Meyer, 2005; Gubhaju, 2006; Jones, 2007).

The mean number of children ever born and mean age at first marriage varied widely across educational levels in each country. Higher educated women tended to marry later and have fewer children as compared to women with primary or no schooling. For each educational level, the age at marriage also varied widely across countries. For instance, secondary and tertiary educated Indonesian women were more likely to marry later, and have fewer children as compared to their counterparts in the Philippines. On the other hand, primary educated Indonesian women were likely to marry earlier, but have fewer

children than their primary counterparts in Cambodia and the Philippines. Tertiary educated Cambodian women entered marriage earlier, but have fewer children as compared to their tertiary educated counterparts in Indonesia and the Philippines.

The result suggests that age at first marriage mediates the relationship between childbearing and women's educational level. Within each country, better educated women are more likely to marry later, and therefore have fewer children. Hence, the null hypothesis is rejected.

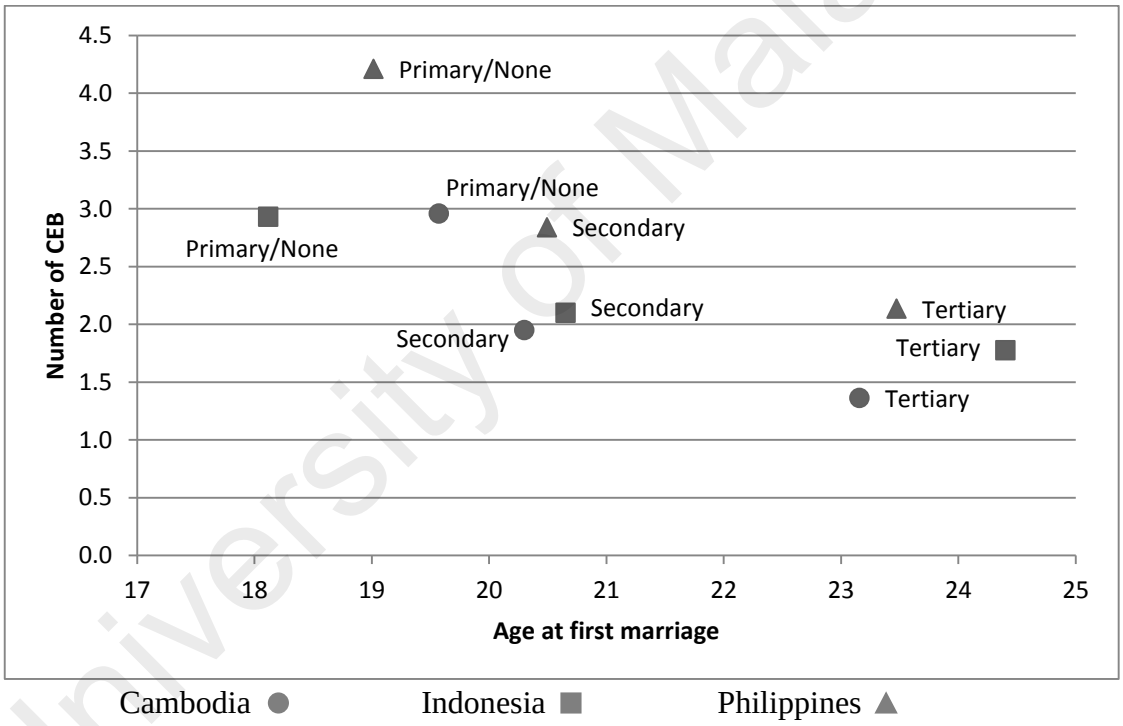

Figure 4.5: Mean number of children ever born and mean age at first marriage by women's educational level for each country

Note: CEB means children ever born.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

4.5.2.2 Contraceptive Prevalence Rate (CPR)

The impact of contraceptive use on family size cannot be assessed at the individual level due to the inverse causation. For instance, high parity women are more likely to use a contraceptive method as compared to the low parity women. Hence, taken at face value, one may come to the absurd conclusion that contraceptive use leads to large family size. However, the effect of contraceptive use on childbearing can be evaluated using group data, as the sub-groups who have a higher contraceptive prevalence rate are likely to have fewer children. The factors that will be examined are place of residence, women's educational level, women's work status, wealth index, and women empowerment indicators.

(a) Hypothesis Testing 2b

Contraceptive use influences the relationship between childbearing and place of residence. The null and alternative hypotheses are as follow:

H_0: Contraceptive use does not influence the relationship between childbearing and place of residence

H_1: Contraceptive use influences the relationship between childbearing and place of residence

In Cambodia and the Philippines, contraceptive prevalence rate in the urban areas was considerably higher than that in the rural areas, and this partly explains the rural-urban fertility differentials (Figure 4.6). However, rural Indonesian women have more children than urban women, despite having higher contraceptive prevalence rate.

The result suggests that except for Indonesia, the null hypothesis is rejected. Urban Cambodian and Filipino couples are more likely to use a contraceptive method, and therefore have fewer children.

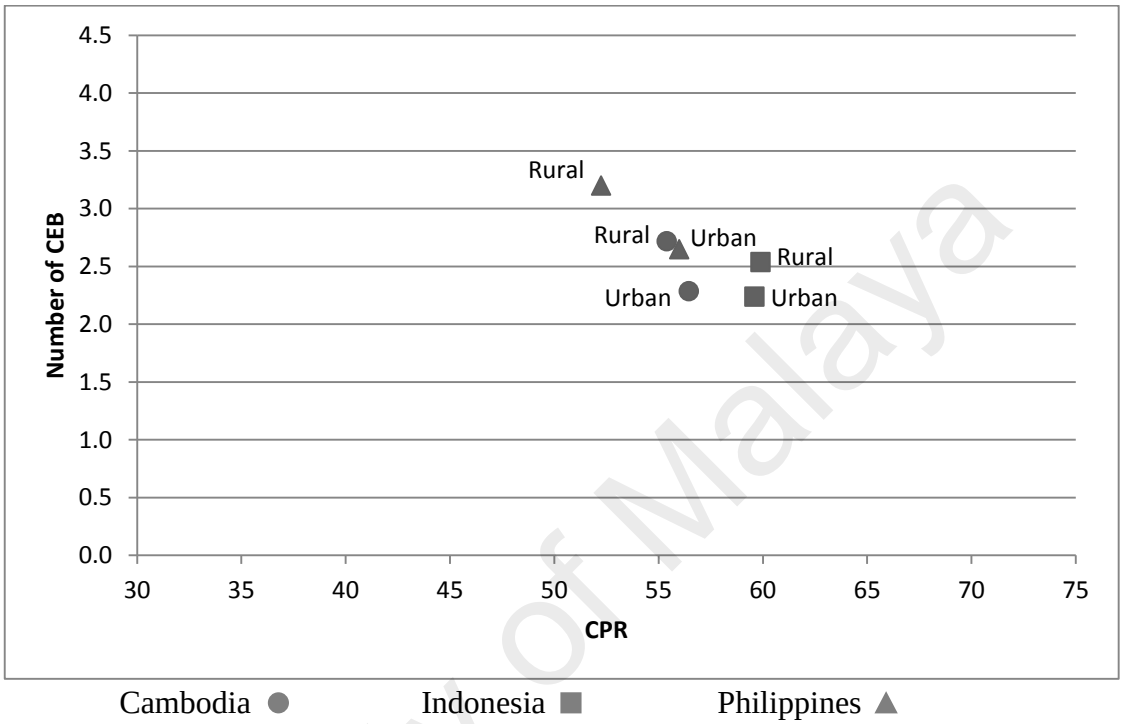

Figure 4.6: Mean number of children ever born and contraceptive prevalence rate by place of residence for each country

Notes:
CEB means children ever born.
CPR means contraceptive prevalence rate.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

(b) Hypothesis Testing 2c

Contraceptive use influences the relationship between childbearing and women's educational level. The null and alternative hypotheses are as follow:

H_0: Contraceptive use does not influence the relationship between childbearing and women's educational level

H_1: Contraceptive use influences the relationship between childbearing and women's educational level

Higher educated women are generally more likely than the lesser educated women to use a contraceptive method, and consequently have fewer children (Sarmad, Akhtar & Manzoor, 2007; Bbaale & Mpuga, 2011; Ilyas et al., 2011). However, tertiary educated women in all three countries under study were less likely to use a contraceptive method, and yet had fewer children as compared to those with lesser education (Figure 4.7).

