Fewer Couples, Fewer Births: Decomposing the Fertility Decline*

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Abstract

We study the contribution of changing partnership patterns to recent fertility change. Using data for several European Union countries and the United States, we analyze fertility developments between 2005 and 2020. Applying a Kitagawa decomposition, we separate fertility changes into a composition component, i.e., shifts in partnership exposure, and a rate component, i.e.,changes in fertility within partnership statuses. We find that declines in marriage and cohabitation reduced total fertility rates in every country studied, including those where overall fertility increased. These results suggest that fertility trends cannot be understood solely as changes in childbearing behavior within unions, but also reflect a contraction in exposure to childbearing. Hence, the results highlight the importance of understanding union formation dynamics for explaining contemporary fertility change.

JEL Classification Codes: J11, J12, J13

Keywords: Fertility; Cross-country analysis; Demographic change

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Abstract

Background: Fertility rates have declined across most high-income countries, alongside substantial changes in marriage and cohabitation patterns. While union formation is a key proximate determinant of fertility, its quantitative contribution to recent fertility change remains insufficiently documented.

Objective: This paper assesses the extent to which declining partnership exposure contributes to recent fertility trends in selected European Union countries and the United States between 2005 and 2020.

Methods: We apply a Kitagawa decomposition of total fertility rates into a composition component (changes in the distribution of women across marital and cohabiting statuses) and a rate component (changes in fertility within each status). Fertility levels in 2020 are compared to those in 2005.

Results: Declines in marriage and cohabitation reduced total fertility in all countries studied. Holding partnership distributions constant would have resulted in higher fertility in 2020, including in countries where total fertility increased over the period. The composition effect is consistently negative across contexts, while within-status fertility responses vary substantially.

Conclusions & Contribution: This paper provides cross-national evidence that a meaningful share of recent fertility change reflects reduced exposure to partnership rather than solely changes in childbearing behavior within unions. Furthermore, it highlights the importance of understanding union formation dynamics for explaining contemporary fertility change.

1 Introduction

Across high-income countries, fertility has fallen to historically low levels. Period total fertility rates (TFRs) are now well below replacement in most OECD countries, and cohort fertility has declined in many contexts. A large literature attributes these trends to postponement, economic uncertainty, changing gender relations, and policy environments (Balbo et al., 2013; Sobotka et al., 2019; Bergsvik et al., 2021; Luci-Greulich and Thévenon, 2013; Doepke et al., 2022; Kearney et al., 2022). Yet comparatively less attention has been devoted to a fundamental structural margin of fertility change: the decline and postponement of stable coresidential partnerships, including both marriage and cohabitation. Over recent decades, partnering has become less universal and increasingly delayed, while complex partnership trajectories have become more common. These developments have occurred alongside a rise in singlehood at young and mid-adult ages (Kuang et al., 2025; Van Winkle, 2018; Berg and Verbakel, 2022; Sobotka and Toulemon, 2008).

This paper quantifies how much of the recent fertility decline can be accounted for by changing *coresidential partnership exposure*. We study the United States and selected European countries from 2005 until 2020, using harmonized household surveys to measure both recent childbearing and coresidential partnership status. We implement a Kitagawa decomposition that separates changes in fertility into: (i) a *composition (exposure) effect*, driven by shifts in the age-specific distribution of women across partnership states (married/cohabiting, unpartnered); and (ii) a *rate effect*, reflecting changes in fertility conditional on partnership status (Kitagawa, 1955). Conceptually, this parallels a two-stage view of childbearing at the macro level: fertility depends on how many women are in a partnership at each age and how intensively partnered women (and unpartnered women) have births (Reimondos et al., 2025). We find that for most countries declining partnership exposure accounts for a drop in 0.2 in total fertility rate, with substantial cross-national heterogeneity.

Why should partnership exposure matter for fertility? First, in classic demographic frameworks, exposure to sexual union is a proximate determinant of fertility (Bongaarts, 1978). Even in settings where nonmarital childbearing is common, most births still occur to women who are married or cohabiting with a partner, making partnership prevalence and stability central to aggregate fertility (Reimondos et al., 2025; Perelli-Harris, 2014). Second, postponement of partnership formation is closely linked to postponement of first births; it compresses the reproductive window and can depress completed fertility if fertility catch-up at older ages is incomplete (Beaujouan, 2023). Third, increasing partnership complexity - including union dissolution - can reduce achieved fertility by shortening time spent in unions, with only partial compensation through births in subsequent unions (Fostik et al., 2023; Andersson, 2023a; Coppola and Di Cesare, 2008). In the U.S. context, rising nonmarital childbearing and the retreat from marriage have followed cohort-specific mechanisms, including shifts in premarital conceptions and responses to them (Hayford, 2005; England et al., 2013), while increases in unmarried women by midlife have been central to rising childlessness (Hayford, 2013). Taken together, these mechanisms imply that aggregate fertility can be understood as a weighted average of partnership-specific fertility rates, where the weights are the age-specific shares of women in each partnership state.

A central barrier to cross-national work at this intersection is measurement. Vital statistics typically record the mother's legal marital status at birth, but do not consistently identify coresidential partnering, limiting cross-country comparability in settings with high levels of childbearing outside marriage (Laplante and Fostik, 2015; Reimondos et al., 2025). We therefore use harmonized household surveys that measure partnership structure directly. We draw on the EU Statistics on Income and Living Conditions (EU-SILC) and the American Community Survey (ACS).

While the EU-SILC (Eurostat, 2024) is not designed primarily for fertility estimation, it enables consistent classification of coresidential partnership states across countries - in aggregate data, the distinction by age group and marital or partnership status simultaneously is not available. Furthermore, recent papers have shown that period fertility measures can be derived from EU-SILC when appropriate precautions are taken. Greulich and Dasré (2017) show that although raw EU-SILC fertility measures tend to underestimate period fertility, biases are largely systematic and can be substantially reduced by allowing for a short time lag between birth occurrence and survey observation. Building on this work, Greulich and Toulemon (2023) develop a semi-retrospective approach combining Bayesian smoothing and post-stratification to obtain age-, parity-, and education-specific period fertility estimates that are consistent with national totals.

Beyond methodological validation, EU-SILC has increasingly been used in substantive fertility research. For example, Nitsche et al. (2018) use EU-SILC to examine how partners' educational pairings shape fertility behavior across Europe, and Hsu (2023) analyze employment instability and birth transitions in 27 European countries using EU-SILC data. These applications show that, despite its limitations, EU-SILC can be used to study fertility dynamics in a comparative framework.

For the United States, the ACS includes a direct question on whether a woman had a birth in the past 12 months and collects detailed household relationship information that allows identification of married and cohabiting couples. Although partnership status is measured at the time of interview rather than at the exact time of birth, the short recall window and large sample size make the ACS a widely used source for estimating recent fertility patterns and family structure in the U.S. context. In addition, the ACS has been used to study fertility and marriage patterns in distinctive and relatively small subpopulations, including the Amish and Ultra-Orthodox Jews in the United States (Stone, 2023; Stone et al., 2025).

We first focus on marriage. In the United States, the decline in fertility between 2005 and 2020 is driven largely by changes in marital composition rather than changes in fertility conditional on marital status. Fertility rates within marital statuses changed little over this period, but the share of married women declined substantially. Holding marital shares fixed at their 2005 levels yields a counterfactual TFR of about 1.9, compared to the observed level below 1.7. The decline in marriage is concentrated among younger women, where fertility rates are highest. Extending the analysis to a selection of European countries, we find that marital shares declined everywhere, while overall TFR trends were heterogeneous. A Kitagawa decomposition shows that changes in marital composition account for a substantial share of fertility change in most countries. Note that the Kitagawa decomposition is linear by definition and that it does not allow for an interpretation of causality. Both directions of causality - that declining coupling rates cause lower fertility or that lower fertility desires cause lower couples rates - seem plausible, but determining which one is dominating is not the aim of this work.

