# Unpacking the differential impact of family planning policies in China: Analysis of parity progression ratios from retrospective birth history data, 1971-2005

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**Summary.** Although China's family planning programme is often referred to in the singular, most notably the 'one child policy' in reality there have been a number of different policies in place simultaneously, targeted at different sub-populations characterised by region and socio-economic conditions. This study represents the first attempt to systematically assess the differential impact of China's family planning programmes over the past 40 years. To achieve this, the paper examines the contribution of parity progression ratios to fertility change among different sub-populations exposed to various Family Planning Policies (FPP) over time. Cross-sectional birth history data from six consecutive rounds of nationally representative population and family planning surveys from early 1970s till mid-2000 are used, covering all geographical regions of China. Four sub-populations exposed to differential FPP regimes are identified. The analyses provide compelling evidence of the influential role of FPP in reducing higher parity progression ratios across different sub-populations, particularly in urban China where fertility dropped to replacement level even before the implementation of the one-child policy. The prevailing socioeconomic conditions in turn have been instrumental in adapting and accelerating FPP responses to reducing fertility levels across China.

## Introduction

The scale and population impact of the Family Planning Policies (FPP) in China has been widely documented in the demographic and social science literature ever since it was introduced (Tien 1980, 1984; Bongaarts & Greenhalgh 1985; Greenhalgh 1986, 2003; Hardee & Banister 1988; Liang & Lee 2006; Zeng 2007; NPFPC 2007; Zhai & Li 2014). Although typically referred to as the 'one-child policy' elsewhere, in reality the FPP in China has been implemented in various phases differentially across various sub-populations based on socioeconomic, geographic and population criteria. There has been little demographic analysis that has systematically disentangled how FPP, implemented over time and differentially across sub-populations, contributed to sustained fertility reduction in China. The analysis of sub-populations characterised by very different socioeconomic conditions is critically important to ascertain the impact of FPP on fertility behaviours, and in particular, to understand how the recent structural changes - reflected in terms of rapid social and economic development - have mediated the influence of FPP in triggering fertility change over time and place.

This study integrates cross-sectional birth history data from successive rounds of nationally representative population and family planning surveys, from the early 1970s till mid- 2000, to evaluate the underlying influence of FPP on fertility change in China, including the post-transitional period. The study further seeks to decompose the contribution of parity progression ratios to total fertility change among different sub-populations subject to differential FPP over time and characterized by different socioeconomic attributes. Two inter-related research questions are addressed in this study. First, how did FPP evolve across different sub-populations and over time in China? Second, how did the differential FPP, implemented across different sub-populations, contributed to overall fertility reduction in China? Our findings go beyond previous studies to offer a more in-depth understanding of how FPP contributed to triggering fertility transition among different sub-populations in China, and help to unpack the role of the FPP in the face of rapid economic and social development.

## Three phases of FPP and fertility transition in China

In the early 1950s, the attitude of the Chinese government was actively pro-natalist, encouraging births. The results of the first census in 1953 delivered a surprise, with the population larger than anticipated, and stimulated the government to rethink population issues.

During the late 1950s and 1960s, efforts were increasingly focused on disseminating the ideal of small family size and reinforcing contraceptive supplies, with such efforts being primarily concentrated in urban areas. Starting from 1970s onwards, a range of intensive FPP have been formulated to reduce population growth (Wang 2012). These policies have varied in their nature and the mode of implementation across time and social context, and can broadly be divided into three key phases.

The first phase of 'Later, longer, fewer' FPP (1973–1979), also known as '*wan, xi, shao*' FPP, emphasized delayed marriage, long intervals between births and fewer births overall. The age at first marriage was encouraged to be at least 23 years for females and 25 years for males. Women were encouraged to give birth at age 24 or older. An interval of at least 3 years between births was recommended and the total number of children recommended per couple was no more than two. This was followed by the 'one-child' FPP (1979–1984). In 1979, recognizing rapid population growth was putting considerable strain on the socioeconomic development and considering birth control to be an essential prerequisite for sustainable development, China began to promote 'one couple, one-child' which became the most controversial FPP in the entire human history (Greenhalgh, 2003). However, four years of strict implementation of the draconian policy caused considerable dissent, especially in rural areas, leading to the third phase of 'differentiated' FPP (1984 onwards).

In 1984, the Communist Party of China (CPC) Central Committee and the State Family Planning Commission issued a Central Document 7, which allowed a second birth for rural couples with 'practical difficulties', as long as the couples adhered to regulations outlined in the local plan. This document led to divergences in policy implementation across provinces. From the mid-1980s, the provinces (autonomous regions and municipalities) under the CPC Central Committee and the State Council, were empowered to assess local socioeconomic conditions and develop context-specific population and family planning regulations.

The differentiated FPP can be broadly sub-divided into four types based on the number of children (total fertility rate) allowed per couple: 'one-child', 'one and half children', 'two children' and 'three children' policies (Greenhalgh 2003; Gu et al. 2007; NPFPC 2007). The central features of each policy, along with the provinces covered and associated population coverage, are listed in Table 2 and illustrated geographically in Figure

1. In November 2013, the new leadership of the Chinese Communist Party announced a 'softening' of the strict family planning policy: families were allowed two children if one of parents is the only child. In October 2015, the government announced it would further relax the rules to allow all couples to have two children, signalling a new era in China's FPP.

Fertility in China was high in the 1950s and 1960s with a total fertility rate (TFR) of about 6 children per woman. From 1970 onwards, fertility declined rapidly to an average of about 2.7 children per woman in 1980 and it further fell below replacement level in 1990 with 2.0 children per woman (Peng & Guo 2000). There is a general consensus from the literature that although rapid socioeconomic development across different regions contributed to boosting fertility transition in China, the effect was largely attributed to the 'Later, Longer, Fewer' policy and the subsequent more strict FPP implemented by the Chinese government (Tien 1984; Bongaarts & Greenhalgh 1985; Wolf 1986; Feeney & Yu 1987; Poston & Gu 1987; Yang & Chen 2004; Retherford et al 2005; Chen et al 2009). There is also, however, evidence to suggest that the onset of fertility transition and the recent trend towards very low fertility in China have both been driven by socioeconomic development. Birdsall and Jamison (1983) argued that China's fertility decline was correlated with income growth, even before the one-child policy was implemented. Similarly, Lavely & Freedman (1990) reported that urban fertility in China began to fall before the commencement of strict family planning programme, attributed primarily to high contraceptive use among better educated and urban elites. More recently, Cai (2010) demonstrated that the current below-replacement fertility in Jiangsu and Zhejiang province is a response to rapid social and economic development. Thus the relative role of policy versus socioeconomic development remains somewhat contested. Using birth history data from a series of cross-sectional population and family planning surveys, this research examines these issues and presents more systematic and refined evidence of the impact of FPP on sub-populations across time and space, applying decomposition techniques to understand the contribution of changes in parity progression ratios to overall fertility decline in China.

## Data

Data are drawn from six consecutive National Population and Family Planning cross-sectional surveys conducted in 1982, 1988, 1992, 1997, 2001 and 2006 respectively by the former State Family Planning Commission of China. The main purpose of the series of surveys was to document fertility, contraceptive use and other reproductive health issues of

the population. Retrospective birth history information is available for all births in five of the six surveys; with the exception of 1992 survey which recorded birth histories of only last four children. These surveys were designed to be nationally representative, except for the exclusion of Tibet in 1982 and 2006 surveys. For the purposes of this study, Tibet is excluded from the analysis and the 1992 survey is not considered in the calculation of parity based fertility measures. A systematic assessment of the data indicated generally good quality and consistent records of marriage and birth history information (Coale 1984; Qin 2016). Further information about the surveys and data quality is reported in several academic studies (Coale & Chen 1987; Feeney & Yu 1987; Feeney & Wang 1993; Feeney & Yuan 1994; Zhang & Zhao 2006; Morgan et al. 2009) although this is the first to use data from all six.

Data from 1982, 1992, 1997, 2001 and 2006 surveys were self-weighting. The dataset from the 1988 survey provided sample weights based on the sampling fraction of each province. Comparing the outcome of $TFR_{ppr}$ (total fertility rates based on parity progression ratios) calculated from un-weighted and weighted data, the discrepancies of $TFR_{ppr}$ in most years from 1977 to 1987 were all less than 2 per cent. Given that the influence of sample weights was trivial, this paper reports calculations based on un-weighted data. Data on rural-urban residence and province were used to construct a typology to classify individuals in various sub-populations exposed to different family planning policies.

**Sub-population I** are those urban residents nationwide; **sub-population II** are those rural residents in 6 provinces (Beijing, Tianjin, Shanghai, Jiangsu, Sichuan and Chongqing); **sub-population III** are those rural residents in 19 provinces (Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Guizhou, Shaanxi and Gansu); and **sub-population IV** are those rural residents in 5 provinces (Hainan, Yunnan, Qinghai, Ningxia and Xinjiang).

This classification was motivated by the main types of differentiated FPP implemented from 1984 onwards listed in Table1. Although sub-populations I and II were regulated by the 'one-child policy', it is important to differentiate between these two because of the substantial differences between the rural and urban context in China. It should be noted that even though, before 1984, the 'later, longer, fewer FPP' and 'one-child FPP' were theoretically applied nationwide without differentiating sub-populations, the compliance with the policies and subsequent fertility behaviour varied considerably among different population groups (Merli & Herber 2002). Therefore the same sub-population classification

through the whole study period (1971-2005) was adopted to examine the differential impact of FPP on fertility. In general, the socioeconomic conditions of sub-populations I, II, III, and IV can be ranked sequentially. Sub-population I represent areas with relatively better socioeconomic circumstances, with the lowest levels of illiteracy and the highest household income, whilst sub-population IV represent the poorest in terms of education and household income. Sub-population IV also has the highest representation of Non-Han ethnicity. Tables 1a, 1b and 1c show the distribution of Non-Han ethnicity, illiteracy and household income among different sub-populations based on data from the surveys held from 1982 to 2006.

