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The Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat organized an Expert Group Meeting on "Fertility, Changing Population Trends and Development: Challenges and Opportunities for the Future" at the United Nations Headquarters in New York on 21 and 22 October 2013. The meeting was convened to inform substantive preparations for the forty-seventh session of the Commission on Population and Development in April 2014. In light of the twentieth anniversary of the 1994 International Conference on Population and Development (ICPD), the Commission's theme for 2014 is an "Assessment of the status of implementation of the Programme of Action of the International Conference on Population and Development".

The meeting brought together experts from different regions of the world to address key questions about the future pace of fertility change, implications for age structure changes and other population trends and effective policy responses. A selection of the papers prepared by experts participating in the meeting is being issued under the Expert Paper Series published on the website of the Population Division (www.unpopulation.org).

The paper reviews the trends toward low fertility in 18 Asian countries that reached a total fertility level of 2.1 or fewer children per woman during the period 2005-2010. It discusses the different pathways by which low levels of fertility have been achieved and the consequences of low fertility and policy implications. Fertility decline in these countries is mostly due to delayed onset of childbearing, aided in part by contraceptive use, an increasing age at marriage, advancement of education and the disapproval of cohabitation and childbearing outside marriage. The rapid decline in fertility has enabled some countries to reap benefits from the demographic dividend but it has not allowed enough time for them to prepare adequately for the problems associated with population ageing. Countries have responded to low fertility with various sets of pronatalist measures, many of which have met with limited success. Low-fertility countries in Asia should learn from countries with experiences of implementing pronatalist policies for several decades, including European countries with successful pronatalist policies. However, it is recommended that every country should design its own policy taking into account its demographic, socio-cultural, economic and institutional structure.

The Expert Paper series aims at providing access to government officials, the research community, non-governmental organizations, international organizations and the general public to overviews by experts on key demographic issues. The papers included in the series will mainly be those presented at Expert Group Meetings organized by the Population Division on the different areas of its competence, including fertility, mortality, migration, urbanization and population distribution, population estimates and projections, population and development, and population policy.

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Low fertility has become an important area of demographic research as fertility in many countries has fallen to and remained at levels well below replacement. Economically-advanced countries have experienced low fertility trends for decades, and many are experiencing lowest-low fertility (i.e., total fertility below 1.3 children per woman) (Kohler, Billari and Ortega, 2002; Caldwell, 2006). Developing countries have recently experienced low fertility levels, and there no longer seem to be any barriers to most countries reaching replacement-level fertility (2.1 children per woman) and subsequently falling below that level. Several Asian countries have attained below-replacement fertility in recent decades (Gubhaju and Moriki-Durand, 2003a; Atoh, 2001; Hirschman et al., 1994; Knodel et al., 1987; Abbasi-Shavazi et al., 2009). However, countries have attained low fertility in different ways (Perelli-Harris, 2005; Basten et al., 2013), suggesting distinctive attributes of countries and regions in reaching low fertility. For instance, Hirschman et al. (1994) have argued that the rapid economic growth and a Confucian cultural heritage of East Asian countries such as Hong Kong SAR, the Republic of Korea, Singapore and Taiwan province of China would not make them a model for fertility decline in other countries in Asia. Given different pathways by which below-replacement fertility is achieved, studies should take into account the demographic, social, economic and cultural context (McNicoll, 1980, 1994; Rindfuss et al., 2003) in analysing family formation and fertility behaviour.

The consequences of low fertility at both the macro (country) and micro (family or individual) levels also may differ according to the timing and the pathways by which low fertility is attained. Economically-advanced countries, including some Asian countries, are now experiencing such demographic, social and economic consequences of low fertility as negative population growth and projected shortages of labour. Population ageing is another inevitable consequence of low fertility experienced by many Asian countries (Donaldson and McNicoll, 2012).

Although research on low fertility has become abundant in recent years, theories of low fertility remain in the early stages of development and the determinants of post-transitional fertility still are not well understood (Wilson, 2011). Social scientists have proposed different explanations for the fall of fertility to below-replacement level or to lowest-low fertility levels. Postponement of marriage and childbearing is one of the main factors pushing fertility in many advanced countries to the lowest end (Bongaarts, 2002; Jones, 2007). Post-modern materialistic views towards life and childbearing consistent with the second demographic transition (Lesthaeghe and Willems, 1999) as well as uncertainty and economic insecurity due to unemployment and low status or temporary jobs (Kohler, Billari and Ortega, 2002) have been mentioned as other factors behind the postponement of marriage and childbearing leading to low fertility. The difficulties confronting women arising from coherence in the levels of gender equity in individual-oriented and family-oriented societies have also been proposed as one of the main forces driving fertility to a low level (McDonald, 2000, 2013a). Contraception has been an enabling factor for women to meet their family size ideals.

The literature on both the causes and consequences of fertility is overwhelmingly based on developed countries, particularly European experiences (Wilson, 2011). This paper focuses on the experiences of low fertility in Asia. It reviews the trends toward low fertility in various Asian countries from 1975-1980 to 2005-2010, and discusses the pathways by which low levels of fertility in Asia have been achieved. The consequences of low fertility and policy implications in Asia are discussed thereafter. While the focus of this paper is on Asian low-fertility countries that achieved low-fertility by 2005-2010, there are several other countries in the region such as Sri Lanka (de Silva 2008), Indonesia (Hull, 2009; Hull and Hartanto, 2009), Mongolia (Spoorenberg and Enkhtsetseg, 2009) and Turkey (Ergocmen, 2012) that are experiencing fertility close to or at replacement level. Thus, the discussion presented in this paper may apply to other Asian countries not included in this analysis.

A. LOW FERTILITY IN ASIA

There are 18 low-fertility countries (out of 50) in Asia, defined as having a total fertility level of 2.1 or fewer children per woman (also known as replacement-level fertility) during the period 2005-2010 (table 1). According to the United Nations (2013a), some 1.9 billion people in 2010 lived in those 18 low-fertility countries of Asia, which represented 27.7 per cent of the world population and 45.9 per cent of the population of Asia. In Eastern Asia, all but one country, Mongolia, have below-replacement fertility. In Southern Asia, only one out of nine countries has reached replacement-level fertility, while there are five out of 11 countries representing low fertility in South-Eastern Asia. By contrast, only six out of 18 countries in Western Asia have low fertility.

1. *Trends in total fertility*

Although the period at which the fertility transition began varies from one country to another, overall, rapid fertility decline occurred in a majority of the 18 low-fertility countries from 1975-1980 onwards. Hence, the time trend in total fertility is shown for the periods 1975-1980, 1990-1995 and 2005-2010 and the percentage decline between two periods with an interval of 15 years.