We then broaden the analysis to coresidential partnerships, defined as marriage and cohabitation combined. This distinction matters, particularly in countries such as France, Sweden, and Norway, where cohabitation is common and childbearing increasingly occurs outside marriage. Focusing only on marriage understates changes in exposure to childbearing in these contexts. When we consider all partnered women, we find a consistent relationship: countries with larger declines in the share of women in coresidential partnerships also exhibit larger negative composition effects on TFR. In other words, the contraction in partnership exposure is systematically associated with lower aggregate fertility.

Distinguishing between exposure and rate components has direct policy relevance. If fertility decline is primarily driven by reduced partnership exposure, then policies targeting the direct costs of children may have limited effects unless they also address structural barriers to partnership formation and stability—such as housing affordability, labor-market precarity, gender inequality in unpaid work, and institutional arrangements shaping the compatibility of employment and family life. Conversely, where the rate effect dominates, interventions that shift within-partnership childbearing may be comparatively more relevant (Sobotka et al., 2019; Bergsvik et al., 2021). By bringing partnership exposure back to the foreground, our analysis reconnects contemporary fertility decline to its proximate demographic foundations and provides a transparent accounting of the structural margins through which fertility change operates.

The rest of the paper is structured as follows: In Section 2, additional background and related literature is discussed while Section 3 focuses on the description of the data. In Section 4, the methodology and especially the Kitagawa decomposition are discussed, followed by the results in Section 5. Finally, Section 6 discusses the results and presents the conclusions.

2 Background and Related Literature

2.1 The retreat from partnering and rising complexity

The retreat from marriage is one of the most consequential demographic shifts of recent decades and a central component of the broader transformation often described as the Second Demographic Transition (Lesthaeghe and Moors, 2000; Lesthaeghe, 2010; Sobotka and Toulemon, 2008). Across much of Europe and North America, marriage has become later and less universal, and living arrangements have diversified (Fokkema and Liefbroer, 2008). Cohabitation has expanded dramatically and, in some contexts, has partially substituted for marriage as a setting for family formation. However, substitution is often incomplete: declines in marriage are not always fully offset by increases in cohabitation, contributing to a net reduction in the proportion of coresidentially partnered women at key childbearing ages (Jalovaara and Andersson, 2023). Complementing these trends, a growing share of adults spend longer spells unpartnered - including both delayed entry into first unions and extended singlehood - with documented increases in young-adult singlehood across European countries (Berg and Verbakel, 2022; Bergström and Brée, 2023; Bellani et al., 2017). Beyond prevalence, partnership trajectories have become more complex. Comparative life-course evidence points to rising instability, union dissolution, and more varied sequencing of union transitions (Andersson, 2003).

2.2 Partnership dynamics, fertility, and decomposition approaches

The transformations in partnership behavior described above have direct implications for aggregate fertility. When fewer women are in coresidential partnerships at a given age, or when partnerships are formed later and are less stable, exposure to childbearing is structurally reduced. Analyses limited to legal marital status may therefore obscure an important channel through which fertility decline operates: changes in the age-specific distribution of women across partnership states.

A growing body of research explicitly links partnership dynamics to fertility change, emphasizing that partnering should be conceptualized as a multidimensional and dynamic process (Thomson et al., 2012). Partnership type (marriage versus cohabitation), timing, duration, dissolution, and repartnering all shape exposure to childbearing and parity progression (Kuang et al., 2025). Delayed union formation is closely associated with delayed first births and may reduce completed fertility when recuperation at older ages is incomplete (Beaujouan et al., 2023; Beaujouan, 2023; Ciganda and Todd, 2019). Educational and socioeconomic gradients in childbearing within cohabitation further underscore that partnership contexts are socially stratified rather than neutral exposure categories (Perelli-Harris et al., 2010). Similarly, union instability can shorten time spent in coresidential partnerships during prime reproductive ages, with repartnering only partially offsetting lost exposure in many contexts (Fostik et al., 2023; Andersson, 2023a; Andersson, 2023b; Rahnu and Jalovaara, 2023). These mechanisms highlight that fertility decline is not solely about changing preferences or economic constraints within stable unions; it is also about shifts in the structure and sequencing of partnerships themselves.

From a demographic accounting perspective, aggregate fertility can be expressed as the sum of partnership-specific contributions. Age-specific fertility rates are weighted averages of fertility within partnership states, where the weights correspond to the age-specific shares of women who are married, cohabiting, or unpartnered. Changes in overall fertility may therefore arise from two conceptually distinct sources: (i) shifts in the distribution of women across partnership states (exposure or composition effects), and (ii) changes in fertility conditional on those states (rate effects). This logic closely follows Kitagawa's classic decomposition framework (Kitagawa, 1955).

Several recent studies apply related approaches to examine the partnership-fertility nexus. Using Australian data, Reimondos et al. (2025) show that rising singlehood and changing partnership patterns have made a measurable negative contribution to fertility decline, particularly at younger ages. Comparative analyses further show that cross-country differences in first-birth rates can largely reflect differences in partnership composition rather than within-partnership fertility behavior (Nishikido et al., 2022). At the cohort level, macro-level decompositions reveal that births within first unions remain dominant even amid rising family complexity, while higher-order unions and non-partnered births contribute smaller but non-negligible shares (Andersson, 2023a). Related work further shows that fertility decline can be decomposed into increasing childlessness and declining parity progression among parents, with evidence that reductions in births among the parous are often quantitatively substantial (Geruso and Spears, 2025). In Latin America, multivariate decompositions similarly demonstrate that rising fertility outside coresidential partnerships reflects both compositional shifts and differential fertility behavior (Laplante et al., 2018).

Despite these advances, cross-national evidence remains limited by measurement constraints. Vital statistics typically record legal marital status at birth but do not consistently identify cohabiting unions, restricting the ability to measure partnership exposure comparably across countries (Laplante and Fostik, 2015). In contexts where childbearing increasingly occurs within cohabitation, reliance on marital status alone may misrepresent the structural exposure to partnered fertility. This challenge motivates the use of harmonized household surveys that directly measure coresidential partnership status. Building on methodological work demonstrating the feasibility of deriving period fertility estimates from EU-SILC under explicit assumptions and robustness checks (Greulich and Toulemon, 2023), we combine survey-based fertility measurement with a Kitagawa-style decomposition to provide a systematic cross-national accounting of how much recent fertility decline reflects declining partnership exposure versus changing fertility behavior within partnership states.

2.3 This paper's contribution

This paper contributes in three ways. First, we provide harmonized cross-national evidence on trends in partnership exposure (marriage, cohabitation) using comparable household survey data. Second, we implement a Kitagawa-style decomposition to quantify the relative contributions of exposure (composition) and conditional fertility (rate) effects to aggregate fertility decline. Third, we compare results across countries to assess whether fertility decline is primarily driven by structural changes in partnering or by behavioral changes within partnerships, thereby clarifying which policy levers are most plausibly aligned with the dominant components of fertility change.

3 Data

This section describes the data sources and the construction of the key variables used in the analysis. We use survey data for the United States and selected European countries. For the United States, we rely on the American Community Survey (ACS) for the years 2005–2020. For Europe, we use the European Union Statistics on Income and Living Conditions (EU-SILC) for the years 2006–2023. In both datasets, we construct measures of fertility and coresidential partnership status. Fertility captures whether a woman had a birth within a specified period. Partnership status is measured in two ways: *marital status*, defined as being legally married, and *couple status*, defined as being in a coresidential partnership (either married or cohabiting). These partnership definitions apply throughout the remainder of the paper. The choice of time periods and variable definitions aims to ensure comparability across countries and data sources.