## Methods

The full birth history data was used to calculate total fertility rates from parity progression ratios ($TFR_{ppr}$) based on the methods proposed by Feeney & Yu (1987), Bhrolcháin (1987) and Hinde (1998). To obtain the fertility rates up to the year of each survey, a synthetic parity cohort approach was considered. Although age-specific fertility rates (ASFRs) are widely used, period parity progression based measures of fertility are better suited for examining the policy influence on fertility behaviour. This is because FPP in China have always had clear focus on parity and birth spacing (Feeney & Yu 1987). For each survey, the parity progression ratio (PPR) was estimated as the proportion of women who have had an additional birth within ten years. The assumption has been made that women who had not had a $(j+1)^{th}$ parity within ten years after their $j^{th}$ parity were unlikely to progress to next parity. PPRs up to the ninth birth order for 1982 and 1988 surveys and up to the fourth birth order for 1997, 2001 and 2006 surveys were examined. The records were truncated at a woman's $49^{th}$ birthday at the time of survey. Women's marriage age was truncated at age 30, because first marriages after age 30 were rare. According to 1982 Population Census and 2005 Population Survey conducted by the National Bureau of Statistics, the proportion of women unmarried for the age group 30-34 was around 1 percent in the 1982, and over 2 percent in 2005 (Lu & Zhai 2009). Therefore the potential contribution of marriage beyond age 30 on the total fertility rate is not expected to be large. In the analysis, multiple births were recoded as second or later birth.

For the calculation of parity progression ratios, we first estimated a series of proportions ($q_x$) for woman who had their $j^{th}$ birth in the $x^{th}$ year before the particular year and had their $(j+1)^{th}$ birth in the particular year. x ranges from 0 to 10.

$$q_x = \frac{\begin{array}{c}number\ of\ women\ who\ had\ their\ jth\ birth\ in\ the\ xth\ year\ before\ the\ current\ year \\ and\ had\ their\ (j+1)th\ birth\ in\ the\ current\ year\end{array}}{\begin{array}{l}total\ number\ of\ women\ who\ had\ a\ jth\ birth\ in\ the\ xth\ year\ before\ the\ current\ year \\ -number\ of\ these\ women\ who\ have\ already\ had\ their\ (j+1)th\ birth\ before\ the\ start\ of\ the\ current\ year\end{array}}$$

The parity progression ratio ($p_j$) based on the $(j+1)^{th}$ births occurring in a particular year to woman who had their $j^{th}$ births in a range of 0-10 during previous years is calculated as

$$p_j = 1-\{(1-q_0)\times(1-q_1)\times(1-q_2)\times...\}$$

The progression ratio from birth to the first marriage is calculated in the similar way. For any given year, let $p_M$ denote the period ratio for progression from birth to first marriage, $p_0$ the period ratio for progression from first marriage to first birth, and $p_j$ 'the period ratio for progression from $j^{th}$ to $(j+1)^{th}$ birth, i = 1, 2, .... The statistics $p_0$, $p_1$, $p_2$, ... are period parity progression ratios and $TFR_{ppr}$, an index of total fertility, is calculated as:

$$TFR_{ppr} = p_M p_0 + p_M p_0 p_1 + p_M p_0 p_1 p_2 \times \ldots$$

Using the survey year and the retrospective birth history data, period $TFR_{ppr}$ were then calculated for each sub-population, as well as for the whole nation.

In order to examine the contribution of marriage and each successive PPRs on fertility change $\Delta TFR_{ppr}$, $\Delta TFR_{ppr}$ was decomposed following the principles outlined by Ogawa and Retherford (1993). For any given time period year A to year B, to calculate the contribution of marriage progression $\Delta p_M$ to $\Delta TFR_{ppr}$ , firstly, a standardized value called $TFR_{ppr}$ (M) was calculated using year B value of $p_M$ but the year A values of the remaining PPPRs (Period Parity Progression Ratios). The contribution of $\Delta p_M$ to $\Delta$ $TFR_{ppr}$ was $TFR_{ppr}$ (M) – $TFR_{ppr}$ (year A).

To calculate the additional contribution of $\Delta p_0$ to $\Delta$ $TFR_{ppr}$, again a standardized value of $TFR_{ppr}$ (M,0) was calculated using the year B value of $p_M$ and $p_0$ and the year A values of the remaining PPPRs. The additional contribution of $\Delta p_0$ to $\Delta TFR_{ppr}$ was $TFR_{ppr}$ (M,0) – $TFR_{ppr}$(M). Following the same method, the contributions from $\Delta p_1$, $\Delta p_2$, $\Delta p_3$, $\Delta p_4$ and so on were calculated. The last contribution added to $\Delta TFR_{ppr}$ was calculated as the difference between $TFR_{ppr}$ (year B) and $TFR_{ppr}$ (year A).

Survey data in 1982, 1988, 1997, 2001 and 2006 were analysed independently. Annual PPPRs and $TFR_{ppr}$ were calculated for up to 10 years prior to each survey. For instance, fertility estimates in 1971-1981 were calculated from the 1982 survey, estimates in 1977-1987 from the 1988 survey and so on. Thus, for some years there were more than one

estimates: 1977-1981 from the 1982 and 1988 surveys respectively; 1986-1987 from the 1988 and 2001 surveys respectively; 1990-1994 from the 1997 and 2001 surveys respectively; 1995-1996 from 1997, 2001 and 2006 surveys respectively, and 1997-2000 from 2001 and 2006 surveys respectively. Theoretically, any duplicated annual estimate for the analysis was acceptable because each survey was designed to be nationally representative. In practice for those duplicated annual estimates the annual fertility estimates for 1977-1981 from the 1982 survey, estimates in 1986-1987 from the 1988 survey, estimates in 1990-1996 from the 1997 survey, and estimates in 1997-2000 from the 2001 survey were used.

It should be noted that non-marital fertility is rare in China (Banister & Harbaugh 1994; Lu & Zhai 2009) and generally data on pre-marital births are either ignored or not published in official statistics. Marriage continues to be universal and childbearing within marriage is a social norm across China.

## Results

This section first presents fertility trends and differentials by FPP, followed by the results showing fertility decomposition during the different FPP regime periods.

### *Fertility trends and differentials*

Table 3 and Figure 2 show $TFR_{ppr}$ and PPPRs for China as a whole from 1971 to 2005. These trends are consistent with the patterns expected during the implementation of the 'later, longer, fewer' policy in the 1970s and the introduction of the strict one-child policy in 1979. After 1984, when the strict one-child policy was gradually relaxed, the PPPRs at parity 1 stopped declining rapidly. Progression ratios from first to second birth were high and stable during 1970s, and dropped sharply in 1981 following the introduction of the one-child FPP and continued to decline ever since. Progression ratios to third and higher births declined significantly during the 1970s when the practice of 'later, longer, fewer' FPP was encouraged. From 1980 onwards, all higher parity progression ratios declined sharply, reflecting the effective implementation of one-child FPP. These patterns are highlighted in red boxes (see Table 3). $TFR_{ppr}$ reached a plateau from 1977 to 1979, just before the introduction of the one-child FPP. Period parity progression ratios also showed similar trends.

Now move to examine the trends in differential fertility amongst the sub-populations of women, regulated by different FPP. Figure 3 presents the $TFR_{ppr}$ by sub-populations regulated by different FPP. The substantial fertility decline in China since 1970s is reflected

in decline in fertility of all sub-populations. Interestingly, however, there are marked differences in the initial level of fertility in 1975 across sub-populations. The $TFR_{ppr}$ of urban women regulated by 'one-child FPP' was lower than those of rural women who were regulated by 'one and half children FPP', which in turn was lower than those regulated by 'two children FPP' at all observed point in time. Over time, the gaps between the sub-populations regulated by different FPP have narrowed, and have remained constant in recent years.

The trends in PPPRs for each sub-population are shown in Tables 4a-4d and graphically illustrated in Figures 4a-4d. All sub-populations share similar patterns in terms of progression from first marriage to first birth, suggesting that both marriage and transition to first birth remain universal across China. Thus the following results will be on the rest of parity progressions, particularly those making transitions from parity 1-2 and parity 2-3 in the different FPP periods.

**1971-1979 (later, longer, fewer FPP):** During the period of the 'later, longer, fewer' policy, the progression from parity 1-2 among sub-population I who lived in urban areas of the whole country dropped from 0.97 to 0.81; among sub-population II, the figures declined slightly from 0.98 to 0.96; among sub-population III and sub-population IV, the progression rate remained high around 0.98. The results indicate that during this period a small share of urban residents started to control their fertility to less than two children, even though the FPP did not restrict the family size less than two children.

For the parity progression from 2 to 3, the ratios declined sharply from 0.78 to 0.26 and 0.97 to 0.45 among sub-population I and sub-population II respectively. Among sub-population III, the ratio decreased from 0.98 to 0.84, while among sub-population IV, the ratio remained high around 0.96 during this period. The results indicate that 'later, longer, fewer' FPP was effective and widely accepted among sub-populations I and II. However, this FPP was not well accepted by the other two sub-populations. During the 1970s, in sub-population IV, about 96 per cent of women who had second birth went on to have a third birth. Although there was some reduction among sub-population III, still about 84 per cent of women who had a second birth have had their third birth by 1979.

