

Moving on from one

How can China manage its declining fertility?

A report by The Economist Intelligence Unit



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About this report

“Moving on from one: How can China manage its declining fertility?” is an Economist Intelligence Unit report that examines the main drivers behind the drop in the fertility rate in China. It reviews the evidence for a range of policy levers that could be used to increase the country’s birth rate back up to (or near) population replacement level. The report also examines the experiences of three other case-study countries—Singapore, South Korea and Australia—and the Special Administrative Region of Hong Kong, in their own endeavours to maintain sustainable fertility rates.

The Economist Intelligence Unit carried out a literature review on fertility rate interventions both in China and across the globe. Alongside this, interviews were conducted with local experts. The report looks at family-friendly policies and whether assisted reproduction technologies, such as fertility medication, in vitro fertilization (IVF) and surrogacy, could play a role in increasing fertility levels. A more detailed description of our methodology is provided in the appendix. This report is sponsored by Merck.

We would like to thank the following individuals and organizations for sharing their insight and experience.

- Wu Fan, Professor, Department of Social Work and Social Policy, Nankai University
- Yang Dongzi, Professor, Chief of Department of Obstetrics and Gynecology, Assisted Reproductive Center of Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University
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The Economist Intelligence Unit bears sole responsibility for the content of this report. The findings and views expressed in the report do not necessarily reflect the views of the sponsor. The EIU team involved in this report consisted of Guo Yue, Samuel Choo and Alan Lovell.

Executive summary

From 7.5 children per couple to just 1.6

China's birth rate has experienced a rapid and sharp fall. It took only 11 years for the fertility rate to tumble from six births per woman in 1967 to fewer than three in 1978. With the introduction of the one-child policy, the rate continued to slowly decline, falling below the replacement rate by 1992. China experienced its lowest total fertility rates—hovering around 1.65—between 2006 and 2015, before climbing slightly to 1.7 in 2016 with the implementation of the two-child policy. While the fertility rate remains low, China's aging population is growing and family sizes are shrinking. This demographic reversal places a tremendous burden on public services. By 2030, 24% of China's population will be over 60, rising to 38.5% in 2075.

Key drivers behind China's falling fertility levels

After the 1990s, the explicit and implicit costs of parenthood, such as financial outlay and impact on women's careers, became a major factor in lowering the fertility rate. These include:

1. Continued gender inequality in child rearing and familial duties. Despite high female labour force participation, women still do the vast majority of household chores.
2. An improved education system has delayed marriage and age at first childbirth, which further reduces the possibility of subsequent children.
3. Work-life balance strains have increased, especially the financial pressure of obtaining housing. These strains act as an impediment to building a family.
4. The large "floating population" of migrant workers who are less willing to have a second child due to the associated cost.

The second-child policy and supporting initiatives aim for 1.8 by 2020

It was announced in October 2015 that all married couples could have two children. Regional initiatives were introduced in 2017 to support the implementation of the new second-child policy. These initiatives mainly focused on extending paid maternity and paternity leave and constructing public health and childcare facilities. The 98 days of paid maternity leave has been extended to 128 days and—in some provinces—up to one year. Likewise, paternity leave now lasts from 7 up to 30 days.

The continued delay of first child births remains an issue

The second-child policy partially compensated for the decline in first-child births in 2016 and 2017. Births in 2016 jumped by 1.31 million from the previous year, up to 17.86 million, the highest figure since 2000, but then dropped to 17.23 million in 2017. However, the birth of the first child among couples continues to be delayed in both rural and urban settings. This can often be explained by the postponement of marriage. Other reasons why the second-child policy has so far had a limited impact include:

1. A lack of childcare resources for children under three and limited childcare leave.
2. The ongoing high economic burden of having children.

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3. A one-child culture has emerged, and existing family members do not necessarily want a second child.
4. Employers comply with existing labour law—which they're obliged to do—but do not necessarily support other initiatives.

The growing role of assisted reproductive technologies

Assisted reproductive technology (ART) is an umbrella term for a range of medical interventions that can give infertile couples a chance of having children. By the end of 2016, there were 451 approved ART centres in China. Fertility treatment is not covered by public insurance, but willingness to pay is relatively high compared to the monetary cost of ART services. On the other hand, physical accessibility to clinics remains a major issue as most reputable clinics are clustered in Tier 1 cities. The licenses of ART clinics and oocyte donation are highly regulated and strictly controlled, while the quality of ART physicians' training remains a concern. Unmet reproductive needs can drive people to resort to looking overseas or going through unregulated channels.

Conclusion and recommendations

It is predicted that China's total fertility rate will remain from 1.6 to 1.7 for the next few years but is unlikely to reach the stated goal of 1.8 children per woman. The UN projects that China's population will peak at 1.44 billion in 2030, then start to decrease, but still remain above 1 billion by 2100. China is therefore not running out of citizens anytime soon. Rather, population policies are needed in order to balance the country's demographic structure; to offset an ageing population. The evidence suggests that governments can improve fertility rates by packaging together several well-funded, long-term, interconnected programmes. We believe effective policy packages in China can be built upon four principles:

1. **Support local governments in their implementation of fertility policies:** Provide sufficient backing to local governments who seek to improve upon existing standards set by national labour law. Improve the enforceability of guidelines and initiatives set out by local governments.
2. **Support family life at all stages:** Ensure that support systems work for families at all stages, from pre-conception, to childbirth and parents' eventual re-integration into the workforce. Improve policies for having children, raising children and for life as a parent.
3. **Break down barriers to ART:** Improve access to assisted reproductive technology alongside bolstering the quality of service. Offering financial support for ART should be considered.
4. **Remove limitations on how many children a family can have:** The limited quota for the number of children a family can have remains an issue for some families, and arguably sends out the wrong message to the wider population.

Introduction

China's birth rate has experienced a rapid and sharp fall, down from a total fertility rate of approximately six births per woman in 1970, to under two today.¹ Today's actual fertility rate remains somewhat uncertain. In 2016, the National Health and Family Planning Commission (NHFPC 2016) stated that the national fertility rate was 1.7, while others have suggested that the real rate is even lower.^{2,3} Either way, old age dependency is rising fast and family sizes are shrinking. This demographic reversal places a tremendous burden on public services. The proportion of the population that is in the workforce continues to fall, while pension and healthcare costs remorselessly rise.⁴ By 2030, 24% of China's population will be over 60, rising to 38.5% in 2075.⁵

There are a number of reasons for this fall in fertility. Drivers include the housework gender gap, poor work-life balance, postponement of marriage and pregnancy, and the increasing prevalence of families being comfortable with just having one child.

To try and address falling fertility levels, China has initiated the "comprehensive two child policy". Alongside this, the government has implemented a series of initiatives to support raising a family. Family-friendly policies, such as offering parental leave, allocating resources to pregnancy-related healthcare, and funding childcare centres, have been used to improve work-life balance and subsidize child-related costs. Alongside these policies, an emerging area for policy intervention is in assisted reproductive technology (ART), an umbrella term for a group of medical interventions that can help address infertility problems.