3.1 United States

For the United States, we use data from the American Community Survey (ACS), accessed through IPUMS (Ruggles et al., 2020). The ACS is an annual, nationally representative household survey conducted by the U.S. Census Bureau since 2005. We restrict the sample to women aged 20–44 and apply the individual sampling weights provided in the data when computing all statistics.

Fertility. Fertility is measured using the question: *"Has this person given birth to any children in the past 12 months?"*, asked of women aged 15–50. We construct age-specific fertility rates (ASFRs) as the proportion of women in each five-year age group (20–24, 25–29, 30–34, 35–39, 40–44) who report having had a birth in the preceding 12 months.[1]

Partnership status. Partnership status is measured at the time of the survey. A woman is classified as *married* if her reported marital status is "married, spouse present." She is classified as *in a couple* if she is either married or cohabiting with a partner. Cohabitation is identified using the detailed relationship-to-household-head variable: a woman is considered to be cohabiting if (i) she is listed as the unmarried partner of a male household head, or (ii)

[1] Note that this question provides a binary measure and therefore does not account for twins or two children born in the period of a year - twin births make up a very small share of births (3%), and we only miss half of those children. Additionally, for adopted children, the biological mother is counted here.

she is the household head and a male household member is listed as her unmarried partner. Because fertility refers to births in the preceding 12 months while partnership status is observed at the time of the survey, we assume that women did not change their partnership status during the year prior to the survey.

3.2 European Union

For Europe, we use cross-sectional data from EU-SILC for Germany, Spain, France, Italy, Poland, Sweden, Norway, and Austria. EU-SILC provides harmonized annual microdata on income, living conditions, and household structure across European countries. As in the U.S. sample, we restrict the analysis to women aged 20–44.

Fertility. EU-SILC does not contain a direct measure of recent births. Instead, we use the presence of small children in the household as a proxy for fertility. Greulich and Dasré, 2017 show that the presence of infants is not a good indicator of fertility because of a relatively higher drop-out rate of new mothers. However, they also show that the downward bias in period fertility disappears when allowing for a certain time delay between the childbirth year and the survey year.

Following Greulich and Toulemon (2023), we identify women who have a two-year-old child living in the household as having given birth two years earlier.[2] This implies that fertility in year t is inferred using information from survey year $t+2$. To reduce sampling variability, and following Greulich and Toulemon (2023), we pool three consecutive survey waves when estimating age-specific fertility rates. Specifically, fertility in year t is estimated using survey waves $t+1$, $t+2$, and $t+3$. For example, fertility in 2020 is estimated using the 2021, 2022, and 2023 survey waves.

[2] The EU-SILC does not allow for differentiation between adopted and biological children - adopted children are measured at the level of the adopting family.

Finally, Greulich and Toulemon (2023) propose a semi-retrospective approach to estimate education-specific fertility rates. Their method combines information on recent births with the observed educational attainment of women above a given age threshold (e.g., age 27), an age by which formal educational trajectories are largely completed.[3] This semi-retrospective strategy cannot be extended to partnership status. In contrast to education, marriage and co-residential partnership are non-absorbing, time-varying states. Individuals may enter and exit unions multiple times. As a result, partnership exposure at a given age cannot be reliably inferred from partnership status observed at older ages in the same way as educational attainment.[4]

Partnership status. Partnership status in EU-SILC is derived from the variable *PB200: Consensual Union*, which distinguishes between legal marriage, cohabitation, and single status. We define marital status as legally married versus not married, and couple status as married or cohabiting versus not in a couple. Because fertility is inferred retrospectively while partnership status is measured at the time of the survey, we assume that women did not change their partnership status during the two years following the birth.[5]

[3] They also use Bayesian methods for producing fertility statistics by education and parity. They document that using Bayesian methods is important due to the small sample sizes and by the fact that conditional on having a child below the age of 20, the probability of having another one is very different from the probability of having a first child before reaching the age of 20. As we exclude the 15-19 age group and do not focus on parity, we do not replicate their Bayesian approach.

[4] Even restricting attention to marriage and focusing on "never married" and "not-never married" would not resolve this issue, as the age at which permanent singlehood can be identified occurs relatively late in the life course. Thus, the retrospective approach could lead to biases.

[5] While in the ACS we know the partnership status at the time of the interview within a year after the birth, for the EU-SILC data we only know the partnership status of mothers two years after the birth. There is a panel dimension of the EU-SILC, but conditioning on observing mothers in the year of the birth limits the sample size and creates biases as argued above. We used the 4-year panel dimension to validate that there is little movement out of marriage and cohabitation between the birth and the first two years after birth. It must be noted that that the sample size for this analysis is small.

3.3 Subgroup Analysis

Age-specific fertility rates within partnership subgroups are computed as the number of births to women in a given age group and subgroup divided by the total number of women in that age group and subgroup. For example, marital-status-specific ASFRs are calculated separately for married and non-married women, and couple-status-specific ASFRs are calculated separately for women in a couple and women not in a couple.

4 Methods

Our objective is to quantify how changes in partnership composition—measured either by marital status or couple status—contributed to changes in total fertility over time. We define the total fertility rate (TFR) in year t as

$$TFR_t = 5 \times \sum_{i=1}^{5} AR_{i,t} = 5 \times \sum_{i=1}^{5} \left[p_{M,i,t} \times AR_{M,i,t} + (1 - p_{M,i,t}) \times AR_{S,i,t} \right], \tag{1}$$

where $AR_{i,t}$ denotes the age-specific fertility rate in five-year age group i (20–24, 25–29, 30–34, 35–39, 40–44). We use the TFR as it is the most widely used method to measure fertility and to have a measure of fertility that is easily comparable across countries and over time. Note that this measure abstracts from the age distribution of women by relying on age-specific fertility rates, and is therefore comparable across populations with different age structures. Differences in age structure are not the focus of our work and would add another layer of heterogeneity between the countries and over time that would be difficult to disentangle from the other changes we are interested in. TFR is also the only widely used measure of fertility suitable for studying fertility by marital or couple status.

In the second equality of the equation, we decompose the age-specific fertility rate in partnership subgroups. The variable $p_{M,i,t}$ is the proportion of women in subgroup M (e.g., married or in a couple) in age group i at time t, $AR_{M,i,t}$ is the fertility rate of women in subgroup M, and $AR_{S,i,t}$ is the fertility rate of women not in subgroup M.

Furthermore, we construct a counterfactual total fertility rate, where we hold subgroup composition constant at their level in base year t_0, while the age-specific fertility rates are taken at time t:

$$\widehat{TFR}_{t,t_0} = 5\sum_{i=1}^{5}\left[p_{M,i,t_0}AR_{M,i,t} + (1-p_{M,i,t_0})AR_{S,i,t}\right]. \tag{2}$$

This counterfactual measures what fertility would have been in year t if partnership composition had remained at its level in t_0, while subgroup-specific fertility rates evolved as observed.

To quantify the relative importance of changes in subgroup composition versus changes in subgroup fertility rates in explaining the change in total fertility between a time t_0 and a time t_1, which in our case would be 2005 and 2020, we apply the Kitagawa decomposition. Let $\Delta TFR = TFR_{t_1} - TFR_{t_0}$. Then:

$$\begin{aligned}\Delta TFR = 5\times\Bigg\{&\frac{1}{2}\sum_{i=1}^{5}\Big[(p_{M,t_1}-p_{M,t_0})\big(AR_{M,i,t_0}+AR_{M,i,t_1}-AR_{S,i,t_0}-AR_{S,i,t_1}\big)\Big]\\ &+\frac{1}{2}\sum_{i=2}^{5}\Big[(AR_{M,i,t_1}-AR_{M,i,t_0})(p_{M,t_0}+p_{M,t_1})\\ &+\quad (AR_{S,i,t_1}-AR_{S,i,t_0})(2-(p_{M,t_0}+p_{M,t_1}))\Big]\Bigg\}.\end{aligned}$$

The change in TFR can be decomposed into a composition effect, the first term, reflecting changes in the share of women in subgroup M, and a rate effect, the second term, reflecting changes in subgroup-specific fertility rates. The composition effect captures how much of the fertility change is attributable to shifts in marital or couple shares, while the rate effect captures behavioral changes within subgroups.

