The Changing Relationship between Development and Fertility by Reproductive Age-Groups over the 20$^{\text{th}}$ Century: New Regional Evidence from France

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Extended abstract for the IPC 2025 conference

September 9, 2024

Abstract

Most of the evidence during the first demographic transition in developed countries has indicated a negative relationship between economic development and fertility. However, some studies at the sub-national level have produced mixed results, as a decline in TFR was sometimes observed in the absence of significant economic development. These findings have sparked a debate, which has now evolved as recent evidence indicates that a positive relationship may be emerging. In this study, we provide fresh evidence of the changing relationship between income per capita and TFR in France by region from 1922-2019. We also break down this relationship by age groups. Findings reveal counteracting trends in the relationship between income and TFR between younger and older age groups that are obscured when births are aggregated for all ages. We argue that these opposite trends help explain the alleged weaker-than-predicted relationship between economic developing and fertility decline suggested by prior studies.

Keywords: Fertility decline · Demographic transition · Historical demography · French regions.

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1 Introduction

The relationship between economic development and the total fertility rate (TFR) has been a subject of debate. For a long time, the tenet that economic development was negatively correlated to fertility rates was corroborated with evidence from country-level studies assessing the fertility decline during the first demographic transition in Europe (Bryant, 2007; Coale, 1974). In the 1960s, the Princeton European Fertility Project evaluated the evidence at the sub-national regional level in Europe, producing mixed results, as a decline in TFR was sometimes observed in the absence of significant economic development (Bongaarts and Watkins, 1996; Coale and Watkins, 1986). The conclusion of this project questioned the tenet that economic development was a necessary precondition for fertility decline and concluded that at best, the negative relationship was weaker than initially presumed by the classical demographic transition theory.

The debate continues and has shifted over time as more recent evidence indicates that a positive relationship between economic development and TFR has emerged in recent decades (Fox et al., 2019; Nisén et al., 2021). Some scholars have postulated the emergence of a new J-shaped relationship between development and TFR in which the longstanding negative correlation stands for countries with low and moderate levels of development, whereas in countries with advanced levels of development, economic development is instead positively correlated with TFR (Lacalle-Calderon et al., 2017; Luci-Greulich and Thévenon, 2014; Myrskylä et al., 2009).

However, most prior studies have measured economic development at country level using Gross Domestic Product per capita, the Human Development Index or other distal proxies for individual income. More direct indicators of economic well-being, such as income per capita have rarely been used. Moreover, because TFR is sensitive to changes in age at first birth, most studies either control for age at first birth or use a tempo-adjusted TFR (Lacalle-Calderon et al., 2017; Luci-Greulich and Thévenon, 2014; Myrskylä et al., 2009). Exploring how the income-TFR gradient has evolved by age groups is worth exploring, yet studies rarely disaggregate the analyses by age groups.

Our study contributes to clarify the debate on the relationship between economic development and TFR, providing new evidence using long-range historical regional data for France, a pioneer in the fertility transition. We add four major contributions to the literature: (1) We analyze the relationship between level of development and TFR in France at a fine geographical scale; (2) we use income per capita to explore this relationship, which is a more direct indicator of individual resources than the more distal measure of GDP per capita, especially in the recent decades; (3) we study this relationship from 1922 to 2019 and provide fresh evidence of the changing relationship over time; (4) we disaggregate this relationship by reproductive age-groups.

Our study reveals counteracting trends in the link between income and TFR by age groups during the first demographic transition; these offsetting trends are obscured when births are aggregated for all age-groups. We argue that these opposite trends help explain the alleged weaker-than-predicted relationship between economic development and fertility decline suggested by prior studies (Bongaarts and Watkins, 1996; Coale and Watkins, 1986). We further provide evidence of an emerging positive link between economic development and TFR during the second demographic transition in France driven by births occurring at older ages.

2 Data and Methods

To examine the evolution of regional fertility levels in France, we rely on data collected from 1894 to 2020. Specifically, we retrieved annual births by the mother's age from public archives for 90 French regions between 1894 and 1968 and 95 regions from 1968 to 2020. Births are categorized by age groups. Additionally, we used population counts by individual ages for the 1st of January of each year, estimated by Bonnet (2020) using methodologies akin to those employed by the Human Mortality Database. We computed age-specific fertility rates by decennial age groups and period total fertility rates for all regions and all years of our panel following methods akin to those of the Human Fertility Database. Finally, we use regional income per capita in 2019 euro values computed by Bonnet et al. (2021). These regional incomes were available for each year between 1922 and 2015 and have been updated for the period 2016-2019.

To explore the relationship between the level of development and the fertility at the local level, we regress for each year the regional fertility levels with the per capita income levels, and extract the coefficients of these regressions, which we call "regional income gradient in fertility" or in short "gradient". We repeat these analyses for both total and age-specific fertility levels, disaggregating TFR by three specific age groups: young women (under 25), middle-aged women (25-34), and older women (35+). We explore this relationship for the years 1922-2019, the only ones for which we have regional income data.