This report examines the options available to Chinese policy-makers in their efforts to reverse declining fertility. We consider the main drivers behind the fall in fertility and look at what impact family-friendly policies have already had in China. We describe four case studies—Singapore, South Korea, Australia, and Hong Kong—to see how they are managing similar challenges. We also review the global evidence-base on the effectiveness and economic impact of family-friendly policies and ART. From this exploration of the literature, we offer some thoughts on China's fertility challenge and propose ways in which the government could approach policymaking in this area.

Some key definitions

Total fertility rate (TFR) represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year.

Replacement rate is the TFR at which women give birth to enough babies to sustain population levels. The replacement rate is commonly considered to be 2.1 children born per women.

Old-age dependency ratio is the ratio of the population 65 years or over to the population aged 15-64, presented as the number of dependents per 100 persons of working age (15-64).

Maternity leave is a period of approved absence for a female employee granted for the

purpose of giving birth and taking care of the infant. Maternity leave may last anywhere from several weeks to a period of months depending on the organization, and may be paid or unpaid⁶. It is granted to mothers for a limited period directly before and after childbirth.⁷

Paternity leave a period of absence from work granted to a father after or shortly before the birth of his child.

Parental leave is a period of approved absence for a parent to care for newborns or young children.⁷

Childcare leave is a period granted to employees having minor children below a certain age, for taking care of children whether for rearing or to look after any of their needs like medical appointments, ill health etc.

China's falling fertility rate

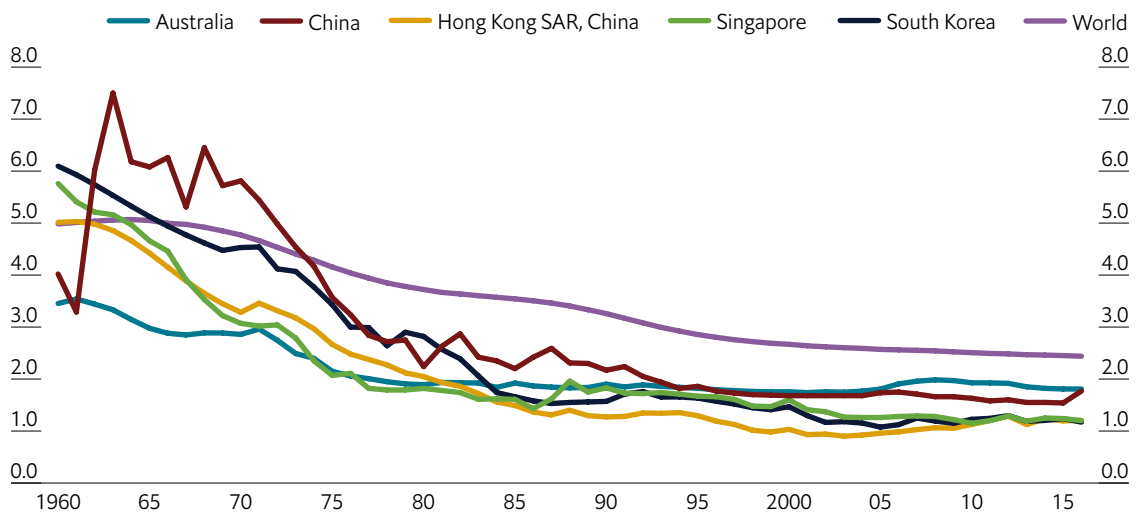
From 7.5 children per couple to just 1.6

During the 1950s and 60s, the total fertility rate in China remained for the most part at 6 and above.⁸ Following these two decades however, it took only 9 years for the fertility rate to fall from more than 6 in 1968 to fewer than 3 in 1977. With the introduction of the one-child policy the rate continued to slowly decline, falling below the replacement rate by 1992. China experienced its lowest total fertility rates—hovering around 1.65—between 2006 and 2015, before climbing slightly to 1.7 in 2016 with the introduction of the two-child policy (Figure 1).

Because of increases in life expectancy, most of those born during the fecund fifties and sixties will survive to old age. The World Health Organization defines an “ageing society” as one in which more than 7% of the population is 65 years or older,⁹ and in 2000 China officially hit that threshold.⁴ By 2017 there were 158 million people over 65; 11.4% of the total population. The Office of the National Working Commission on Aging’s projections suggest that China’s population over 65 will be “above 300 million in 2033, 400 million in 2050, and reach a peak in 2058” (Figure 2).

Elderly people require more healthcare services than their younger kin, and the cost of medical treatment, care and service as share of GDP in China is predicted to increase from 6.97% in 2015 to 21.77% in 2050, a figure higher than that of many developed countries.⁴ The aging population will also affect the financial stability of some families. According to the 2010 census questionnaire, most elderly people in China rely on their families, one quarter of them depend on pensions, and about one in five (especially rural residents) continue to work.¹⁰ As the aging population increases, the pressure to

Figure 1: Total fertility rate for China, Singapore, South Korea, Australia and Hong Kong SAR, China from 1950 to 2016



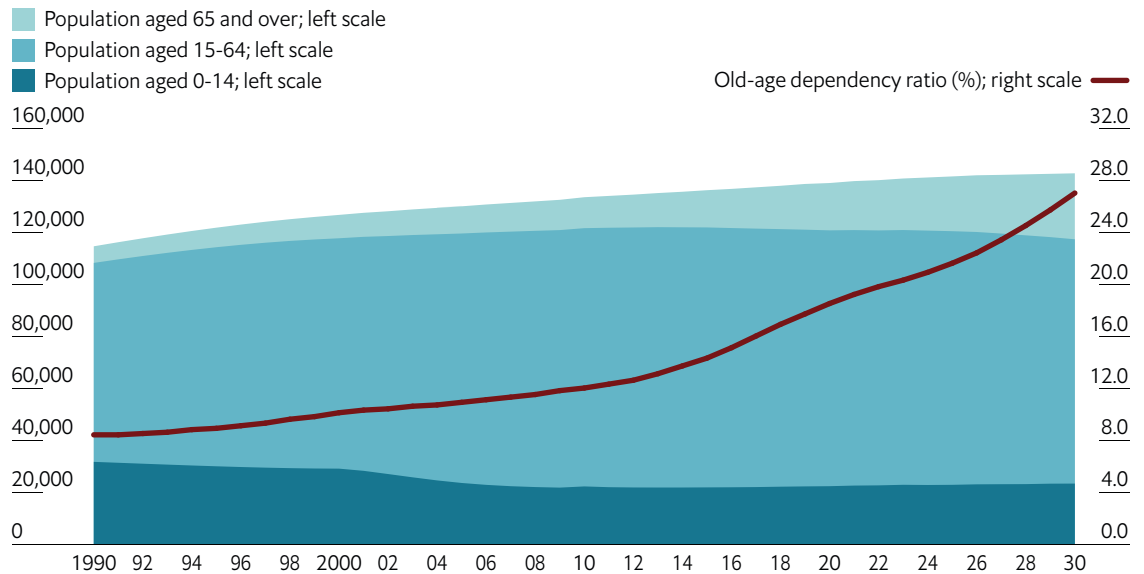
Source: Fertility rate, total (births per woman), The World Bank (Singapore, South Korea, Hong Kong SAR, Australia, World), China Population and Development Research Center (China).