Table 1 and figure 1 show the trend in total fertility and the speed of decline in low-fertility countries of Asia. Total fertility had already declined to or below three children per woman in all low-fertility countries in Eastern Asia in 1975-1980. In Japan and Macao SAR, total fertility was below two children per woman. Replacement-level fertility had already been reached in Japan during the period 1960-1965 and in Macao SAR during the period 1970-1975. China, Hong Kong SAR and the Republic of Korea approached replacement-level fertility by 1990-1995, while the Democratic Republic of Korea reached this level only in 2000-2005. Fertility decline was relatively large between the periods 1975-1980 and 1990-1995 in China, the Democratic People's Republic of Korea, Hong Kong SAR, Japan and the Republic of Korea as compared to the recent periods between 1990-1995 and 2005-2010. In Macao SAR, however, fertility decline accelerated further in the recent period. Total fertility for China declined from three children per woman in 1975-1980 to 1.6 in 2005-2010. However, Zhao and Chen (2011: 823) argued that the actual level of fertility has been lower than the figures reported by the Chinese Government and the United Nations. They showed that total fertility has been lower than 1.45 for the last decade.

The only low-fertility country of Southern Asia, the Islamic Republic of Iran, had very high fertility (above six children per woman) during the period 1975-1980. Rapid fertility decline occurred between 1975-1980 and 1990-1995, which accelerated further in the later period between 1990-1995 and 2005-2010. The sharp decline in fertility in Iran occurred during the late 1980s and early 1990s, reaching replacement-level fertility in 2000-2005 (Abbasi-Shavazi et al., 2009). In 2011, total fertility in Iran was around 1.8 (Abbasi-Shavazi et al., 2013).

In South-Eastern Asia, Singapore was the only country where fertility dropped below-replacement level (to 1.8 children per woman) during the period 1975-1980. Myanmar and Viet Nam had total fertility levels of 5.2 and 5.5 children per woman, respectively, during the same period, while in Malaysia and Thailand total fertility was just under 4 children per woman. Thailand reached replacement-level fertility in 1990-1995 while Viet Nam joined the low fertility group in 2000-2005 and Malaysia and Myanmar did so recently in 2005-2010. Fertility continued to fall in Singapore and Thailand, dropping to ultra-low levels of 1.3 in the former and 1.5 in the latter in 2005-2010.

In Western Asia, fertility transition was already fairly advanced in Armenia, Cyprus and Georgia, with total fertility of 2.5 or lower during the period 1975-1980. By contrast, total fertility was 3.6 in Azerbaijan, 4.2 in Lebanon and 5.7 in the United Arab Emirates. Replacement-level fertility was reached in Georgia during the period 1990-1995 while Armenia and Cyprus reached replacement-level fertility in 1995-2000. The fertility transition that was initiated in Azerbaijan, Lebanon and the United Arab Emirates during the 1970s continued further. As a result, Azerbaijan and Lebanon joined the low fertility group in 2000-2005 and the United Arab Emirates in 2005-2010.

The national averages presented in this section mask the considerable variation in total fertility across states, provinces or regions within countries. For instance, according to the National Family Health Survey-3 (IIPS, Macro International, 2007) carried out in 2005-2006, total fertility was 2.7 in India. However, ten states of India (Andhra Pradesh, Delhi, Goa, Himachal Pradesh, Kerala, Karnataka, Maharashtra, Punjab, Sikkim and Tamil Nadu) had total fertility levels at or below-replacement level of 2.1 children per woman. The weight of population of these areas on the national average is important. Yet there are also some regions within countries that have relatively high fertility. For instance, in two states of India—Bihar and Uttar Pradesh—total fertility was about 4.0. In the Islamic Republic of Iran, Sistan and Baluchistan province had the highest level of fertility in 2011 (3.7 children per woman) compared to the national level of 1.8 children per woman (Abbasi-Shavazi et al., 2013). This suggests that population policies should look beyond national or regional level variations and consider fertility levels at subregional and subnational levels as well.

The results presented in this section revealed that the level of fertility, the onset of low fertility, and the speed of the fertility decline varied by region and country in Asia. The sharp fertility decline in such Muslim countries as the Islamic Republic of Iran, the United Arab Emirates and Lebanon is worth noting. The following section examines whether the age patterns of fertility mirror the diverse fertility levels and trends observed in the region.

2. *Age patterns*

It is important to examine age patterns of fertility as the path to low fertility may differ from one country to another due to such factors as delayed marriage or non-marriage and government policies and programmes to control fertility. Figures 2 to 5 show age patterns of fertility in low-fertility countries of Eastern, Southern, South-Eastern and Western Asia, respectively, during the period 2005-2010. It is evident that the low-fertility countries of Asia have reached the current levels of fertility with diverse levels and age patterns of fertility. In some countries the age-specific fertility rates peak in young age groups and at high levels; in other countries, fertility either peaks at later ages or is bimodal. In only a few countries does fertility peak at levels above 120 births per 1,000 women. In Eastern Asia, age-specific fertility rates differ quite significantly in China and the Democratic Republic of Korea from that of Hong Kong SAR, Macao SAR, Japan and the Republic of Korea (figure 2). In the case of China, fertility is very high among women in their twenties, with peak fertility (142 births per 1,000 women) occurring in the 20-24 age group followed by the 25-29 age group, and it drops significantly among women in the age group 30-34. Fertility drops to a minimum in the older age groups. This pattern is presumably related to early age at marriage and the one child policy. The mean age at marriage for females was 23.6 years in 2005 (Jones and Gubhaju, 2009). Hence, the majority of women in China tend to complete childbearing relatively early. In the Democratic People's Republic of Korea, fertility reaches its peak (210 births per 1,000 women) in the age group 25-29 followed by women in the age groups 30-34 and 20-24. In sharp contrast, four other countries or areas, namely Hong Kong SAR, Macao SAR, Japan and the Republic of Korea have more or less similar age patterns of fertility, with fertility reaching its peak in the age group 25-34 and dropping somewhat linearly in the age group 35-39. This pattern is obviously related to the delay in age at marriage and higher proportions of women remaining single, combined with a higher percentage of women using contraception. The mean age at marriage in Hong Kong SAR, Japan and the Republic of Korea was around 30 years in 2005 (Jones and Gubhaju, 2009).

In the Islamic Republic of Iran, fertility rates are relatively high in the middle age groups 20-34 (figure 3), peaking in the age group 25-29 and similar to the patterns in Cyprus, Lebanon and the United Arab Emirates in Western Asia (figure 5).