The result suggests that this hypothesis is partially supported for all three countries under study. Within each country, secondary educated women were more likely to use a contraceptive method, and had fewer children than their lesser educated counterparts. A separate tabulation shows that husband's educational level yielded the same results as that of wife's education (see Appendix Figure D.1).

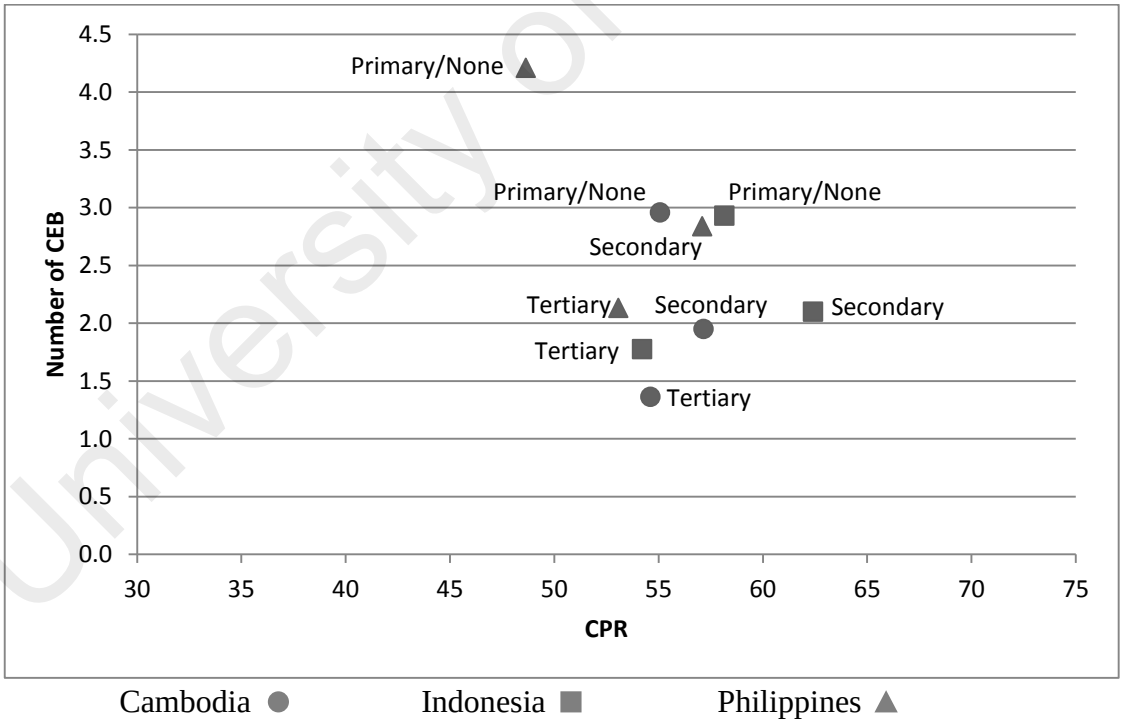

Figure 4.7: Mean number of children ever born and contraceptive prevalence rate by women's educational level for each country

Notes:
CEB means children ever born.
CPR means contraceptive prevalence rate.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

(c) Hypothesis Testing 2d

Contraceptive use influences the relationship between childbearing and women's work status. The null and alternative hypotheses are as follow:

H_0: Contraceptive use does not influence the relationship between childbearing and women's work status

H_1: Contraceptive use influences the relationship between childbearing and women's work status

Studies have found that working women were more likely than non-working women to use a contraceptive method, and have fewer children (Amin, Hill & Li, 1995; Gage, 1995; Schuler, Hashemi & Riley, 1997; Nazar-Beutelspacher et al., 1999). However, this study shows different results (Figure 4.8). Non-working women in Indonesia and the Philippines had about the same number of children as those who were engaged in the non-agricultural sector, despite significant differentials in contraceptive use. Consistent with most past findings, Cambodian women engaged in the non-agricultural sector had the highest contraceptive prevalence rate and smallest mean number of children.

The result suggests that this hypothesis is partially supported for all three countries. Cambodian and Filipino women working in the agricultural sector were more likely to use a contraceptive method, but paradoxically have more children than their non-working counterparts. On the other hand, Indonesian women engaged in the agricultural sector were more likely to use a contraceptive method, but had more children than their non-agricultural counterparts.

Cambodian women whose husbands worked in any sector were more likely to use a contraceptive method, and consequently have fewer children than those whose husbands that were not working. However, Filipino women with working husbands were more likely to use a contraceptive method, but also have more children than those with non-working husbands. In Indonesia, women whose husbands worked in the agricultural sector have about the same number of children as those with non-working husbands, although contraceptive prevalence rate between these two employment groups differed about 20 percent (see Appendix Figure D.2).

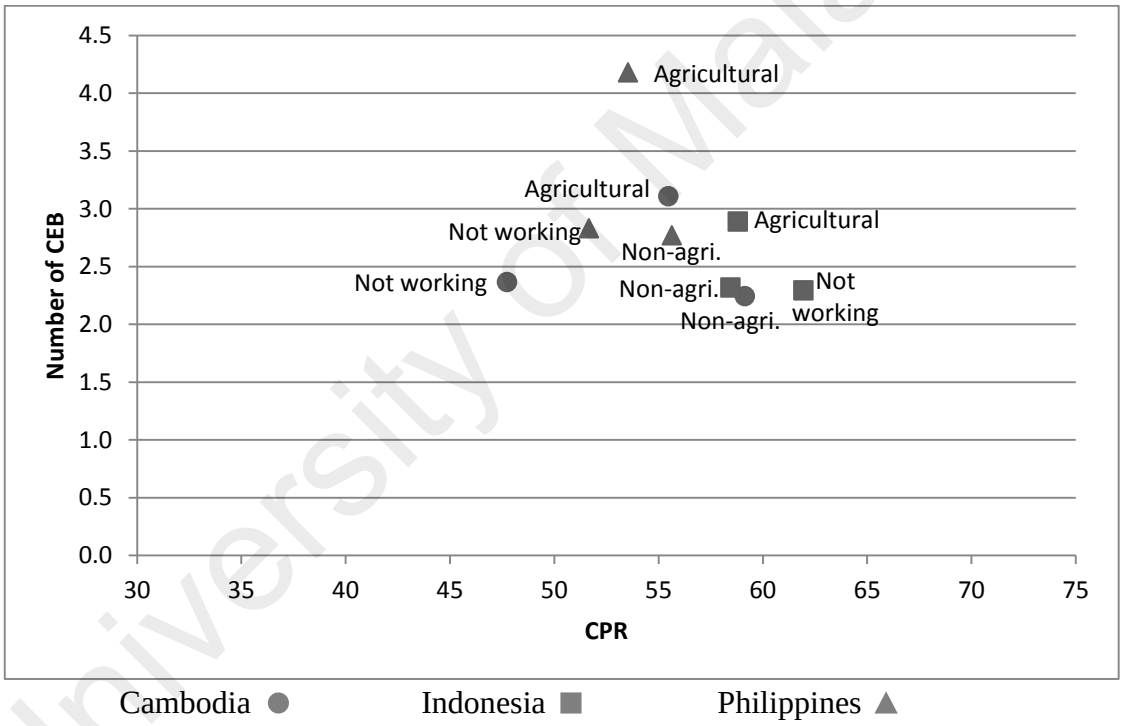

Figure 4.8: Mean number of children ever born and contraceptive prevalence rate by women's work status for each country

Notes:
Non-agri. means non-agricultural sector.
CEB means children ever born.
CPR means contraceptive prevalence rate.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

(d) Hypothesis Testing 2e

Contraceptive use influences the relationship between childbearing and wealth index. The null and alternative hypotheses are as follow:

H_0: Contraceptive use does not influence the relationship between childbearing and wealth index

H_1: Contraceptive use influences the relationship between childbearing and wealth index

The negative relationship between mean number of children ever born and wealth index mediated through contraceptive use is most pronounced in Cambodia (Figure 4.9). The contraceptive prevalence rate was lowest among women from the poorest families, and this explains their much larger family size as compared to those from the richest families in each of the three countries. However, there was little difference in both contraceptive prevalence rate and mean number of children ever born among women from the other three wealth quintiles, particularly in Indonesia. A notable paradox is the case of Filipino women from the richest families had lower contraceptive prevalence rate but fewer children than those from the poorer, middle and richer families.

The result suggests that the null hypothesis is rejected in Cambodia, and this hypothesis is partially supported in Indonesia and the Philippines. Within each country, women from the richest families were more likely to use a contraceptive method, and therefore have fewer children than their poorest counterparts.