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provide will therefore continue to fall on working members of the family. And this at a time when the working age population, those aged 15-64, is starting to shrink. By 2050, the working population will fall to 795 million people, about 204 million less than it was in 2010, leading to a shortage of supply and increasing labour costs.⁴

Figure 2: Population distribution by age group and old-age dependency ratio of China from 1990 to 2030



Sources: National Census Bureau; China National Bureau of Statistics, and EIU calculations.

The fertility rate had already more than halved by the time of the one child policy

This historical fall in fertility rates in China had a number of drivers. After the 1970s, the sharp decline of the fertility rate from 6.45 in 1968 to 2.84 in 1977 was accompanied by a reduction in the under-five mortality rate from 119.4 per 1,000 live births in 1969 to 74.9 in 1977¹¹ and the implementation of family planning.⁴ Professor Zheng Zhenzhen, from the Institute of Population and Labor Economics at the Chinese Academy of Social Sciences, concludes that this rapid drop was mainly related to 1) national implementation of birth control, 2) improved health care access, especially in the control of infectious diseases and decreased infant mortality rate, resulting in more children reaching adulthood, and 3) the Great Leap Forward and People's Commune Movement in 1958, which pushed more women out of the house and into the workforce in the 1960s.

By the time the one-child policy was introduced (between 1978 and 1980), the fertility rate had already more than halved from its post-war peak. Instead of a clear further decline, the fertility rate after the adoption of the one-child policy rather fluctuated over the years. Professor Wu Fan, Deputy Chairperson from the Department of Social Work and Social Policy at Nankai University, commented "it is difficult to predict how many births were truly affected by the one-child policy". She went on to remark that "Quality over quantity has been the prevailing trend. After the 1990s, the explicit and implicit costs, such as financial outlay and impact on women's careers become a major factor in lowering the fertility rate."

A woman's work is never done

Despite high labour force participation, Chinese women are still outworking men at home. China has a high female labour participation of 61.5% in 2017, compared with 60.5% in Singapore, 54.0% in Hong Kong, 52.2% in South Korea, and 50.5% in Japan.¹² But China now ranks 100th out of 144 countries for gender parity, falling for ten consecutive years since 2008, when it ranked 57th.¹³ Professor Zheng echoes that “the traditional concept of ‘caring for the family is solely a woman’s duty’ is still entrenched in China”. Childcare is mainly undertaken by mothers (whether in the work force or not) and the vast majority of hours spent on household chores and child-rearing are done by women. According to the recently published China Family Development Report, nine out of ten “primary parents” of children below five are women.¹⁴

Therefore, when conflicts between family and work occur, it is nearly always the woman who must give up her career aspirations to fulfil family needs. This iniquitous division of child rearing and familial duties negatively affects many women’s fertility intentions. However, although “China has not established a systematic family-friendly policy”, pushing women back home will not solve the fertility problem, argues Professor Wu. She points to the example of Germany, where subsidies are used to encourage women to quit their jobs and spend more time taking care of kids. But still, she explains, a lot of women insist on staying in the labour market and hence the fertility rate is relatively low compared to some EU countries. Other countries in Europe, such as in Scandinavia, “utilize family policies centred around gender equality; men and women both receive governmental support to keep both their work and family lives, and their fertility rate is high.”

Professor Zheng also stated that “Globally, many countries which face ultra-low birth rates have conservative cultures with entrenched gender roles. Rigidity in the division of child rearing duties between men and women are prominent in countries like Japan, South Korea, Spain and Italy.” Therefore, our interviewees argued, a root solution to increase China’s fertility rate is to improve gender equality.

More schooling, leading to later marriages and fewer births

The fertility decline, especially for the birth of the first child, has been accompanied by a delay in marriage and childbirth. The marriage rate of Chinese women between the ages of 20 and 34 has dropped from 75% in 2006 to 67.3% in 2016. The age at first marriage of females has simultaneously risen from 23.6 years in 2006 to 26.3 years in 2016, and the age at first birth from 24.3 years to 26.9 years.

The reason behind this delay in marriage and childbirth is largely attributed to the improved education system. Longer time spent in education and the pursuit of career development post-qualification inevitably postpones marriage and childbirth. “The proportion of students entering university is ever rising, while the number of years of education is increasing”, explains Professor Zheng. “Marriage often occurs after university graduation; hence the average age of marriage is being pushed back. Besides, after graduation, women with high educational qualifications pursue personal development and career attainment. It usually takes time to build a career before considering starting a family. Pregnancy and breast-feeding distract them from work, which further delays their first childbirth age.”

Work-balance strains mean many families are surviving rather than flourishing

The breakneck speed of economic growth in China has forged a culture lacking work-life balance. This has a significant effect on young women who seek to have children. According to one large-scale survey on desired fertility conducted by the National Health and Family Planning Commission in 2015, parents who had decided not to have a second child reported that this was because of 1) the economic burden (74.5%), 2) the extra work involved, on top of their already stressful jobs (61.1%), and 3) the insufficient childcare support system (60.5%). Professor Zheng agreed that “China lacks mechanisms to modulate work-family balance. A lack of flexible working arrangements and high-quality child care services negatively impact the childbearing decisions of women.”

The high economic pressure on housing in tier 1 and 2 cities also acts as an impediment to building a family. In recent years, housing developments have ballooned, and house prices have rocketed. From June 2015 through to the end of last year, the 100 City Price Index of China rose 31% to nearly \$202 per square foot, which is 38% higher than that in the US, where per-capita income is more than 7 times higher.¹⁵ As a result, most housing is too expensive for the average Chinese family to finance.¹⁶ Professor Zheng stated that “difficulty in purchasing a house negatively impacts household fertility decisions. Policies that provide housing loan subsidies, better employment, and economic security can alleviate the situation.”

