The Rising Importance of Nuptiality Change: Policy Mismatch and Fertility Decline in Low-Fertility East Asia

Abstract

Despite the strong relationship between marriage and childbearing, existing policies aimed at supporting parenthood often prioritize parity progression within married couples while overlooking a concurrent yet increasingly significant trend: the rising prevalence of delayed and non-marriage. This study focuses on four low-fertility East Asian societies: South Korea, Japan, Taiwan, and Singapore. In these societies, changes in nuptiality behavior play an important role in fertility change, and a variety of population policies have been implemented in response to their "lowest-low" fertility. Against this background, we first review existing policy efforts mitigating declining fertility, arguing that these pronatalist policies are mistargeted, before examining the extent to which the decrease in fertility is attributable to changes in marital fertility versus shifts in nuptiality. We conducted a decomposition analysis of fertility trends in these four low-fertility Asian societies using data from the United Nations Population Division and found that while the decline in marital fertility played a dominant role during the initial stages of the fertility transition, contemporary patterns highlight nuptiality as the primary driver of declining fertility rates. These findings underscore the importance of the rising prevalence of singlehood and the potential, albeit modest, increase in diverse family forms, both of which have received scant attention in policy discourse.

Keywords: marriage, nuptiality, low fertility, decomposition analysis, East Asia

Introduction

Over the past three decades, sub-replacement fertility has emerged as a global phenomenon (Sobotka et al. 2019). Currently, half of the world's population resides in countries where the total fertility rate (TFR) is below 2.1 births per woman. In response, many nations with low fertility rates have introduced policies to increase fertility. Pronatalist policies have been of particular focus in East Asian[1] societies like South Korea, Japan, Taiwan, and Singapore, which face some of the lowest fertility rates in the world (Jones 2019). As early as the 1990s, governments in East Asia began implementing policy measures to address concerns surrounding the socioeconomic impacts of rapid population aging, potential population stagnation and decline, and shifts in family values from traditional attitudes toward more liberal ones (Frejka et al. 2010; Gietel-Basten 2022). These policy measures have primarily targeted financial barriers to childbearing and the challenges of reconciling work and family life (Chen et al. 2020; Gauthier 2016; McDonald 2002, 2006; Tan 2023); they include initiatives such as additional cash bonuses, expanded parental leave, and increased access to affordable health and childcare services. Although the assumption underlying these measures is that fertility rates might stabilize or increase by alleviating financial and work-life burdens, empirical evidence suggests that their potential positive effects are typically modest (Bergsvik et al. 2021; Gauthier 2007; Thévenon and Gauthier 2011; Sobotka et al. 2019).

Moreover, while East Asia has been at the forefront of efforts to address declining fertility, an increasing number of studies have highlighted potential misalignments in the focus of its policies (Chen et al. 2020; Gauthier 2016; Lee 2009). A critical but perhaps less carefully considered factor in policy discourse is the close link between marriage and

[1] Although Singapore is geographically located in Southeast Asia, this manuscript categorizes it alongside East Asian societies due to its parallel trends in fertility and marriage rates, as well as its cultural similarities with East Asia.

childbearing—the latter is less likely to occur without the former in Japan, South Korea, Taiwan, and Singapore, where nonmarital births comprise only about 2%–4% of all births (Jones 2007; Raymo et al. 2015). For example, Chen et al.'s (2018) study on parity-specific pronatalist policies (e.g., cash transfers, childcare subsidies, and tax reliefs) suggests that policies designed to support marriage and the transition to parenthood would likely be more effective, given the strong connection between marriage status and childbearing. However, few policies have been designed to facilitate marriages. Previous research has suggested that, given the increasing prevalence of singlehood and the ongoing association between marriage and childbearing, declining marriage rates could greatly contribute to the overall decline in fertility (Koh 2011; Raymo et al. 2021).

The preceding context informed this study's research question: To what extent does nuptiality change contribute to declining fertility in low-fertility East Asian societies? Is the role of nuptiality change uniform across these societies or over time? By empirically evaluating these questions, we seek to provide critical policy implications on the relationship between marriage trends and current policy efforts that aim to support childbearing. We focus on four East Asian societies with persistently low fertility rates—South Korea, Japan, Taiwan, and Singapore—as these nations are characterized by increasingly delayed and fewer marriages, negligible levels of nonmarital childbearing, and relatively similar cultural values and have been the most proactive in implementing population policies. We first critically review these nation's policies to support childbearing and discuss how they may not reflect the ongoing reality of fertility change in these societies. In the second part of this paper, we focus on quantifying and exemplifying the importance of marriage to childbearing. While recognizing that factors like gender equity and work-family balance are also crucial, we focus this investigation on how trends in marital fertility and nuptiality have influenced fertility changes over time using a decomposition analysis of birth rates from 1970 to 2020. Through

this approach, we aim to highlight the significance of marriage in understanding declining fertility and to suggest that family policies should consider supporting marriage as well as other diverse forms of families (e.g., unmarried couples, same-sex couples).

Literature review

The trend among low fertility policies exhibits a strategic focus on specific milestones that occur before and throughout childbearing and parenthood that can be broadly categorized into six areas: (1) facilitating conception, (2) supporting healthcare and medical expenses related to pregnancy and childbirth, (3) providing parental leave, (4) offering financial support, (5) ensuring accessible and affordable childcare services, and (6) creating more family-friendly work environments (Jones and Hamid 2015; Lee and Choi 2015; Lee and Lin 2016; Tsuya 2015). These address a range of barriers to childbearing and childrearing and are informed by the economic, social, and interpersonal considerations that influence marital fertility. The following subsections address each of these categories of strategic approaches.

Healthcare and assistive conception services

Reproductive behavior is intrinsically motivated and relates to an individual's desire for close, enduring relationships (Miller et al. 2013)—but while intrinsic motivation is a strong facilitator of parenthood, individuals and couples may face health or financial constraints that deter them from it. Regarding health constraints, appropriate policy measures (i.e., those seen as aiding individuals or couples in achieving their intended number of children) have been shown to support people's intrinsic motivation for childbearing (Botev 2015). Healthcare access and assistive conception services, for example, have received considerable attention of late in light of the risks of increasingly advanced parental age in low-fertility societies.

To this end, the government of Japan provides a Childbirth and Childcare Lump-sum Grant of 500,000 yen (USD 3,200) for each baby to cover childbirth expenses, while South Korea provides medical allowances to mothers and newborns, including 500,000 won (USD 365) for pregnancy-related medical bills. The Singaporean government's MediSave maternity package allows for withdrawals from national medical savings schemes for pre-delivery services, delivery expenses, and post-childbirth hospital stays (Made for Families 2024). Finally, Taiwan offers a maternity benefit equivalent to salary earnings for 60 days based on the mother's average monthly insurance salary over the last six months (Taiwanese Ministry of Labor 2022).