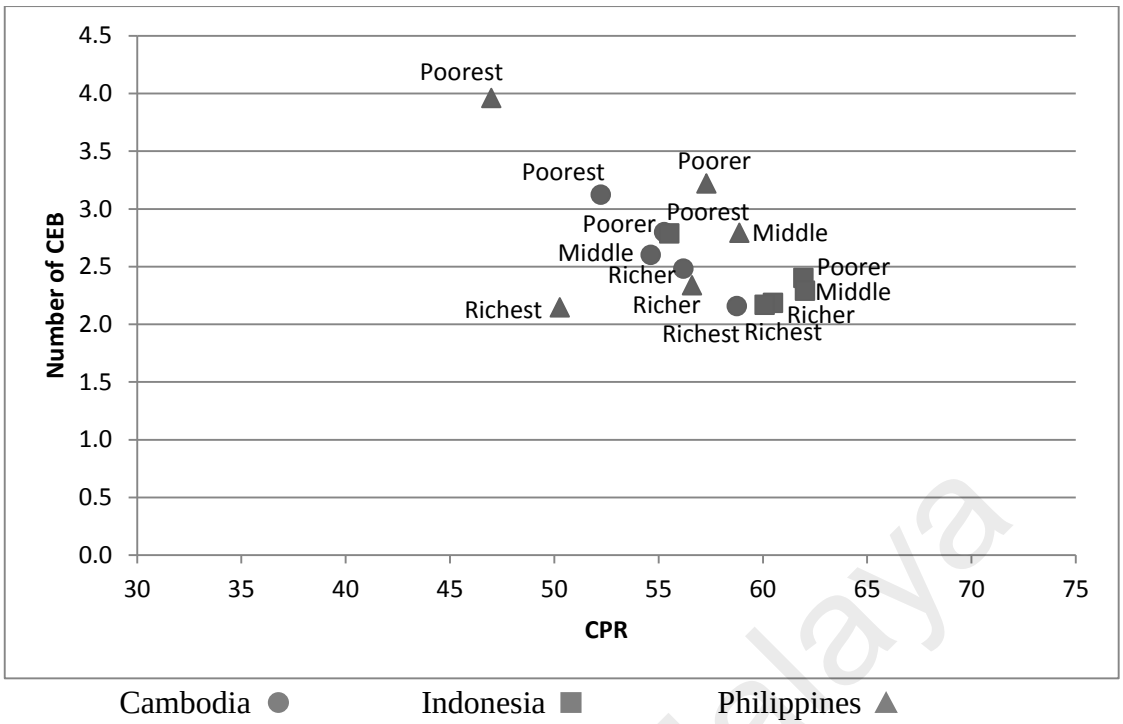

Figure 4.9: Mean number of children ever born and contraceptive prevalence rate by wealth index for each country

Notes:
CEB means children ever born.
CPR means contraceptive prevalence rate.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

(e) Hypothesis Testing 2f

Contraceptive use influences the relationship between childbearing and household decision-making autonomy. The null and alternative hypotheses are as follow:

H_0: Contraceptive use does not influence the relationship between childbearing and household decision-making autonomy

H_1: Contraceptive use influences the relationship between childbearing and household decision-making autonomy

The more empowered women tended to be more likely to use a contraceptive method (Morgan & Niraula, 1995; Gwako, 1997; Malhotra, Schuler & Boender, 2002) and have fewer children (Dyson & Moore, 1983; Balk, 1994) in Asian countries. However, the results in this study are not consistent with those of past studies. For instance, the Cambodian and Filipino women with no autonomy in household decision-making were less likely to use a contraceptive method but had fewer children as compared to their full autonomy counterparts (Figure 4.10). In Indonesia, there were no significant differences in the mean number of children ever born and contraceptive prevalence rate between women with some and full autonomy in household decision-making.

The result suggests that the null hypothesis is not rejected in the Philippines. This hypothesis is partially supported in Cambodia and Indonesia, as women with some autonomy are more likely to use a contraceptive method, and thus have fewer children than their no autonomy counterparts.

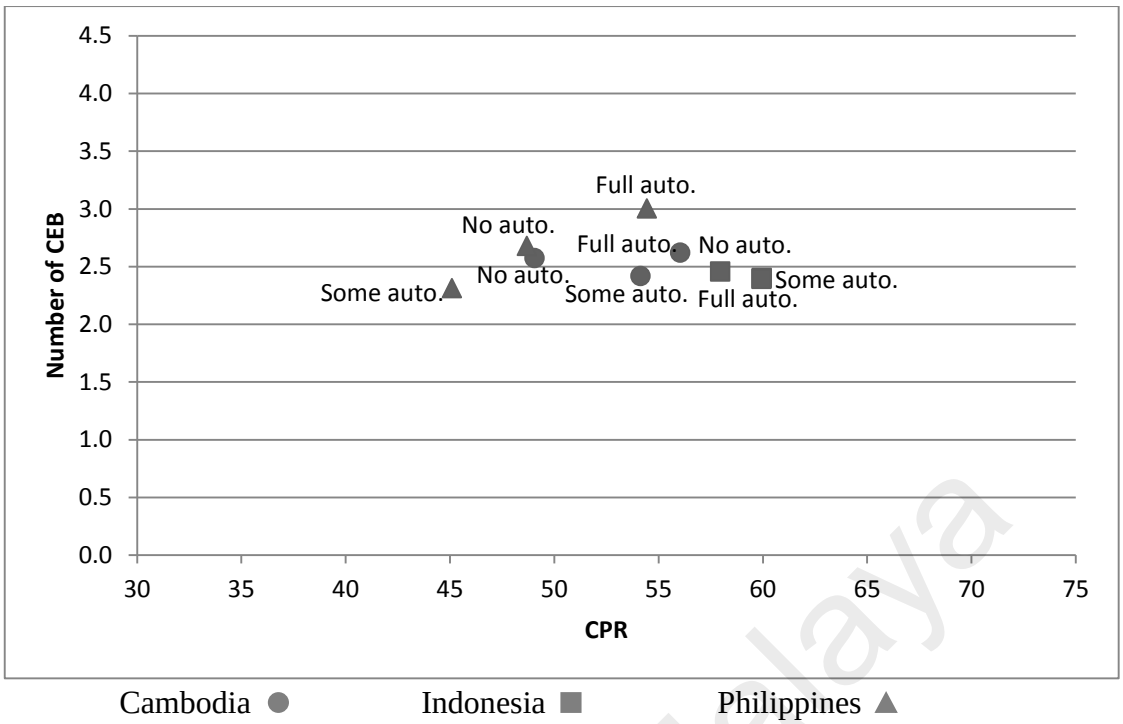

Figure 4.10: Mean number of children ever born and contraceptive prevalence rate by household decision-making autonomy for each country

Notes:
Auto. means autonomy.
CEB means children ever born.
CPR means contraceptive prevalence rate.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

(f) Hypothesis Testing 2g

Contraceptive use influences the relationship between childbearing and attitude towards wife beating. The null and alternative hypotheses are as follow:

H_0: Contraceptive use does not influence the relationship between childbearing and attitude towards wife beating

H_1: Contraceptive use influences the relationship between childbearing and attitude towards wife beating

Women who condoned wife beating were least likely to use a contraceptive method and had more children as compared to those who disagreed, except for the Filipino women (Figure 4.11). In the Philippines, women with low disagreement towards domestic violence reported higher contraceptive prevalence rate but higher mean number of children ever born than their moderate and high disagreement counterparts.

The result suggests that this hypothesis is partially supported for all three countries. Cambodian and Indonesian women with high disagreement towards wife beating were more likely to use a contraceptive method, and therefore have fewer children than their low disagreement counterparts. On the other hand, Filipino women with high disagreement towards wife beating were more likely to use a contraceptive method, and therefore have fewer children than those with moderate disagreement.