A similar decomposition can be done for each age group. Let $\Delta R_i = R_{i,t_1} - R_{i,t_0}$. Then

$$
\begin{aligned}
\Delta R_i = 5 \times \frac{1}{2}\Big(p_{M,i,t_1} - p_{M,i,t_0}\Big)\Big\{\big(AR_{M,i,t_0} - AR_{S,i,t_0}\big) + \big(AR_{M,i,t_1} - AR_{S,i,t_1}\big)\Big\} \\
+ 5 \times \frac{1}{2}\Big(AR_{M,i,t_1} - AR_{M,i,t_0}\Big)\Big(p_{M,i,t_0} + p_{M,i,t_1}\Big) \\
+ 5 \times \frac{1}{2}\Big(AR_{S,i,t_1} - AR_{S,i,t_0}\Big)\Big(2 - p_{M,i,t_0} - p_{M,i,t_1}\Big),
\end{aligned}
\tag{3}
$$

and $\Delta TFR = \sum_{i=1}^{5} \Delta R_i$. This age-specific decomposition allows us to identify the ages at which changes in partnership composition or subgroup fertility contribute most to overall fertility change.

5 Results

Having established the methodology, we first show the importance of compositional effects. We focus on the United States, where long and consistent time-series data on fertility and partnership status allow for a clear illustration. Furthermore, we first focus on the composition of married versus unmarried, discussing couples later on. We document the joint evolution of the TFR and the share of married women of childbearing age, and construct a counterfactual fertility rate holding marital composition constant at its initial level. This exercise isolates the contribution of changes in marital exposure to aggregate fertility decline. Then, we apply the full Kitagawa decomposition to both the United States and the selected European countries to compare the relative importance of composition and rate effects across contexts. Finally, we perform the same decomposition, but use couples, both married and cohabiting, rather than only married.

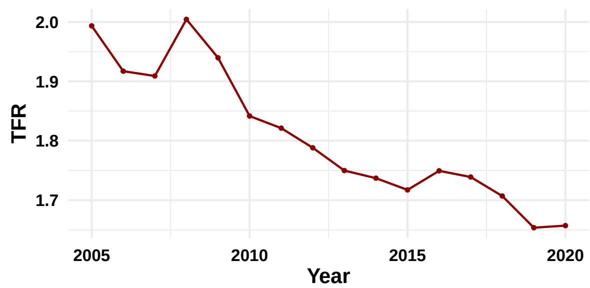
5.1 U.S. fertility since 2005

Figure 1a shows the TFR for the U.S. from 2005 until 2020 computed using the ACS. The total fertility rate passed from 2 children per women in 2005 to 1.65 in 2020, a drop of around 0.35 children per women in 15 years. Figure 1b shows the TFR conditional on being married or not. Notably, the change in fertility within each of these groups has been less than the overall decline in TFR. The TFR computed among married women stayed stabled at 3.1, meanwhile for unmarried women it declined from 1.1 to 0.9. Considering this, it must be the case that a part of the decline in the TFR is due to a change in composition among married and unmarried women. Indeed, the share of married women declined from 53% in 2005 to 45% in 2020, as shown in Figure 1c.

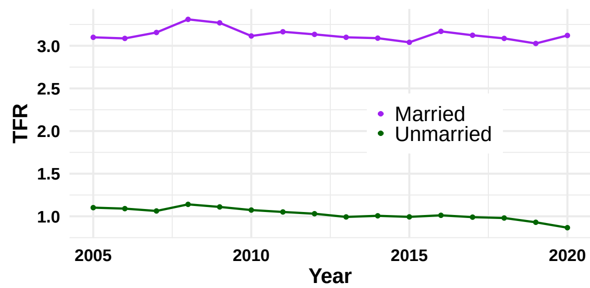
The importance of this effect can be seen in Figure 1d, that shows the TFR and a counterfactual TFR. The latter is computed using equation 2, we use the age-specific marital shares for 2005, i.e. $t_0 = 2005$, and the age-specific fertility rates for each subgroup, i.e. married and unmarried, for each year. We can see that had marital shares not changed, the TFR would have been significantly larger, with a drop of 0.1, from 2 to 1.9, rather than the realised drop of 0.35. Thus, changes in the marital share throughout this period account for around 70 % of the total decline in TFR from 2005 to 2020.

Why does the counterfactual TFR remain so much higher than the observed TFR? Insight can be gained by examining age-specific fertility rates and marital shares across age groups, as shown in Figure 2. First, among both married and not married women, fertility is highest in the youngest age groups. Second, the gap in age-specific fertility rates between married and not married women is largest precisely at these younger ages. Third, between 2005 and 2020, fertility declined sharply among younger women in both marital groups, while slightly increasing or stabilizing among older women. Finally, marital shares declined most dramatically among younger women, whereas changes were much smaller among women aged

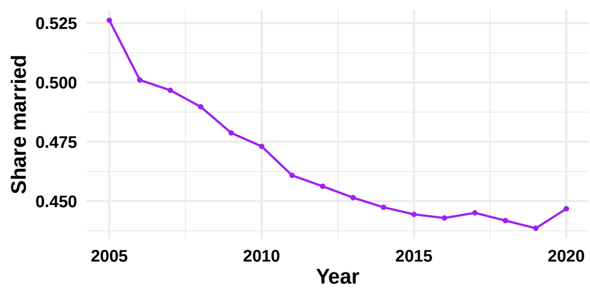
Figure 1: Fertility Decline and Marital Composition in the U.S.



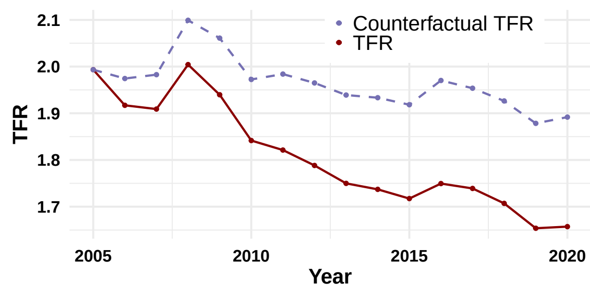
(a) Total Fertility Rates



(b) TFR by Marital Status



(c) Marital Share

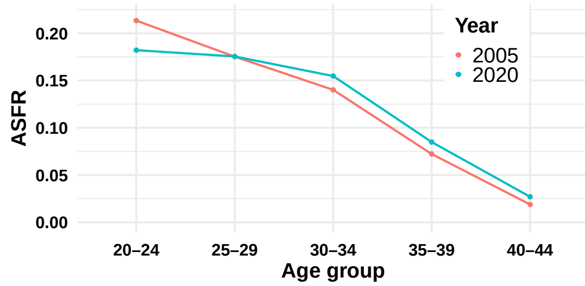


(d) Actual and Counterfactual TFR

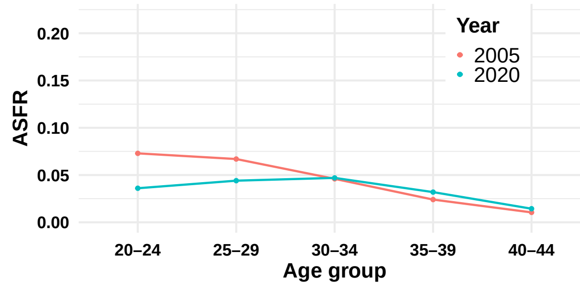
35–44.