For higher parity progression in sub-population I, only 17 per cent of women who had a third birth had the fourth birth by 1979, and only 14 per cent of women who had their fourth birth had their fifth birth among sub-population I. The corresponding ratios were 26 per cent

and 19 per cent respectively among sub-population II, 62 per cent and 44 per cent among sub-population III, and 86 per cent and 73 per cent among sub-population IV. Again, these results reflect a wider acceptance of FPP in sub-populations I and II accompanied by overall better socioeconomic conditions when compared to sub-populations III and IV.

**1979-1984 (one-child FPP)** Among sub-population I, the progression from parity 1-2 declined sharply, from 0.81 in 1979 to 0.19 in 1984, which suggest that the strict one-child FPP was implemented very effectively among sub-population I. Among sub-populations II, III and IV, the ratios declined from 0.96 to 0.39, 0.99 to 0.85 and 0.98 to 0.96 respectively, highlighting that although the policy had an effect, it was not universally adopted. Even in sub-population II (rural residents of the 6 'developed' provinces of Beijing, Tianjin, Shanghai, Jiangsu, Sichuan and Chongqing), about 39 per cent of women who already had a first birth did not follow the one-child FPP and this was 85 per cent amongst rural residents in the other parts of the country (sub-population III) and 96 per cent (sub-population IV). This provides clear and compelling evidence of the level of non-compliance of the one-child policy which subsequently led to the differentiated family planning policy that continued until 2013.

The period 1984-1986 was not considered in the decomposition analysis since the majority of provincial regulations were still under process of formulation during this period.

**1986-2005 (differentiated FPP):** During this period, the progression from parity 1-2 declined significantly from 0.25 to 0.14 and from 0.66 to 0.21 respectively among sub-populations I and II, both of which were subject to the 'one-child only' FPP. The progression ratio from parity 1-2 and parity 2-3 among sub-population III, who were subject to the 'one and half children FPP', decreased from 0.91 to 0.63 and 0.49 to 0.01 respectively, reflecting that the policy was effective in reducing third births to virtually zero, and second births were curtailed. Among sub-population IV, who were subject to 'two children FPP', the progression from parity 1-2 and parity 2-3 reduced from 0.95 to 0.66 and 0.92 to 0.30 respectively, again highlighting the effectiveness of the policy in reducing third births. Actual fertility amongst each sub-population was slightly higher than that implied by the differentiated FPP targets, reflecting the fact that there were some exceptions or non-compliance for each type of FPP. Nevertheless, the results demonstrate evidence that all four types of FPP were effective and widely implemented.

***Decomposition of fertility change***

Table 5 shows the results of decomposition of $TFR_{ppr}$ by different FPP period for the national and sub-populations. $TFR_{ppr}$ reached a plateau during 1977-79. To examine this trend, we divided the decomposition of later, longer, fewer FPP periods into 1971 to 1977 and 1977 to 1979. Over the entire period from 1971 to 2005, the $TFR_{ppr}$ declined by 4.6 children per woman, with substantial reduction in the 1-2 and 2-3 parity progressions accounting for 98 per cent of the overall decline.

**1971-1977 (early stage of later, longer, fewer FPP):** During the first six years of the 'later, longer, fewer' policy, the $TFR_{ppr}$ declined by 2.7 children per woman from 6.04 to 3.29. This decline was largely attributed to a decrease in higher parity progression ratios, with approximately 94 per cent of the change being due to reduction in parity progressions at three, four, five and six. The results reflect that the 'later, longer, fewer' FPP was being effectively implemented among the general population as a whole during this period.

**1977-1979 (later stage of later, longer, fewer FPP):** In the latter years of the policy, however, the $TFR_{ppr}$ remained almost constant. The drop of 0.1 in the $TFR_{ppr}$ mainly resulted from a decline in progression to parity three, four and five. However it appears that the policy had run its course and further reductions in total fertility proved difficult to achieve, stimulating a change in course and the introduction of a more stringent policy.

**1979-1984 (one-child FPP):** During the period of strict enforcement of the one-child policy, the $TFR_{ppr}$ dropped from 3.2 to 2.1. The decomposition of fertility change showed that a reduction of progression from parity 1-2 contributed significantly to the overall decline in fertility at the national level, accounting for 69 per cent. In addition, reduction of progression from parity 2 to 3 contributed 23 per cent. The results are broadly consistent with the expected impact of FPP during this period of time.

**1986-2005 (differentiated FP policies):** During this period, when different policies were applied in different parts of the country, the national $TFR_{ppr}$ continued to decline from 2.2 to 1.4 children per woman. The decomposition analysis illustrates that 74 per cent of fertility decline during this period was attributed to a reduction of progression from parity 1 to 2 and 33 per cent attributed to a reduction from parity 2 to 3.

Overall the results provide clear evidence of the influence of family planning policy on fertility decline in China. The later, longer, fewer FPP was effective in reducing higher parity

births, and fertility reaching plateau at the late stage of this policy possibly led to the initiation of one-child FPP.

## Discussion

The prevailing socioeconomic conditions were instrumental in adapting and accelerating FPP response to reducing fertility levels across China. The classification of FPP based sub-populations is a reflection of the socioeconomic conditions taking into account of mainly the composition and distribution of ethnic groups. As a result, it is difficult to accurately differentiate the independent effects of FPP and socioeconomic factors associated with reduction in total fertility and parity progression rates. A key contribution of this research is the evidence highlighting different trajectories of parity transitions and convergence of total fertility rates across sub-populations which have had different socioeconomic conditions.. Our study found that the fertility differentials explained by the FPP remain convincing in the transitional and post-transitional stage, providing an alternative view at the macro level to that of Cai (2010) and others. However, the disaggregation of fertility change amongst different sub-populations indicates that social economic conditions have played an important role for policy implementation. Women living in the geographical regions regulated by the 'one and half children FPP' tend to have higher fertility than those regulated by the 'one-child FPP'; and those regulated by 'two children FPP' tend to have higher fertility than those regulated by 'one and half children FPP'. The implication of this finding is that FPP remains an important determinant of China's overall level of fertility. Tsui (2001) and McNicoll (1975, 2001) affirm a potential direct effect of policy on fertility transition through improving access to fertility-regulation methods and through diffusion of supportive ideas. The Chinese government was indeed proactive in mobilizing resources and programme coordination aimed at reducing fertility through a variety of strategic top-down administrative approaches, such as stringent legislation, wider dissemination of family planning information, provision of incentive-oriented and extended contraceptive services and political control . Over time, the role and influence of national FPP interventions and programmes have been differentially implemented across sub-populations, with the national policies (such as later, longer, fewer and the one-child policy) being more readily adopted by those who were relatively better off in terms of socioeconomic development than their counterparts. By the time the differentiated policy was introduced in 1986, fertility in urban areas was already below replacement level. The results suggest that socioeconomic conditions expedited the extent and speed of FPP response across China.

The findings reconfirm the overall patterns of fertility change in China, which are broadly consistent with evidence reported elsewhere, for example, Feeney & Yu (1987), Luther, Feeney & Zhang (1990), Feeney & Wang (1993), Freedman & Wang (1993), Feeney & Yuan (1994), Zeng (1996) and Retherford et al (2005). This paper adds new evidence on PPPRs among sub-populations differentially exposed to FPP and how these contributed to policy impact on $TFR_{ppr}$ across time and place. The classification of sub-populations defined by different FPP enables us to understand the dynamics and heterogeneity of fertility trends and variations across China.

More recently, there has been a series of public debates about the implications of FPP on future population challenges in China particularly on issues related to labour shortages, population ageing and skewed sex ratios. The Chinese government has already taken new steps to reform the FPP. The most recent FPP reform by all means is a cautious step, relaxing the policy to two children rather than removing the policy altogether, warranting concerns that the relaxation might trigger a baby boom (Basten & Jiang 2015). On the other hand, findings from recent fertility intention surveys point towards a TFR far below replacement level in the foreseeable future (Zhuang et al. 2014, Zheng et al. 2009). Mao & Lu (2013) argue that physiological factors and practical pressures will take precedence over fertility intention and preferences in reducing the actual fertility rate even lower than predicted. Alongside, with the increasing women's education and participation in economic activities, it is likely that the fertility increase might not be as large as is often assumed.