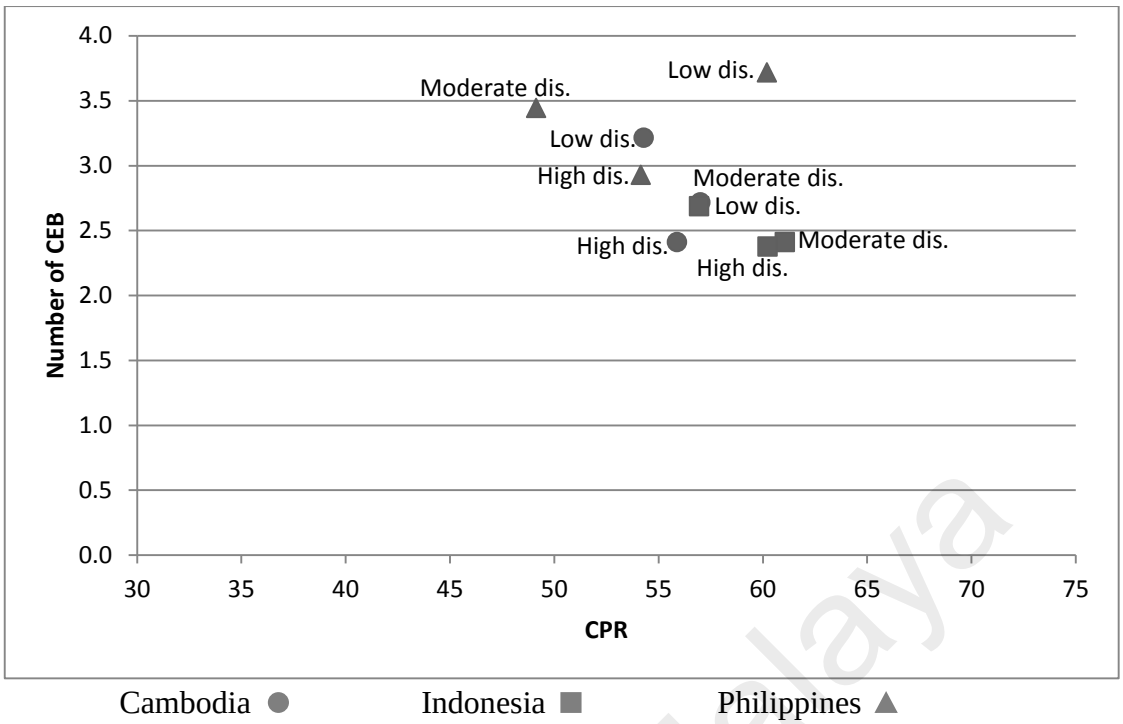

Figure 4.11: Mean number of children ever born and contraceptive prevalence rate by attitude towards wife beating by husband for each country

Notes:
Dis. means disagreement.
CEB means children ever born.
CPR means contraceptive prevalence rate.
Sources: Constructed with data from 2014 CDHS, 2012 IDHS and 2013 NDHS.

4.5.3 Hypothesis 3

It is hypothesized that delayed marriage and contraceptive use have the strongest fertility-inhibiting effects. The null and alternative hypotheses are as follow:

H_0: Marriage postponement and contraceptive use are not the most important proximate determinants of fertility

H_1: Marriage postponement and contraceptive use are the most important proximate determinants of fertility

This section describes the application of Bongaarts' model in estimating the fertility-inhibiting effects of the four main proximate determinants. Then, the third hypothesis is tested based on the sequence of influence of these determinants on fertility in these three countries under study.

4.5.3.1 Fertility-Inhibiting Effects of the Proximate Determinants

Bongaarts' model (1978; 1982) with eight proximate determinants was modified from Davis and Blake's fertility framework (1956) with 11 intermediate variables. Subsequently, Bongaarts found that much of the variation in fertility across populations was caused by the four most important proximate determinants: (i) marriage (proportion married), (ii) contraception, (iii) post-partum infecundability (as measured by breastfeeding), and (iv) induced abortion. The following equation summarizes the basic framework of the Bongaarts' model (1978; 1982), where TFR is the product of four indices related to fertility measures and the TF:

$TFR = C_m \times C_c \times C_i \times C_a \times TF$

where

TF is the total fecundity rate;

C_m is the index of marriage;

C_c is the index of contraception;

C_i is the index of post-partum infecundability; and

C_a is the index of induced abortion.

Each index ranges between 0 and 1. The lower the value of an index, the greater the fertility-reducing impact due to that intermediate variable.

(a) Index of Marriage (C_m)

This index is used to evaluate the fertility-inhibiting effect of marriage pattern. The inhibiting effect of marriage on fertility is inversely related to the proportion who were married. The formula is shown as below.

$$C_m = \frac{TFR}{TM} = \frac{\sum m(a)g(a)}{\sum g(a)}$$

where m(a) is the age-specific proportion of married women at age a, g(a) is the age-specific marital fertility rate at age a, and TM is the total marital fertility rate.

The age-specific fertility rates [f(a)] and proportion currently married among women [m(a)] are obtained from each DHS report. The proportion currently married among women refers to the women currently in union, which includes women that are currently married or currently living together with their partners. The age-specific marital fertility rates [g(a)] are obtained by dividing the age-specific fertility rate by proportion married for each 5 years age group. The value of age-specific marital fertility rate for the age group 15-19 is estimated as: g(15-19) = 0.75 * g(20-24) because the direct estimate of g(15-19) = f(15-19)/m(15-19) tends to be unreliable, especially in populations with low proportion of married women for the age group 15-19 (Bongaarts, 1982). The TM is obtained by adding up the age-specific marital fertility rates. Applying these data to Bongaarts' model, the estimated C_m for each country is shown in Table 4.16. The index of marriage shows that delayed marriage has a very strong effect in reducing the fertility in the Philippines, followed by Cambodia and Indonesia. Marriage postponement had reduced the fertility by 40 percent, 37 percent and 49 percent respectively in Cambodia, Indonesia and the Philippines.

Table 4.16: Proportion married among women, age-specific fertility rate, age-specific marital fertility rate and index of marriage for each country

Age group	m(a)	f(a)	g(a)	m(a)g(a)
Cambodia				
15-19	0.156	0.057	0.200	0.031
20-24	0.608	0.162	0.266	0.162
25-29	0.793	0.152	0.192	0.152
30-34	0.862	0.102	0.118	0.102
35-39	0.855	0.051	0.060	0.051
40-44	0.824	0.017	0.021	0.017
45-49	0.780	0.004	0.005	0.004
Total			0.862	0.519
C_m				0.60
Indonesia				
15-19	0.128	0.048	0.174	0.022
20-24	0.595	0.138	0.232	0.138
25-29	0.862	0.143	0.166	0.143
30-34	0.914	0.103	0.113	0.103
35-39	0.92	0.062	0.067	0.062
40-44	0.891	0.021	0.024	0.021
45-49	0.857	0.004	0.005	0.004
Total			0.780	0.493
C_m				0.63
Philippines				
15-19	0.097	0.057	0.259	0.025
20-24	0.429	0.148	0.345	0.148
25-29	0.688	0.147	0.214	0.147
30-34	0.827	0.127	0.154	0.127
35-39	0.873	0.084	0.096	0.084
40-44	0.851	0.037	0.043	0.037
45-49	0.829	0.007	0.008	0.007
Total			1.119	0.575
C_m				0.51

Sources: Computed with data from the published reports of 2014 CDHS, 2012 IDHS and 2013 NDHS.

(b) Index of Contraception (C_c)

The fertility-inhibiting effect of contraception depends on the prevalence of contraceptive use and the type of method used. Generally, the modern methods are effective in preventing a birth. For instance, the use effectiveness of sterilization is 100 percent while that of traditional methods may be as low as 70 percent (Bongaarts, 1982). The fertility-inhibiting effect of contraceptive use is directly related to the level of use. The formula is shown as below.

$C_c = 1 – 1.08 \times u \times e$

where u is the proportion of currently married women that are currently using contraception, and e is the average use effectiveness of contraception.

Couples should be encouraged to use modern methods which are more effective and safe. However, it is worth noting that a sizable proportion of couples still relied on the less effective traditional methods. Table 4.17 shows the percentage distribution by methods of contraception, contraceptive prevalence rate and contraceptive use effectiveness in each country under study. Applying these figures to Bongaarts' model, the fertility-reducing impact of contraception was 49 percent in Cambodia, 52 percent in Indonesia and 50 percent in the Philippines.

Table 4.17: Percentage distribution by methods of contraception, contraceptive prevalence rate, use effectiveness and index of contraception for each country

Method	Percentage distribution by method			Method effectiveness
	Cambodia	Indonesia	Philippines	
Not using	43.7	38.1	44.9	
Modern method				
Pill	17.8	13.6	19.1	0.90
IUD	4.4	3.9	3.5	0.95
Injectables	9.1	31.9	3.7	0.70
Condom (male and female)	2.1	1.8	1.9	0.70
Sterilization (male and female)	3.1	3.4	8.6	1.00
Implants/Norplant	2.2	3.3	-	0.70
Lactational amenorrhea method	0.1	0.0	0.5	0.70
Other modern method	-	-	0.3	0.70
Traditional method				
Rhythm/Periodic abstinence	3.0	1.3	5.1	0.70
Withdrawal	14.5	2.3	12.1	0.70
Other traditional method	0.1	0.4	0.2	0.70
Use effectiveness (e)	0.80	0.78	0.83	
Contraceptive prevalence rate (u)	56.3	61.9	55.1	
C_c	0.51	0.48	0.50	

Note: The "0.0" value was obtained due to the rounding off. It indicates the value is smaller than 1 but greater than 0.