Taken together, these patterns explain the large divergence between the observed and counterfactual TFR. The decline in marriage has been concentrated at ages where fertility is both highest and most sensitive to marital status. As younger women are simultaneously less likely to be married and experience the largest fertility gap by marital status, compositional shifts away from marriage reduce aggregate fertility. In contrast, changes in marital shares at older ages have a much smaller impact, since fertility levels are lower and marital differentials are narrower. The interaction between age-specific fertility profiles and declining marital shares at the youngest ages therefore magnifies the aggregate fertility decline.

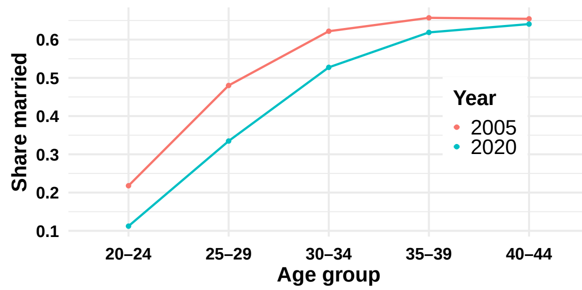
Figure 2: Fertility and Marital Status Across Age Groups



(a) ASFR married



(b) ASFR unmarried



(c) Share married

5.2 Kitagawa decomposition of TFR by marital status for U.S. and Europe

Having analyzed the role of marital composition in explaining the decline in the total fertility rate (TFR) in the United States, we now extend the analysis to selected European countries. We consider eight countries: Germany, Spain, France, Italy, Poland, Sweden, Norway, and Austria, and compare their results with those of the U.S.

Table 1 summarizes the main descriptive findings. The first three columns report the share of married women in 2005 and 2020, as well as the change over the period. The next three columns provide the same information for the TFR. The final two columns report the counterfactual TFR in 2020 - computed by holding age-specific marital shares fixed at their 2005 levels - and the difference between this counterfactual and the observed TFR in 2020.

With the exception of France, where the aggregate marital share remained unchanged, all

Table 1: Changes in marital share and TFR 2005-2020

	Share married (in %)			TFR			Counterfactual TFR	
	2005	2020	Change	2005	2020	Change	2020	Diff.
Italy	51	40	− 11	1.24	0.85	− 0.39	1.13	+ 0.28
U.S.	53	45	− 8	1.99	1.66	− 0.34	1.89	+ 0.23
Spain	53	38	− 14	1.26	1.01	− 0.24	1.23	+ 0.22
Poland	66	58	− 7	1.23	1.41	+ 0.18	1.60	+ 0.19
Norway	41	32	− 10	1.95	1.49	− 0.47	1.67	+ 0.18
Austria	51	45	− 6	1.38	1.45	+ 0.06	1.57	+ 0.13
Sweden	35	31	− 4	1.71	1.75	+ 0.04	1.83	+ 0.09
Germany	50	46	− 3	1.16	1.35	+ 0.19	1.42	+ 0.06
France	45	45	0	1.95	1.31	− 0.64	1.32	+ 0.01

countries experienced a decline in the proportion of married women. The magnitude of the decline varies substantially, ranging from 3 percentage points in Germany to 14 percentage points in Spain. Over the same period, fertility trends were heterogeneous. The TFR declined markedly in Italy, Norway, Spain, France, and the United States, while it increased in Germany and Poland. Austria and Sweden experienced small increases. To ensure that the TFR obtained from the EU-SILC corresponds to the TFR obtained from aggregated data, we compare them to the TFR from the Human Fertility Database (HFD) in Tables 4 and 5 in the Appendix.

Despite this heterogeneity in fertility trends, the counterfactual exercise reveals a common pattern: in every country, the TFR in 2020 would have been higher had marital shares remained at their 2005 levels. The magnitude of this composition effect differs across countries. It is largest in Italy (approximately 0.28), which experienced both a substantial decline in marital shares and a large drop in fertility. The United States, Spain, Poland, and Norway show differences of around 0.2. In contrast, Austria, Sweden, and Germany exhibit smaller effects (around 0.1 or below). France stands out: because marital shares remained essentially constant, the counterfactual TFR differs only marginally from the observed one.

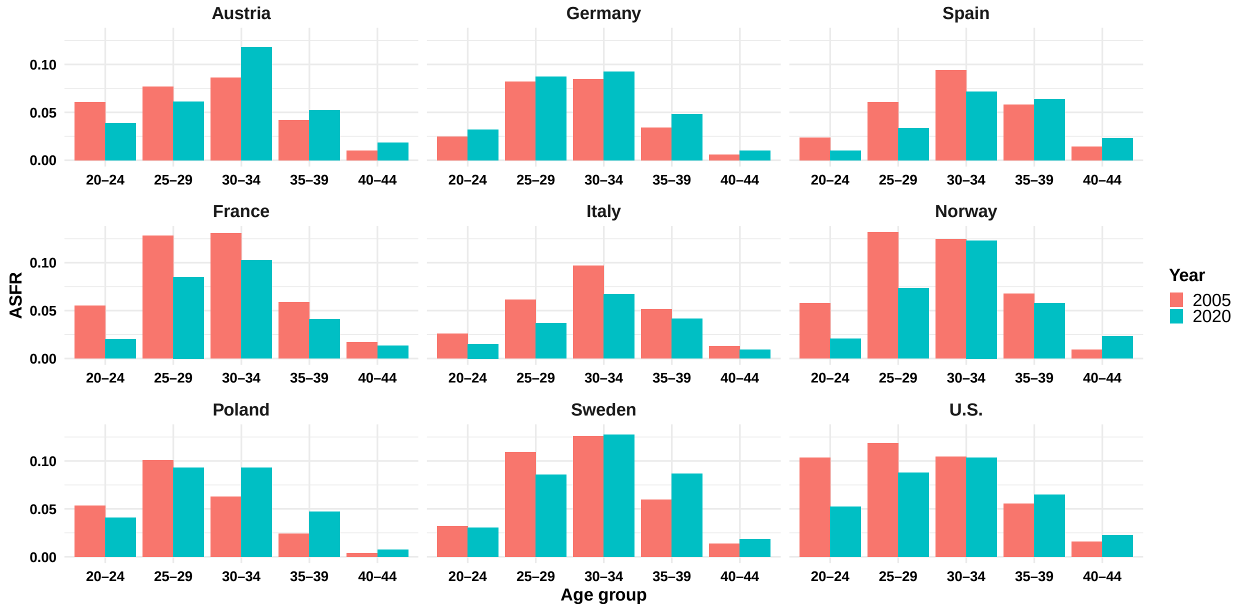
To better understand these cross-country patterns, Figure 3a presents age-specific fertility rates (ASFRs) in 2005 and 2020 for each country. In most countries, fertility declined markedly among women under age 30. The main exceptions are Germany and Poland, where fertility at younger ages increased slightly (in Poland, primarily among women aged 25–29). At ages 30–34, trends are more heterogeneous: fertility increased in Austria and Poland, remained broadly stable in Germany, Norway, Sweden, and the United States, and declined in Spain, France, and Italy. At older ages (35–44), most countries experienced increases in fertility, though the magnitude varies; France and Italy instead show slight declines at some older ages.

Figure 3b shows the evolution of marital shares by age group. A pronounced decline in the proportion of married women is observed among younger age groups in nearly all countries. Unlike fertility, however, the decline in marital shares is not confined to younger ages; reductions are also visible among older age groups in most countries, albeit typically smaller in magnitude.

The Kitagawa decomposition results are presented in Figure 4. For each country, the total change in TFR between 2005 and 2020 (green bar) is decomposed into a composition effect (purple bar), reflecting changes in marital shares, and a rate effect (orange bar), reflecting changes in fertility conditional on marital status. By construction, the total change equals the sum of these two components.

Three patterns emerge. First, consistent with the descriptive evidence reported in Table 1, changes in TFR are highly heterogeneous across countries: fertility increased slightly in Poland, Germany, Austria, and Sweden and declined elsewhere. Second, the composition effect is negative in all countries. This finding mirrors the counterfactual results discussed above: in every case, holding marital shares constant would have produced a higher TFR in 2020. Thus, the decline in marriage systematically exerted downward pressure on fertility, irrespective of the overall fertility trajectory.