There is evidence that socioeconomic factors have mediated the influence of FPP on fertility change over time and place, with high compliance in the most urban, industrialized areas and weaker acceptance among women living in the poorest rural areas. This research confirms potential impact of FPP throughout the fertility transition process, including the persistent role of policy in the post-transitional stage at a very low fertility level. Given the current changes in FPP, follow-up research is needed to monitor reproductive preferences and future trends in fertility especially in urban areas and among different socioeconomic groups. Although marriage remains widespread both socially and culturally across China, younger generation tend to delay marriage increasingly towards late twenties. According to 2010 census, there is also gradual trend in the proportion of women remaining single, estimated at little over 5 percent (National Bureau of Statistics of China, 2012). Future research may consider truncation of age at first marriage beyond 30 to reduce potential underestimation of marriage effect on parity progressions and the total fertility rate.**References**

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**Table 1a.** Percentage of Non-Han ethnic women aged 15-49 by sub-population, 1982-2006.

| Sub-population | 1982 | 1988 | 1992 | 1997 | 2001 | 2006 |
|---|---|---|---|---|---|---|
| I | 2.3 | 6.9 | 1.9 | 5.4 | 6.7 | 8.1 |
| II | 2.5 | 2.6 | 4.7 | 2.6 | 1.5 | 1.3 |
| III | 5.9 | 8.2 | 5.6 | 8.4 | 8.2 | 9.5 |
| IV | 47.7 | 43.7 | 42.7 | 57.0 | 59.9 | 52.5 |
| Overall (China) | 6.7 | 10.5 | 6.5 | 9.1 | 9.4 | 10.9 |

Note: calculations based on data from 1982, 1988, 1992, 1997, 2001 and 2006 surveys

**Table 1b.** Percentage of women aged 15-49 by level of education and sub-population, 1982-2006

| | 1982 | | | 1988 | | | 1992 | | | 1997 | | | 2001 | | | 2006 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sub-population** | **None** | **Primary** | **More than primary** | **None** | **Primary** | **More than primary** | **None** | **Primary** | **More than primary** | **None** | **Primary** | **More than primary** | **None** | **Primary** | **More than primary** | **None** | **Primary** | **More than primary** |
| I | 7.3 | 20.5 | 72.2 | 7.9 | 17.6 | 74.5 | 3.7 | 12.1 | 84.2 | 9.6 | 35.8 | 54.6 | 3.1 | 9.3 | 87.6 | 1.6 | 9.2 | 89.2 |
| II | 41.2 | 32.6 | 26.2 | 36.0 | 32.4 | 31.6 | 22.6 | 39.8 | 37.6 | 36.5 | 32.1 | 31.4 | 19.7 | 36.4 | 43.9 | 6.3 | 30.3 | 63.4 |
| III | 43.2 | 32.5 | 24.3 | 43.2 | 32.8 | 24.0 | 25.6 | 39.3 | 35.1 | 35.6 | 32.1 | 32.3 | 20.6 | 34.3 | 45.1 | 11.1 | 34.8 | 54.1 |
| IV | 53.2 | 30.4 | 16.4 | 56.2 | 26.2 | 17.6 | 35.5 | 39.2 | 25.3 | 41.0 | 15.2 | 43.8 | 32.9 | 42.7 | 24.4 | 15.6 | 41.0 | 43.4 |
| Overall (China) | 37.3 | 30.4 | 32.3 | 35.1 | 28.5 | 36.4 | 21.2 | 33.8 | 45.0 | 29.9 | 32.2 | 37.9 | 16.6 | 28.6 | 54.8 | 7.7 | 26.0 | 66.3 |

Note: calculations based on data from 1982, 1988, 1992, 1997, 2001 and 2006 surveys

**Table 1c.** Mean annual household income (*Renminbi*, Yuan) by sub-population, 1982-2006

| Sub-population | 1982 | 1988 | 1992 | 1997 | 2001 | 2006 |
|---|---|---|---|---|---|---|
| I | 494 | 1187 | 2026 | 5151 | 6860 | 11442 |
| II | 349 | 837 | 1277 | 3273 | 4039 | 6400 |
| III | 267 | 521 | 750 | 2034 | 2272 | 3426 |
| IV | 240 | 501 | 694 | 1512 | 1793 | 2672 |
| Urban China | 535 | 1180 | 2027 | 5160 | 6860 | 11760 |
| Rural China | 270 | 545 | 784 | 2090 | 2366 | 3587 |

Estimated from National Bureau of Statistics (2010)

**Table 2.** Description of the main types of differentiated FPP

| Type of FPP | Regions/ provinces covered | Nature/ features of the policy | Percentage of population covered |
|---|---|---|---|
| One child | Nationwide urban *Hukou* residents<br>Rural *Hukou* residents in six provinces (municipalities): Beijing, Tianjin, Shanghai, Jiangsu, Sichuan and Chongqing | Couple can have only one child | 36 |
| One and half children | Rural *Hukou* residents in nineteen provinces (autonomous regions and municipalities): Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Guizhou, Shaanxi, Gansu. | If the first child is a girl, then a second child is permitted | 53 |
| Two children | Rural *Hukou* residents in five provinces (autonomous regions): Hainan, Yunnan, Qinghai, Ningxia, Xinjiang | Couple can have two children | 10 |
| Three children | Ethnic minority farmers in Qinghai, Ningxia (mountainous areas) and Xinjiang; ethnic minority farmers in Hainan and Inner Mongolia whose first two children are girls; ethnic minority farmers in Yunnan border areas and sparsely populated minority residents in Yunnan and Heilongjiang. | Couple can have three children | 2 |

**Table 3.** Period parity progression ratio-based total fertility rates ($TFR_{ppr}$) and period parity progression ratios: China 1971-2005

| Year | $TFR_{ppr}$ | Period parity progression ratios | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $p_M$ | $p_0$ | $p_1$ | $p_2$ | $p_3$ | $p_4$ | $p_5$ | $p_6$ | $p_7$ | $p_{8+}$ |
| 1971 | 6.04 | 0.982 | 0.980 | 0.983 | 0.949 | 0.887 | 0.857 | 0.853 | 0.810 | 0.807 | 0.830 |
| 1972 | 5.41 | 0.984 | 0.979 | 0.978 | 0.928 | 0.843 | 0.816 | 0.790 | 0.743 | 0.746 | 0.753 |
| 1973 | 4.82 | 0.974 | 0.977 | 0.977 | 0.916 | 0.812 | 0.743 | 0.701 | 0.683 | 0.668 | 0.667 |
| 1974 | 4.45 | 0.985 | 0.987 | 0.980 | 0.886 | 0.778 | 0.672 | 0.626 | 0.596 | 0.545 | 0.552 |
| 1975 | 3.88 | 0.985 | 0.986 | 0.968 | 0.834 | 0.696 | 0.589 | 0.528 | 0.501 | 0.485 | 0.476 |
| 1976 | 3.56 | 0.983 | 0.987 | 0.968 | 0.793 | 0.635 | 0.506 | 0.480 | 0.450 | 0.400 | 0.427 |
| 1977 | 3.29 | 0.987 | 0.985 | 0.960 | 0.742 | 0.564 | 0.470 | 0.411 | 0.385 | 0.363 | 0.310 |
| 1978 | 3.24 | 1.000 | 0.989 | 0.960 | 0.716 | 0.530 | 0.457 | 0.374 | 0.357 | 0.312 | 0.309 |
| 1979 | 3.23 | 0.995 | 0.992 | 0.963 | 0.704 | 0.544 | 0.435 | 0.423 | 0.335 | 0.332 | 0.275 |
| 1980 | 2.73 | 0.998 | 0.989 | 0.909 | 0.578 | 0.430 | 0.327 | 0.291 | 0.275 | 0.303 | 0.245 |
| 1981 | 2.67 | 0.998 | 0.992 | 0.866 | 0.564 | 0.440 | 0.376 | 0.376 | 0.305 | 0.364 | 0.284 |
| 1982 | 2.67 | 0.999 | 0.991 | 0.815 | 0.586 | 0.445 | 0.506 | 0.441 | 0.444 | 0.433 | 0.447 |
| 1983 | 2.19 | 0.997 | 0.987 | 0.674 | 0.490 | 0.386 | 0.470 | 0.382 | 0.340 | 0.345 | 0.405 |
| 1984 | 2.09 | 0.996 | 0.988 | 0.624 | 0.486 | 0.387 | 0.457 | 0.370 | 0.334 | 0.365 | 0.361 |
| 1985 | 2.05 | 0.997 | 0.982 | 0.644 | 0.446 | 0.335 | 0.435 | 0.363 | 0.330 | 0.322 | 0.367 |
| 1986 | 2.19 | 0.997 | 0.985 | 0.713 | 0.470 | 0.359 | 0.327 | 0.369 | 0.376 | 0.402 | 0.329 |
| 1987 | 2.33 | 0.997 | 0.989 | 0.748 | 0.502 | 0.401 | 0.376 | 0.385 | 0.392 | 0.423 | 0.435 |
| 1988 | 2.20 | 0.998 | 0.995 | 0.741 | 0.469 | 0.371 | | | | | |
| 1989 | 2.16 | 1.000 | 0.991 | 0.723 | 0.465 | 0.371 | | | | | |
| 1990 | 2.08 | 0.996 | 0.998 | 0.723 | 0.387 | 0.312 | | | | | |
| 1991 | 1.74 | 0.998 | 0.989 | 0.581 | 0.266 | 0.199 | | | | | |
| 1992 | 1.66 | 0.998 | 0.991 | 0.538 | 0.218 | 0.194 | | | | | |
| 1993 | 1.55 | 0.981 | 0.978 | 0.489 | 0.218 | 0.201 | | | | | |
| 1994 | 1.52 | 0.997 | 0.968 | 0.467 | 0.193 | 0.153 | | | | | |
| 1995 | 1.46 | 0.999 | 0.982 | 0.421 | 0.141 | 0.152 | | | | | |
| 1996 | 1.44 | 1.000 | 0.981 | 0.384 | 0.183 | 0.202 | | | | | |
| 1997 | 1.43 | 0.994 | 0.982 | 0.392 | 0.172 | 0.152 | | | | | |
| 1998 | 1.45 | 0.991 | 0.982 | 0.424 | 0.130 | 0.168 | | | | | |
| 1999 | 1.41 | 0.997 | 0.974 | 0.377 | 0.169 | 0.225 | | | | | |
| 2000 | 1.43 | 0.997 | 0.981 | 0.411 | 0.111 | 0.148 | | | | | |
| 2001 | 1.41 | 0.990 | 0.958 | 0.401 | 0.165 | 0.247 | | | | | |
| 2002 | 1.38 | 0.993 | 0.968 | 0.382 | 0.123 | 0.179 | | | | | |
| 2003 | 1.37 | 0.993 | 0.946 | 0.400 | 0.113 | 0.196 | | | | | |
| 2004 | 1.44 | 0.998 | 0.966 | 0.440 | 0.117 | 0.118 | | | | | |
| 2005 | 1.43 | 0.999 | 0.969 | 0.437 | 0.081 | 0.071 | | | | | |