3 Selected results

Figure 1 maps the regional fertility rates in 1895, 1925, 1955, 1985, and 2020. We observe large significant disparities in TFR by region in 1895. Fertility rates were close to two in the Southwest, while they were still above four in Brittany, north of the country, or mountain regions in the center. Overall, fertility rates significantly decreased and converged over the period, as shown by the 1985 and 2020 maps.

The top left panel of Figure 2 illustrates the evolution of the income gradient for the Total Fertility Rate (TFR) with a 95% confidence interval (CI). This panel shows a negative correlation between income and fertility until the 1940s, with a large regional variance evidenced by the broad CIs; given the large variance, the correlation is rarely significant. The correlation becomes positive from 1940s-late1960s, but still not significant due to the large variation. From the 1980s to 2000 a significant positive relationship emerges, with much lower variance.

The next three panels of Figure 2 disaggregate the gradient by age-group. We observe that for the youngest group (¡ 25), the correlation is positive until around 1970 and mostly significant despite the relatively large CIs; from the 1990s, we observe a significant negative correlation instead. That is, for young women, fertility rates were on average higher in regions with the highest income until 1970s, and this relationship reversed in the 1990s. An inversed pattern is observed for middle-aged (25-34) and older women (35 and older). Among these groups fertility was instead lower on average in the regions with higher income until the 1940s (WWII); in the 1980s the correlation changed becoming positive and significant. For the 25-34 age group, the correlation becomes null from the 2000s; whereas for the 35 and older group the positive correlation trend continues. The analyses reveal that the positive relationship observed in recent decades is driven by births occurring at older ages (35 and over). These results reveal that conflating fertility among all age-groups results in an

apparent weak relationship between individual income and TFR.

In the following months, (1) we will extend the regional TFRs values for the period 1872-1893, (2) we will extend the gradient calculation to the period 1872-1921 (for the moment, we are starting in 1922, as the income dataset begins that year); (3) we will calculate the regional Cohort Fertility Rates (CFR) and we will conduct the same analyses. The results will be compared to those using the TFRs to evaluate whether the regional income gradient in fertility remains the same.

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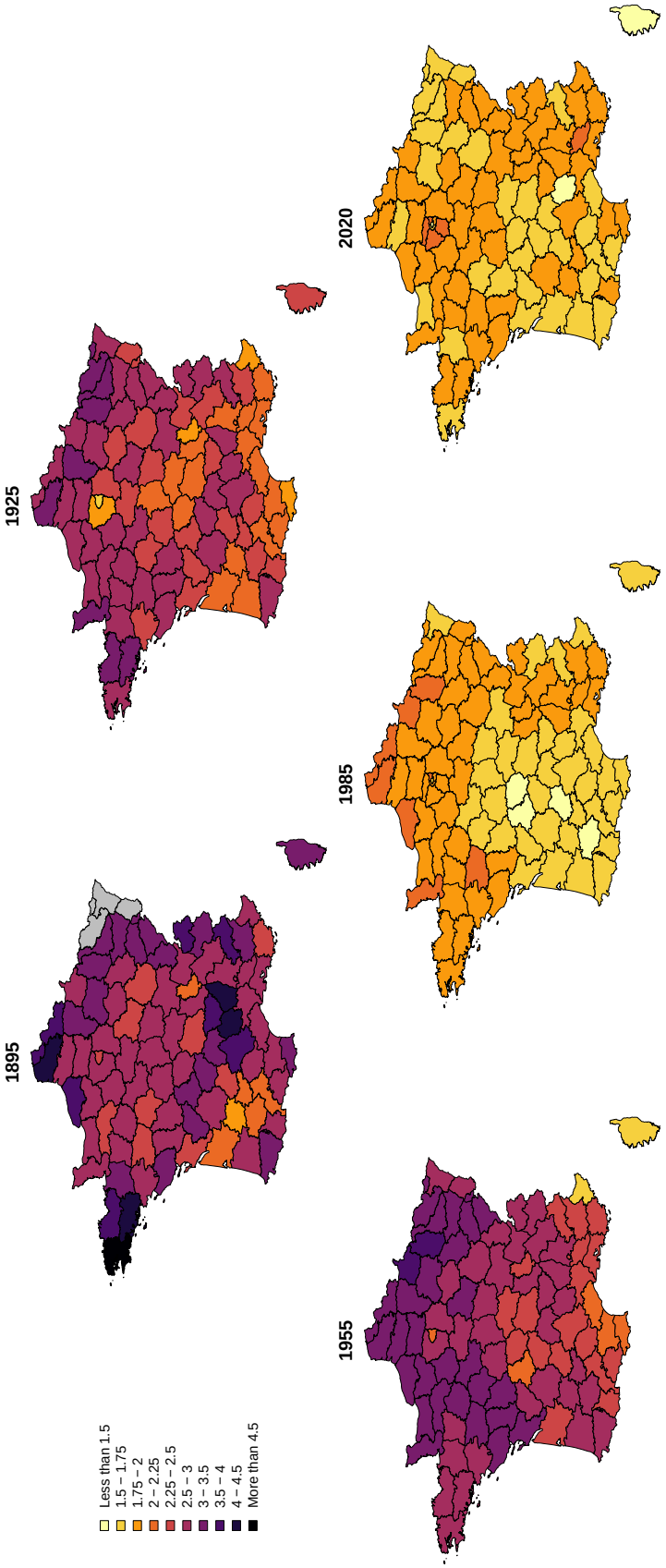