In South-eastern Asia, the age pattern of fertility in Singapore is entirely different from that of Malaysia, Myanmar, Thailand and Viet Nam (figure 4). It is the only country in the subregion where fertility peaks in the age group 30-34, similar to the age patterns of fertility in Hong Kong SAR and Japan in Eastern Asia (figure 2). The main contributing factor to such a pattern is late marriage and

non-marriage. In 2012, on average, Singaporean women married around 28 years of age and around 25 per cent of women aged 30-34 and around 13 per cent of women aged 45-49 remained single (table 2). The fertility of Singaporean women is pushed towards later ages, with peak fertility occurring in the age group 30-34 followed by the age group 25-29. In Malaysia, Myanmar, Thailand and Viet Nam, fertility is bimodal, peaking in the age groups 20-24 and 25-29 in Thailand and Viet Nam and in age groups 25-29 and 30-34 in Malaysia and Myanmar.

In Western Asia, fertility peaks in the age group 20-24 followd by the age group 25-29 in Armenia, Azerbaijan and Georgia, suggesting an early age at marriage (figure 5). It peaks in the age group 25-29 in Cyprus, Lebanon and the United Arab Emirates, suggesting a later age at marriage. It is also interesting to note that childbearing in these countries is concentrated within a narrow age range (20-29 years).

Despite variations in age patterns of fertility, distinctive patterns exist in the Asian region. For example, East Asian countries are experiencing a late pattern of childbearing while China, Azerbaijan, Armenia, Malaysia and the Islamic Republic of Iran have relatively young age patterns of childbearing. The following section examines the pathways by which low fertility has been attained in different regions and countries in Asia.

B. EXPLANATION OF LOW FERTILITY IN ASIA

Eastern and South-eastern Asian subregions reached low fertility much earlier than other subregions, and have also experienced very low fertility. The economic, social and cultural contexts of subregions of Asia vary to a large extent, and thus the reasons behind and the pathways to low fertility in Asia vary by region and even countries. Despite the differences, some common factors have contributed to low fertility across Asia though the degree and timing of their impacts differ by context. For example, Eastern Asian countries implemented anti-natalist and government-sponsored family planning programmes more vigorously than other Asian countries in the 1960s. This was followed by rapid economic and social changes towards the end of the last century in the region. Western and Southern Asian countries initiated family planning programmes later and at a slower pace, which can partly explain why South Asian countries, with the exception of the Islamic Republic of Iran, have not experienced low fertility. Religious beliefs and practices also differ in Asia. Confucianism is the dominant religion in Eastern Asia while Islam is mainly practiced in the Western, Central and parts of Southern Asia. Some scholars have argued that Confucianism and the strong patriarchal family traditions are the distinct cultural factor behind very low fertility in Eastern Asia (Basten et al., 2013:31). However, there is no clear evidence to confirm the role of religion on low fertility as some of the Muslim countries (i.e., Islamic Republic of Iran, Lebanon and the United Arab Emirates) have reached low fertility despite having pronatalist ideologies (Jones and Karim, 2005; Groth and Sousa-Poza,2012).

Fertility decline in Asia in recent decades is mostly due to delayed onset of childbearing, resulting in part from an increasing age at first marriage combined with low levels of non-marital births (Frejka et al., 2010). For instance, in 2012 the singulate mean age at first marriage (SMAM) for women was 30.3 years in Hong Kong SAR, and 29.7 years in Japan and the Republic of Korea (table 2). Japan's fertility decline since 1970s has been attributed almost entirely to decreasing rates of first marriage among young Japanese women (Tsuya et al., 2012).

The SMAM for women in some countries in Southern and Western Asia was still lower than 25 years. For example, the SMAM for women in the Islamic Republic of Iran was 23.5 years, despite the low fertility level in the country, while it was 22.7 years in Viet Nam, 24.1 years in Thailand, and around 24 years in Armenia and China. The proportion of never-married women aged 35-39 was 21 per cent in Myanmar and 23-24 per cent in Hong Kong SAR, Lebanon and Japan in 2012 (table 2). The proportion of women remaining single has increased in Singapore as in many other East Asian countries (Jones, 2012: 320). In 2012, around 12-13 per cent of women aged 45-49 in Hong Kong SAR, Japan and Singapore remained single (table 2).

Figure 6 shows the trend of total fertility and SMAM during the period 1975-1980 and 2005-2010. Postponement of marriage is associated with low fertility. During 1975-1980, the SMAM for most of the countries was around 22-23 years of age while total fertility varied between 2.4 and 5.6 children per woman. The exception was Singapore with a SMAM of 26 years and total fertility of 1.8 children per woman. By 2005-2010, two distinct patterns had emerged. SMAM was around 27-30 years in Eastern and South-Eastern Asian countries where total fertility was also very low (below 1.5 children per woman). In contrast, the SMAM in Western Asian countries and the Islamic Republic of Iran was around 23-25 years and total fertility was around replacement level. Decomposition of fertility into marital fertility and nuptiality has shown that the rapid decline in fertility in the Republic of Korea (Retherford and Ogawa, 1978) and several other Eastern Asian countries (Japan, Hong Kong SAR, and Taiwan province of China) were strongly associated with rising age at first marriage. The decline in the proportion of married women accounts for well over 60 per cent of the overall decline in fertility in these countries (Jones, 2012; Tsuya, 2012).

Fertility trends in the Asian region continue to be affected by changes in the timing of birth with the exception of the Islamic Republic of Iran, where low fertility and early childbearing co-exist (Basten et al., 2013) and delays in age at marriage have been modest. In Iran, the cultural constraint that women should marry at a relatively early age, combined with the expectation that couples should have their first birth as soon as possible within marriage, meant that tempo effects deriving from delay of the first birth were initially small (Abbasi-Shavazi et al., 2009; Hosseini-Chavoshi et al., 2013).

Multiple factors contribute to the postponement of marriage in the Asian region. The advancement of education, and particularly women's education, has increased aspirations for work and employment (Coleman, 2007; Rindfuss et al., 2003). Analysing low fertility in Singapore, Jones (2012: 320) argued that though most women desire to marry, many factors hinder the realization of their goals. He refers to the expansion of education, particularly for women, as well as the expansion of labour markets towards more employment in occupations traditionally favouring men that have opened up employment possibilities for women, widened their aspirations, and freed many women from financial dependence on men. Economic insecurity has been one of the main factors behind the delay of marriage and childbearing in South-East Asian countries (Basten et al., 2013; Jones, 2012).