Figure 3: Country statistics by age group and year

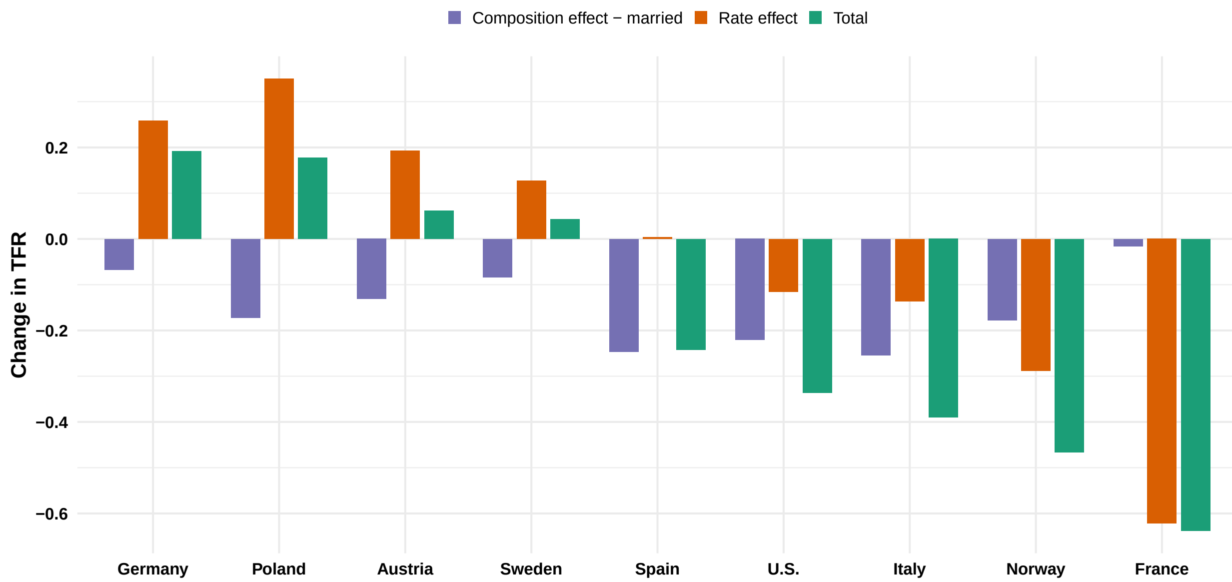


(a) Age-specific fertility rates

(b) Share of married women

Third, in contrast to the relatively uniform composition effect, the rate effect varies substantially across countries. It is positive in Germany, Poland, Austria, Sweden, and Spain, and negative in Italy, Norway, France, and the United States. This heterogeneity in the rate component explains why some countries experienced fertility increases despite declin-

Figure 4: Kitagawa decomposition by marital status



ing marital shares, while others saw the compositional decline reinforced by falling fertility within marital groups.

Interestingly, the magnitude of the composition effect is remarkably similar across countries, typically ranging between -0.1 and -0.25. France is again an exception, with a much smaller composition effect (around -0.05), reflecting its already relatively low marital shares in 2005. The combination of a relatively stable marital share and a large negative rate effect in France highlights an important limitation of using marital status alone as a proxy for partnership context. In settings where cohabitation is widespread, changes in legal marriage may not fully capture shifts in union formation. We return to this issue in the next section by jointly considering married and cohabiting women.

Table 2 presents the age-specific Kitagawa decomposition. Two features stand out. First, among younger age groups, the composition component tends to be more negative than the rate component. This indicates that declining marital shares among younger women account for a substantial portion of the observed fertility change. Second, the rate component differs in sign across countries and age groups. In Germany and Poland, fertility rates increased across most age groups, generating positive rate effects. In contrast, in countries such as Spain, Norway, France, and the United States, fertility declined at younger ages and increased at older ages, leading to offsetting rate effects across the age distribution. Italy is distinctive: except for the youngest age group, rate effects are negative across the age spectrum. Finally, the composition effect is 0 for the oldest age group.

Table 2: Kitagawa decomposition for marital status by age group

	Age group									
	20-24		25-29		30-34		35-39		40-44	
	Comp.	Rate	Comp.	Rate	Comp.	Rate	Comp.	Rate	Comp.	Rate
Germany	0.01	0.03	-0.02	0.05	-0.04	0.08	-0.01	0.08	0.00	0.02
Spain	-0.04	-0.03	-0.08	-0.05	-0.10	-0.01	-0.03	0.05	0.00	0.05
Italy	-0.11	0.06	-0.10	-0.02	-0.03	-0.11	-0.01	-0.04	0.00	-0.02
France	-0.02	-0.16	-0.01	-0.21	0.00	-0.14	0.01	-0.09	0.00	-0.02
Austria	-0.07	-0.04	-0.03	-0.05	-0.03	0.18	0.00	0.06	0.00	0.04
Sweden	-0.01	0.01	-0.05	-0.07	-0.02	0.03	-0.01	0.14	0.00	0.02
Norway	-0.05	-0.14	-0.09	-0.20	-0.03	0.02	-0.01	-0.04	0.00	0.06
Poland	-0.08	0.01	-0.05	0.01	-0.03	0.18	-0.01	0.12	0.00	0.02
U.S.	-0.08	-0.18	-0.09	-0.07	-0.05	0.04	-0.01	0.05	0.00	0.03

Overall, the decomposition highlights that while changes in fertility behavior within marital groups differ substantially across countries, the decline in marital shares has exerted a broadly similar downward influence on aggregate fertility across the U.S. and Europe.

5.3 Kitagawa decomposition of TFR by couple status for U.S. and Europe

The analysis of fertility rates by marital status masks the fact that marriage is not the only partnership type that is prevalent today. Cohabitation without marriage has become an alternative living arrangement chosen by a large share of couples, also as a basis for building a family. Therefore, we repeat the above exercises by couple status rather than marital status. This captures another margin of fertility rates and understand how couple status more generally interacts with fertility.

Figure 5 shows the share of women in a couple (i.e. married plus cohabiting, the bars) and married (the black dots) across age groups, in 2005 and 2020, and for the different countries. From the figure it is possible to observe that the share of coupled women has also decreased across most countries - it increased slightly in Austria, and remained constant in Germany. Furthermore, the largest changes in couple rates from 2005 to 2020 happened for the younger age groups.

Considering couple status rather than marital status enables us to have a clearer picture. For instance, in France, Norway, and Sweden, the marital decline was substantially lower than the coupling decline, especially for the younger age groups. In Austria, the share of coupled women over the age of 24 increased, while the share of married women decreased. This points to a structural change in couples choosing cohabitation over marriage and underlines again the importance of looking at couple status in addition to marital status.