Urbanization and the floating population

China continues to witness an urban transition in which large numbers of people have shifted from agricultural employment to industrial, commercial, or service employment.¹⁷ Under the economic reforms of the last three decades China has unwittingly created a “floating population” of 247 million people, accounting for 18% of the total population.¹⁸ The size of this transient population is rising sharply still, as more people are moving towards the coastal cities.¹⁹ A number of studies show that a floating population contributes to fertility decline.²⁰⁻²² One study found the total fertility rate being 25% lower in migrant populations compared to non-migrant populations, with the difference further exacerbated by a higher average age of first childbirth among migrant populations.²⁰⁻²² According to Professor Zheng, “economic migration significantly delays the first marriage age of mobile populations as well as the first child-birth age of migrant women.” Further to a delay in having a first child, the willingness of migrants to have a second child is also weaker, mostly because of the associated costs.²³

The policy response

From a one-child policy to a two-child policy

The relaxation of one-child policy began in 2013, when couples in which at least one of the pair was themselves an only child, were allowed to have a second child.²⁴ Then in October 2015, China scrapped the last remnants of its strict one-child policy. All married couples irrespective of their Hukou (certificate of residency) could now have two children.²⁵ Through this reform, 90 million women have become eligible to have a second child.²⁶

Alongside the relaxation on the number of children allowed, a series of initiatives were introduced in 2017 that aimed to support “the implementation of a comprehensive two-child policy” to reach a fertility rate of 1.8 by 2020.²⁷ Updated policies mainly focus on extending and authorizing paid maternity, parental, and paternity leave, and constructing public health and childcare facilities. Public health services have been strengthened for obstetric and paediatric departments, and new pathways introduced for high-risk pregnant women. Baby care facilities are now required for baby feeding and nappy changing in both public spaces and business settings.

Since the abolishment of the one-child policy, China’s National Health and Family Planning Commission reported that births in China jumped by 1.31 million from the 2015 level to 17.86 million, the highest figure since 2000, but then dropped to 17.23 million in 2017. The second-child policy partially compensated for the universal decline in first-child births. Around 51.2% of China’s new-born babies in 2017 were second children in the family, an 11% increase from 2016. Indeed, this ratio has been climbing since 2002, which is mainly attributed by the continual decline of the first child percentage, mostly due to the increasing number of unmarried women.²⁸ This trend started in urban regions and is gradually expanding to the rural population.²⁹

The change to a second-child policy has only impacted a small demographic

The two-child policy has only made a difference to a relatively small number of people, mostly between the ages of 38 and 40. Professor Zheng noted that women from different age cohorts had their own reasons for not being influenced by the change in policy. For example, “women born in the 1960s or early 1970s are past fertile age; they believe childbearing should happen within the right age”. Then moving on to people born in the 1980s, they are “in their critical moments for career progression and are unlikely to prioritize a second child, while those born in the 1990s are more independent in thinking and are unlikely to adhere to government recommendations”.

Furthermore, even for couples in their late 30s who wanted two children, many “already had a second child and paid the penalties before the implementation of second-child policy”, explained Professor Zheng. This is because the penalties of the previous one-child system were not consistently applied, with wide variations across the country.³⁰ The policy was strictly enforced only for urban residents, who accounted for less than half of the total population in 2007. Indeed, Professor Yang told us that “the people who come to our IVF clinics for a second child are usually urban citizens between the ages of 38 and 40. Most couples under the age of 40 usually try on their own.”

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The biggest benefactors of the second-child policy are public sector employees born in the late 1970s. These families were previously held back by the one-child policy. “They had the economic capabilities and family support, and have the highest likelihood to have a second child”, explained Professor Zheng. Professor Yang Dongzi, from the Sun Yat-Sen Memorial Hospital, confirmed that “after introduction of the second-child policy, the outpatient volume at ART centres increased significantly, especially in those over 40.” But she also mentioned “the increase in outpatient volume is temporary, only in these two years. The increase in our IVF cycles between 2016 and 2017 was around 25%, while in the latter half of 2017, the uptrend has slowed down.”

Maternity leave has been extended but varies by province and is funded by employers

Many of the 2017 initiatives introduced to support the two-child policy are implemented at a regional level, and each province has revised their regional regulation on population and family planning. China’s national parental leave system includes 98 days of paid maternity leave with the payment based on the average wage of the company funded by maternity insurance. Meanwhile, women with special conditions, such as obstructed labour or multiple births, can further apply for an extension of 15 days. The revised provincial regulation on population and family planning extends the paid maternity leave from between 128 days to 180 days. As for fathers, the paid paternity leave lasts from 7 up to 30 days (Table 1). Women are entitled to be absent from work for one hour per day for breastfeeding without it impacting on their salary.

Table 1 Maternity, Paternity and Parental Leave Policy

	Paid maternity leave (days)	% average payment rate	Paid parental leave available to mothers (months)	% average payment rate	Paid paternity leave (days)	% average payment rate
National level (Labour Law)	98					
Beijing	+30	100	N/A*1	N/A	15	100
Shanghai	+30	100	N/A	80	10	100
Guangdong	+80	100	N/A	Negotiate with employers	15	100
Zhejiang	+30	100	N/A	N/A	15	100
Fujian	+60~82	100	N/A	N/A	15	100
Anhui	+60	100	N/A	N/A	10 or 20 for long distance couples	100
Chongqing	+30	100	12*2	75 (no less than the minimum wage standard)	15	100
Heilongjiang	+82	100	N/A	N/A	15	100
Yunnan	+60	N/A	N/A	N/A	30	N/A
Gansu	+82	100	N/A	N/A	30	100

*1 Public sector employers can enjoy a further 1~3 months extension under the permission

*2 Requires employer’s permission

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However, “extending maternity leave alone is too limited to improve fertility”, commented Professor Wu. This is because maternity insurance is funded by employers, which increases the economic burden of companies when hiring female employees. Professor Wu went on to say that “extending maternity leave is a dilemma for career women. It increases the difficulty for female employees to apply for a job due to an invisible stigma. It also becomes a struggle to pick up from where they left off before pregnancy due to the fast pace and intense competition at the workplace.” Professor Zheng also pointed out that “a better way is paid child-care leave or flexible working hours. Family-friendly policies should be supported by the labour market and prevailing work culture.”

Professor Yuan described that even though maternity and paternity leave is extended in the local regulations of population and family planning, they are merely regulations and not enshrined in the national Labour Law. “Employers stick to the Labour Law compliance. All the institutions need to cooperate with the Office of Family Development to ensure the initiatives are truly implemented.”

Child care support for children under three years of age is in short supply

One of the primary reasons that Chinese people choose not to have a second child, despite the two-child policy, is the lack of childcare resources. These include paid child care leave with flexible working hours, subsidies, or facilities for children under three. Professor Yuan, Director of the Center for Strategic Studies on Ageing at Nankai University, pointed out that “China has nearly no childcare facilities for children between 0 and 3 years of age.” Only 4% of children up to three are in childcare facilities in China, well below the OECD average of 34.4%.³¹ Grandparents play a significant role in raising young children at home. Professor Wu informed us that “though taken care of by grandparents, children at this age rely strongly on their mothers. The major barrier of having a second child is that we have neither paid childcare leave nor enough alternative social resources to take care of children”.

More specifically, Professor Wu stated “there is no detailed regulatory standard for childcare services for children at that age. Both the public or private sector could take the lead in developing practice standards, but as of now there is still little progress”. The government is however taking some action by investigating methods to fulfil the shortage of affordable and reliable kindergarten and day care services.³² One example is Shanghai, which has published regulations of early childhood education service management. This has set an industry standard in both construction guidelines and the qualification of teachers of childcare facilities³³. Professor Wu remarked that the Shanghai case is “a breakthrough and a good start”. There are other examples. Professor Zheng informed us that coastal areas often have good policies on supporting fertility. For example, “Zhejiang province funds ‘mommy cottages’, which provide small group day-care for female employers, and some manufacturers in Jiangsu have their own kindergartens”. However, in general Professor Wu declared that more detailed industrial standards under the government’s supervision on child care facilities for children under three years of age are required as soon as possible.