In addition to financial assistance for pregnancy and childbirth and maternity benefits, the provision of financial aid or subsidies for assistive conception services, such as in-vitro fertilization and egg freezing, is another critical aspect of health-related policies to support childbearing (Lee and Choi 2015; Singapore Ministry of Health 2023). For example, the government of Japan reimburses 70 percent of in-vitro fertilization costs through public health insurance (Yokoyama and Lee 2024). In a different approach, the South Korean government offers partial allowances for artificial insemination and in-vitro fertilization, regardless of income (Korean Ministry of Health and Welfare 2024). In 2021, Taiwan expanded eligibility for its in-vitro fertilization subsidy program from only low-income families to cover all couples (Taiwanese Department of Information Services 2023). Finally, Singapore provides up to 75 percent of co-funding for couples undergoing assisted conception procedures in public fertility centers (Made for Families 2024). With more people having children in their 30s and 40s and experiencing infertility, subsidizing reproductive treatments constitutes a promising measure for increasing birth rates for those who wish to have children (Bergsvik et al. 2021).

Although statistics quantifying the success of these services are not yet available and cannot capture the physical and emotional toll of fertility challenges, governmental support for couples attempting to conceive and childless individuals is clearly integral for comprehensive fertility policies (Leridon and Slama 2008). Governmental support addresses not only the immediate need for medical interventions but also the broader societal need for a supportive environment for all families.

Parental leave schemes

Parent–child bonding is important for perinatal mental health and infant development. However, entrenched gender norms and precedent policy signals create an expectation that mothers should be the primary caregivers of children while men prioritize paid work. Policies have been implemented to pave the way for the second stage of what some scholars have called the gender revolution (Esping-Andersen and Billari 2015; Goldscheider et al. 2015), which is predicted to improve men's involvement in children and caregiving responsibilities.

Expanding parental leave schemes is key to this move toward gender equity. Most governments provide paid parental leave to care for a newborn child, a recently adopted child, or a child needing parental care. In Singapore, women can take 16 weeks of government-paid maternity leave, and since 2024, government-paid paternity leave has been expanded to four weeks for working fathers, up from the previous two weeks (Made for Families 2024). Similarly, the South Korean government provides 90 days of paid maternity leave, with a minimum of 45 days taken after birth, and mandates that all of this leave be taken (Kim et al. 2023). Moreover, both parents in South Korea can now take parental leave simultaneously, a measure intended to encourage the use of paternity leave (Kim and Lundqvist 2023).

Similar policies are also in place in other low-fertility nations. These support working parents by helping them maintain their jobs while starting families and encouraging fathers to spend time with their newborns (Sobotka et al. 2019). These policies are suggested to benefit fertility rates and job security for parents, ensure the physical and mental well-being of parents and children, promote gender equality in the workplace, and facilitate high job satisfaction (Haar et al. 2014; McDonald 2006).

Financial support

Per rational choice theory, individuals make calculated decisions to have children based on the assessment that the benefits of an additional child would outweigh the costs (McDonald 2002). The theory thus indicates that financial incentives may provide a direct approach to lowering the economic costs of parenthood. To this end, a well-established and popular policy centers on providing financial support to parents before, during, and after birth.

For example, in South Korea, families with children receive tax exemptions and can take out means-tested loans for renting or purchasing a house (Lee and Choi 2015). Previous research has estimated that Korean parents with a child receive a sum ranging from 35 million won (USD 25,000) to 50 million won (USD 36,000) through various incentives and support programs from the birth of their child until they reach the age of seven (Song 2024). Taiwan also offers childbirth and parenting benefits. Recently, the government added an extra NT$20,000 (USD 653) payment per Taipei city-born child on top of existing childbirth bonuses, along with introducing new tax deductions for parents with preschool-age children (Lee and Lin 2016; Thomson 2023). The Japanese and Singaporean governments provide similar child allowances to alleviate the financial burden of childbearing by removing income thresholds for eligibility, increasing allowances, and extending coverage for children until older ages over the years (Made for Families 2024). However, compared to work-life

initiatives (i.e., policies that help parents better manage and balance their work and family life), financial incentives and one-off cash transfers (e.g., Baby Bonuses) typically have a shorter-term impact than what would be needed to have a potential effect in increasing the quantum of childbearing (Thévenon and Gauthier 2011). Moreover, as they only cover a small proportion of the overall costs of raising children, these allowances tend to have a limited impact on completed family size (Boydell et al. 2023).

Childcare services

In line with various theories on gender equity (e.g., second gender revolution theory) and economic costs (e.g., rational choice theory), the provision of accessible and affordable childcare aids working parents in managing their work and childcare responsibilities, especially for working mothers who stay in the workforce after having a child. As high childcare costs may be untenable for families, steps to reduce their financial strain may make it more feasible for people to have children or larger families.

As such, the governments of South Korea, Japan, Taiwan, and Singapore have implemented policies to enhance access to high-quality and affordable preschools and childcare (Jones and Hamid 2015; Lee and Choi 2015; Lee and Lin 2016; Tsuya 2015). Japan's initiatives, such as the Angel Plans of 1994 and 1999, the Plus-One Plan of 2002, the Basic Law to Address Low Fertility of 2003, the Strategy to Assist Children and Families of 2007, the Vision for Children and Childcare of 2008, and the 2013 Plans to Accelerate the Reduction of Preschool Children on Waiting Lists, have substantially increased the availability of daycare spaces and the enrollment of children in daycare centers (Frejka et al. 2010; Tsuya 2015). Similarly, through its universal childcare system of 2013, South Korea provides access to free childcare and an age-graded home care allowance for childcare at home (Korean Ministry of Health and Welfare 2024). In 2018, Taiwan amended the Early

Childhood Education and Care Act to diversify service models for childhood education and care and expedite the addition of slots at public preschools and childcare facilities (Taiwanese Department of Information Services 2023). The Taiwanese government also provides subsidized private daycare centers or home babysitting services, with additional childcare subsidies for parents with two or more children and those from low- or lower-middle-income families (Chen 2020). Finally, Singapore provides monthly subsidies for center-based childcare programs, infant care programs, and kindergarten fee assistance (Made for Families 2024).

With many households relying on dual incomes, accessible and reliable childcare options help reduce the stress of balancing work and family life for parents (Frejka et al. 2010). Childcare programs enable them to maintain their careers, setting families on a path toward financial stability: Per previous research, policies that improve family life without sacrificing work life, including comprehensive childcare services, have positive associations with fertility rates (Bergsvik et al. 2021; Luci-Greulich et al. 2013; Sobotka et al. 2019).

Family-friendly work environments

Family-friendly labor policies can mitigate the opportunity costs of childrearing by reducing the tradeoffs between work and family. By creating more accommodating work environments through, for example, the promotion of flexible work arrangements, policies may be able to foster a more equitable division of paid and unpaid labor among couples and alleviate the burden of childrearing, which is primarily placed on women. This shift makes it possible for fathers to engage more actively with their families, encouraging the development of an atmosphere that supports childbearing.