Yet rising economic and employment uncertainty among young adults has led to the decline of marriage, the rise of more unstable forms of partnerships, and the spread of new values incompatible with parenthood (Kohler et al., 2002). High unemployment rates accompanied by the increased cost of living affect the family formation behaviours of young people. As a result, age at marriage has been increasing, divorce has been on the rise (Aghajanian and Thompson, 2013), and fertility has been on decline. Using Swedish Labour Force Survey data, Lundstrom and Anderson (2012: 719) show that unemployment and temporary employment had negative effects on the propensity to become a parent. In Japan, market uncertainties and employment insecurity have increasingly become important indicators of family formation and fertility (Tsuya et al., 2012). Employers began in the early 1990s to move away from lifetime employment. Regular employment with job security and career prospects was replaced by rapid increases in temporary employment such as employment under a fixed-term contract with limited provisions of fringe benefits. Under this condition, young people continue to hop from one temporary job to another. This has considerable implications for marriage and family building among young people in Japan (Tsuya et al., 2012).

Gender roles and the incompatibility between work and family discourage marriage and childbearing. In many East Asian countries, persistent gender inequality marked by the limited involvement of men in household work and childrearing have contributed to low fertility (McDonald, 2000, 2013a; Coleman, 2007; Rindfuss et al., 2003). Over the last three decades, some low-fertility countries in Europe have introduced family-friendly policies to help women with children to return to the labour market, which led to rising fertility (Hoem, 2000, 2005; Sobotka, 2013). However, such policies have not either been introduced in Asian countries or they have not been generous or comprehensive, and thus their pronatalist impacts have been negligible. The unsuccessful

implementation of family policies in Asia, as in Southern Europe, could be due to the gender role assignments within the strong patriarchal family system. Tsuya et al. (2000) noted that despite rapid increases in married women's employment in Japan, the Republic of Korea and the United States of America, and despite overwhelming preferences for wives to work in all three countries, gender role assignments of breadwinning primarily to husbands and housework to wives are still prevalent, affecting wives' employment patterns. Under such circumstances, the combination of work and family becomes a burden for employed women, especially for mothers. More than children, it is family care that puts pressure on families and influences childbearing decisions. The inflexibility of the job market makes life even more difficult for employed married women with family responsibilities. In the Republic of Korea, for example, married women seem to have only two options: either work long hours or not at all, illustrating the limitations that the market and society impose on women's ability to reconcile employment and family responsibilities (Tsuya et al., 2000). The impacts of female labour force participation and the incompatibility between work and family on fertility depend on institutions that can ease or complicate the task of being a parent and worker. Rindfuss, et al. (2003) argued that in the absence of appropriate societal responses, pressures on prospective parents could lead to extremely low fertility. They noted that "role incompatibility and the linkage between marriage and child-rearing frequently involve deeply held values which are not easily manipulated by policy makers". It is true that male involvement in family domains increases fertility, but it is not easy to change husbands and their culturally-influenced gender roles in the Asian setting.

Another aspect of the Asian family system that has contributed to low fertility as compared to European countries is the disapproval of cohabitation and childbearing outside marriage. Marriage is the gatekeeper to fertility. There is a low level of cohabitation (around three per cent in Singapore and Japan and around one per cent in the Republic of Korea). Only fewer than two per cent of births occur out of wedlock in Singapore (Jones, 2012).

The perceived and actual cost of education for children is another reason for low fertility in the Asian setting. Across Asia, and particularly in East Asian countries, there is a strong social expectation about intensive parenting and raising the 'successful' child. The burden of raising the successful child falls heavily on the mother. Families are concerned about quality of their children and spend more on their formal and informal schooling than in the past. In this context, the direct costs as well as the opportunity costs for mothers to raise their children have increased (Jones, 2012: 323). As a result, the demand for children has declined (Basten et al., 2013), and there is a high aspiration for women to invest in their own human capital.

Contraceptive use has been a major factor in fertility decline. During the period 1975-1980, countries with low levels of contraceptive use had much higher fertility than countries with high levels of contraceptive use (Gu and Che, 2013). This relationship, however, no longer holds for low-fertility countries as new patterns of contraceptive use have emerged. Figure 7 shows that in 2005-2010 the level of contraceptive use in the low-fertility countries in Asia varies between 40 per cent (in Myanmar and United Arab Emirates) and 80-85 per cent (China and Hong Kong SAR). In Japan, contraceptive prevalence declined with decreasing fertility from 61 per cent when total fertility was 1.8 in 1975-1980 to 52 per cent in 2005-2010 when total fertility was around 1.3 children per woman (figure 7). Awareness of contraceptive use has increased, and urban and educated women and men are increasingly using non-modern methods of contraception as well as abortion. While some couples obtain their contraception care from government clinics, most seek private sources and, thus, contraceptive use has become routine health behaviour (Tsui, 2013: 27).

C. CONSEQUENCES OF LOW FERTILITY IN ASIA

Changes in the age structure of the population and population ageing are inevitable consequences of declines in fertility. A long-term decline in fertility gives rise to a higher percentage of older persons in the population. The speed of ageing is determined by the timing of the onset of fertility decline and the completion of the fertility transition. The impact of fertility decline on population ageing is much more revealing in the later stage as the high fertility cohort begins to reach

the older age groups. In addition, reductions in mortality levels not only increase life expectancy at birth but also increase the number of additional years expected to be lived by older persons aged 60 and 80 years (United Nations, 2007). These improvements in old-age mortality contribute to the ageing of the elderly themselves.

Countries that have reached below-replacement fertility have populations with a markedly higher percentage of the population aged 60 years and older. For example, Japan, the first country in this region to have completed the fertility transition from high to low fertility by the early 1960s, has the largest proportion of older persons in 2010 (31 per cent), a proportion that is expected to increase further to 36 per cent in 2025 and 43 per cent in 2050. Similarly, the Republic of Korea and Singapore, which have witnessed rapid declines in fertility (currently reaching ultra-low levels), will experience a large increase in the proportion of older persons in the population. Between now and 2050, the percentage of older persons is expected to increase from 16 per cent to 41 per cent in the Republic of Korea and from 14 per cent to 36 per cent in Singapore. Other low-fertility countries will also see a dramatic increase in older persons: from 12 per cent to 33 per cent in China and from 13 per cent to 38 per cent in Thailand. In the case of the Islamic Republic of Iran, although the percentage of older persons is currently 7 per cent, due to a faster ageing process this is expected to reach 29 per cent in 2050.