Figure 5: Share of coupled and married women by age group and year

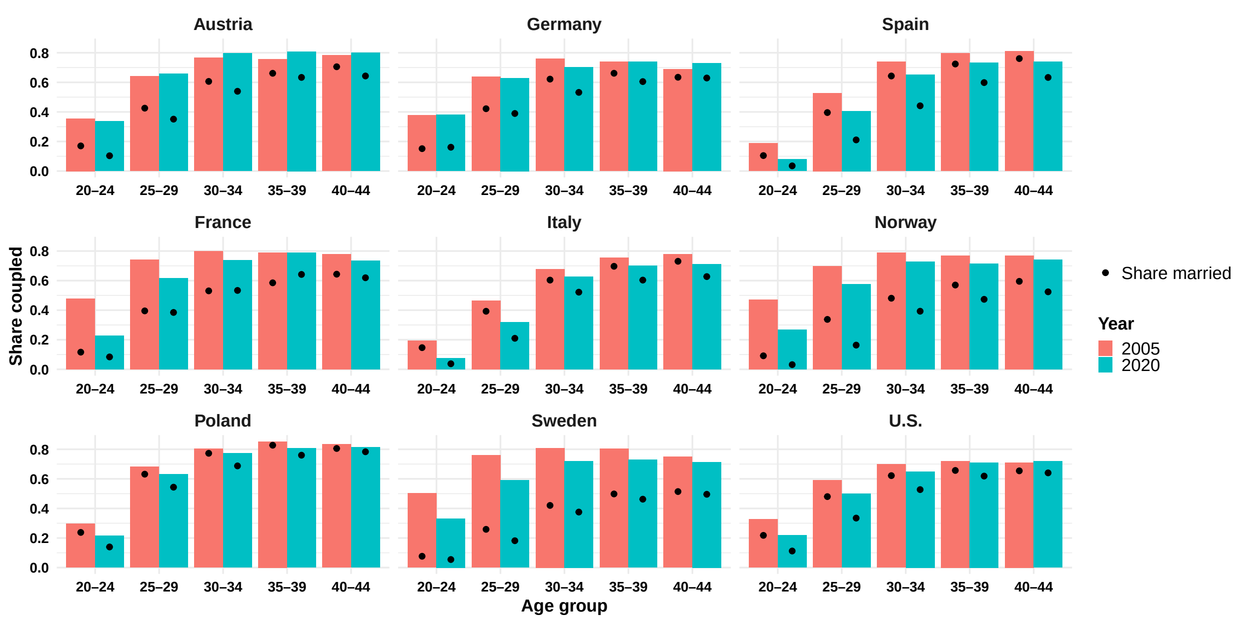
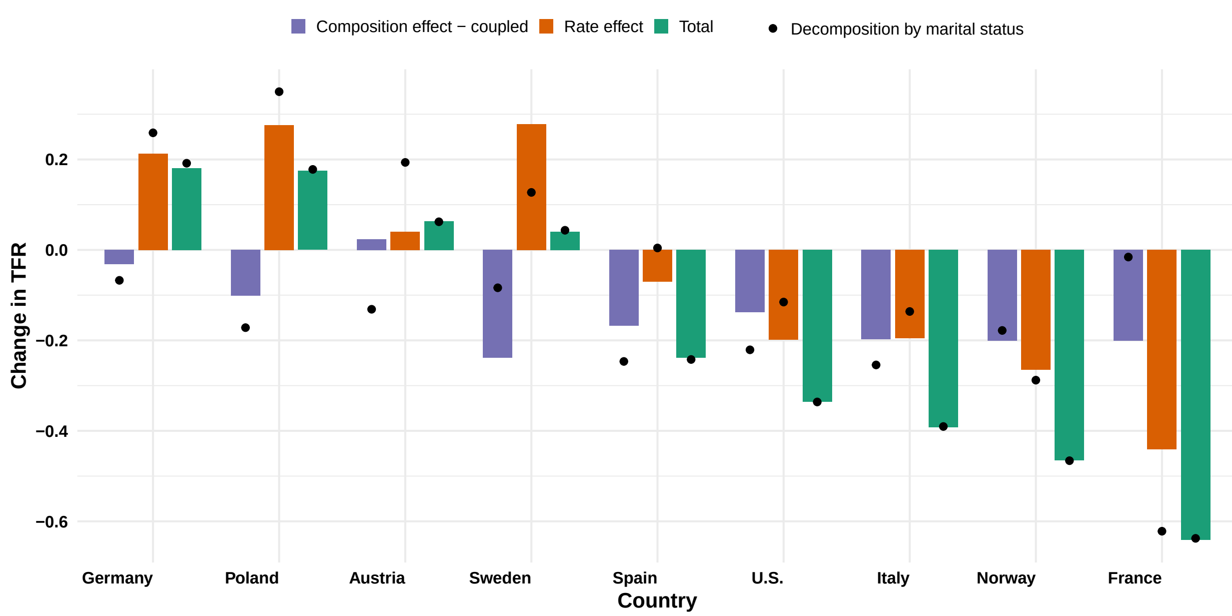


Figure 6 presents the Kitagawa decomposition splitting the change in the TFR into the change in the TFR conditional on couple status and the share of couples. The figure also reports the results obtained when using marital status only (i.e. the black dots). Overall, the main finding remain similar: the change in coupling rates affects negatively TFR in all countries. Austria is the only exception, as the composition effect of couples is positive, while the composition effect of marital status was negative. This implies that the that changes in coupling, in particular cohabitation, contributed to the increase in TFR. As noted earlier in Figure 5, coupling rates in Austria actually increased while marriage rates decreased.

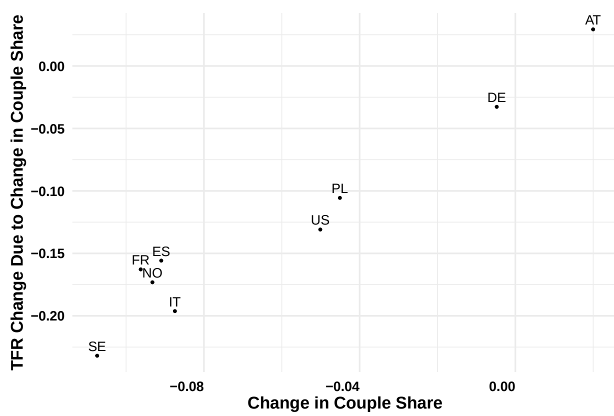
When comparing the effects of the marital status versus the couples status, Germany and Norway are the only two countries where the results barely differ. For Sweden and France looking at marital rates masked a lot of the movement in coupling rates. For these three countries the decomposition effects by couple status are larger than by marital status. In contrast, for Spain, U.S., Poland, and Italy, the composition effect is more negative when decomposing by marital status. One potential explanation for these differences among countries could be that cohabitation is a closer substitute to marriage in countries like Sweden or France than in the U.S. or Italy.

Figure 6: Kitagawa decomposition by couple status



To get an even better overview of how the change in the share of women in couples and the change in the TFR are connected, Figure 7 shows the difference between the counterfactual TFR computed by Equation (2) and the TFR in 2022 as a function of the change in the share of couple rates. The larger the decline in the share of women in couples, the greater its contribution to the decline in the TFR. This is not obvious and again points towards a connection between couple formation and fertility.

Figure 7: Difference between counterfactual TFR and TFR in relation to couple share changes



The main conclusions about the Kitagawa decomposition for each age group drawn from Table 2 for marital shares are also applicable to couple status more general. We show in Table 3 in the Appendix that the differences we observed in Figure 6 translate in the decomposition for each age group as well. Overall, the level component remains negative for the younger age groups. However, for Austria, the level component already turns positive for age group 25-29. While for some countries, the level effect becomes stronger, for others it becomes weaker.

6 Discussion

This paper shows that a non-trivial share of recent fertility change across several European Union countries and the United States is attributable to declining partnership exposure. Using the Kitagawa decomposition framework, we show that changes in the distribution of women across marital and cohabiting statuses exerted systematic downward pressure on total fertility rates in all countries studied. Holding the partnership distribution from 2005 fixed would have resulted in higher fertility in 2020. This is true even in countries that experienced an increase in the TFR over the period: in those cases, rising fertility within unions masked the negative pressure coming from declining partnership exposure.

This finding shifts part of the fertility debate away from a narrow focus on within-union fertility behavior. Fertility is not determined solely by how many children couples choose to have; it also depends on how many individuals form and sustain partnerships during their reproductive years. In contemporary low-fertility societies, a growing share of adults spend substantial portions of their fertile years outside coresidential partnerships. This decline in exposure represents a structural margin of adjustment. This interpretation aligns with recent evidence from East Asia and Australia (Raymo et al., 2015; Reimondos et al., 2025).