China’s tax system remains skewed towards individual taxation

Another commonly reported barrier to having a second child is the economic burden. Some initiatives are designed to help with the financial impact on families. For example, Xiantao in Hubei province provides 1,200 RMB for a second child and Tianjin funds additional thirty days’ maternity allowance, as well as housing subsidies, and flexible working hours before and after pregnancy. In other areas, subsidies are in the form of tax relief³⁴ or prolonged maternity leave payment.³⁵

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While better funded childcare services and other initiatives may go some way to easing the cost to parents, many commentators remarked on China's tax system. China still uses an individual-centric income tax system, rather than one based around a whole family's income level. Professor Yuan suggested that "the threshold of personal income tax should consider the size of the family unit." Supporting this idea, Professor Wu agreed that "technically, it can be tackled to provide some tax breaks to families with elders and children." Taxation is already complicated in China, but more generous tax breaks and other measures for families may help more people reach the decision to have a second child.

Assisted reproductive technologies are expensive but couples are often willing to pay

Family-friendly policies are not the only levers available to national governments to raise fertility rates. Governments can support access to assisted reproductive technologies (ART), a range of technologies that can help people who are willing but struggling to have a child.

The prevalence of infertility in China is 15.5% among couples of reproductive age.³⁶ Infertility is a heavy burden, exacerbated by the trend of delaying marriage and having children.³⁷ In China, ART treatment is often best conceived as an active effort to achieve the "must have one child" due to the intense stigmatization of childlessness.³⁸ While there is no official number of IVF babies in China, a 2016 article estimated that there have been 2 million IVF births in China since the arrival of China's first IVF baby in 1988.³⁸

Large scale ART centres are becoming commonplace in China. By the end of 2016, there were 451 approved ART centres. The largest clinic, in Changsha, conducted 44,596 cycles in 2017, more than the cycles usually carried out in mid-sized European countries. Professor Yang stated that "compared to other countries, China has good quality ART outcomes. Our technology is among the world's best." The figures support this assertion, as outcomes are comparable with many high-income countries. For example, the clinical pregnancy rate in Peking University Third Hospital from 2011 to 2014 is similar to the US rate, published by the Centers for Disease Control and Prevention.³⁹

Other than a medical intervention to help infertile couples to achieve pregnancy, ART centres also host education programmes on reproductive knowledge. Males are taught about healthy lifestyle choices and females about contraception and how to prevent the abuse of abortions. Programmes include "Baby Fund", run by the China Women's Development Foundation launched in 2014,⁴⁰ which provides a series of lectures providing psychological assistance and infertility treatment education, free drug distribution, and poverty support to infertile women.⁴¹

The estimated cost per IVF cycle is around 30,000 RMB and 40,000 RMB for ICSI.³⁸ Fertility treatment has traditionally not been covered by public or private insurance in China, but as noted by Professor Yang, "people are willing to pay." ART in China is thus not considered inaccessible by physicians and patients despite its relatively high cost. However, while ART funding is rare in China, it is not unknown.⁴² For example, in order to facilitate the second-child policy, local government in Shihezi, a city in northwestern China's Xinjiang region, recently issued a policy to provide a one-time incentive of 10,000 RMB to fund IVF treatment for a second child. In Guangxi, families can receive a cumulative subsidy of up to 50,000 RMB for fertility assessments, assisted reproductive treatments and other diagnostic procedures. Similar subsidies offered by local governments are becoming more common,

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with areas like Fujian, Hubei, Hefei and Liaoning having such programmes. When asked whether ART should be widely reimbursed in China, Professor Yang answered “it’s understandable that ART is not reimbursed, since the reimbursement might bring problems such as the unbalanced distribution of public resources. It might also be difficult to identify which patients are qualified to receive the infertility treatment”. Nevertheless, the professor went on to say that “overall, it is better than nothing. ART reimbursement is a good thing.”

ART centres are highly regulated, but quality is variable

Though cost is not perceived to be a significant issue, the accessibility of ART clinics remains a major issue in China. The clinics providing ART have to live up to a series of strict requirements including equipment, procedures, and personnel in order to be licensed. Meanwhile the number of clinics are restricted based on the rule that one clinic serves 3 million population, compared with 700,000 people per clinic in the United States.⁴³ Also only Class 3 hospitals (tertiary hospitals of at least 500 beds) can provide pre-implantation genetic diagnosis (PGD), the genetic profiling of embryos prior to implantation.⁴⁴ Therefore, IVF centres in class 3 hospitals are often over-stretched.

Although the licenses of IVF clinics are stringently regulated, their quality remains a concern. The technical evaluation for ART centres is only based on the job title of physicians, to see whether the obstetrics and gynaecology physicians have other senior positions or have trained in ART centres. “But the training quota is limited and the quality is worrying”, remarked Professor Yang. “To get an ART certificate, an obstetrics and gynaecology physician doesn’t have to go through a national test, and all the evaluations are internal and do not contain any surgical operations. An obstetrics and gynaecology physician can prescribe IVF drugs after staying in an ART centre for three months. But in Hong Kong, it takes years and countless exams for an obstetrics and gynaecology doctor to become a reproductive doctor”. Therefore, she suggested that China needs to open more IVF training centres and improve the training quality for ART physicians. The argument is that as long as ART doctors are qualified, the number of ART centres should not be restricted. Doctors can spread out and open more IVF clinics. Then patients will not need to flow to centralized, public-funded ART centres. Access to ART would become simpler, meaning patients spend less time and money on traveling, and hence their indirect costs such as loss of working hours would be lowered.

An overarching concern is that having one child has become a norm for many families

Regardless of the new wave of policies, forty years of the one-child policy has resulted in the social norm that one child is enough. The first generation of only-children have now become parents and have “not experienced the benefit of multi-child families, and hence they might prefer not to have two or more children”, said Professor Yuan. Coupled to this, more parents are respecting their first child’s opinion on whether or not to have a sibling, and “70-80% of the time the answer is no”. Additionally, he pointed out that some grandparents are not willing to raise the second child and prefer more leisure time. Therefore, even though the one-child policy is officially abandoned, its influence remains on people’s mindset, leading to many of the younger generation being reluctant to have a second child.

How have other regions responded to falling fertility?

We've described how supporting initiatives for the second-child policy in China have mainly focused on extending maternity leave. There are other elements Chinese policymakers may wish to consider, including parental and child care leave, baby bonus, child care services and subsidies, and ART policy, making them a series of holistic measures of family friendly policies. Here are some examples of policy implementation from four case study regions: Singapore, South Korea, Hong Kong, and Australia.