Sources: Computed with data from the published reports of 2014 CDHS, 2012 IDHS and 2013 NDHS.

(c) Index of Post-partum Infecundability (C_i)

The fertility-inhibiting effect of breastfeeding depends on the duration of breastfeeding. The index of post-partum infecundability takes the value of 0 if post-partum abstinence and breastfeeding is present and 1 if post-partum abstinence and breastfeeding is absent. The formula is shown as below.

$$C_i = \frac{20}{(18.5 + i)}$$

where i is the mean duration of post-partum infecundability in months caused by breastfeeding or post-partum abstinence, as calculated by the formula: 1.753 exp (0.1396 × B – 0.001872 × B^2), and B is the mean duration of breastfeeding.

Currently married women who had children aged less than 2 years old were asked to state their duration of breastfeeding the youngest child. Because about half of the married women were not breastfeeding, the weighted mean breastfeeding duration was adjusted as shown in Table 4.18. The estimated C_i value indicating that the fertility-inhibiting effect of breastfeeding was rather low, especially in the Philippines. The contribution of post-partum infecundability to fertility reduction was 27 percent in Cambodia, 30 percent in Indonesia and 19 percent in the Philippines.

Table 4.18: Mean duration of breastfeeding and index of post-partum infecundability for each country

	Cambodia	**Indonesia**	**Philippines**
Mean duration of breastfeeding	19.0	20.5	16.6
Adjusted mean duration of breastfeeding (B)	14.3	15.9	10.5
C_i	0.73	0.70	0.81

Sources: Computed with data from the published reports of 2014 CDHS, 2012 IDHS and 2013 NDHS.

(d) Index of Induced Abortion (C_a)

The index of induced abortion refers to the fertility-inhibiting effect of abortion. It takes the value of 1 if induced abortion is absent, and 0 if vice versa. The formula is shown as below.

$$C_a = \frac{TFR}{TFR + 0.4 \times (1+u) \times TA}$$

where u is the proportion of currently married women that are currently using contraception, and TA is the total abortion rate among currently married women.

Bongaarts suggested that the index of induced abortion equals to 1 if reliable statistics for induced abortion is not available (Bongaarts, 1982). In this study, index of induced abortion was estimated as a residue, given that the indices of marriage, contraception, post-partum infecundability were known and total fecundity was assumed based on the extensive study by Bongaarts. In all three countries, the estimated index of induced abortion was higher than the other three indices, indicating that the fertility-inhibiting effect of induced abortion was very low, especially among the Filipino and Indonesian women (Table 4.19).

Table 4.19: Index of induced abortion for each country

	Cambodia	**Indonesia**	**Philippines**
C_a	0.78	0.80	0.93

Note: Index of induced abortion was estimated as a residue.

4.5.3.2 Relative Contribution of Each Proximate Determinant of Fertility

The precision and consistency of the estimated fertility-inhibiting effects of the proximate determinants of fertility was affected by the total fecundity value that has been found to vary between 13 and 17 births per woman. Nevertheless, the assumed total fecundity value was taken based on the average fecundity rate of 15.3 in the developed and developing countries (Bongaarts, 1978; 1982).

The fertility-reducing effects of the proximate determinants can be used to determine the relative contribution of each of the variable to the fertility reduction. The magnitude of the fertility-inhibiting effect contributed by each proximate determinant was prorated by the proportion of the logarithm of each index to the sum of logarithms of all indices (Odimegwu & Zerai, 1996). After natural log transformation, the transformed Bongaarts model is shown as below.

$$\ln(TF) - \ln(TFR) = \ln(C_m) + \ln(C_c) + \ln(C_i) + \ln(C_a)$$

The proportional contribution of each proximate determinant to the reduction of fertility from the TF to the TFR is calculated based on the following formula:

$$C_x = \frac{100 * \ln(C_x)}{\ln(C_m) + \ln(C_c) + \ln(C_i) + \ln(C_a)}$$

where C_x is the index of marriage, contraception, post-partum infecundability or induced abortion. This formula yields the proportion contributed by each proximate determinant to the reduction of fertility.

The proportional contribution of each variable obtained determines the ranking of the proximate determinants based on the fertility-reducing effects. The concept of prorating the total fertility-inhibiting effect by the logarithm of each index has been widely used in past research (Wang et al., 1987b; Bahobeshi & Zohry, 1995; Odimegwu & Zerai, 1996; Islam, Mamun & Bairagi, 1998; Letamo & Letamo, 2001-02; Islam, Islam & Chakraborty, 2002; Maseribane, 2003; Nath & Mazumder, 2005; Islam, Dorvlo & Al-Qasmi, 2011).

Table 4.20 shows the summary of estimated indices and the percent of fertility reduction by the four main proximate determinants based on all the surveys available in each country for comparison purpose. The TFR had fallen by about 32.5 percent, 21.2 percent and 26.7 percent respectively in Cambodia, Indonesia and the Philippines between the first and recent surveys. Marriage had the highest fertility-reducing effect in Cambodia and the Philippines in the 1990s and 2000s, but the recent surveys revealed that contraception had caught up and emerged as the highest fertility-reducing factor in these two countries. The fertility-reducing effect of contraception remained the highest in Indonesia since late 1980s and accounted for about 40.0 percent of the fertility reduction in the country. It is worth mentioning that the proportion of fertility reduction contributed by post-partum infecundability had declined between the first and recent surveys available in Cambodia and Indonesia, but the reverse was true in the Philippines. Another interesting observation is that the proportion of fertility reduction contributed by induced abortion had decreased between the first and recent surveys available in the Philippines, but the opposite was true in Cambodia and Indonesia. Between 1987 and 2012, the fertility-reducing effect of induced abortion had doubled in Indonesia, which shows the rising importance and the likelihood of this variable in explaining a substantial part of fertility reduction in the future. However, lack of reliable data and growing number of unsafe abortion precludes a more detailed analysis.

Table 4.20: Indices and percent of fertility reduction by proximate determinants for each country, various years

	TFR	Marriage		Contraception		Post-partum infecundability		Induced abortion	
		C_m	%	C_c	%	C_i	%	C_a	%
Cambodia									
2000	4.0	0.57	41.4	0.80	17.0	0.68	29.2	0.85	12.4
2005	3.4	0.58	36.2	0.66	27.6	0.72	21.4	0.80	14.7
2010	3.0	0.56	35.4	0.57	34.7	0.69	22.6	0.89	7.3
2014	2.7	0.60	29.2	0.51	38.4	0.73	18.0	0.78	14.4
% change (2000-2014)	-32.5		-29.5		125.8		-38.4		16.8
Indonesia									
1987	3.3	0.64	29.2	0.53	41.7	0.70	23.0	0.91	6.2
1991	3.0	0.64	27.2	0.55	37.3	0.70	21.6	0.80	13.8
1994	2.9	0.64	26.8	0.51	40.1	0.69	22.3	0.83	10.7
1997	2.8	0.65	25.6	0.50	40.7	0.69	22.1	0.82	11.7
2002-03	2.6	0.62	26.7	0.49	40.8	0.72	18.4	0.78	14.2
2007	2.6	0.62	26.6	0.48	41.0	0.75	16.3	0.75	16.1
2012	2.6	0.63	25.9	0.48	41.3	0.70	20.1	0.80	12.7
% change (1987-2012)	-21.2		-11.3		-0.8		-12.3		104.6
Philippines									
1993	4.1	0.54	47.0	0.63	34.9	0.91	7.0	0.86	11.1
1998	3.7	0.52	46.3	0.58	38.2	0.91	6.7	0.88	8.9
2003	3.5	0.56	39.3	0.56	39.8	0.88	9.0	0.84	11.9
2008	3.3	0.54	40.0	0.54	39.8	0.87	8.8	0.84	11.4
2013	3.0	0.51	40.9	0.50	42.0	0.81	13.0	0.93	4.2
% change (1993-2013)	-26.7		-13.0		20.4		84.9		-62.2

Sources: Computed with data from various years of published reports of CDHS, IDHS and NDHS.