Note: calculations based on data from 1982, 1988, 1997, 2001 and 2006 surveys

**Table 4a.** Period parity progression ratios for sub-population I: China 1971-2005

| Year | $TFR_{ppr}$ | Period parity progression ratios | | | | | |
|---|---|---|---|---|---|---|---|
| | | $p_M$ | $p_0$ | $p_1$ | $p_2$ | $p_3$ | $p_4$ |
| 1971 | 3.17 | 0.976 | 0.972 | 0.966 | 0.784 | 0.551 | 0.492 |
| 1972 | 3.07 | 0.983 | 0.989 | 0.939 | 0.735 | 0.519 | 0.465 |
| 1973 | 2.92 | 0.982 | 0.984 | 0.935 | 0.699 | 0.499 | 0.325 |
| 1974 | 2.60 | 0.980 | 0.984 | 0.922 | 0.582 | 0.351 | 0.252 |
| 1975 | 2.38 | 0.979 | 0.984 | 0.875 | 0.492 | 0.308 | 0.248 |
| 1976 | 2.21 | 0.983 | 0.978 | 0.853 | 0.385 | 0.297 | 0.202 |
| 1977 | 2.10 | 0.958 | 0.968 | 0.852 | 0.391 | 0.213 | 0.162 |
| 1978 | 2.04 | 0.952 | 0.987 | 0.859 | 0.293 | 0.206 | 0.133 |
| 1979 | 1.98 | 0.982 | 0.980 | 0.807 | 0.261 | 0.168 | 0.142 |
| 1980 | 1.59 | 0.977 | 0.967 | 0.619 | 0.102 | 0.092 | 0.051 |
| 1981 | 1.34 | 0.994 | 0.987 | 0.344 | 0.062 | 0.073 | 0.004 |
| 1982 | 1.44 | 0.986 | 0.986 | 0.386 | 0.177 | 0.259 | 0.267 |
| 1983 | 1.22 | 0.982 | 0.982 | 0.221 | 0.165 | 0.221 | 0.271 |
| 1984 | 1.20 | 0.983 | 0.983 | 0.192 | 0.187 | 0.229 | 0.296 |
| 1985 | 1.20 | 0.973 | 0.973 | 0.215 | 0.198 | 0.211 | 0.270 |
| 1986 | 1.28 | 0.979 | 0.979 | 0.250 | 0.238 | 0.271 | 0.292 |
| 1987 | 1.29 | 0.980 | 0.980 | 0.261 | 0.240 | 0.235 | 0.293 |
| 1988 | 1.28 | 1.000 | 1.000 | 0.215 | 0.231 | 0.323 | |
| 1989 | 1.18 | 0.993 | 0.978 | 0.169 | 0.208 | 0.333 | |
| 1990 | 1.22 | 0.989 | 0.997 | 0.227 | 0.026 | 0.333 | |
| 1991 | 1.09 | 0.998 | 1.000 | 0.089 | 0.032 | 0.000 | |
| 1992 | 1.17 | 0.996 | 1.000 | 0.167 | 0.050 | 0.250 | |
| 1993 | 1.07 | 0.961 | 0.925 | 0.153 | 0.177 | 1.000 | |
| 1994 | 1.07 | 0.986 | 0.937 | 0.129 | 0.130 | 1.000 | |
| 1995 | 1.02 | 1.000 | 0.951 | 0.056 | 0.313 | 0.000 | |
| 1996 | 0.97 | 1.000 | 0.908 | 0.067 | 0.034 | 0.000 | |
| 1997 | 1.08 | 0.980 | 0.981 | 0.120 | 0.064 | 0.000 | |
| 1998 | 1.09 | 0.976 | 0.974 | 0.134 | 0.084 | 0.000 | |
| 1999 | 1.01 | 0.977 | 0.936 | 0.100 | 0.077 | 0.167 | |
| 2000 | 1.03 | 0.987 | 0.953 | 0.088 | 0.059 | 0.167 | |
| 2001 | 1.12 | 0.966 | 0.963 | 0.181 | 0.088 | 0.285 | |
| 2002 | 1.11 | 0.988 | 0.974 | 0.137 | 0.092 | 0.056 | |
| 2003 | 1.04 | 0.989 | 0.934 | 0.116 | 0.068 | 0.071 | |
| 2004 | 1.10 | 0.997 | 0.966 | 0.137 | 0.058 | 0.111 | |
| 2005 | 1.10 | 0.983 | 0.971 | 0.142 | 0.058 | 0.000 | |

Note: calculations based on data from 1982, 1988, 1997, 2001 and 2006 surveys

**Table 4b.** Period parity progression ratios for sub-population II: China 1971-2005

| Year | $TFR_{ppr}$ | Period parity progression ratios | | | | | |
|---|---|---|---|---|---|---|---|
| | | $p_M$ | $p_0$ | $p_1$ | $p_2$ | $p_3$ | $p_4$ |
| 1971 | 4.34 | 0.983 | 0.983 | 0.981 | 0.969 | 0.884 | 0.855 |
| 1972 | 4.00 | 0.972 | 0.980 | 0.986 | 0.939 | 0.796 | 0.741 |
| 1973 | 3.72 | 0.974 | 0.977 | 0.988 | 0.909 | 0.684 | 0.661 |
| 1974 | 3.64 | 0.980 | 0.994 | 0.982 | 0.869 | 0.662 | 0.592 |
| 1975 | 3.41 | 0.988 | 0.992 | 0.972 | 0.796 | 0.615 | 0.538 |
| 1976 | 3.13 | 0.997 | 0.984 | 0.974 | 0.730 | 0.510 | 0.401 |
| 1977 | 2.88 | 0.986 | 0.989 | 0.978 | 0.669 | 0.387 | 0.261 |
| 1978 | 2.59 | 0.997 | 0.995 | 0.936 | 0.547 | 0.282 | 0.149 |
| 1979 | 2.49 | 0.996 | 0.996 | 0.955 | 0.448 | 0.258 | 0.189 |
| 1980 | 2.02 | 0.997 | 0.989 | 0.780 | 0.302 | 0.131 | 0.133 |
| 1981 | 2.14 | 0.999 | 0.993 | 0.756 | 0.406 | 0.233 | 0.270 |
| 1982 | 1.96 | 0.993 | 0.993 | 0.751 | 0.239 | 0.255 | 0.352 |
| 1983 | 1.60 | 0.991 | 0.991 | 0.509 | 0.187 | 0.198 | 0.304 |
| 1984 | 1.45 | 0.990 | 0.990 | 0.390 | 0.183 | 0.219 | 0.196 |
| 1985 | 1.53 | 0.985 | 0.985 | 0.463 | 0.199 | 0.213 | 0.262 |
| 1986 | 1.89 | 0.992 | 0.992 | 0.663 | 0.316 | 0.187 | 0.265 |
| 1987 | 1.77 | 0.990 | 0.990 | 0.637 | 0.207 | 0.229 | 0.215 |
| 1988 | 1.76 | 0.976 | 1.000 | 0.635 | 0.241 | 0.100 | |
| 1989 | 2.05 | 1.000 | 0.995 | 0.725 | 0.377 | 0.224 | |
| 1990 | 1.84 | 1.000 | 1.000 | 0.606 | 0.314 | 0.222 | |
| 1991 | 1.52 | 0.986 | 0.954 | 0.496 | 0.237 | 0.050 | |
| 1992 | 1.47 | 0.977 | 1.000 | 0.441 | 0.129 | 0.071 | |
| 1993 | 1.40 | 0.980 | 0.968 | 0.396 | 0.189 | 0.091 | |
| 1994 | 1.38 | 1.000 | 0.987 | 0.357 | 0.128 | 0.000 | |
| 1995 | 1.47 | 1.000 | 1.000 | 0.444 | 0.069 | 0.000 | |
| 1996 | 1.27 | 1.000 | 0.969 | 0.283 | 0.098 | 0.053 | |
| 1997 | 1.23 | 0.979 | 1.000 | 0.233 | 0.074 | 0.083 | |
| 1998 | 1.24 | 1.000 | 0.974 | 0.262 | 0.043 | 0.000 | |
| 1999 | 1.25 | 1.000 | 0.967 | 0.263 | 0.106 | 0.056 | |
| 2000 | 1.23 | 0.994 | 0.983 | 0.236 | 0.082 | 0.125 | |
| 2001 | 1.10 | 0.978 | 0.966 | 0.108 | 0.508 | | |
| 2002 | 1.14 | 1.000 | 0.959 | 0.153 | 0.217 | | |
| 2003 | 1.16 | 0.977 | 0.985 | 0.161 | 0.244 | | |
| 2004 | 1.24 | 1.000 | 1.000 | 0.192 | 0.231 | | |
| 2005 | 1.25 | 1.000 | 0.986 | 0.210 | 0.289 | | |