6.1 Why Has Partnership Exposure Declined?

Additionally to changes in preferences and norms, and societal transformation, highlighted within the Second Demographic Transition framework (Lesthaeghe, 2010), several economic mechanisms have also contributed to declining partnership formation.

First, economic uncertainty and deteriorating labor market prospects - especially for less-educated men - may delay or deter marriage formation (Kearney and Levine, 2022). If stable income is viewed as a prerequisite for family formation, increased volatility raises the option value of waiting. Search models of marriage predict precisely such a delay when income risk rises (Santos and Weiss, 2016).

Second, rising inequality and changes in assortative mating may have altered marriage market dynamics. When income dispersion increases, the gains from sorting may rise for high earners but fall for low earners, potentially depressing union formation among economically disadvantaged groups (Greenwood et al., 2016; Ciscato and Weber, 2020).

Third, gender role tensions may discourage partnership formation. As women's educational and labor market opportunities expanded, the traditional specialization gains from marriage diminished (Greenwood and Guner, 2008). If domestic burdens remain unequally distributed, highly educated women may find marriage and childbearing less attractive (Doepke and Kindermann, 2019). In bargaining frameworks, fertility requires agreement; if women bear disproportionate childcare costs, disagreement increases and births fall.

6.2 Causality and Selection

Our decomposition is accounting-based: it attributes portions of fertility change to shifts in partnership shares and within-status fertility rates. It does not establish whether declining marriage causes fertility decline or whether both reflect deeper preference shifts.

One possibility is that individuals increasingly prefer childlessness or smaller families, and that this preference shift simultaneously reduces incentives to marry. In this interpretation, declining marriage would be partly endogenous to fertility intentions: if individuals do not desire children, the economic or emotional value of partnership may fall.

Conversely, individuals who strongly desire children may be more likely to enter partnerships, which would mechanically raise conditional fertility among the partnered. As partnership becomes increasingly selective, within-union fertility may remain relatively high even as overall fertility declines.

6.3 Implications

The findings have direct implications for family policy. Policies aimed solely at reducing the financial cost of children may have limited effects if declining partnership formation remains unaddressed. More broadly, understanding fertility in low-fertility societies requires jointly analyzing union formation, intra-household allocation, labor market structure, and changes in preferences and norms. Fertility decline appears embedded within a broader transformation of adult life-course trajectories. In sum, declining marriage and cohabitation are not peripheral to contemporary fertility decline; they are central. The exposure margin has become a structural component of fertility dynamics in advanced economies.

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Appendix

Table 3: Kitagawa decomposition for couple status by age group

	Age group									
	20-24		25-29		30-34		35-39		40-44	
	Level	Rate	Level	Rate	Level	Rate	Level	Rate	Level	Rate
Germany	0.00	0.03	0.00	0.03	-0.03	0.07	0.00	0.07	0.00	0.02
Spain	-0.05	-0.02	-0.05	-0.08	-0.04	-0.07	-0.02	0.05	-0.01	0.05
Italy	-0.09	0.03	-0.07	-0.05	-0.03	-0.12	-0.01	-0.04	0.00	-0.02
France	-0.08	-0.10	-0.08	-0.13	-0.03	-0.11	0.00	-0.09	0.00	-0.02
Austria	-0.01	-0.10	0.01	-0.09	0.02	0.14	0.01	0.04	0.00	0.04
Sweden	-0.05	0.03	-0.10	-0.02	-0.06	0.07	-0.03	0.16	0.00	0.03
Norway	-0.06	-0.13	-0.09	-0.21	-0.04	0.03	-0.02	-0.03	0.00	0.07
Poland	-0.05	-0.01	-0.03	-0.01	-0.01	0.16	-0.01	0.12	0.00	0.02
U.S.	-0.06	-0.19	-0.05	-0.11	-0.02	0.02	0.00	0.05	0.00	0.03

Table 4: Comparison Kitawaga decomposition by marital status for TFR (20-44) from EU-SILC/ACS and from the Human Fertility Database

	TFR			Kitagawa		TFR from HFD			Kitagawa	
	2005	2020	Change	Level	Rate	2005	2020	Change	Level	Rate
Germany	1.16	1.35	0.19	-0.07	0.26	1.31	1.53	0.22	-0.08	0.30
Spain	1.26	1.01	-0.24	-0.25	0.00	1.27	1.15	-0.13	-0.26	0.14
Italy	1.24	0.85	-0.39	-0.25	-0.14	1.29	1.22	-0.07	-0.32	0.25
France	1.95	1.31	-0.64	-0.02	-0.62	1.87	1.75	-0.12	-0.02	-0.10
Austria	1.38	1.45	0.06	-0.13	0.19	1.34	1.41	0.06	-0.13	0.19
Sweden	1.71	1.75	0.04	-0.08	0.13	1.75	1.65	-0.10	-0.08	-0.02
Norway	1.95	1.49	-0.47	-0.18	-0.29	1.79	1.46	-0.33	-0.17	-0.16
Poland	1.23	1.41	0.18	-0.17	0.35	1.17	1.34	0.18	-0.16	0.34
U.S.	1.99	1.66	-0.34	-0.22	-0.12	1.85	1.56	-0.30	-0.21	-0.09

Table 5: Comparison Kitawaga decomposition by couple status for TFR (20-44) from EU-SILC/ACS and from the Human Fertility Database

	TFR			Kitagawa		TFR from HFD			Kitagawa	
	2005	2020	Change	Level	Rate	2005	2020	Change	Level	Rate
Germany*	1.16	1.34	0.18	-0.03	0.21	1.31	1.53	0.22	-0.04	0.26
Spain	1.25	1.01	-0.24	-0.17	-0.07	1.27	1.15	-0.13	-0.18	0.05
Italy	1.24	0.85	-0.39	-0.20	-0.20	1.29	1.22	-0.07	-0.25	0.17
France	1.95	1.31	-0.64	-0.20	-0.44	1.87	1.75	-0.12	-0.22	0.11
Austria	1.38	1.45	0.06	0.02	0.04	1.34	1.41	0.06	0.02	0.04
Sweden	1.71	1.75	0.04	-0.24	0.28	1.75	1.65	-0.10	-0.23	0.13
Norway	1.96	1.49	-0.46	-0.20	-0.26	1.79	1.46	-0.33	-0.19	-0.14
Poland	1.23	1.40	0.17	-0.10	0.28	1.17	1.34	0.18	-0.10	0.27
U.S.	1.99	1.66	-0.34	-0.14	-0.20	1.85	1.56	-0.30	-0.13	-0.17

* For Germany, the latest data available from the Human Fertility Database is 2017.

Tables 4 and 5 report the TFR we obtained from the EU-SILC alongside the TFR from the Human Fertility Database (HFD), computed for the same age groups (20-44-year-olds). In some countries the TFR from the HFD is consistently below the TFR obtained from the survey data (Austria, Norway, Poland, U.S.), in other countries consistently above (Germany, Spain, Italy). For France, the HFD reported a lower TFR in 2005 than we computed with the EU-SILC, but for 2020 it was the other way around. For Sweden, the opposite holds true. Overall, the direction of the change in TFR is the same for all countries except Sweden. For Sweden the absolute change in TFR is relatively small in the EU-SILC as well as in the HFD. To ensure that our results are not driven by these differences, we correct the TFR calculated from the EU-SILC by multiplying all ASFRs with the factor by which the TFR from the EU-SILC and the TFR from the HFD differ. While the aggregate fertility data from the Human Fertility Database is reliable, it does not provide disaggregation of the fertility rates by age groups and marital status at the same time. We report the Kitagawa decomposition with the data from EU-SILC and the corrected fertility rates. The magnitude of the change in TFR is noticeably bigger for Italy and France in the EU-SILC than the HFD, but the Kitagawa decomposition produces similar level components in both decompositions. Overall, while the values change, the magnitudes remain mostly the same and the main result holds - the level component is negative for nearly all countries.