Table 4.21 shows the order of influence of these determinants on fertility in each country. Marriage and contraception were by far the two most important proximate determinants of fertility, and the hypothesis made is supported, except for the 2000 Cambodian survey. The results of this study are consistent with that observed in China (Coale, 1984; Poston Jr., 1986; Feeney et al., 1989; Kaufman, 1993; Tu, 1995; Zhang, 2004), Nepal (Ross et al., 1986), Turkey (Koc, Hancioglu & Cavlin, 2008), Malaysia (Tey, Ng & Yew, 2012), and Vietnam (Das, Das & Thi Ngoc Lan, 2013).

Table 4.21: Order of influence of proximate determinants on fertility for each country, various years

Order of influence	1	2	3	4
Cambodia				
2000	Marriage	Post-partum infecundability	Contraception	Induced abortion
2005		Contraception	Post-partum infecundability	
2010				
2014	Contraception	Marriage		
Indonesia				
1987	Contraception	Marriage	Post-partum infecundability	Induced abortion
1991				
1994				
1997				
2002-03				
2007			Post-partum infecundability Induced abortion	
2012			Post-partum infecundability	Induced abortion
Philippines				
1993	Marriage	Contraception	Induced abortion	Post-partum infecundability
1998				
2003	Marriage Contraception			
2008				
2013	Contraception	Marriage	Post-partum infecundability	Induced abortion

CHAPTER 5: CONCLUSION

Following the launching of family planning programs in the 1960s and 1970s, fertility level has been declining in all ASEAN countries, to below replacement level in six of the countries. Cambodia, Indonesia and the Philippines are three out the four where fertility rate still remains above replacement level. Indonesia was regarded as having one of the most successful family planning programs in the 1970s and 1980s, and its TFR was expected to reach replacement level earlier than most Southeast Asian countries. However, change in program thrust in the 1990s has slowed down the pace of fertility decline in this most populous country of the region. The settings in each country differ markedly in terms of cultural norms, political structures, socio-economic development, population growth, urbanization, income, poverty, gender equality (in terms of school enrolment, employment and politics), infant mortality, and life expectancy. All these have brought about divergence in fertility transition across the three countries in this study.

As the mortality rate has dropped to relatively low level and the scope for further decline is rather limited, the future course of fertility will therefore be crucial in determining the rate of population growth. Hence, a better understanding and knowledge of fertility dynamics and the factors affecting childbearing behavior is essential for policy formulation and program implementation as an integral part of development planning. Socio-economic development influences childbearing behavior; on the other hand, population in the form of human capital is of vital importance to national development. Using data from the DHS, this thesis examined the socio-economic differentials in childbearing, and analyzed the distal determinants (including women's empowerment) and the proximate determinants of fertility in Cambodia, Indonesia and the Philippines, within and across countries. This chapter relates the findings with those of previous

studies and the fertility theories, discusses the implications before putting forth some recommendations for research and policy, and discusses the limitations and contributions of this thesis.

5.1 Summary on the Factors Affecting Fertility in Cambodia, Indonesia and the Philippines

Globalization, increased cross-border migration and the advent of Information Communication and Technology have brought about global economic and social transformation, as well as modernization. All these changes have influenced the values and aspirations of individuals, including prioritizing career advancement over family formation. The ever rising cost of living has also forced couples to want fewer children. This thesis has clearly demonstrated that improvement in education, urbanization, increased female participation in the modern (or non-agricultural) sector of the economy, as well as improvement in the standard of living have resulted in delayed marriage and greater use of contraceptive methods, which in turn leads to a reduction in childbearing. Family planning efforts have also played a key role in fertility reduction.

The three countries in this study are in Stage Three of the demographic transition. Each country has undergone significant decline in the fertility rate of more than 40 percent from their pre-transition level of more than 5 children per woman in the 1960s in all three countries to 2.8, 2.3 and 3.0 children in Cambodia, Indonesia and the Philippines respectively as of 2014. In comparison, their neighboring countries - Malaysia, which is also in Stage Three, went through a more rapid fertility transition in a shorter period, with TFR dropping from 4.7 in 1970 to 2.0 in 2014, at an accelerated pace since the dawn of the new millennium (ESCAP, 2014b). Malaysia is the third most urbanized country in

Southeast Asia, and more females than males are enrolled in institutions of higher learning. All these social changes along with rising standard of living and women empowerment have led to delayed marriage and demise of universal marriage, which is the main cause for fertility decline in Malaysia.

The findings from this analysis show that not all socio-economic factors have significant effects on the number of children ever born among women aged 15-49 in Cambodia, Indonesia and the Philippines, and the impacts differ across different sub-groups of population within each country. Multivariate analyses revealed that much of the effects of the socio-economic variables were rather small after controlling for age and duration of marriage. However, the differentials in mean number of children ever born remain very substantial across the wealth quintiles even after taking into account the demographic variables.

Place of residence is not an important factor in explaining the differentials in number of children ever born, and the negative relationship between urbanization and number of children ever born is only significant at the bivariate level in all three countries under study. The lack of urban-rural differentials in childbearing shows that the family planning program has permeated to both urban and rural areas, such that rural women are just as likely as urban women to use a contraceptive method to space and limit childbearing. Contrary to expectation, after adjusting for other socio-economic variables, age and duration of first marriage, urban Filipino couples would instead have more children than their rural counterparts. The findings show that besides longer marital duration among the Filipino rural women, if they possessed the same socio-economic background and women's status as those from the urban families, they would actually have fewer children than the urban women. Hence, an important lesson is that empowering women with

education and greater job opportunities can reduce the urban-rural differentials in fertility and reduce the overall fertility rate.

Women's education exerts significant negative impact on the number of children ever born in Cambodia and the Philippines, even after controlling the effects of other variables. Nevertheless, the magnitudes of differentials across educational groups are smaller compared to the family wealth when other variables and covariates are taken into account. In Indonesia, women's education has no effect in explaining differential in childbearing after controlling for other socio-economic variables and covariates. The findings suggest that the educational effects on fertility among Indonesian women is due to the fact that better educated women tend to be younger and get married later, have greater employment opportunities, and came from the wealthier families, and better empowered as compared to their lesser educated counterparts. Once these variables are held constant, the educational differential in the number of children become insignificant.

At the multivariate level, husband's education is inversely correlated with the number of children ever born among the Filipino and Cambodian women. In Indonesia, women whose husbands with at least secondary education tended to have larger family size than those whose husbands with lesser education after the demographic controls, due to younger age and shorter duration of marriage among women whose husbands with higher education.

In all three countries, women engaged in the agricultural sector have larger family size than non-working women, even after adjusting for other variables, but the reverse is true when age and duration of first marriage are further controlled, except for Cambodia. This suggests that women working in the agricultural sector tended to be older, enter marriage earlier and desired more children. In short, Indonesian and Filipino working women employed in agricultural and non-agricultural sectors have significantly smaller family size than those who were not working after holding the other variables and covariates at constant, and Cambodian women engaged in the non-agricultural sector have significantly fewer children than non-working women. According to Leibenstein (1957), one of the disutilities that will impinge on couples' desire in wanting an additional child was the opportunities and wages foregone in childrearing. Since men were often viewed as the primary family breadwinners in many Asian countries, women were responsible in childrearing. The finding of this study is in line with Leibenstein's theory, in which working women, especially those engaged in the non-agricultural sector have fewer children than non-working women, due to the higher opportunity costs of childbearing and childrearing among working women. With urbanization and structural changes in the economy, shifting from agriculture to non-agriculture activities, children are no longer needed to provide the additional hands for the farm.

In all the three countries, women from the poorest families have the most number of children. The differentials in mean number of children ever born across all wealth index categories remained very significant even after taking into account other factors and covariates. In the multivariate models that include the demographic variables, the differences in mean number of children ever born have reduced only slightly in the case of Cambodia and the Philippines, but have increased in Indonesia as compared to that at the bivariate level. The negative relationship between family wealth and demand for

children found in this study can be explained by Becker's (1960) economic analysis of fertility. He deduced that couples' decision to have children were comparable to that of purchasing other consumption goods. Higher income families preferred better quality goods, and thus had a demand for children with higher quality rather than quantity. This is known as the "quality-quantity tradeoff" (Becker, 1981). The quality of children was measured by the costs and investments spent on that child. The rising cost in higher education in Asia and the Pacific (Asian Development Bank, 2012) implies that higher income couples would opt to invest more in a child's education (for higher quality), which in turn lowers their demand for an additional child.