Family policy packages in Singapore

The Singapore government introduced the "Marriage and Parenthood Package" (M&P Package) in 2001, and strengthened it in 2004, 2008, 2013, and 2015.⁴⁵ The package comprises of housing, community and workplace support, pre-school and education, better health, and childcare.⁴⁵ Standards on flexible work arrangements have also been introduced, aiming to help employees and job seekers recognize companies with flexible practices. The work-life grant was set up to support the adoption of flexible work arrangements, and currently 77% of establishments provide ad-hoc flexibility to employees.⁴⁶ These arrangements may have contributed to the relative high (and increasing) female labour force participation rate of 60.5% in 2017, compared to 54.0% in Hong Kong, 52.2% in South Korea, and 50.5% in Japan.⁴⁷ In addition to encouraging flexible work, the government set up the Building and Construction Accessibility Fund to cover up to 60% of construction costs to upgrade private buildings with family-friendly features, including nursing rooms.⁴⁵

Parental and child care leave in Australia, South Korea and Singapore

Australia's paid parental leave scheme includes 18 weeks of child's primary carer and two weeks of partner leave. The scheme is funded by the government and currently runs at AUS\$719.35 per week before tax, based on the weekly rate of the national minimum wage.⁴⁸ On top of the government funded scheme, employers can also provide paid parental leave based on registered agreements, employment contracts and workplace policies.⁴⁹

South Korea entitles working mothers 90 days of paid maternity leave, funded by employers for the first 60 days, and then Employment Insurance for the remaining 30 days with a monthly ceiling of 1.35 million won. Employers need to make up any shortfall. Fathers receive six weeks paid paternity leave. Parents are also allowed to have 52 weeks of paid parental and home care leave. However, employers don't have a legal obligation to pay employees during the leave period unless company rules mandate it. Employees themselves are obliged to request the benefits, which are 40% of ordinary monthly wages.⁵⁰

In Singapore, working mothers are entitled to 16 weeks of paid maternity leave, four weeks of which can be shared by fathers. This leave is jointly funded by the employer and government. Fathers receive two weeks of paid paternity leave, funded solely by the government. Additionally, employees are entitled to up to four weeks unpaid leave for immediate family members with unexpected care needs.⁴⁵

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Singapore also provides an example of child care leave. Parents have access to six days of unpaid infant care leave per year with children below two years of age, six days of Government-Paid childcare Leave per year with children under seven years of age, and two days per year with children from 7 to 12 years of age.

Baby bonus in Singapore

Government financial support to families in Singapore is increasingly generous and incorporates a baby bonus consisting of cash gifts and co-savings. The cash gift contains S\$8,000 per child for the first and second child, and S\$10,000 per child for the third child onwards. The co-saving scheme, named the Child Development Account, provides S\$6,000 for the first and second child, S\$12,000 for the third and fourth child, and S\$18,000 for the fifth child and beyond.⁴⁵ Other than the baby bonus, there are a range of tax measures, including tax rebates and tax relief. Parents are eligible to claim the Parenthood Tax Rebate of S\$5,000 for their first child, S\$10,000 for the second child, and S\$20,000 for the third and each subsequent child.

Child care services in Hong Kong and South Korea

Hong Kong has the world's highest enrolment rate of 100% for kindergarten education.⁵¹ Other than childcare services, there are childcare services on full-day, half-day or a two-hour sessional basis for parents with sudden engagements or various commitments.⁵²

South Korea has increased the number of national, public and company day-care centres by 410 in 2017. Of the children in these centres, 32% are those of parents with unpredictable working constraints.⁵³ The government has also increased subsidies of 200,000 to 220,000 won to improve the working environment for child-care teachers.³¹

Child care subsidies in Hong Kong and Australia

The cost of raising a child from birth to university graduation in Hong Kong is estimated to be up to HK\$5.5 million.⁵⁴ In recognition of this financial burden on parents the government has increased its financial commitment over recent years, and the expenditure on subsidizing kindergarten education has increased from about HK\$1,600 million in the 2007/8 to about HK\$3,400 million in 2014/5.⁵¹ Hong Kong enhanced the supply of childcare services by introducing the Pre-primary Education Voucher Scheme (PEVS).⁵⁵ The scheme provides a direct fee subsidy of up to HK\$20,010 per student per annum (figures correct for 2014/15) for children attending eligible local non-profit-making kindergartens. A total of 35,632 families have enjoyed fee remission as of January 2015⁵¹ and around 80% of the kindergarten students receive voucher subsidies.⁵¹

Australia also sets a good example of child care benefits. The government has increased spending on supporting families with children over the past 25 years, from 0.9% of GDP in 1980 to 2.9% in 2014.⁵⁶ ⁵⁷ The government provides family tax benefit with upfront or annual payments.⁵⁸ From 2 July 2018, the Australian Government provided childcare benefits and rebates for children below 14 years of age with payments based on the family's income, the activity level of both parents, type of child care service and whether the child attends school. The new childcare subsidy is better targeted than the previous single, means-tested one that covers 50% of out of pocket child care expenses, up to an annual limit of AUS\$7,613 per child. Parents have to be working, volunteering, studying or looking for work to be eligible for the new subsidy.⁵⁹ Other than the childcare subsidy, the Australian government also

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provides additional funding to grandparents and parents who are looking for work or in temporary financial hardship.⁶⁰

ART and ART policy in Australia and South Korea

One in six Australian couples use IVF and one in every 25 Australian children are now born as a result of IVF.⁶¹ Services related to an ART treatment cycle (without a number cap or age limit), including consultations, pathology, and diagnostic imaging services, are partially covered by Medicare.⁶² There were 68 ART clinics and 66,347 cycles in 2011, said to have met 100% of demand.⁶³ The cost of one IVF cycle in Australia is approximately \$9,495 (19% of the annual disposable income compared with 12% in Japan and more than 100% in China), with AUS\$4,707 of out of pocket costs (6% of the annual disposable income after the government subsidization).^{64, 65} Heterosexual couples, lesbian couples and single women all have access to the publicly funded ART program.⁶³

South Korea provides sliding support for infertility treatment costs according to income level (with caps on the total amount and number of cycles). From 2006 to 2015, 100,993 babies were born to parents who received state support for their infertility treatments.⁶⁶ The direct cost of a fresh IVF cycle is less than US\$2,000, the lowest among a comparison of 32 countries.⁶⁷ Since 2006, South Korea has adopted an incremental approach in developing subsidies for infertility treatments. In its maiden year, patients were subsidised for two cycles only. This increased to three cycles in 2009 and four cycles in 2011. Furthermore, before 2010, subsidies were available only to families earning less than 130% of the average household income. This threshold was increased to 150% in 2010. Most recently, South Korea doubled the subsidies available for IVF between 2016 and 2017, up to a total of 2.4 million won per cycle.⁶⁸ Beyond subsidies, the health insurance coverage for infertility treatment has also recently been expanded with the goal of providing a universal support system to strengthen counselling, treatment and psychological support.⁶⁸ To support these policies, the budget has been increased from 31.5 billion won in 2007 to 92.5 billion in 2016.⁶⁶ Donation of sperm or oocyte is also permitted and regulated in South Korea, although they're "infrequently used".⁶⁹