In a trend accentuated by the COVID-19 pandemic, which underscored the viability and benefits of widespread telecommuting and flexible work arrangements for families,

governments and employers in Japan, South Korea, Taiwan, and Singapore are placing greater emphasis on workplace flexibility. In Japan, the government initiated policies and institutional reforms to increase flexible working hours for employees with children (Lowenson et al. 2019), whereas the South Korean government launched educational campaigns promoting gender equality within families and society at large alongside incentives for companies to adopt family-friendly practices (e.g., reducing work hours) (Kim 2023; Lee and Choi 2015; Yun et al. 2022). Similarly, in Singapore, organizations have been increasingly encouraged to embrace flexible work arrangements, enabling parents to manage work and family responsibilities more effectively. In this regard, Singapore's forthcoming Tripartite Guidelines (slated to take effect in December 2024) are intended to delineate how employees can request flexible work arrangements and how employers and supervisors should handle such requests to enable employees to achieve better work-life harmony while giving employers a competitive advantage in talent attraction and retention (Singapore Ministry of Manpower 2024). Finally, the government of Taiwan revised its labor regulations to cap weekly work hours at 40 and allow greater flexibility in start and finish times, with arrangements tailored to workers' needs or family requirements (Hsiao 2015).

Given the global post-pandemic shift in workplace dynamics, the promotion of family-friendly work environments and flexible arrangements is dually intended to reduce work-family conflict and enhance employee retention (Laß and Wooden 2023).

Existing critiques against pronatalist policies

Based on the assumption that alleviating financial or work-life burdens on families will encourage people to have (more) children, current policies in East Asia largely focus on (marital) fertility behavior. However, existing studies have raised the concern of whether

these pronatalist policies in East Asia may be mistargeted (Chen et al. 2020; Matsuda 2015; Tsutsui 2023). Unlike Europe, where policies are less marriage-specific and nonmarital fertility rates are relatively higher, East Asian societies face a distinctive cultural context in which marriage has been a precursor to childbearing while nonmarital childbearing is still numerically small and often socially stigmatized. Moreover, some policies may (unintentionally) discriminate against single parents. In Singapore, for example, unmarried parents with children have less entitlement to public housing, tax reliefs, and Baby Bonus cash gifts, all of which are prioritized for married parents (Association of Women for Action and Research 2021). This highlights the need to integrate (non)marriage considerations into fertility policies. In this regard, existing discussions of Japan's population policies indicate their misalignment with the primary drivers of fertility decline, such as delayed and reduced marriage rates (Atoh et al. 2004; Iwasawa 2002, 2015; Raymo et al. 2015; Tsuya and Mason 1995). Similar discussions extend beyond Japan to other countries in the region (Chen et al. 2018; Fukuda 2020; Gauthier 2016).

Few studies, such as Chen et al. 2020, have yet examined the importance of nuptiality change and its link to existing policy measures. To address this gap, we conducted a comparative analysis of an extended period of data to isolate the impact of nuptiality, assess whether policy mismatches exist, and determine whether changes in marriage patterns or marital fertility rates are the primary drivers of fertility decline. Given the explicit focus of policies on increasing the number of children within marriage, this analysis acknowledges the cultural and social contexts that influence fertility behaviors. Our analysis thus contributes to the empirical evidence quantifying the effects of different factors (e.g., marriage and marital fertility) on overall fertility trends. In turn, our results help in identifying which factors have a more substantial impact on fertility decline. More specifically, a decomposition analysis can uncover whether a tailored and potentially context-specific policy is required to address and

comprehend the varying levels of marriage and fertility declines by isolating the specific contributions of changes in nuptiality and marital fertility. For example, if fertility decline is primarily driven by changes in marriage patterns, policies focusing solely on supporting marital fertility might be less effective. By identifying shifts in the relative importance of different factors over time (i.e., whether the impact of nuptiality has increased or decreased over time) as well as differences across societies that may be useful for more effective and targeted policy interventions, our paper aims to provide comparative baseline evidence to help inform policymakers.

Changes in fertility and nuptiality

According to the Second Demographic Transition (SDT) framework, societies with increased fertility postponement and childlessness are proposed to experience sustained sub-replacement fertility, develop new forms of living arrangements, and observe a shift from family-centric to individualistic values (Lesthaeghe 2010). In line with this framework, East Asia's demographic transition has been marked by a substantial decline in fertility rates to well below the replacement level of 2.1 births per woman (Figure 1). Although changes like the decoupling of marriage and childbearing have been slower to manifest in East Asia than in Western societies, they are still occurring, albeit in different ways and rates (Cheng 2020).

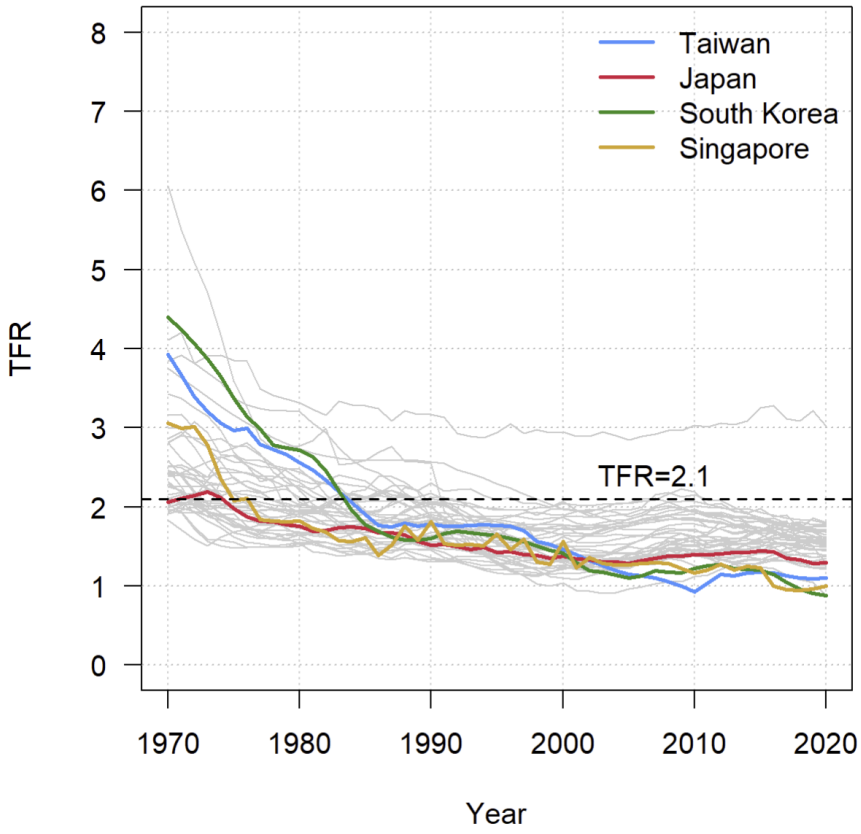

Figure 1. Period total fertility rate, selected countries, 1970–2020.

Notes: The gray lines represent data from 37 countries, the majority of which are European. A detailed list of these countries can be found in Appendix A1.

Source: Authors' illustration based on fertility data from the United Nations Population Division (UNPD 2022).