In this study, women empowerment is measured in terms of household decision-making autonomy and attitude towards wife beating. Both indicators, however, show different effects on the mean number of children ever born. For instance, high autonomy in household decision-making is directly correlated with family size among the Filipino in the bivariate context, but the relationship is found insignificant at the multivariate level with covariates. Family size among the Cambodian and Indonesian women is not associated with household decision-making autonomy, and this is true after controlling for other variables, age and duration of first marriage. On the other hand, women who disagreed with wife beating have significantly fewer children than those who agreed in the bivariate analysis for all three countries. However, the relationship has turned out to be insignificant after the remaining variables, age and duration of first marriage are taken into account in Cambodia and the Philippines. The results suggest that attitude towards wife beating is an important factor affecting the number of children in Indonesia, but not in the case of Cambodia and the Philippines. Both women empowerment indicators have no effect on the number of children ever born among the Cambodian and Filipino women after controlling for other socio-economic variables and covariates.

Application of Bongaarts' model on the DHS data showed that contraceptive use and marriage postponement are the two most important proximate determinants of fertility for all three countries under study, similar to the outcomes obtained in other studies (Zhang, 2004; Koc, Hancioglu & Cavlin, 2008; Tey, Ng & Yew, 2012; Das, Das & Thi Ngoc Lan, 2013). This suggests that Bongaarts' proximate determinants framework is well fitted to DHS data used in this thesis. The effect of breastfeeding through post-partum infecundability is minimal, and the effect of induced abortions could not be assessed due to unavailability of data.

Indonesian women had the lowest SMAM in the 1980s across these three countries, but it has increased sharply, such that they are now marrying at an older age as compared to the Cambodian (UN, 2013c). This is similar to that reported in the IDHS surveys, in which Indonesian women are postponing marriage, from 17.6 years in 1987 to 20.1 years in 2012. On the other hand, the mean age at first marriage has remained relatively stable in Cambodia and the Philippines, at around 20 and 21 years respectively. Women's education is strongly positively correlated with age at first marriage, which in turn exerted negative impact on the mean number of children ever born.

The near replacement fertility level achieved in Indonesia and rapid fertility transition in Cambodia were mainly attributed to the successful implementation of national family planning programs in these two countries, with a contraceptive prevalence rate of 61.9 percent in Indonesia (2012) and 56.3 percent in Cambodia (2014). Although 55.1 percent of Filipino couples in the reproductive age groups were using a contraceptive method in 2013, the pace of fertility reduction has been relatively slow, partly due to the weaker family planning efforts in the country as a result of opposition from the Catholic Church and persistently high level of use of inefficient contraceptive method. In 2009, the family

planning efforts score for the Philippines stood at a low level of 29.8, as compared to 59.9 and 55.8 in Indonesia and Cambodia respectively (Ross & Smith, 2010).

The differential response to family planning program among socio-economic sub-groups has resulted in wide variation in contraceptive use, and hence the childbearing differentials. Women with higher socio-economic and empowerment status are more likely to use a contraceptive method, resulting in smaller family size. However, the relationship is not consistent across countries. For instance, couples with at least secondary education in the Philippines and secondary education in Cambodia, and urban women in these two countries continue to have higher contraceptive prevalence rate and smaller mean number of children ever born than their lesser educated and rural counterparts, but the effects of urbanization and education on contraceptive use had the opposite effect in Indonesia, as urban women and couples with tertiary education have lower contraceptive prevalence rate but fewer children, as compared to those from rural areas and with lesser education. Cambodian women, Filipino couples and Indonesian women whose husbands engaged in the non-agricultural sector were more likely to use a contraceptive method and have fewer children as compared to those who worked in the agricultural sector, but Indonesian women and Cambodian women whose husbands employed in the non-agricultural sector were less likely to use a contraceptive method and had smaller family size than their agricultural counterparts. Women from the poorest families have the lowest contraceptive prevalence rate and largest family size across the wealth quintiles for all three countries. Cambodian and Filipino women with lower autonomy in household decision-making are less likely to use a contraceptive method, but have smaller family size than their full autonomy counterparts. This suggests that women who have a choice may not necessary opt for fewer children. In Indonesia, no consistent pattern was found between women's autonomy, contraceptive use and

childbearing. In Cambodia and Indonesia, women who agreed with wife beating were least likely to use a contraceptive method, and they had more children than those who disagreed. However, Filipino women who agreed with wife beating were most likely to use a contraceptive method and they have larger family size than those who disagreed.

The findings in this study revealed that fertility level differs significantly across Cambodia, Indonesia and the Philippines, and pronounced socio-economic differentials in fertility exist within each country. Fertility level is falling in all three countries, and it is quite close to replacement level in Indonesia. Strong family planning programs have resulted in substantial fertility decline in Indonesia and Cambodia, but the policy of decentralization implemented in Indonesia in 2004 has brought about leveling off in contraceptive use over the past ten years and has prompted the government to step up efforts to revitalize family planning. For instance, during the period from 2000 to 2010 (before and after decentralization), contraceptive prevalence rate in Indonesia had increased by 6.1 percent (from 54.8 percent to 60.9 percent), resulting in the leveling of fertility at about 2.4 children per woman (World Bank, 2015b). Since 2010, the Indonesian government has provided free family planning services to 7 out of 33 provinces in Indonesia, and was committed to provide free family planning services throughout the region under the Universal Healthcare Coverage program by 2014 (Advance Family Planning, 2015). The upcoming survey will be collecting data to examine the effectiveness of this new healthcare program that was officially launched on 1 January 2014 to strengthen family planning services.

Cambodia launched its family planning program more than two decades later than Indonesia and the Philippines, but it has caught up quickly and the strong program efforts have contributed significantly to rapid fertility decline. Findings from the DHS are consistent with that of Bayer (2011), which suggested that fertility decline in Cambodia is mainly caused by the increased availability of contraceptive supply and services. DHS shows that 99 percent of the Cambodian women are aware of at least one modern contraceptive method, and positive attitude of the public towards family planning has led to the sharp rise in contraceptive prevalence rate and fertility decline, as found earlier by Sreytouch (2010). While abortion in Cambodia is increasingly common since the National Abortion Law was enacted in 1997 (Long & Ren, 2001), contraceptive methods were preferred over induced abortion in fulfilling fertility intentions (McDougall et al., 2009). At the current rate, Cambodia is expected to achieve replacement fertility level in the next one to two decades. Although user fees have been applied, waiving and exemption systems are utilized and subsidized by international donors when the user is unable to afford contraceptive methods (Sreytouch, 2010). Therefore, it is likely that contraceptive use will continue to rise with the commitment from the Royal Government of Cambodia and financial support from the international donors.

The constantly high level of use of traditional (less effective) contraceptive methods, low family planning efforts and the opposition over the use of contraceptive methods and sterilization from the Catholic Church are some of the reasons for the slower fertility decline in the Philippines compared to the other two countries, and thus, Filipino will probably take a longer duration to reach replacement fertility level as compared to their Indonesian and Cambodian counterparts. Besides, socio-economic and regional inequalities in the Philippines also explain the implausibility of replacement levels in the near future. However, starting from mid-April of 2014, the Philippine Supreme Court

had permitted the government to provide reproductive health care services and free contraceptives access to nearly everyone, particularly to the poorest groups (Associated Press, 2014). It can be expected that contraceptive use will increase eventually, but it will probably take a longer time because competing forces of religious beliefs on the use of contraception in this Catholic country. On the other hand, international migration will also have some impacts on the fertility because nearly 10 percent of the Filipino workers are working overseas. International migration has the potentials to influence the population dynamics because it tends to disrupt childbearing through spousal separation.

Indonesia is one of the few ASEAN countries that have experienced and capitalized upon its demographic dividend through rigorous institutional development. Although Cambodians and Filipinos have yet to reap demographic dividends due to the large young age group population in Cambodia and persistent high fertility rate in the Philippines, these two countries will be reaping the demographic dividend ultimately in the next half a century or so, and therefore it is crucial to plan for the eventual ageing of the population. The linkage between population and economic growth must be taken into account in development planning to ensure sustainable development.

The 2015 Revision on World Population Prospects (UN, 2015) estimated that the population in these three ASEAN countries will continue to grow in the next three decades, but the growth will slow down due to fertility decline. The continuing population growth is due to the population momentum, as a large number of people born during the 1980s and 1990s are now entering the reproductive age groups, and hence ensuring the continued growth in the next few decades.