Note: calculations based on data from 1982, 1988, 1997, 2001 and 2006 surveys

**Table 4c.** Period parity progression ratios for sub-population III: China 1971-2005

| Year | $TFR_{ppr}$ | Period parity progression ratios | | | | | |
|---|---|---|---|---|---|---|---|
| | | $p_M$ | $p_0$ | $p_1$ | $p_2$ | $p_3$ | $p_4$ |
| 1971 | 4.54 | 0.986 | 0.983 | 0.989 | 0.979 | 0.940 | 0.902 |
| 1972 | 4.39 | 0.991 | 0.978 | 0.985 | 0.966 | 0.908 | 0.841 |
| 1973 | 4.20 | 0.975 | 0.978 | 0.983 | 0.960 | 0.888 | 0.759 |
| 1974 | 4.16 | 0.990 | 0.986 | 0.988 | 0.949 | 0.861 | 0.658 |
| 1975 | 3.85 | 0.994 | 0.986 | 0.982 | 0.908 | 0.766 | 0.540 |
| 1976 | 3.67 | 0.988 | 0.989 | 0.984 | 0.889 | 0.697 | 0.463 |
| 1977 | 3.50 | 0.991 | 0.984 | 0.976 | 0.851 | 0.638 | 0.468 |
| 1978 | 3.49 | 0.996 | 0.988 | 0.982 | 0.834 | 0.619 | 0.463 |
| 1979 | 3.53 | 0.998 | 0.992 | 0.988 | 0.841 | 0.620 | 0.444 |
| 1980 | 3.04 | 0.999 | 0.990 | 0.975 | 0.697 | 0.465 | 0.338 |
| 1981 | 2.97 | 1.000 | 0.988 | 0.957 | 0.671 | 0.460 | 0.364 |
| 1982 | 3.02 | 1.000 | 0.993 | 0.949 | 0.691 | 0.483 | 0.375 |
| 1983 | 2.60 | 0.999 | 0.989 | 0.877 | 0.565 | 0.396 | 0.312 |
| 1984 | 2.54 | 0.999 | 0.990 | 0.853 | 0.554 | 0.390 | 0.305 |
| 1985 | 2.43 | 0.999 | 0.986 | 0.871 | 0.482 | 0.324 | 0.280 |
| 1986 | 2.53 | 0.999 | 0.987 | 0.910 | 0.490 | 0.368 | 0.305 |
| 1987 | 2.67 | 0.999 | 0.993 | 0.941 | 0.525 | 0.396 | 0.331 |
| 1988 | 2.62 | 1.000 | 0.993 | 0.953 | 0.528 | 0.367 | |
| 1989 | 2.53 | 1.000 | 0.995 | 0.928 | 0.503 | 0.319 | |
| 1990 | 2.45 | 1.000 | 0.988 | 0.919 | 0.466 | 0.314 | |
| 1991 | 2.04 | 0.994 | 0.990 | 0.777 | 0.321 | 0.207 | |
| 1992 | 1.90 | 0.999 | 0.979 | 0.720 | 0.269 | 0.164 | |
| 1993 | 1.82 | 1.000 | 0.982 | 0.674 | 0.224 | 0.187 | |
| 1994 | 1.81 | 0.990 | 0.985 | 0.668 | 0.233 | 0.179 | |
| 1995 | 1.72 | 0.993 | 0.987 | 0.609 | 0.201 | 0.225 | |
| 1996 | 1.68 | 0.999 | 0.984 | 0.588 | 0.168 | 0.217 | |
| 1997 | 1.63 | 0.998 | 0.979 | 0.559 | 0.165 | 0.148 | |
| 1998 | 1.62 | 0.997 | 0.984 | 0.576 | 0.109 | 0.161 | |
| 1999 | 1.60 | 1.000 | 0.982 | 0.524 | 0.164 | 0.189 | |
| 2000 | 1.58 | 0.997 | 0.978 | 0.558 | 0.103 | 0.128 | |
| 2001 | 1.59 | 0.999 | 0.967 | 0.542 | 0.167 | 0.144 | |
| 2002 | 1.56 | 1.000 | 0.966 | 0.536 | 0.129 | 0.147 | |
| 2003 | 1.56 | 0.998 | 0.954 | 0.567 | 0.116 | 0.112 | |
| 2004 | 1.67 | 1.000 | 0.974 | 0.634 | 0.115 | 0.071 | |
| 2005 | 1.61 | 1.000 | 0.968 | 0.626 | 0.060 | 0.061 | |

Note: calculations based on data from 1982,1988,1997,2001 and 2006 surveys

**Table 4d.** Period parity progression ratios for sub-population IV: China 1971-2005

| Year | $TFR_{ppr}$ | Period parity progression ratios | | | | | |
|---|---|---|---|---|---|---|---|
| | | $p_M$ | $p_0$ | $p_1$ | $p_2$ | $p_3$ | $p_4$ |
| 1971 | 4.24 | 0.982 | 0.948 | 0.962 | 0.936 | 0.975 | 0.923 |
| 1972 | 4.31 | 0.984 | 0.972 | 0.966 | 0.936 | 0.960 | 0.879 |
| 1973 | 4.06 | 0.974 | 0.943 | 0.978 | 0.952 | 0.871 | 0.864 |
| 1974 | 4.42 | 0.985 | 0.980 | 0.990 | 0.961 | 0.925 | 0.855 |
| 1975 | 4.33 | 0.985 | 0.985 | 0.973 | 0.965 | 0.911 | 0.814 |
| 1976 | 4.26 | 0.983 | 0.975 | 0.984 | 0.973 | 0.884 | 0.778 |
| 1977 | 4.06 | 1.000 | 0.950 | 0.977 | 0.961 | 0.831 | 0.746 |
| 1978 | 4.18 | 0.997 | 0.974 | 0.978 | 0.942 | 0.879 | 0.732 |
| 1979 | 4.20 | 0.996 | 0.974 | 0.984 | 0.957 | 0.863 | 0.733 |
| 1980 | 3.88 | 0.999 | 0.978 | 0.983 | 0.886 | 0.783 | 0.639 |
| 1981 | 3.92 | 0.997 | 0.979 | 0.986 | 0.913 | 0.758 | 0.663 |
| 1982 | 3.96 | 0.998 | 0.986 | 0.982 | 0.893 | 0.785 | 0.686 |
| 1983 | 3.56 | 0.997 | 0.981 | 0.974 | 0.827 | 0.682 | 0.570 |
| 1984 | 3.44 | 0.995 | 0.986 | 0.963 | 0.789 | 0.665 | 0.550 |
| 1985 | 3.13 | 0.998 | 0.977 | 0.940 | 0.737 | 0.562 | 0.490 |
| 1986 | 2.91 | 0.910 | 1.000 | 0.952 | 0.920 | 0.424 | |
| 1987 | 3.31 | 0.997 | 1.000 | 1.000 | 0.802 | 0.647 | |
| 1988 | 2.26 | 1.000 | 0.864 | 0.838 | 0.602 | 0.551 | |
| 1989 | 2.85 | 0.811 | 0.966 | 0.949 | 1.000 | 0.778 | |
| 1990 | 2.79 | 0.988 | 0.947 | 0.967 | 0.678 | 0.550 | |
| 1991 | 2.27 | 0.966 | 0.878 | 0.967 | 0.542 | 0.363 | |
| 1992 | 2.41 | 1.000 | 0.962 | 0.959 | 0.370 | 0.534 | |
| 1993 | 2.40 | 0.986 | 1.000 | 0.906 | 0.470 | 0.251 | |
| 1994 | 2.43 | 0.990 | 0.981 | 0.883 | 0.514 | 0.373 | |
| 1995 | 2.38 | 1.000 | 0.961 | 0.961 | 0.429 | 0.262 | |
| 1996 | 2.35 | 1.000 | 0.968 | 1.000 | 0.408 | 0.054 | |
| 1997 | 2.31 | 0.997 | 1.000 | 0.847 | 0.469 | 0.193 | |
| 1998 | 2.07 | 0.999 | 0.883 | 0.903 | 0.394 | 0.262 | |
| 1999 | 2.11 | 1.000 | 0.988 | 0.705 | 0.487 | 0.248 | |
| 2000 | 2.33 | 0.996 | 0.988 | 0.819 | 0.585 | 0.143 | |
| 2001 | 1.76 | 0.999 | 0.912 | 0.664 | 0.333 | 0.234 | |
| 2002 | 1.85 | 1.000 | 0.953 | 0.788 | 0.189 | 0.037 | |
| 2003 | 1.96 | 0.998 | 0.975 | 0.831 | 0.195 | 0.136 | |
| 2004 | 1.77 | 1.000 | 0.953 | 0.677 | 0.249 | 0.100 | |
| 2005 | 1.79 | 1.000 | 0.962 | 0.656 | 0.296 | 0.045 | |

Note: calculations based on data from 1982,1988,1997,2001 and 2006 surveys

**Table 5.** Change in the period parity progression ratio-based total fertility rate (TFRppr) and shares of that change attributable to changes in period parity progression ratios: China, 1971-2005

| Period | Starting $TFR_{ppr}$ | Ending $TFR_{ppr}$ | Percentage contribution to change in $TFR_{ppr}$ from change in $p_M$ | $p_0$ | $p_1$ | $p_2$ | $p_3$ | $p_4$ | $p_5$ | $p_6$ | $p_7$ | $p_8$ | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Whole population** | | | | | | | | | | | | | |
| 1971-1977 | 6.04 | 3.29 | 1.1 | 1.0 | 4.3 | 32.2 | 32.9 | 19.6 | 9.4 | 2.7 | 0.8 | 0.2 | 100.0 |
| 1977-1979 | 3.29 | 3.23 | 42.8 | 38.5 | 9.1 | 115.2 | 37.2 | 33.0 | 4.7 | 7.8 | 1.4 | 0.4 | 100.0 |
| 1979-1984 | 3.23 | 2.09 | 0.5 | 1.2 | 69.4 | 22.8 | 7.1 | 0.4 | 0.4 | | | | 100.0 |
| 1986-2005 | 2.19 | 1.43 | 15.4 | 7.0 | 74.3 | 32.9 | 1.8 | | | | | | 100.0 |
| **1971-2005** | 6.04 | 1.43 | 2.3 | 1.6 | 61.5 | 36.6 | 2.5 | 0.2 | | | | | 100.0 |

Note: the negative signs refer to percentage contribution in the opposite direction of change.