The current policy landscape in East Asian countries actively targets marital fertility but often overlooks the complex socio-cultural factors that shape fertility over an individual's life course. In this context, however, marriage typically precedes childbearing. Therefore, shifts in marriage patterns play a more important role in recent fertility declines in East Asia than other low fertility settings (Jones 2007; Jones and Yeung 2014). In this regard, marriage rates have steadily declined in East Asia: From 1970 to 2020, the proportion of marriages fell by 14 percentage points in Japan, 9 percentage points in South Korea, 9 percentage points in Taiwan, and 1 percentage point in Singapore, with corresponding increases in singlehood.

Figure 2 illustrates the decline in the proportions of married women aged 15–49 from 1970 to 2020. These changes in nuptiality raise important questions about the rise in singlehood and the extent to which this trend is driven by choice or circumstance.

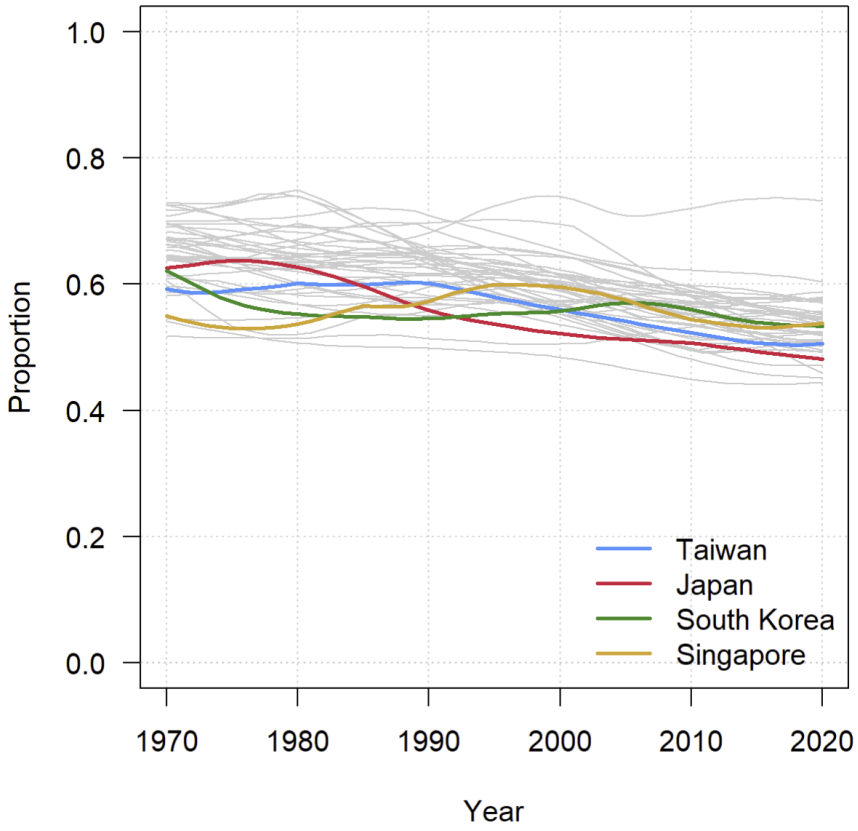

Figure 2. Proportions of married women aged 15–49, 1970–2020.

Source: Authors' illustration based on marriage estimates from the UNPD (2020).

Data

We compiled data on age-specific fertility and the proportion of married women in each society (Japan, South Korea, Taiwan, and Singapore) from 1970 to 2020. The fertility data was sourced from the United Nations Population Division (UNPD 2022). The UNPD has been gathering, compiling, and disseminating official demographic and social statistics since 1950 from over 230 national statistical offices. Its data are thus consistent, comparable, comprehensive, and cover a lengthy period. The proportions of married (or in union) women

were extracted from the UNPD (2020). This database, covering years from 1970 to 2020, offers a comparable and update-to-date set of data on the marital status of the population by age for 232 countries and territories. It sources information from censuses, sample surveys, and national estimates based on population register data or estimation methods using census data. For both datasets, we focused on the available five-year age groups: 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45-49.

Method

To isolate the impact of marriage age composition on the TFR, we define the age-specific fertility rate (ASFR) at age x and time t, $ASFR(x,t)$ as follows:

$$\begin{aligned} ASFR(x,t) &= \frac{Births\ from\ women\ in\ age\ group\ x}{Women\ in\ age\ group\ x} \\ &= \frac{Births\ from\ women\ in\ age\ group\ x}{Married\ women\ in\ age\ group\ x} \times \frac{Married\ women\ in\ age\ group\ x}{Women\ in\ age\ group\ x} \\ &= MFR(x,t)MP(x,t) \end{aligned} \quad (1)$$

where $MFR(x,t)$ represents the marital fertility ratio,[2] which measures the ratio between the number of births and married women in a specific age group; $MP(x,t)$ is the proportion of women who are married.

The TFR in a given time t, $TFR(t)$, is then calculated as follows:

$$TFR(t) = \sum_{x=\alpha}^{\beta} ASFR(x,t) = \sum_{x=\alpha}^{\beta} MFR(x,t)MP(x,t), \quad (2)$$

[2] Notably, the definition of age-specific marital fertility rate in the study by Jiang et al. (2019) differs from the traditional approach. As detailed in studies by Cho and Retherford (1973) and Nishikido et al. (2022), these traditional methods calculate the numerator based only on births from married women within a specific age group. Our study defines this using a ratio, aligning with the definitions of rate and ratio provided by Preston et al. (2001, p. 3). When no nonmarital births occur, the marital fertility ratio is equivalent to the age-specific marital fertility rate.

where α and β represent the minimum and maximum reproductive ages, respectively.

Next, we apply the standard decomposition approach to split the effect of the marital fertility ratio and marriage age composition on the change of TFR (Kitagawa 1955). The formulation is as follows:

$$\Delta TFR(t) = \sum_{x=\alpha}^{\beta} [\Delta MFR(x,t)\overline{MP}(x,t) + \overline{MFR}(x,t)\Delta MP(x,t)]. \quad (3)$$

where Δ and overbar separately denote the difference and average between the two populations or time points. For example, in the case of one-year changes, $\Delta MFR(x,t) = MFR(x,t+1) - MFR(x,t)$, and $\overline{MP}(x,t) = \frac{MP(x,t+1)+MP(x,t)}{2}$.

Based on Eq. (3), the two effects can be defined as:

$$\text{Marital fertility ratio effect} = \sum_{x=\alpha}^{\beta} \Delta MFR(x,t)\overline{MP}(x,t), \text{ and}$$

$$\text{Marital age composition effect} = \sum_{x=\alpha}^{\beta} \overline{MFR}(x,t)\Delta MP(x,t).$$

In cases where nonmarital births are negligible, the marital fertility ratio effect can be considered as the marital fertility rate effect; similarly, the marital age composition effect can be viewed as the composition effect (more detailed discussion and mathematical proofs are available in Appendix A2). In East Asian contexts (i.e., Japan, South Korea, Taiwan, and Singapore), the marital fertility ratio effect and marital age composition effect can be interpreted as changes in marital fertility and nuptiality, respectively. Our decomposition approach is similar to the total fertility decomposition approach developed by Nishikido et al. (2022). With detailed survey data, where the number of births can be distinguished between

those within and outside of marriage, the age-specific marital and nonmarital fertility rates can be constructed, and the proportion of women in marital and nonmarital unions can be calculated. However, their approach may not be suitable for large-scale comparisons using limited survey data over extended periods, especially when the data contain inconsistencies in how marital status is measured (e.g., varying definitions of stable union, marriage, and cohabitation).