5.2 Implications and Recommendations

Based on the foregoing analysis, a number of policy and research implications and recommendations can be drawn. Women from the poorest families tended to have larger family size than those who are better off in all three countries, especially in the Philippines, and this trend is expected to perpetuate the vicious cycle of poverty, and slow down economic growth. Greater efforts are thus required to provide reproductive health information, education and communication activities to the disadvantaged groups and to ensure equal access to contraceptive services to enable them to plan the number of children and timing of childbearing accordingly.

The Indonesian case provides an important lesson of the need to sustain high level of contraceptive use to reduce the fertility level. In view of the strong fertility-inhibiting effect of contraceptive use in all three countries, family planning program should be targeted at the poorer segments of the population that have low contraceptive use, high unmet need and high fertility so that they are able to plan their families based on their financial situation, and to reduce the unmet need for contraception. Couples who opt to use traditional methods should be taught the proper way to improve use effectiveness and avoid unwanted pregnancy. This is particularly important in the Philippines because of the constantly high prevalence of traditional contraceptive methods in the country.

Women with lesser education are much more likely to enter marriage earlier and have more children than their higher educated counterparts in all three countries. Hence, there is a need to introduce family life education in elementary schools to better prepare the future generation for a planned parenthood. The importance of women's education as the key to their health and financial independence should also be highlighted.

More and more women are participating in the modern labor market where maternal role is incompatible with work. The low female labor force participation rate could be due to women withdrawing from the labor market after giving birth, given the high opportunity costs. Besides, women may find it difficult to re-enter the labor market. Hence, efforts should be made to facilitate childcare and remove the barriers for women to re-enter the labor market.

From the theoretical perspectives, this thesis found some significant deviations from conventional explanations of the association between socio-economic factors and fertility. The fertility behavior in this fast changing world needs to be examined from new perspectives and theories. There is also a need to have more refined composite indicators such as the role of men. More reliable data on induced abortion, breastfeeding, sexual behavior, and sterility need to be collected for a better understanding of the effects of all the proximate determinants of fertility.

Many studies have found that fertility intention is a strong predictor of actual fertility. There is therefore a need to examine the linkage between socio-economic variables and desired family size and the predictive power of fertility preference for achieved fertility for the various sub-groups of the population.

Factors affecting fertility differ across countries, and such changes affect each country differently. I now turn to a more detail explanation of the implications for this thesis for each of the three countries under study. Although fertility rate in Cambodia has declined substantially since the launching of family planning program in the mid-1990s, there is a need to improve substantially access to better quality of health care services and education for the vast number of rural and poor Cambodians. While the Cambodian government

has implemented the first National Population Policy in 2003 to harmonize population and economic growth, there is a need to revise from time to time to be abreast of the development. Currently, family planning is not free in Cambodia. Family planning services should be made available to the groups of population that may not be able to bear the contraceptive cost. Public and private partnerships in providing family planning services is strongly encouraged to ensure public can access these services at lower rate.

Fertility level in Indonesia has stalled since 2002-03, and the fertility-reducing effects of the four main proximate determinants remain largely unchanged, especially contraceptive use. Nevertheless, the fertility-inhibiting effect of contraception remained the highest, even after the policy of decentralization was implemented in 2004. This indicates that family planning continues to play an important role in future population policy development. Hence, more efforts are needed to revitalize family planning program in Indonesia. Better quality of healthcare and family planning services and easy access to and availability of these services are crucial to increase contraceptive use.

Opposition from the Roman Catholic Church on the use of family planning services, low family planning efforts, and heavy reliance on traditional methods have been the main reasons for the relatively high fertility in the Philippines across different sub-groups of the population, as shown in the findings of this study. The reproductive health law implemented in 2014 has allowed the Filipino government to distribute free contraception to the poor. However, the Court has restrained the government from delivering certain implant contraceptives to the public since June 2015 because this type of birth control was regarded as the cause of abortion (Orendain, 2015). All these imply that the current patterns of childbearing and contraceptive use in the Philippines will persist if the government policy makers and political influential leaders fail to come to a consensus in

family planning. Follow-up studies are therefore required to obtain a better understanding on the relationship between religious beliefs and family planning practice in the country.

5.3 Limitations of Study

This research is restricted by the data availability. All analyses in this study are performed at the national level in Cambodia, Indonesia and the Philippines subject to the latest data available from DHS. The available data do not allow for a more detailed analysis by some pertinent variables. For instance, variables such as childhood place of residence, women's employment before marriage and respondents' income that could be important factors in affecting fertility level were not collected in these surveys. For cross-country comparison, this study focuses on the variables that are common in all three countries, and the more detailed analysis by ethnicity, region and religion that are very important for policy intervention, are outside the scope of this thesis. Religiosity variable is not available in Indonesia, and ethnicity information is not available in Cambodia and Indonesia. The effect of contraceptive use on fertility can only be assessed with aggregate data, due to the opposite causal effect. In addition, the cross-sectional DHS data limit the analysis of cause-effect relationship between variables. Testing all fertility theories presented in Chapter 2 would not be possible with the limited data available for the three countries. For instance, Caldwell's theory of fertility decline requires longitudinal data to analyze wealth transfers across generations. The children ever born is a cumulative measure and indicates the number of children born to women of different age groups as at the time of the survey, and this will likely lead to the problems of censoring and truncation. These problems can be overcome by controlling for the differences in the age structure and duration of marriage in comparing the fertility levels across socio-economic characteristics of the population.

5.4 Research Contributions

This study is expected to fill the contextual gap in the extant literature of fertility studies in several ways. Firstly, the fertility rates in the three ASEAN countries in this study are still above replacement level, although six out of ten ASEAN countries have achieved below replacement fertility. It is important to understand the childbearing behavior in these three countries that are influential in setting the fertility level in ASEAN region on the whole, giving the large population base and wide differences in socio-economic settings.

From the theoretical perspectives, this study intends to contribute to the literature and knowledge by providing insights regarding the divergence in childbearing behavior across socio-economic and women empowerment sub-groups, based on the latest nationally representative survey data in each country, and provide a better understanding on the roles of contraceptive use and delayed marriage in mediating the effects of these factors on childbearing. The country-by-country decomposition of fertility change by the proximate determinants has been a successful endeavor at validating Bongaarts' framework. The analysis can be easily updated when new DHS data are available. Besides using Bongaarts' model in determining the role of contraception on fertility decline, this thesis also determines the relationship by examining the scatter plots of mean number of children ever born and contraceptive prevalence rate for the various socio-economic sub-groups. As most of the past studies have inherently concentrated on the fertility decline at micro or macro level (Lee, 2003; White et al., 2008; Bbaale & Mpuga, 2011), this study has contributed to the literature by examining the effects of socio-economic factors and proximate determinants on fertility simultaneously to uncover the underlying reasons for the fertility differentials within and across countries.

This study made a major contribution to the research methodology by using the relevant statistical technique to analyze the mean number of children ever born - a count variable with a small bounded range. Rather than using multiple linear regression model that were conventionally used in past research that treated the mean number of children ever born as a ratio scale variable (Bhasin & Nag, 2002; Kannan & Nagarajan, 2008; Adhikari, 2010; Sufian, 2013), this study utilized Negative Binomial Regression model that was less rigid on the normality assumptions, and more appropriate for count data. It is hoped that the detailed analysis of fertility differentials and determinants, using appropriate statistical techniques will result in a better understanding of fertility dynamics, the most important demographic process that will affect future population growth.

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LIST OF PUBLICATIONS AND PAPERS PRESENTED

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5. Lai, S.L. (2012). Fertility Trends and Differentials in Bangladesh and Pakistan. Paper presented at the *2nd Asian Population Association Conference,* Bangkok, Thailand.

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7. Lai, S.L. (2014). The Role of Private Sector in Family Planning in 3 ASEAN Countries. Paper presented at the *7th APCRSHR Conference,* Manila, Philippines.

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10. Tey, N.P. & Lai, S.L. (2015). The Changing Demographic Landscape Around the World - What the Population Censuses Reveal. Paper presented at the *19th Advanced Analytics and SPSS Users Association of Kuala Lumpur and Selangor (AASUG) Conference,* Eastin Hotel, Petaling Jaya, Malaysia.

11. Lai, S.L. (2016). Women's Empowerment and Socio-Economic Disparities in Contraceptive Use in Cambodia. Paper presented at the *8th APCRSHR Conference,* Nay Pyi Taw, Myanmar.

12. Lai, S.L. & Tey, N.P. (2016). Factors Affecting Women's Empowerment in Cambodia. Paper presented at the *Joint World Conference on Social Work, Education and Social Development 2016,* Seoul, Korea.