In the long run, population ageing is not the only radical outcome of persistent low fertility. An ageing population will eventually lead to a decline in the overall growth of the population in general and the working-age population in particular. Population will, however, continue to grow for a few decades after attaining below-replacement fertility because of population momentum. Once the momentum is gone, there will be a decrease in the number of births which in turn will lead to negative population growth. Migration is one response to help address negative population growth in ultra-low fertility countries, but this mechanism has not been considered seriously as an alternative policy option in Asia as it has been in European countries.

Meeting the needs of a growing ageing population is of particular concern (Jones and Leete, 2002). Elderly populations are often perceived as posing serious burdens, including for health care and social support. The rapidity of the process leading to low fertility has not allowed enough time for low-fertility countries in Asia to prepare adequately for the problems associated with ageing of the population. The rising number of the elderly on the one hand, and the declining number of the younger population on the other hand, will also mean that there will be a shortage of caregivers for the elderly population. For example, some ageing countries such as Japan, the Republic of Korea and Singapore are facing the problem of increasing national expenditures for old-age social security, a shrinking labour force and mounting burdens of providing care for the growing number of elderly persons. Countries such as China and Thailand, where fertility declined very rapidly and without an established social security system, will face the problem of supporting increasing proportions of elderly persons when the proportion of the younger generation is growing smaller (Gubhaju and Moriki-Durand, 2003b; United Nations Population Fund, 2006a; 2006b).

Nevertheless, population ageing should be analysed based on the advancements in health and human capital of the new and future generations of older people. Life expectancy in many East Asian countries has increased to around 80 years of age, much higher than the world average. Older people are more active and healthier than the previous generations. Thus, conventional measures of ageing that count years since birth need should be reconsidered. Sanderson and Scherbov (2005, 2007, 2008) proposed the median age of the population standardized for expected remaining years of life as a new measure of ageing: most of the aged people will be still active after their retirement and their education and human capital will be higher than the previous generations. More importantly, with the advancement of new technology and changing work environments, their participation in economic activities and job markets will be transformed. The increased proportion of the aged population, therefore, should not be considered so negatively as burden to their societies.

When a population transitions from high to low fertility levels, the proportion of the working-age population increases. This growth in the working-age population with fewer dependent children and elderly to support provides a window of opportunity to build human capital. Studies have shown that the benefits afforded by the changing age structure, called a "demographic dividend", will last for a few decades, typically between four and seven, in most countries (Seetharam, 2006). The window of opportunity closes within a generation as the population ages and dependency increases. All subregions in Asia, while at various stages of the demographic transition, have experienced significant increases in the proportion of the working-age population since the 1970s (figure 8). They are either entering the peaks of the demographic bulge or reaching it, and in both cases are well placed to reap the "demographic dividend" before their populations start ageing. The demographic transition has been fastest and most pronounced in Eastern Asia, where the working-age population, about 57 per cent in 1970, reached a peak at 73 per cent in 2010 and then experienced a rapid decline. The working-age population will peak in 2025 in South-Eastern Asia, while swelling numbers should peak around 2035-2040 in Central, Southern and Western Asia.

The opening of this demographic window has been effectively utilized by several East Asian countries and areas (Japan, the Republic of Korea and Taiwan province of China) between the 1960s and 1990s (Bloom, Canning and Sevilla, 2003). The East Asian experience provides compelling evidence of the impact of demographic dividend in the region's spectacular economic growth. Studies suggest that the demographic dividend accounts for between one-fourth and two-fifths of East Asia's "economic miracle". With the benefits of good education and a liberalized trade environment, this huge work force was absorbed into the job market, thereby increasing the region's capacity for economic production (Bloom, Canning and Sevilla, 2003). The experience of Japan in having enjoyed the economic successes further reinforces the benefits of demographic dividend combined with strong policies.

China's experience in effectively capitalizing on the demographic dividend is similar to other East Asian countries. China's rapid fertility decline in the 1970s has brought a significant demographic dividend, which coincided with the economic boom experienced by China. This has further triggered the rapidly growing and dynamic economy. An abundant labour supply, combined with a relatively low dependency ratio (young and old), made a significant contribution to increasing output per capita and thus the standard of living. Hence, China has been able to reap the benefit of a favourable population structure, which is estimated to have contributed to 15 per cent of China's economic growth between 1982 and 2000 (Wang and Mason, 2005).

South-Eastern Asia has recently begun to reap the benefit from the demographic dividend, but is likely to see this benefit reduced over the next three decades, as the population ages. The demographic transition in Central, Southern and Western Asia is still continuing, suggesting growing potential for economic growth. However, to fully capitalize on the benefits from a demographic dividend, these Asian countries would need to follow the policy initiatives employed by Eastern Asia. Some of the policy recommendations for stimulating economic growth as a result of demographic dividend include, for example, massive investment in education and human resource development. Such investments are possible because of savings from the low dependency ratios resulting from the demographic transition. These savings should be properly utilized to increase the capacity of the current and future labour force to participate fully in a skill-based economy. Lee and Mason (2006) postulated that a second dividend is also possible when a population concentrated at older working ages and facing an extended period of retirement has a powerful incentive to accumulate assets, unless it is confident that its needs will be provided for by families or Governments. With proper financial mechanisms encouraging workers saving and investment in property, business, pension funds or other assets, the demographic dividend can continue to pay out as Asia ages (Kinguasa, 2013; Tsui, 2013).

In summary, rapid ageing is inevitable in countries where there has been a sharp fertility decline. However, countries like the Islamic Republic of Iran that have recently experienced low fertility should seize the opportunity of the demographic dividend to ensure more investment and further economic growth for the future of aged population.

Policy responses to low fertility vary across low-fertility countries in Asia. In general, the majority of Asian countries that have reached low levels of fertility have been slow to introduce pronatalist policies. Indeed, the introduction of pronatalist policies depended upon the onset of low fertility in these countries. For instance, Japan and Singapore introduced pronatalist policies in the 1980s (Ogawa, 2003; Saw, 1990; Suzuki, 2009, 2012; Wong and Yeoh, 2003), much earlier than other countries in the region. The Republic of Korea and Taiwan province of China introduced their pronatalist policies in 2006, while countries and areas like China, Hong Kong SAR and Thailand are in the process of implementing new policies to deal with low fertility. The Islamic Republic of Iran has recently begun discussions on the consequences of low fertility and rapid ageing, and the country's Parliament has drafted a new population policy law.

Japan and Singapore have introduced a range of policies over the last two decades. Their policies have mainly been focused on promoting marriage and childbearing. They have provided direct subsidies for childbearing and initiated changes in the institutions to facilitate family-friendly policies enabling women to combine work and the family. They have increased the provision of paid maternity and childcare leave and subsidized daycare of infants and young children (Frejka, Jones and Sardon, 2010; Jones, Straughan and Chan, 2009; Ogawa, 2003; Suzuki, 2009, 2012). The Republic of Korea and Taiwan province of China have a less developed set of pronatalist measures, focusing on subsidized childcare, maternity leave and parental leave benefits, but not including direct subsidies for childbearing (Lee and Kim, 2013).