Evidence of effectiveness for policies from the wider literature

Impact of family-friendly policies

When Chinese couples decide to have a first child their decision is centred on when, rather than if, since nearly all married couples will have at least one child. Whether to have a second child is a bigger decision.⁷⁰ Family-friendly policies are designed to support the family unit by providing periods of leave, flexible working schedules, and living support for working parents.⁷¹ Such policies can arguably pay for themselves. For example, the family-friendly policies introduced by Nordic countries over the past 50 years, and associated increases in female employment, may have boosted growth in GDP per capita by 10% to 20%.⁷² However, Professor Wu cautions that while European examples of policy can be instructive, their applications in China are limited due to the social differences between Europe and China. She states that “it’s difficult to find policies that could be taken from one country and transferred to another”. Research results must therefore be carefully studied to understand scope, qualifications, and limitations.

Policy decisions can help address the lack of childcare, problems in balancing work and family life, and other barriers to parenthood. While most of the available evidence suggests that individual family policies generally have small effects on fertility rates, we describe here some examples where packages of complementary interventions in other countries have made an impact.

Working hours and parental leave

After China’s birth control policies largely relaxed, Wang Feng pointed out “new programs are needed to encourage young people to have children, but it will be increasingly difficult to fund such programs since the unprecedented pace of economic growth inevitably slows down”.⁷³ The initiatives in China to support the second-child policy mainly focus on extending the length of parental leave. However, a 2017 Center for Economic Performance (CEP) study noted that the effect of parental leave on fertility is “negligible”. CEP’s review also noted, however, that a study of Austrian policy change from one to two years parental leave showed “substantial fertility effects of leave extension, accounting for 12 additional children per 100 women,” and that a German policy of paid maternity leave based on income led to “sizeable fertility gains”.⁷⁴ A cross-national analysis suggested this may be because increasing the duration and benefit level provided by paid leave policies increase rates of women’s labour participation.^{75, 76}

Child Care

Childcare services in China focus mostly on children between 3 to 6 years old. The lack of accessible and affordable childcare for children below three years of age is one of the major factors affecting fertility in China. Provision of childcare services is a “strongly positive factor in the decision to have children”.⁷⁷ Rindfuss and colleagues presented evidence that high-quality, affordable, worker-friendly childcare leads to more childbearing. The effect is substantial, with evidence that moving from having

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no child-care slots available for pre-school-age children to having slots available for 60% of pre-school-age children leads to the average women having between 0.5 and 0.7 more children.⁷⁸ A study covering 30 OECD countries (including Japan, and South Korea) also found that early childhood education and care spending for children under three years old had a “robust” positive correlation with fertility rate, with one extra percentage point of GDP spending associated with 0.2 extra children per woman.⁷⁴

Baby bonus

According to Professor Zheng, cash incentives to boost fertility are “the least useful”. Kalwij’s 2010 review of 16 Western European countries determined that increases in family allowance had “no significant impact on the timing of births or on completed fertility”.⁷⁹ Other authors have suggested that financial transfers might influence the decision to have children if these transfers sufficiently reduce the direct monetary cost of raising children.⁸⁰ However, any such transfers need to cover childhood for at least the child’s first year, as their influence is more significant during this period than benefits granted at childbirth.⁸¹ Thévenon concluded that while child credits may have an impact, the “policies are costly”, and therefore not cost-effective.⁷⁷

Assisted reproductive technology

Since the first IVF baby in 1978, the number of people conceived by ART reaches several million today, and rapidly approaches 0.1% of total world population.⁸² The affordability and location are major barriers to access for this ART,⁸² and areas of the world with the highest rates of infertility are often those with the poorest access to ART.⁸³

A 2009 review showed that full access to IVF after three years increases the fertility rate by 0.08 children.⁸⁴ Another study found that if the United Kingdom had similar ART coverage and utilization as Denmark, the UK fertility rate would increase from 1.64 to 1.68 (or fall to 1.62 if ART was not available) and concluded that the increase was equivalent to other more orthodox policies, and possibly more cost-effective.⁸⁵

The European Society of Human Reproduction and Embryology concluded in 2010 that though ART’s impact on fertility rate is hard to evaluate due to a variety of biological and behavioural factors, government ART support “is beneficial for families, but the effect on fertility rate is extremely small”.⁸⁶ While opinions are varied on the overall effectiveness of ART in raising fertility rate, the potential benefits for the many couples who have difficulty conceiving are self-evident.

Discussion and recommendations

By the end of 2017, China had 1.39 billion inhabitants, the largest population of any country in the world. Although its annual net increase has reduced to 7 million, the population is still growing. “China is not lacking people”, remarked Professor Yuan. The UN projects that China’s population will peak at 1.44 billion in 2030, then start to decrease, but will still remain above 1 billion by 2100.⁸⁷

Therefore population policies are not needed because of the danger of a shortage of people. Rather, Professor Yuan emphasized, it’s because of the demographic structure, both macro and micro. At the macro level, China faces an aging problem. At the micro level, the 4-2-1 family structure (families consisting of four older people, paternal and maternal grandparents, two parents, and only one child) is unsustainable. Couples have to support four seniors and raise at least one child, and seniors have always been dependent on their descendants in China. How can China re-balance its demographic structure?

The evidence suggests that a number of interventions can, in the right context and settings, have a positive impact on total fertility rates. High-income countries that have successfully maintained sustainable fertility rates (without recourse to immigration) have tended to bundle together several well-funded, long-term, interconnected programmes. Difficult though it may be to influence fertility rate, governments have plenty of scope to make society a more welcoming place for young and old families alike. From the research described in this report, we suggest there are four principles around which successful fertility policies in China can be built (table 2).

Table 2: The principles around which successful fertility-raising policies can be designed, and the actions that need to be taken to implement them.

	Principles	Actions needed
1	Support local governments in their implementation of fertility policies	Provide sufficient backing to local governments who seek to improve upon existing standards set by national labour law. Improve the enforceability of guidelines and initiatives set out by local governments.
2	Support family life at all stages	Ensure that support systems work for families at all stages, from pre-conception, to childbirth and parents’ eventual re-integration into the workforce. Improve policies for having children, raising children and for life as a parent.
3	Break down barriers to ART	Improve access to assisted reproduction technology alongside bolstering the quality of service. Offering financial support for ART should be considered.
4	Remove limitations on how many children a family can have	The limited quota for the number of children a family can have remains an issue for some families, and arguably sends out the wrong message to the wider population.

1. Support local governments in their implementation of fertility policies and drive the development of legislation to support families

While the advent of the second-child policy is a good start, further actions can be supported on a provincial level to work towards boosting fertility. Local governments have promoted a number of initiatives on population and family planning, including extended maternity leave as well as paternity leave, but most hirers stick to the national labour law set out by the central government. Without legal backing from the central government it will remain difficult for local initiatives to gain momentum as they are not enforceable.