Results

The preceding section described our analysis of the decline in fertility rates by decade to capture the decrease in the TFR across Japan, South Korea, Taiwan, and Singapore. We find that from 1970 to 2020, the TFR decreased from about 2.06 children per woman to 1.29 in Japan, from 4.39 to 0.88 in South Korea, from 3.92 to 1.10 in Taiwan, and from 3.06 to 1.00 in Singapore (UNPD 2022). Figures 3 to 6 show the changes in fertility rates decomposed into changes due to marital fertility and the proportion of married women according to each age group. In all societies, fertility decline was driven by both changes, with more substantial changes due to the change in the proportion of married women in their 20s and 30s, particularly during the past two decades.

In Japan, changes in nuptiality had a more dominant impact on the change in TFR (Figure 3). The change in TFR by the decade was –0.309 children (1970–1980), –0.242 children (1980–1990), –0.131 children (1990–2000), +0.012 children (2000–2010), and –0.102 children (2010–2020). In periods where TFR had declined, most of the decline was due to changes in nuptiality, particularly among the 20–24 and 25–29 age groups. These results are consistent with findings from earlier studies that declining fertility in Japan is largely the result of the trend toward later and less marriage (e.g., Atoh et al 2004; Iwasawa 2002).

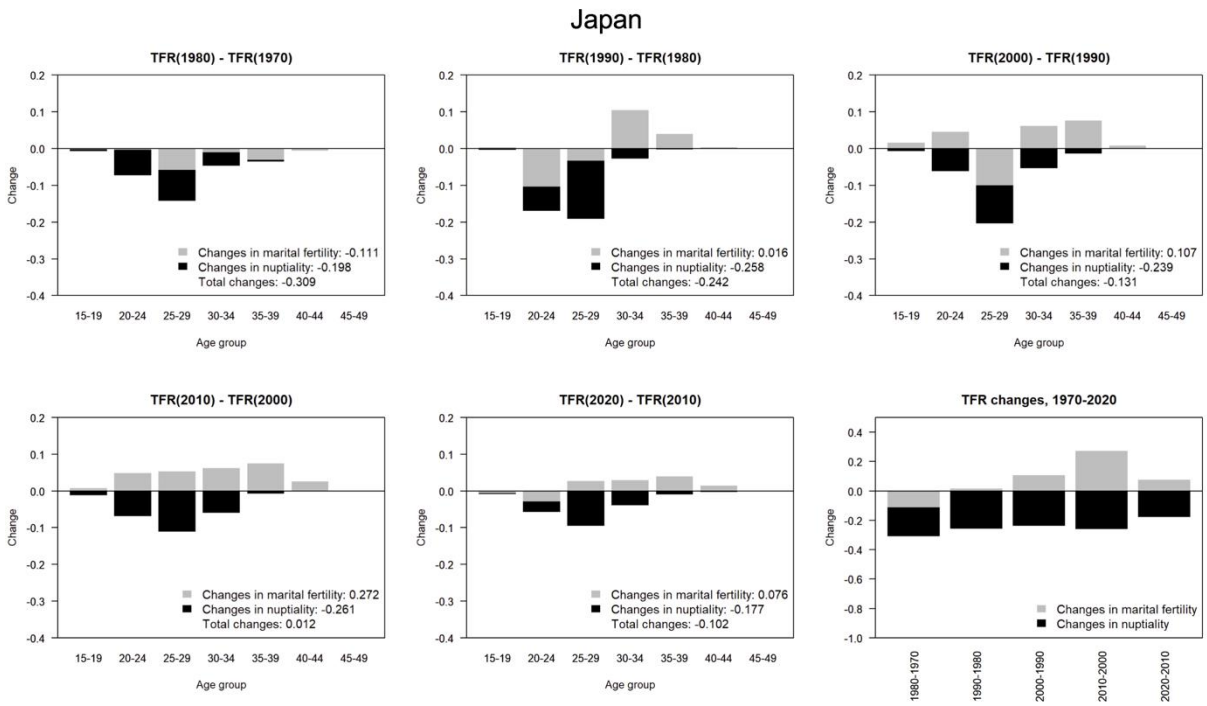

Figure 3. Decomposition of the change in TFR in Japan, 1970–2020.

Source: Calculated by the authors using data from the UNPD fertility and marriage datasets (2020, 2022).

In South Korea, the declines in nuptiality consistently contributed to the decline in the TFR (Figure 4). The TFR declined by –1.681 children between 1970 and 1980, by –1.113 children between 1980 and 1990, by –0.185 children between 1990 and 2000, by –0.196 children between 2000 and 2010, and by –0.338 children between 2010 and 2020. During the transition from high to low fertility, the decline in fertility was initially driven largely by changes in marital fertility from 1970 to 1990. However, after 1990, as TFRs approached lowest-low levels, changes in nuptiality contributed more to the reductions in TFR than changes in marital fertility. Since 2000, the decline in nuptiality had about twice as much of an effect as marital fertility, resulting in declines in the TFR.