Despite the relatively long existence of pronatalist policies in Japan and Singapore, there is little sign of success as fertility has declined to very low levels, and the age at marriage has risen significantly in these countries. One of the reasons given for the limited success of the pronatalist policies in the region is the slow or belated response to low fertility by some Governments, which has led to what Lutz et al. (2006) call a "low-fertility trap". For instance, birth control policies have continued even after reaching below-replacement fertility. In the Republic of Korea, total fertility reached the replacement level in 1983 but the Government did not stop the distribution of birth control pills for free until 1989. It takes several years for a new policy to be effective, and thus, it would be important to introduce new policies as soon as a country reached a low level of fertility.

However, the timing of the introduction and implementation of policies is not the only pre-condition for the success of a policy. A thorough analysis and a deep understanding of population issues are needed to design a comprehensive and effective policy. Policies tend to fail when there is a lack of understanding of population dynamics and when quick-fix plans are implemented. Most policies have not been sustainable and have changed in a short period of time either due to lack of funding or due to changes in the administration by succeeding Governments. Policies usually tend to be top-down with less attention to the views and collaboration of the people who are the target of policies. Setting narrow targets such as reaching positive population growth or increasing fertility and age at marriage is another feature of such policies. For instance, Singapore's President Lee Kuan Yew asserted in 1983 that highly educated women should have more babies. The low fertility policy started in 1984, which included discrimination according to education level (Suzuki, 2009; Wong and Yeoh, 2003: 10), received criticism within the next few years, and the Government subsequently decided to introduce a more comprehensive and culturally-sensitive policy. Thirty years later, after the implementation of several policies and providing incentives for marriage and childbearing, the Population White Paper (National Population and Talent Division, 2013) was prepared in consultation with the public. The White Paper not only paid attention to fertility, but also highlighted the importance of migration, identity, development as well as the quality of life of Singaporeans.

The cultural and institutional structure in East Asian countries has also worked against the successful implementation of pronatalist policies. For example, in Singapore, many employees do not avail themselves of available maternity and childcare leave for fear of losing out on promotion

prospects, or incurring the displeasure of bosses or of co-workers (Jones, 2012: 326). Family-friendly working environments should be developed, but this is not easy in Confusionist-influenced societies. Nonetheless, although pronatalist policies in the region are generally judged to have failed, these policies may have prevented fertility from declining even further (United Nations Population Fund, 2012).

The results in this paper show diverse pathways to low fertility among Asian countries. Hong Kong SAR, Japan, Republic of Korea, Singapore and Taiwan province of China are among the world's 'lowest'- or 'ultra-low'-fertility countries and areas (Jones, Straughan and Chan, 2009). In some countries that have recently reached low fertility and where their age structure is still youthful, population momentum could generate many years of natural increase even without reaching replacement fertility. This momentum has been exhausted in many East Asian countries. Also, the contexts of low fertility vary. Among the low-fertility countries presented in this paper, marriage is nearly universal in countries like China, Democratic People's Republic of Korea, Islamic Republic of Iran, Republic of Korea and United Arab Emirates. In Hong Kong SAR, Japan, Myanmar and Singapore, significant proportions of women remain single, and there are signs of cohabitation in Japan and Republic of Korea. Indeed, the proportion of births outside marriage is emerging in East Asia, but so far this does not seem to contribute to a rise of fertility. Extra-marital births are taboo in other Asian countries, particularly in the Islamic countries. Thus, no single policy fits all Asian countries. Low-fertility countries in Asia should learn not only from the experiences of leading East Asian countries, with experiences of implementing pronatalist policies for three decades, but also adopt policies that kept fertility high in English-speaking countries in Europe, especially family-friendly working conditions (McDonald, 2013b: 24). It is important to note, however, that every country should design its own policy taking into account its demographic, socio-cultural, economic and institutional structure.

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TABLE 1. TOTAL FERTILITY OF LOW FERTILITY COUNTRIES IN ASIA BY SUBREGIONS, 1975-1980 TO 2005-2010

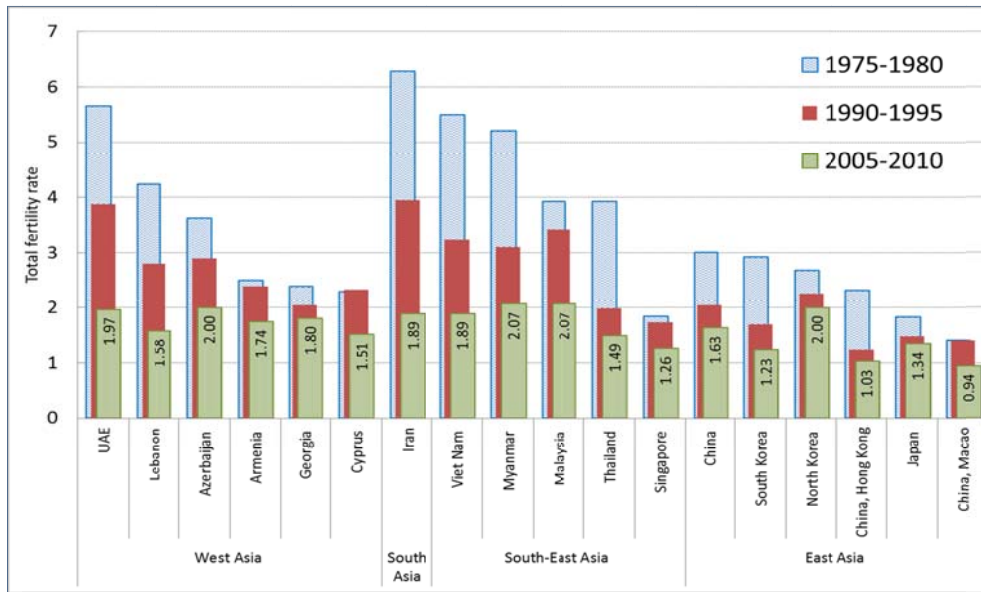| Subregion, country or area	Total fertility			Percentage decline	
	1975-1980	*1990-1995*	*2005-2010*	*1975-80 to 1990-95*	*1990-95 to 2005-10*
WORLD	3.85	3.04	2.53	21.2	16.7
ASIA	4.09	2.96	2.25	27.6	23.9
Eastern Asia	2.86	2.00	1.61	30.1	19.5
China	3.01	2.05	1.63	32.0	20.5
China, Hong Kong SAR	2.31	1.24	1.03	46.3	17.3
China, Macao SAR	1.41	1.41	0.94	0.2	33.2
Dem. People's Republic of Korea	2.68	2.25	2.00	16.1	11.0
Japan	1.83	1.48	1.34	19.4	9.3
Republic of Korea	2.92	1.70	1.23	41.9	27.6
Central Asia	4.43	3.55	2.67	20.0	24.6
Southern Asia	5.25	3.92	2.72	25.2	30.6
Iran (Islamic Republic of)	6.28	3.95	1.89	37.1	52.2
South-Eastern Asia	4.80	3.10	2.35	35.5	24.0
Malaysia	3.93	3.42	2.07	12.9	39.4
Myanmar	5.21	3.10	2.07	40.5	33.3
Singapore	1.84	1.73	1.26	5.9	27.4
Thailand	3.92	1.99	1.49	49.1	25.3
Viet Nam	5.50	3.23	1.89	41.3	41.6
Western Asia	5.34	4.00	2.92	25.1	26.9
Armenia	2.50	2.38	1.74	4.9	27.1
Azerbaijan	3.62	2.90	2.00	20.0	31.0
Cyprus	2.29	2.33	1.51	-1.8	35.3
Georgia	2.39	2.05	1.80	14.2	12.2
Lebanon	4.23	2.80	1.58	33.8	43.8
United Arab Emirates	5.66	3.88	1.97	31.5	49.2