Figure 1. Total fertility rates (TFR) by region in France, 1894-2020

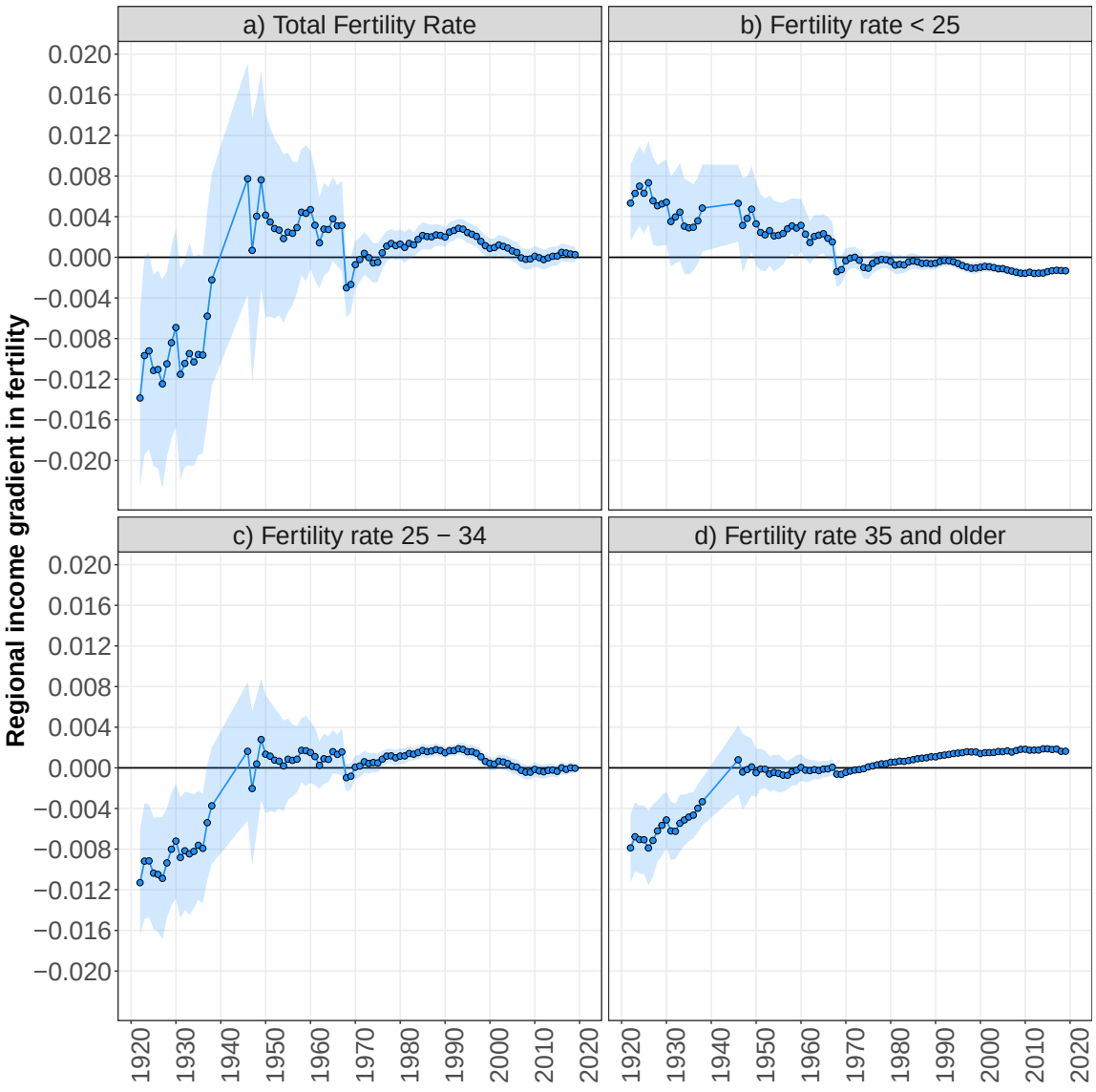

Figure 2. Trends of regional income gradient in fertility in France, 1922-2019