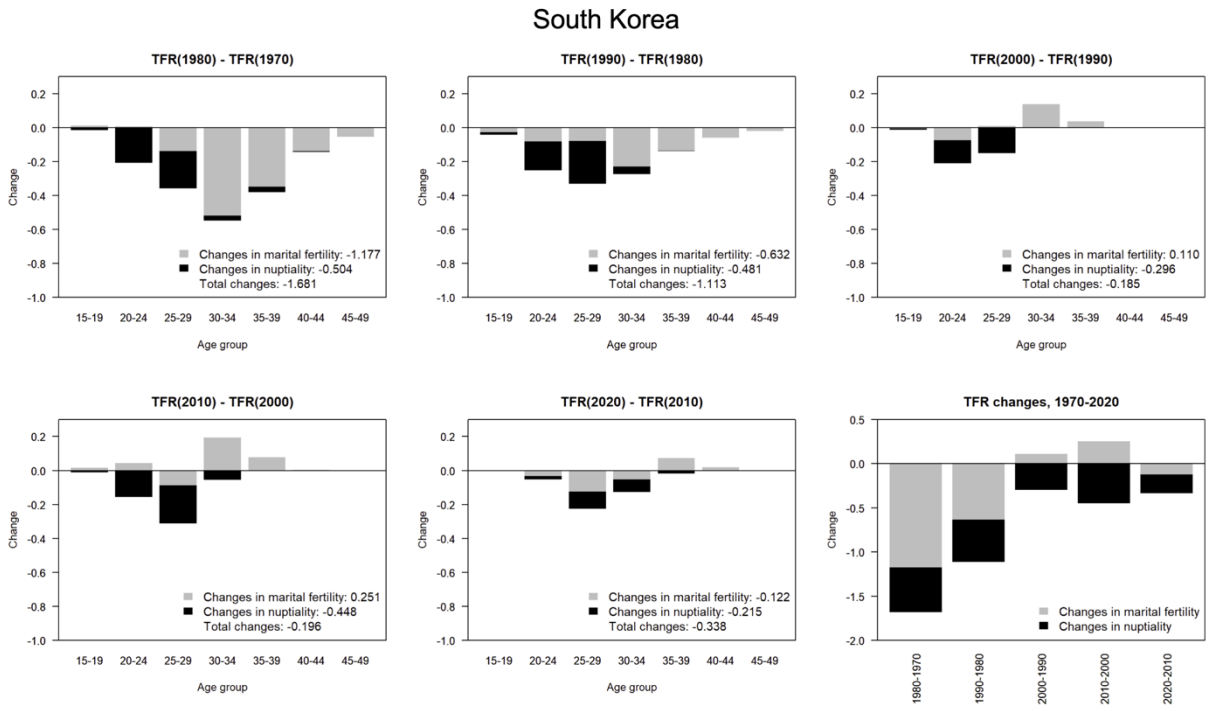

Figure 4. Decomposition of the change in TFR in South Korea, 1970–2020.

Source: Same as the previous figure.

In Taiwan, the decline in marital fertility played a major role in decreasing the TFR between 1970 and 1980, with nuptiality only later beginning to play a more significant role (Figure 5). The decline in TFR was –1.366 children between 1970 and 1980, –0.774 children between 1980 and 1990, –0.326 children between 1990 and 2000, –0.536 children between 2000 and 2010, and +0.180 children between 2010 and 2020. Changes in the proportion of married women stand out as a major contributor to the decline in fertility, particularly from 1980 to 2010 and for the 20–24 and 25–29 age groups. Notably, the change in TFR was about +0.180 children from 2010 to 2020—during this period, the positive contributions of marital fertility (+0.303) were offset by the negative contributions of nuptiality (–0.123). This indicates that despite policies aimed at boosting marital fertility, TFRs cannot fully rise if marriage continues to decline, thereby offsetting the increases in marital fertility.

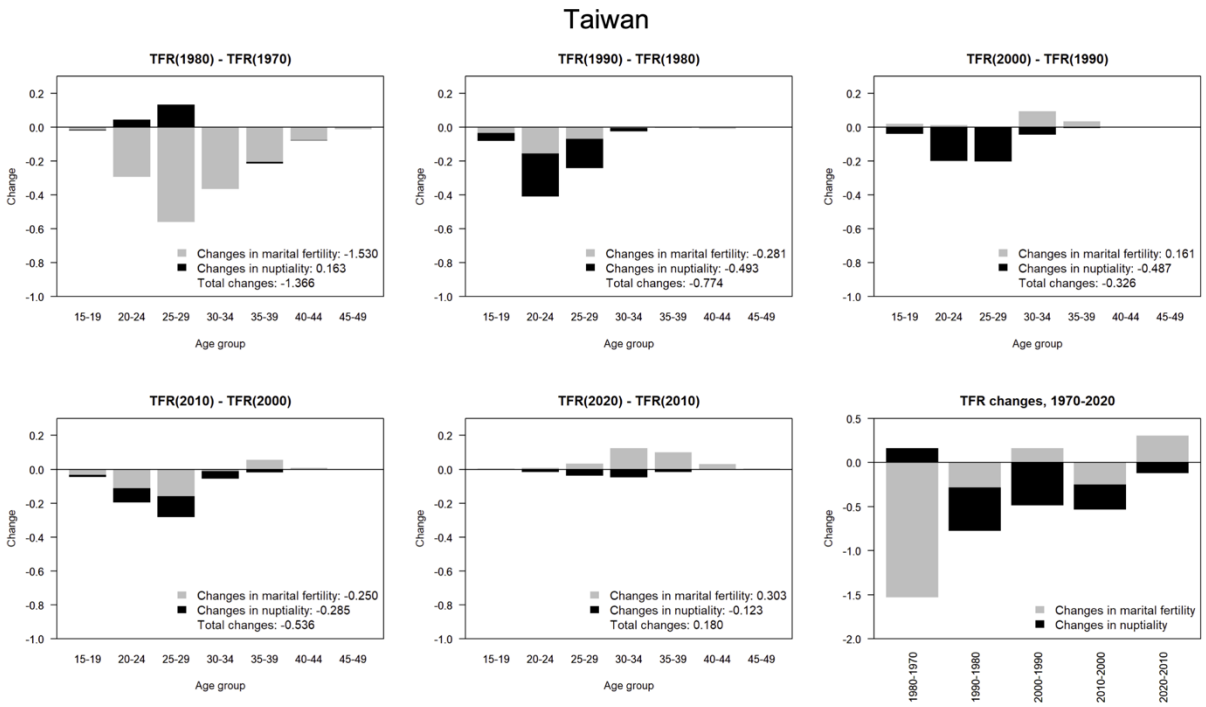

Figure 5. Decomposition of the change in TFR in Taiwan, 1970–2020.

Source: Same as the previous figure.

Similarly, the decline in Singapore's TFR was initially driven by changes in marital fertility, with nuptiality later driving more of the change (Figure 6). The changes in TFR were –1.237 children (1970–1980), –0.008 children (1980–1990), –0.251 children (1990–2000), –0.400 children (2000–2010), and –0.167 children (2010–2020). The decline in marital fertility and the proportion of married women played important roles in the decline of TFR in different periods. More specifically, marital fertility was the greater contributor to the decline in TFR from 1970 to 1980, yet the decline in TFR after 1980 was mainly due to the decline in the proportion of married women, which contributed to a large negative effect on overall fertility.