Source: United Nations (2013b). *World Population Prospects: the 2012 Revision*. CD Rom Edition.

TABLE 2. SINGULATE MEAN AGE AT MARRIAGE BY SEX AND PROPORTION REMAINING SINGLE BY AGE GROUP FOR WOMEN, LOW FERTILITY COUNTRIES IN ASIA, 2012
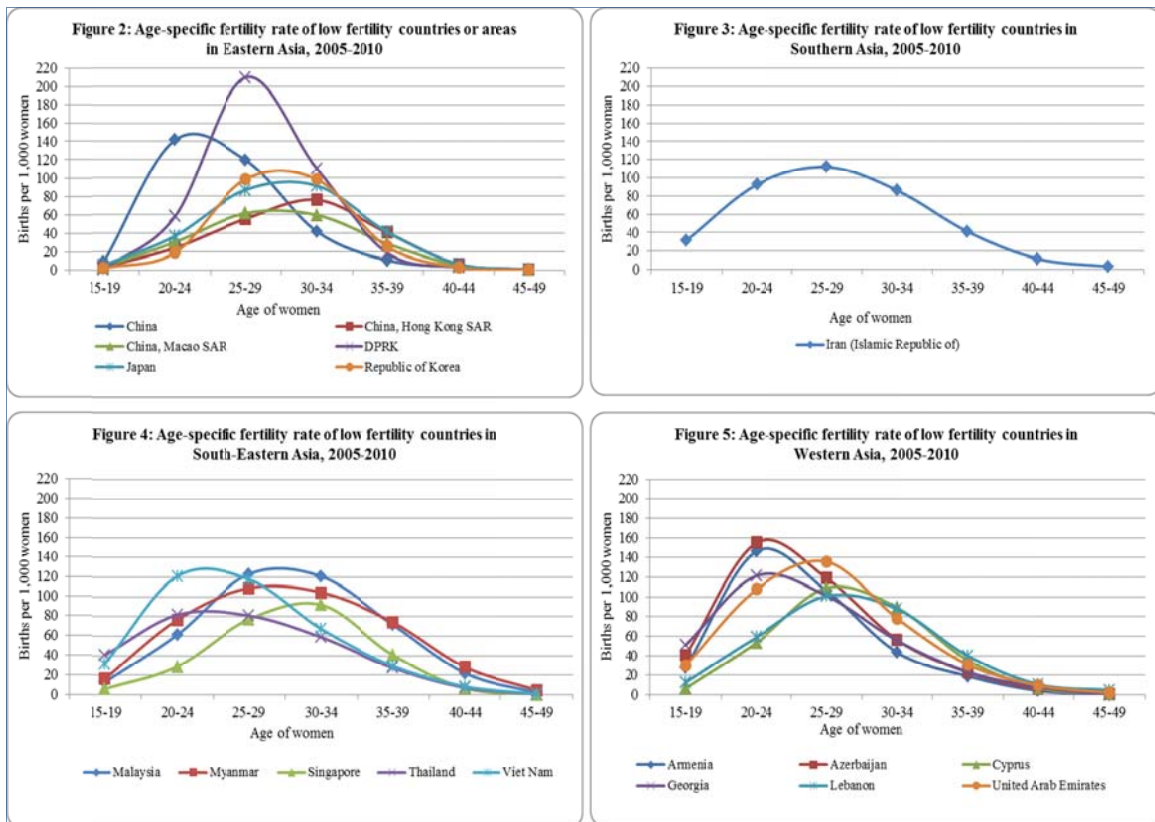
Region	Country	SMAM		Percentage of women remaining single by age					
		Men	Women	20-24	25-29	30-34	35-39	40-44	45-49
	China	26.5	24.7	67.5	21.6	5.4	1.8	0.8	0.4
	North Korea	29.0	25.5	80.8	24.6	3.9	1.7	1.0	0.5
	China, Macao	29.5	27.7			27.4	16.8	11.4	8.9
	Rep. of Korea	32.0	28.8	93.7	59.1	19.0	7.6	3.6	2.4
	Japan	31.2	29.7	89.6	60.3	34.5	23.1	17.4	12.6
East Asia	China, Hong Kong	32.8	30.3	92.4	67.7	35.0	22.6	16.5	11.9
South Asia	Iran	26.8	23.5	47.1	26.2	15.5	9.1	5.5	3.4
	Viet Nam	26.2	22.7	50.8	18.2	8.0	6.1	5.7	5.6
	Thailand	27.4	24.1	56.0	29.0	16.2	11.7	9.3	8.0
	Malaysia	28.0	25.7	67.1	37.8	17.9	10.8	6.7	5.4
	Myanmar	27.6	26.1	67.9	43.2	29.0	21.4	17.3	14.8
South-East Asia	Singapore	30.4	27.9	91.8	54.0	25.1	17.1	14.1	12.8
	Georgia	28.0	23.7	52.2	28.4	17.2	11.4	8.9	7.8
	Armenia	27.8	24.4	55.4	29.0	16.3	8.8	5.8	4.4
	Azerbaijan	28.2	24.4	55.4	28.6	16.7	11.2	8.2	6.9
	UAE	26.8	25.3	63.1	31.2	14.7	7.6	4.2	2.8
	Cyprus	30.8	27.9	84.9	50.2	23.5	13.0	9.5	6.6
West Asia	Lebanon	32.3	28.3	80.7	52.1	33.5	23.7	21.7	15.6

Source: United Nations (2013). United Nations, Population Division (2013). *World Marriage Data 2012*.