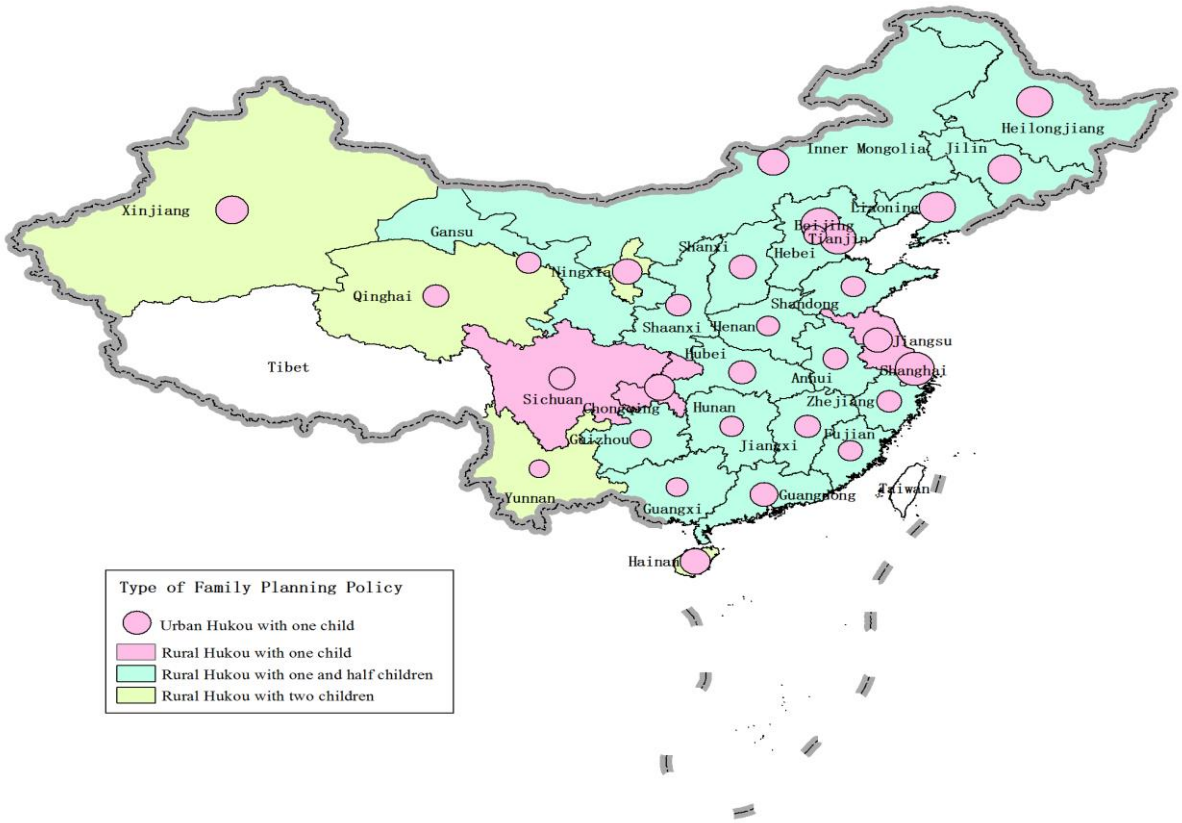



Fig. 1. Map of China illustrating different types of family planning policy by geographic areas

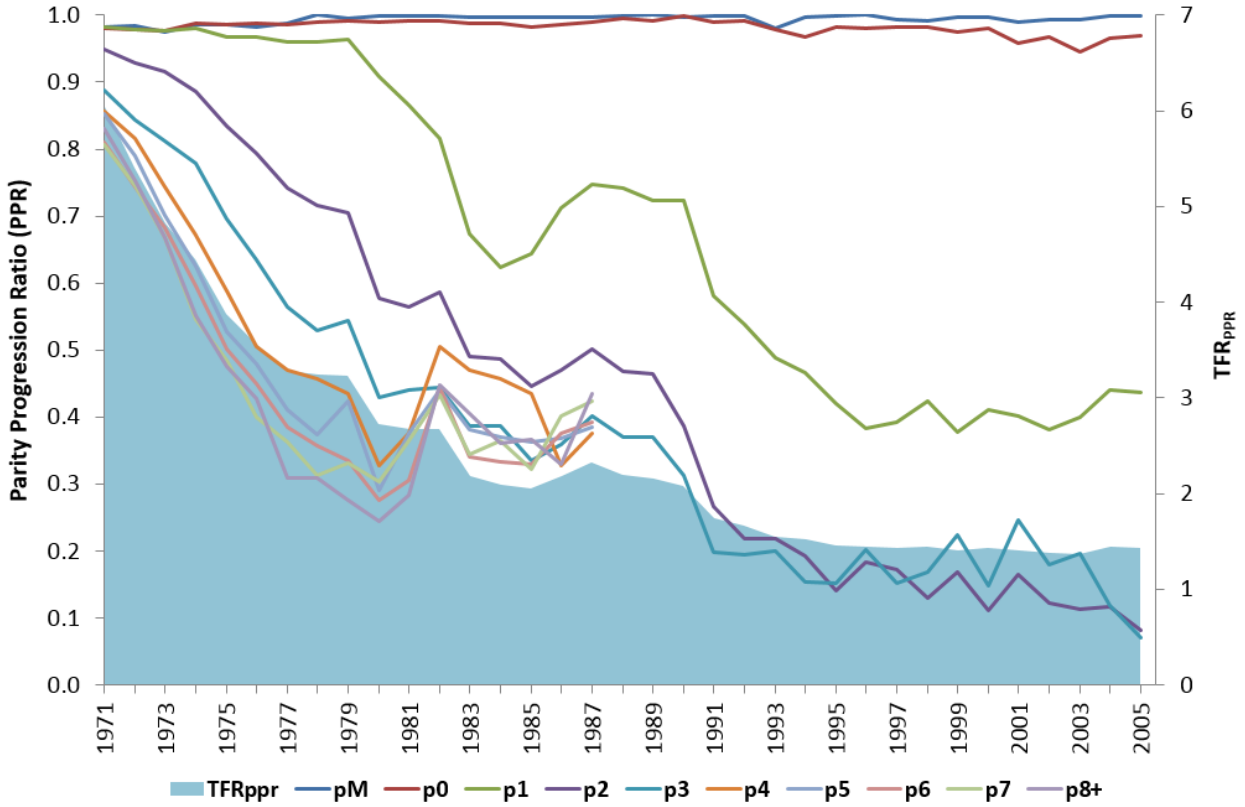
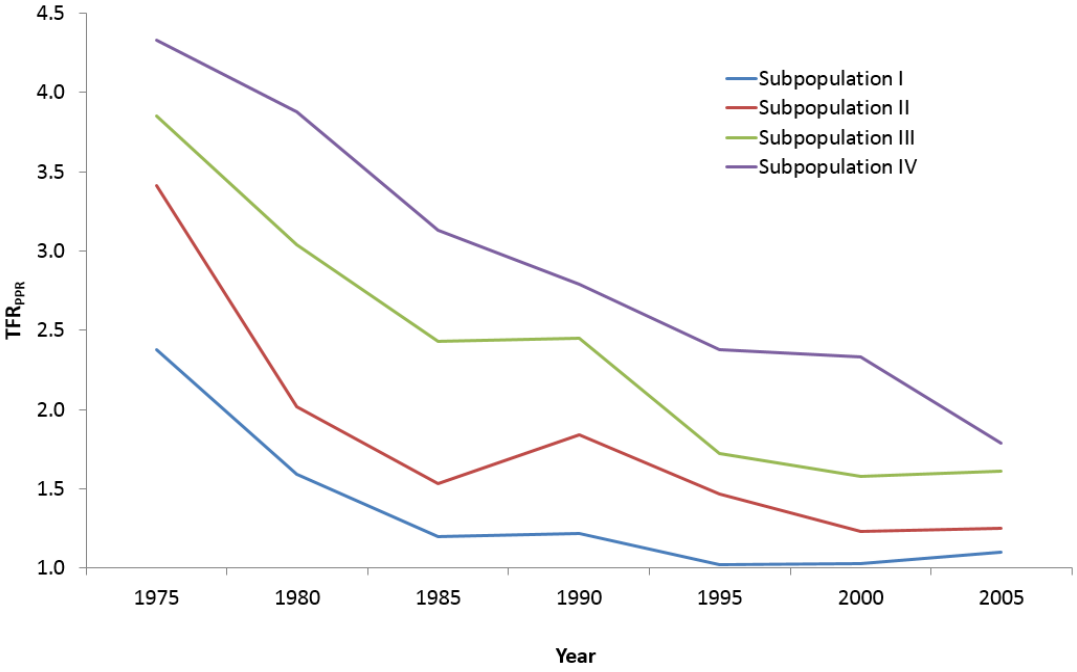