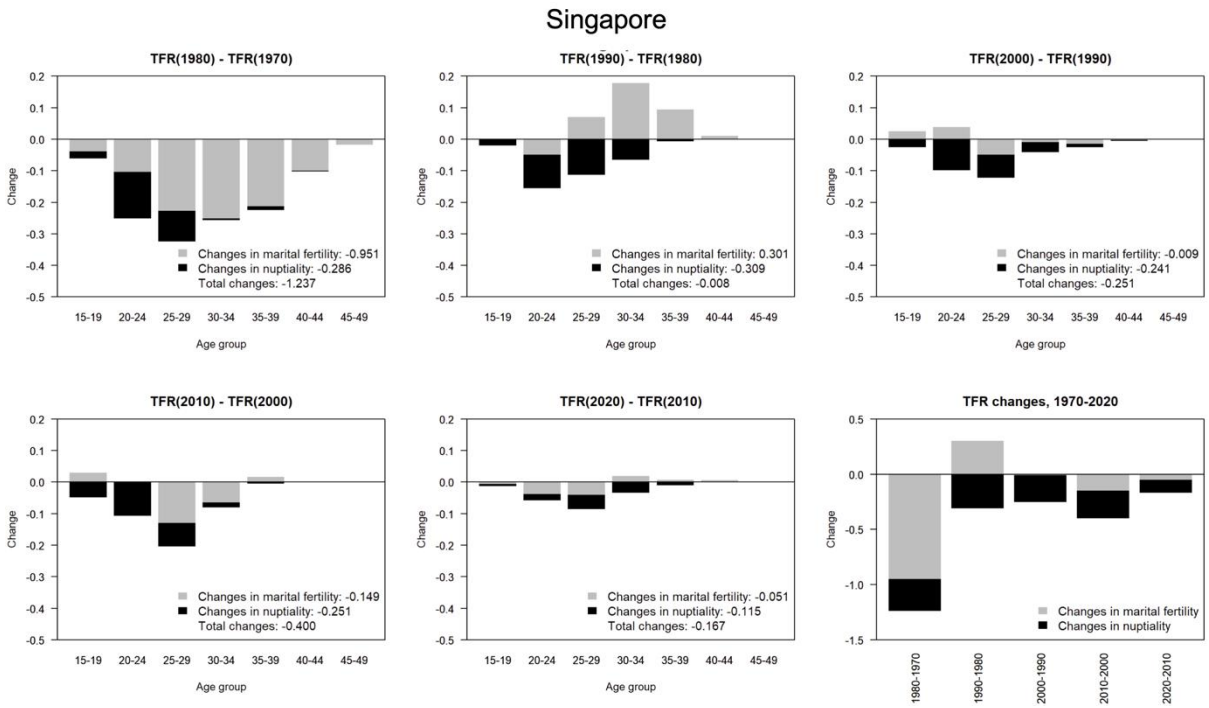

Figure 6. Decomposition of the change in TFR in Singapore, 1970–2020.

Source: Same as the previous figure.

Our findings highlight that declines in fertility are influenced by both marital fertility and the proportion of married women. Of these factors, the latter has become increasingly significant across all four societies, especially in the past two decades. Additionally, changes in nuptiality are consistently negative. The major age-specific nuptiality contributions have gradually shifted toward higher age groups over the past decades, suggesting that marriage is increasingly being delayed and forgone in these societies.

Discussion

This study examined the contributions of changes in nuptiality and marital fertility to TFR declines in East Asian societies between 1970 and 2020. To empirically quantify these contributions, we conducted a decomposition analysis using data from the UNPD Fertility

and Marriage Datasets in Japan, South Korea, Taiwan, and Singapore (all societies characterized by the lowest-low fertility at present). Through a comparative lens, we illustrate how fertility declines in these contexts are largely attributable to the recent nuptiality decline. Here, we wish to highlight the importance of considering an alternative, more holistic, structural approach to improving the utility of existing family policies.

Our findings indicate that Japan was the first of these countries to undergo a transition in fertility, falling from about 4 children per woman in 1950 to below the replacement level by 1974, with rates continuing to fluctuate slightly downward for the remainder of the period (Okazaki 1967). During their earlier estimation periods (1970–1980), South Korea, Taiwan, and Singapore exemplified a fertility transition, with TFRs decreasing from a high of about of about three to four children to below the replacement level. Most of this early decline appears attributable to reductions in marital fertility. Based on this finding, the rapid decline in TFR during the fertility transition was primarily due to changes in marital fertility. In turn, it is understandable that policymakers in these countries have predominantly aimed to increase marital fertility. Following Japan's lead, these societies have adopted a broad range of policy measures targeted at boosting post-marriage fertility rates, including financial support for families and initiatives designed to reconcile work and family life in hopes of increasing within-marriage childbearing.

Despite these policies, fertility rates have not substantially increased; regarding potential reasons for their ineffectiveness, our results reveal that the primary challenge of increasing fertility within East Asian countries in recent decades has been their declining marriage rates. Specifically, we find that changes in nuptiality have contributed negatively to TFR changes in all of four societies over the past few decades (1990–2020). Drawing on a comparative approach, our results demonstrate that changes in nuptiality play an important

role in understanding recent changes in TFR from low to lowest low across all four East Asian Societies. The norm of universal marriage appears to be gradually diminishing, with a trend toward delayed or non-marriage throughout the lifespan. These societies have undergone significant economic, social, and attitudinal changes since the 1970s—a period described as one of "compressed modernity" (Chang 1999). Based on these findings, we propose that the rapid changes of these past decades may have promoted what Lesthaeghe (2010) identified as the postmodern attitudes associated with the SDT (e.g., individuality, self-actualization) and the traditional Confucian family values that Cheng (2020) noted as influencing family formation trends. The commonality in these societies supports that economic costs are not the only deterrent against marriage and childbearing for women: Married women in highly patriarchal societies are often expected to assume caregiving roles despite government efforts to encourage more involvement from men. When considering economic and cultural factors, Jones et al. (2012) found that the high cost of living, demanding work culture, and stagnant economy and wages contribute to fewer people opting to date or marry. Based on this evidence, fewer marriages lead to lower overall fertility.

To address low and delayed marriage, some governments have attempted to promote marriage among singles. In this regard, the Singaporean government established the Social Development Unit in 1984; it later evolved into the Social Development Network and aimed to encourage social interaction among single graduates and non-graduates as a means of promoting marriage. Housing support policies in South Korea and Singapore have also been introduced to help couples purchase homes earlier than they would otherwise. Despite these policy measures, which may have prevented an even greater proportion of singles and lower fertility rates, significant structural barriers and cultural constraints remain to be addressed.

In addressing low fertility, drawing on lessons from low-fertility European societies that have experienced a recuperation of fertility rates and focusing on broader issues (e.g., gender equity and improving family and children's well-being) appears beneficial (Sobotka et al. 2019). In contrast to the standard hours in many countries of 40–44 per week, the French family support system includes a standard 35-hour workweek (Letablier 2003). Notably, up to 12 hours of overtime work is common in low-fertility Asian societies (Kim and Min 2023; Singapore Ministry of Manpower 2023). Adjusting working hours may enhance work-family balance by supporting full-time labor force participation among men and women alike, providing them time to spend with their families and potential partners. Other previously implemented policies that could be trialed in East Asia address obstacles and barriers faced by specific population groups, such as unmarried couples, single parents, and same-sex couples (Sobotka et al. 2019). Most East Asian nations are less accepting of legalizing same-sex marriage, parenting, and adoption rights, making it far more challenging for non-heteronormative citizens to become parents. Crucially, the stigmatization of less conventional family forms may adversely impact these groups' reproductive rights as well as any of their possible contributions to fertility. Modern family policies should thus better reflect the diversity of family forms and support individuals' reproductive decisions.

Beyond its implications for policy, this study contributes to the advancement of decomposition analysis in fertility research based on foundational methodological works (Cho and Retherford 1973; Retherford and Ogawa 1978; Jiang et al. 2019; Nishikido et al. 2022). We discussed two methods for constructing the ASFR, with each leading to different but related approaches for decomposing changes in the TFR. The first method, used by Cho and Retherford (1973), Retherford and Ogawa (1978), and Nishikido et al. (2022), comes from a weighted mean: ASFR = ASMFR * MP + ASNMFR * NMP, with MP and NMP as weights (see Appendix A2). The second method, employed in our study and by Jiang et al.