Figure 1. Decline in total fertility in low-fertility countries of Asia, 1975-1980 to 2005-2010
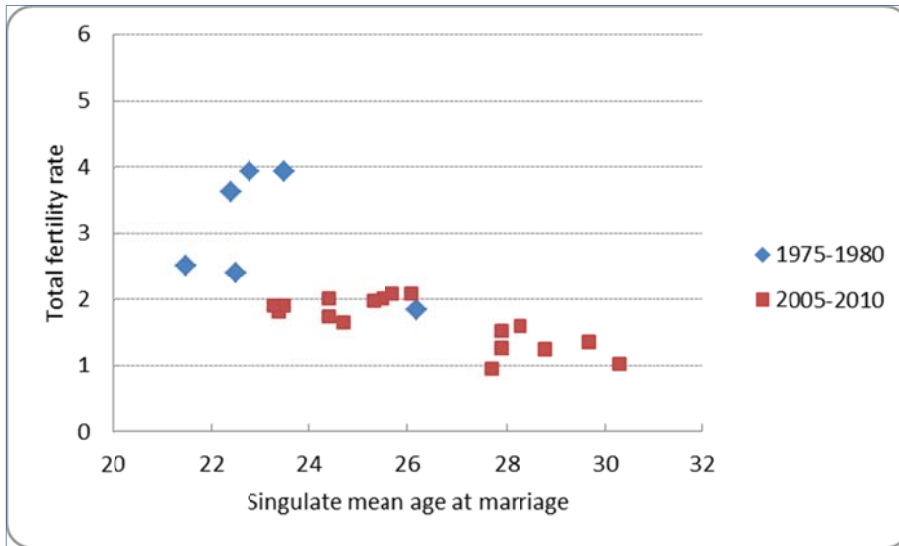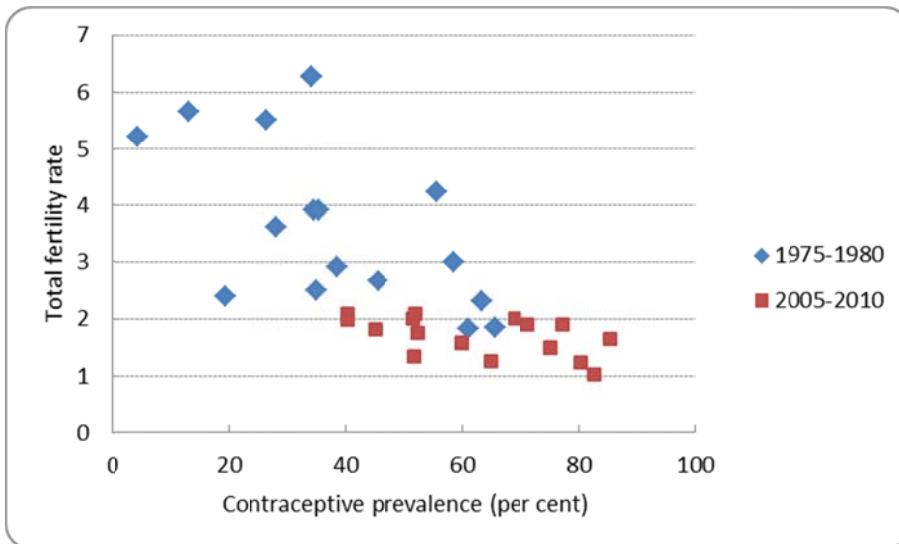

Source: Table 1

Source: United Nations (2013b). *World Population Prospects: the 2012 Revision*, CD Rom Edition

**Figure 6. Relationship between singulate mean age at marriage and total fertility
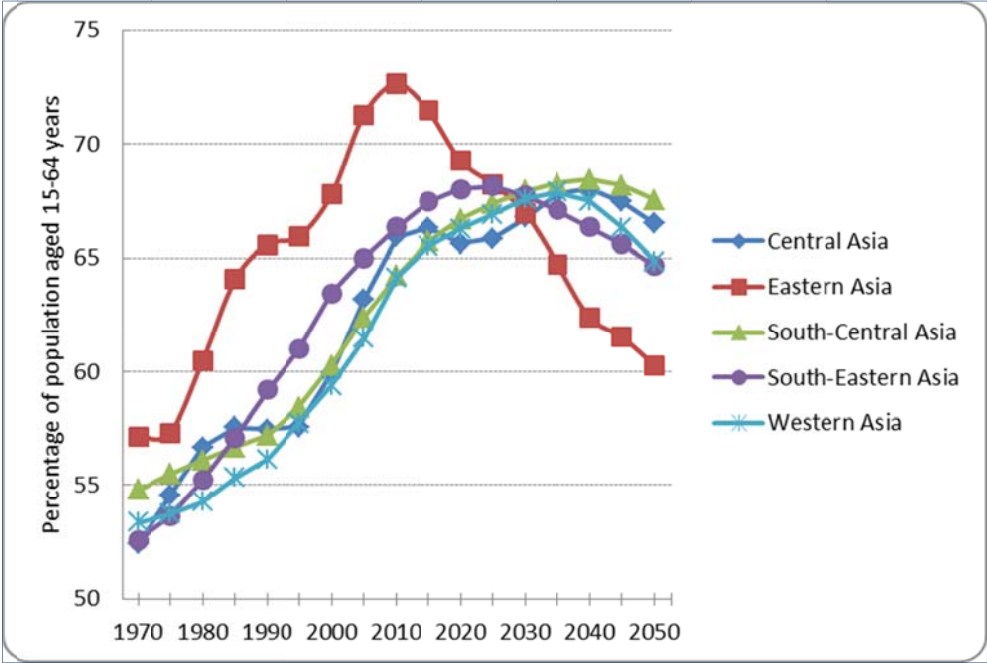in low-fertility countries of Asia, 1975-1980 and 2005-2010**

**Figure 7. Relationship between contraceptive prevalence and total fertility
in low-fertility countries of Asia, 1975-1980 and 2005-2010**

Figure 8. Demographic dividend by subregions of Asia: percentage of population aged 15-64, 1970-2050

Source: United Nations (2013). *World Population Prospects: the 2012 Revision.* CD Rom Edition.