**Fig. 2.** Period progression ratios and $TFR_{ppr}$: China, 1971-2005




Note: calculations based on data from 1982,1988,1997,2001 and 2006 surveys

**Fig. 3.** $TFR_{ppr}$ among different sub-populations

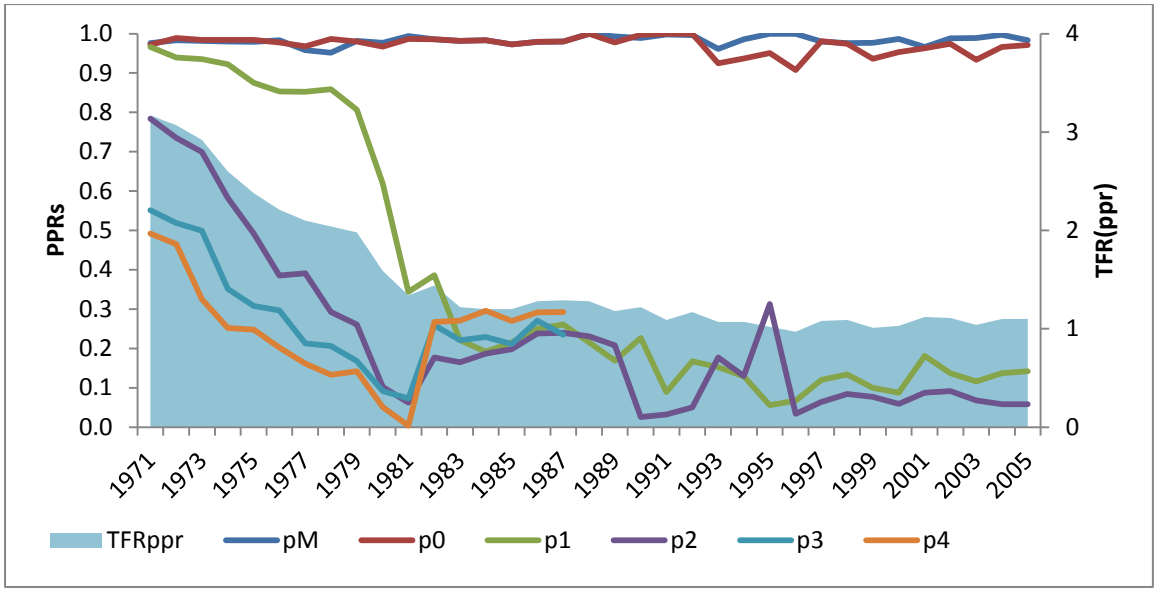



**Fig. 4a.** Period progression ratios and $TFR_{ppr}$ for sub-population I: China, 1971-2005

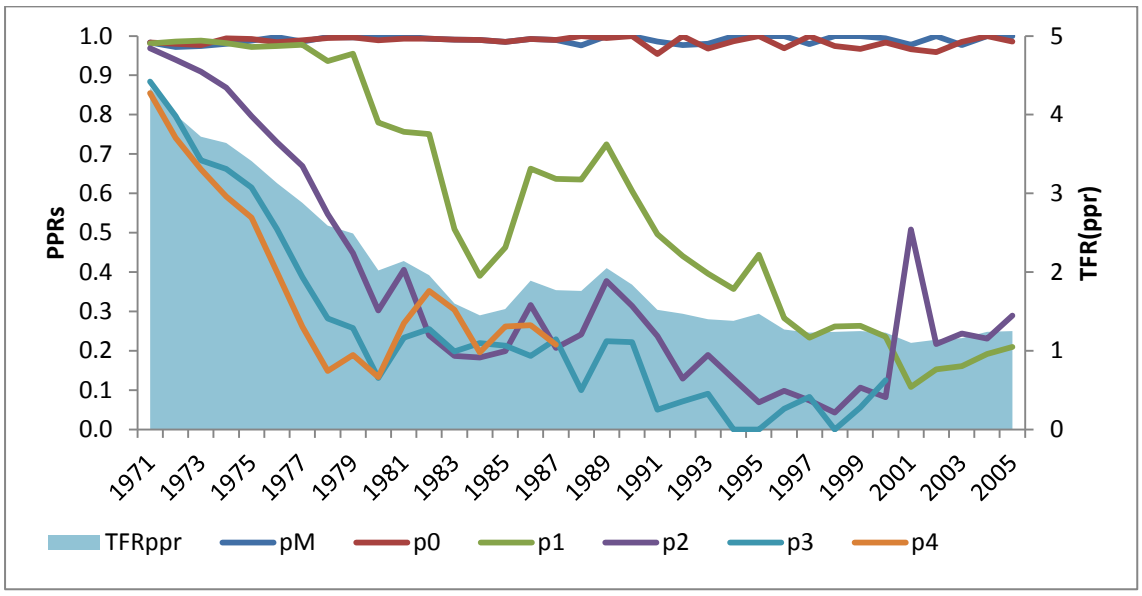



**Fig. 4b.** Period progression ratios and $TFR_{ppr}$ for sub-population II: China, 1971-2005

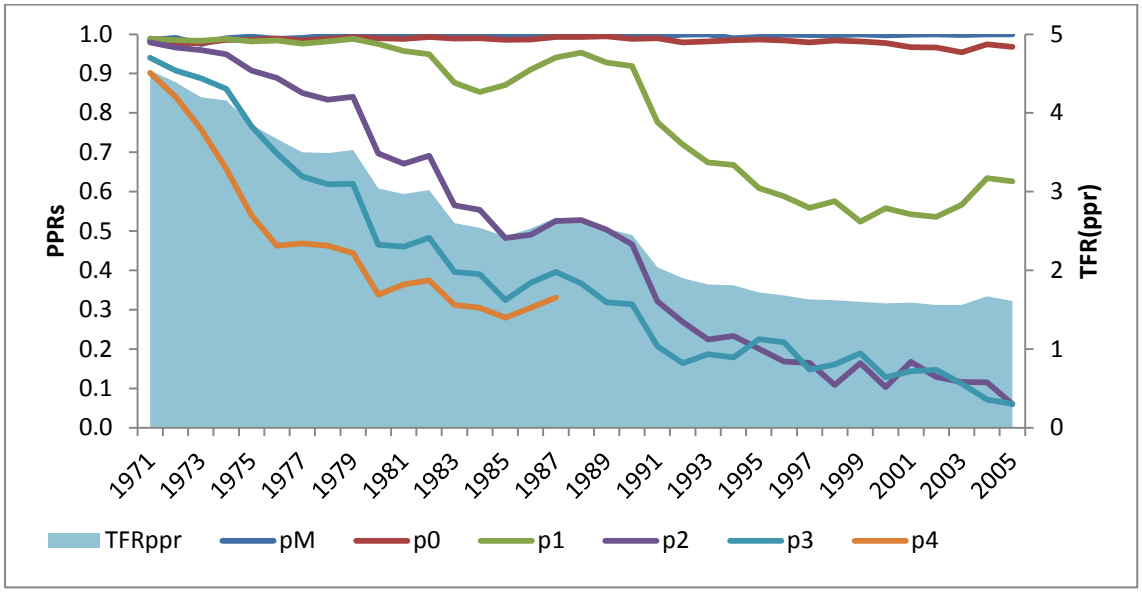



**Fig. 4c.** Period progression ratios and $TFR_{ppr}$ for sub-population III: China, 1971-2005

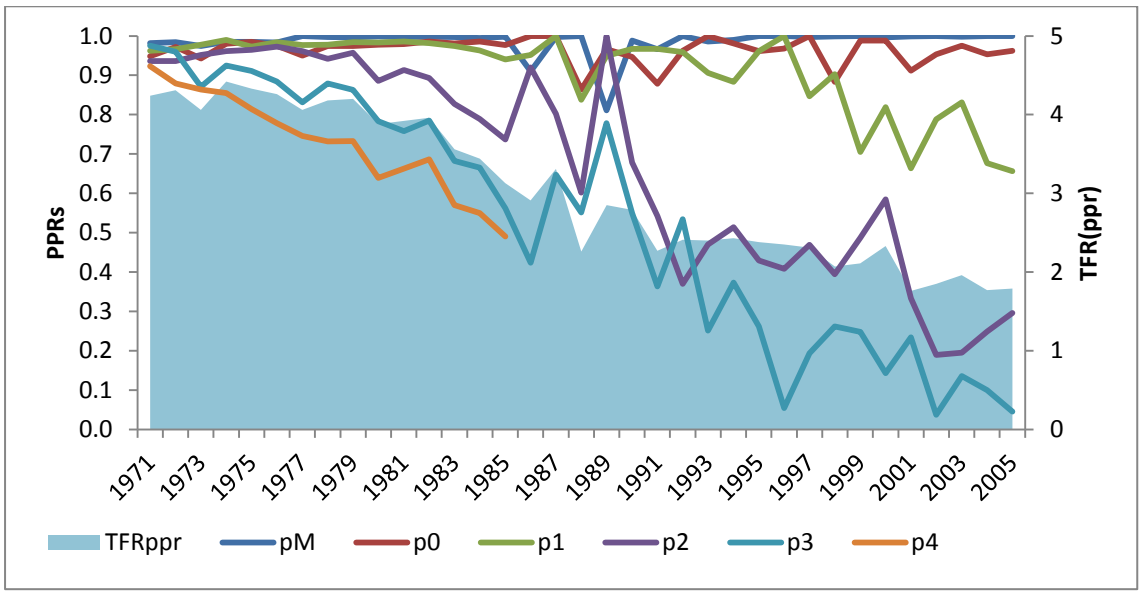



**Fig. 4d.** Period progression ratios and $TFR_{ppr}$ for sub-population IV: China, 1971-2005

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## Conflict of interest

None.