(2019), calculates ASFR using the marital fertility ratio multiplied by MP (details in the Methods section). Both methods are valid yet require careful interpretation when analyzing the results. Nishikido et al. (2022, p. 9) explain that the rate effect summarizes the impact of age- and partnership-specific fertility rates on TFR differentials, while the composition effect reflects the influence of age-specific partnership composition. Although mathematically precise, these interpretations mix the distinctions between marital and nonmarital fertility rates and composition effects, making it more complex to untangle them. Typically, policy focuses on the effects of marital fertility and nuptiality rather than combined effects, leading to potential discrepancies between policy intent and measurement outcomes. In contexts with negligible nonmarital births, the rate effect is primarily driven by the marital fertility rate, and the composition effect is mainly influenced by marital age composition; however, to the best of our knowledge, these details had not been discussed in depth before this study.

Ultimately, we conclude that a multi-pronged approach to population policies may be pivotal in addressing the contemporary demographic reality facing many of these low-fertility Asian societies. While current policies do assist citizens who seek to start and grow a family, more can be done to improve the inclusivity of these policies to embrace more diverse families. Reorienting public expenditure, welfare, health, and social care systems is thus necessary to address population aging. To this end, policies should include investments in lifelong learning, gerontechnology, active aging, closing the digital divide, reducing inequalities, community engagement, and policies to support and train carers, potentially offsetting some challenges from aging and population decline (Gietel-Basten 2022). In tandem with existing policies, more inclusive measures and aging-related preparations may aid in addressing the imminent demographic challenges.

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Appendix A1

The 37 countries included in Figure 1 are:

Australia, Austria, Belgium, Canada, Chile, China, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Ukraine, and United States of America.

Appendix A2

The use of the Kitagawa decomposition technique (1955) to investigate the impact of marriage age composition on the total fertility rate was pursued by Cho and Retherford (1973) and recently revisited by Nishikido et al. (2022). The approach of Nishikido et al. (2022) can be reformulated as follows:

$$\Delta TFR(t) = \sum_{x=\alpha}^{\beta} [\Delta ASMFR(x,t)\overline{MP}(x,t) + \Delta ASNMFR(x,t)\overline{NMP}(x,t) + \overline{ASMFR}(x,t)\Delta MP(x,t) + \overline{ASNMFR}(x,t)\Delta NMP(x,t)] \quad \text{(A1)}$$

where $ASMFR(x,t)$ and $ASNMFR(x,t)$ represent the age-specific marital and nonmarital fertility rates. $MP(x,t)$ and $NMP(x,t)$ are the proportions of women in a marital union and those outside of a marital union, respectively.

When nonmarital births are negligible, $ASNMFR(x,t) \approx 0$ and $\Delta ASNMFR(x,t) \approx 0$. Thus, we approximate:

$$ASMFR(x,t) = \frac{Births\ from\ married\ women\ in\ age\ group\ x}{Married\ women\ in\ age\ group\ x} \approx \frac{Births\ from\ women\ in\ age\ group\ x}{Married\ women\ in\ age\ agroup\ x} = MFR(x,t)$$

Then, $ASMFR(x,t) \approx MFR(x,t)$, and $\Delta ASNMFR(x,t) \approx \Delta MFR(x,t)$. Consequently, Eq. (A1) simplifies to $\Delta TFR(t) = \sum_{x=\alpha}^{\beta}[\Delta MFR(x,t)\overline{MP}(x,t) + \overline{MFR}(x,t)\Delta MP(x,t)]$, as derived in Eq. (3).

To validate our approach—which requires fewer data than that of Nishikido et al. (2022)—we reconstructed the first-order marital and nonmarital fertility rates, as well as the proportions of women in and outside of marital unions using the 2018 Spanish Fertility Data (INE 2019). These calculations utilized the two distinct yet interconnected decomposition approaches. As Figure A1 illustrates, the marital fertility ratio effect and marital age

composition effect from our approach exhibit similar age schedules to the rate (especially the marital fertility rate effect) and composition effects (particularly the marital composition effect) derived from Nishikido et al. (2022). Additionally, at younger ages, where births outside of marital unions are relatively more common than at older ages, notable disparities emerge between the approaches. However, the magnitude of these differences is not substantial.

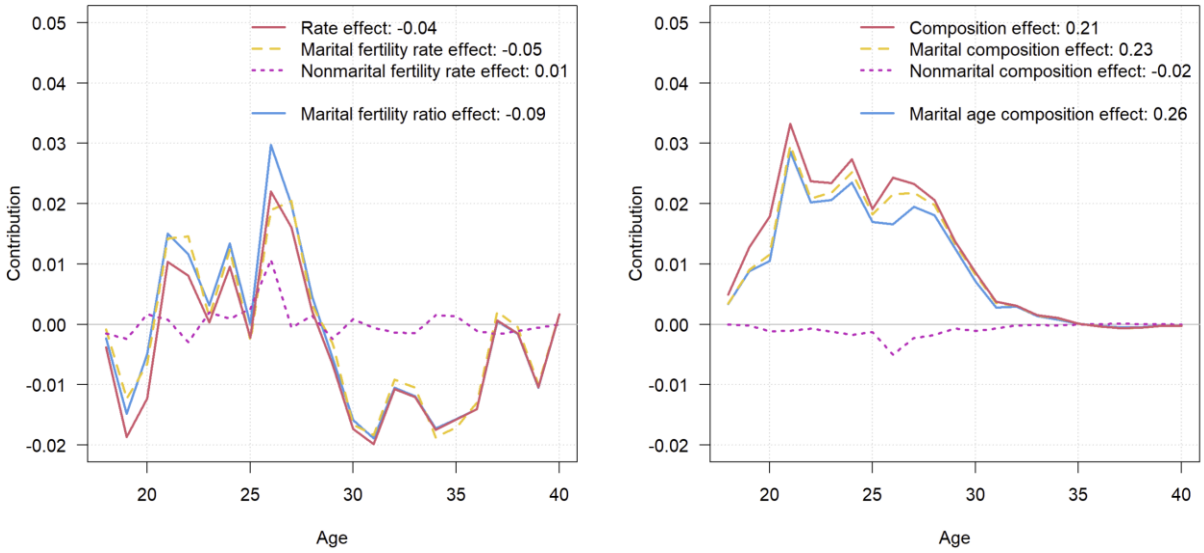

Figure A1. Contribution of partnership-specific first-birth rate and composition to the first-birth differential by age group (1965–1969) using the two decomposition approaches.

Notes: $Rate\ effect\ =\ marital\ fertility\ rate\ effect\ +\ nonmarital\ fertility\ effect$ and $Composition\ effect\ =\ marital\ composition\ effect\ +\ nonmarital\ composition\ effect$. The rate and composition effects were calculated using the method by Nishikido et al. (2022). The marital fertility ratio effect and marital composition effect were calculated using the approach outlined in this paper.

Source: Calculated by the authors using the 2018 Spanish Fertility Survey (INE 2019).