Alongside support for current provincial level policies, detailed standards for childcare facilities and ART practitioners are also needed. These standards will benefit from being created on a national level as it ensures consistency and enforceability. From child safety to teachers' qualifications, there is little room to be lackadaisical when formulating how future generations will be treated in their respective pre-schools and kindergartens.

2. Support family life at all stages and improve the support systems for having children

Measures introduced with the explicit objective of supporting fertility, such as extending maternity leave alone or cash subsidies, often have a limited impact. However, those measures designed to support work-life balance or raise living standards have a more tangible impact on fertility, even though this may not be their primary aim. Professor Wu pointed out that "raising the fertility rate does not rely on short-term government regulations on giving birth, but instead needs to think about why people don't want a second child and look to solve their concerns."

The iniquitous division of child rearing, lack of work-life balance, economic pressures, little support for the floating population, and a shortage of childcare services or leave, are the reasons commonly listed when couples decide not to have a child. "Raising a child is not only about giving birth; after birth, you need to feed them, nurture them, and educate them" remarked Professor Yip.

China has laws against sex discrimination, including a rule that bars firms from firing pregnant women until their child is at least one year old, but enforcement is lax.⁸⁸ Cases have been reported where many female job applications have been turned down, and many companies have blatantly stated that they prefer women with two children already. This understandably leads to an unfriendly working environment for females.^{40,89}

The government needs to therefore continue to institute a comprehensive, consistent, stable and adequately funded package of policies which not only incentivises families to have children, but also continues to support them in the child rearing years and after. While not a comprehensive list, policy developments could include:

- The institution of a parental leave system that does not merely rely on the extension of maternity leave. Instead provide more paternity and parental leave and, more importantly, arrange workplace flexibility. This could include shorter and more flexible hours and easing the transition for mothers returning to work.

- Setting up an industrial standard of alternative social childcare resources for children aged up to three years of age. For grandparents taking care of children, the government may consider providing support, such as paid elder care leave or subsidies, allowing them to rest from time to time.
- An improvement on tax incentives for family-building and care for elders and children.
- Addressing the unequal roles of men and women related to household duties and childcare in order to distribute this workload more evenly.
- Funding more generous family benefits that, when providing subsidies on parental leave, don't let the employers pay the full bill.

“Try to make China a place where everybody loves to stay, live, work, and enjoy their lives”, remarks Professor Yip. “It’s a more realistic goal to improve the quality of life for inhabitants.”

3. Break down barriers to ART, as it can bring happiness to individual families

Assisted reproductive technology describes a range of medical interventions to help infertile couples to have a child. It can consequently have a large psychological impact on the happiness of individual families. Our interviewees acknowledged that ART’s price is high and its success rate is not perfect, especially for older women. Nevertheless, given its role in improving awareness and offering the opportunity for children to those who otherwise have little hope, it was suggested that financial support for ART should be considered. As remarked by Professor Yang, “commercial ART-related insurance and reimbursement can be encouraged, and if patients whose treatment is unsuccessful get some compensation, then more people might be willing to undergo infertility treatment.”

To solve the accessibility of ART, other policies that China could consider implementing include:

- Approving more ART centre licenses and refining the regulation of ART centres, which should be based around well-trained healthcare practitioners, rather than having the number of centres calculated from the local population.
- Standardising the quality of ART training through setting national evaluation standards on ART cycles, operations (oocyte retrieval and embryo transfer) conducted, and examinations. In the meanwhile, higher quotas for training positions can be implemented.
- Encouraging commercial health insurance coverage and extending subsidies in the public sector for ART.
- Promoting more policy and workplace support for ART, including paid leave and flexible scheduling.

4. Remove current limitations on the number of children a family can have

With respect to improving fertility in general, Professor Yip pointed out that the two child limit remains an issue. He remarked that “when you give people a choice, then things will be good.” Removing the limits to the number of children which families can have is a boon for those who want to have more children. Professor Zheng comments that “people who love kids would have three or four children but are restricted by the two-child policy”.

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While current policy positions “encourage” more births by referring to low fertility levels and the rapidly aging population, it is difficult to influence the sizeable portion of couples who are resolute on having one child. Professor Yip shared that “we are currently losing the battle to boost fertility. It’s difficult to reverse people’s mind sets”.

In view of the difficulty in changing the preferences of couples who prefer one child, raising fertility could be better served by enabling couples with inherent desires for a larger family to indeed have three or more children. Either way, the limit to the number of children a family can have arguably sends out the wrong message to the wider population. Families are a blessing, and a restriction on the size of them suggests to the world that they are viewed as a drain on the public purse.

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Appendix: Methods

To investigate falling fertility levels in China, its key drivers and the range of possible policy responses (including family-friendly policies and support for ART), The Economist Intelligence Unit conducted a literature review and performed six interviews (one interviewee provided written answers to our interview questions) with experts and a research institute.

Literature review

For the literature review we searched published and grey literature to identify relevant academic studies and reports on fertility in China and the case study countries. We also performed a global literature search for evidence of impact on fertility rate and economic outcomes for family-friendly policies and ART. Database searches were performed in MEDLINE (PubMed) and Embase (Elsevier).

In addition to database searches we conducted grey literature searches, including searches of relevant organisations' websites. Supplemental search techniques such as reference harvesting and citation searching were used to identify further research reports from "pearl" articles. The search was pragmatic, iterative and targeted in scope, and was carried out by an experienced health information specialist. References were managed in Endnote.

Case studies

Case studies were performed for Singapore, South Korea, Australia and Hong Kong, using data from the literature review and supplemental searching. We summarise how these four countries have responded to the challenges of falling fertility levels, including their policies on parental leave, child-care, subsidies and ART. Because each country is unique, successful interventions cannot simply be applied in China; similarly, failure of a policy in one country does not necessarily mean it will fail elsewhere. Nevertheless, the comparative case study approach offers insights into the landscape of possible approaches.

Primary research

We interviewed five experts in mainland China and one Hong Kong expert, Professor Yip, Paul Siu Fai from the University of Hong Kong. Interviewees included expert voices from policy-makers, academia (in demography and economics) and experts in ART. Interviews were semi-structured in nature, with the questions varying slightly depending on the interviewee's field of expertise. Transcripts were made for all but one interview, where instead interview notes were kept. Direct and indirect quotes from the interviewees are used throughout the report.

We have summarized current policy arrangements, costs and other data points throughout the document using the most recent information available to us. We have made every effort to ensure that such figures are correct at the time of writing—September 2018. However, these figures will change over time. Also, costs and impact have been reported in the currency used in the original source report, including Chinese Yuan, South Korean won and Dollars from Australia, Singapore, Hong Kong and the USA. Where possible we have retained the original currency used to avoid inaccuracies caused by fluctuating exchange rates.

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