Demographic Transitions: Past and Present*

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Abstract

This chapter documents the broad empirical patterns of demographic transitions across countries and over time. Using a common characterization of crude birth and crude death rate transitions, we summarize each country's mortality and fertility transitions by their pre-transition levels, start and end dates, and post-transition levels. Four findings emerge. First, mortality and fertility transitions differ in their timing and in the economic conditions under which they begin. Second, later transitions are substantially faster than earlier ones. Third, fertility transitions increasingly began under highly heterogeneous income conditions, especially in the late twentieth century. Fourth, after controlling for income, countries are more likely to begin fertility decline when geographically and culturally close countries have already done so. Together, the patterns suggest that demographic change diffuses through interaction, communication, and social learning rather than tracking a single development threshold. We close by connecting these patterns to the present: the global fertility slowdown, continued declines in already low-fertility countries, and the possibility that the world is entering a phase of sustained population decline.

Keywords: Demographic transition; fertility decline; mortality decline; population growth; demographic contagion; fertility crisis.
JEL Codes: J11; J13; N30; O15.

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1. Introduction

The demographic transition, the shift from high fertility and high mortality to low fertility and low mortality, is among the most consequential transformations in economic and social history. It reshaped population growth, age structure, family life, schooling, labor supply, and the long-run relationship between demographic behavior and economic development. In the canonical pattern, mortality falls first, fertility follows with a lag, and population growth rises before slowing again. The sequence has long been recognized as one of the central regularities of modern history (Chesnais, 1992; Lee, 2003; Bongaarts, 2009; Reher, 2011).

A vast literature asks why this transformation occurred. Economic theories of fertility and demographic transition have emphasized the quantity-quality trade-off, the opportunity cost of parents' time, declines in mortality, improvements in health and human capital, and the interaction between demographic change and long-run growth (Becker, 1960; Becker and Lewis, 1973; Barro and Becker, 1989; Galor and Weil, 2000). Jones et al. (2010) review these mechanisms, focusing on the negative relationship between fertility and income and the conditions under which different fertility theories can account for it. Hannusch and Yum (2026) cover the twentieth-century fertility decline, the baby boom and baby bust, persistently low fertility in advanced economies, fertility in developing countries, and the interaction with long-run growth. Work on persistently low fertility in advanced economies emphasizes family policy, labor-market institutions, bargaining, and social norms; Doepke et al. (2023) review this literature, and Bloom et al. (2024) discuss the determinants, economic consequences, adjustment mechanisms, and policy responses associated with low fertility in high-income countries.

This chapter takes a different perspective. Its goal is not to adjudicate among competing mechanisms but to document the broad empirical patterns of demographic transitions across countries and over time; the facts any successful theory must ultimately explain. Before asking which theory best explains the demographic transition, or what the ultimate consequences of very low fertility will be, it helps to establish the big-picture facts.

To do so, we use a common characterization of mortality and fertility transitions based on crude death rates and crude birth rates. Building on Delventhal et al. (2021), we summarize each transition by four objects: its pre-transition level, start date, end date, and post-transition level. The approach lets us compare transitions across countries and across cohorts of countries that entered at different times. The resulting view is deliberately comparative and long run: rather than focusing on a single country or a single mechanism, the chapter studies how the timing, speed, and shape of demographic transitions vary across space and historical time.

Four empirical patterns emerge. First, mortality and fertility transitions differ systematically in their timing and in the economic conditions under which they begin. Mortality transitions span a wider range of dates than fertility transitions, which are concentrated in the twentieth century. Second, transitions have become markedly faster. Later transitions compress into a few decades demographic changes that earlier countries spread over much longer periods. Third, the economic conditions at the onset of transition have changed. Mortality transitions began at progressively lower income levels, and fertility transitions, especially in the late twentieth century, began under highly heterogeneous income conditions. Fourth, demographic transitions do not occur in isolation. After controlling for income, countries are more likely to begin their fertility transition when other countries that are geographically or culturally close have already done so.

This last finding shows that the transition spread not only through domestic economic development but also through the diffusion of knowledge, norms, institutions, and behavior. Thus, the chapter connects to an older literature, especially the Princeton tradition, that emphasized the diffusion of fertility decline across culturally connected populations, and to more recent work on culture, contagion, and the diffusion of fertility norms in the historical fertility transition (Coale and Watkins, 1986; Spolaore and Wacziarg, 2022; Beach and Hanlon, 2023).[1] Our emphasis is broader: the chapter documents the pattern comparatively and ties it to a global historical narrative.

The chapter also connects these long-run patterns to the present. Fertility has fallen almost everywhere, and in many places it has kept falling even after reaching below-replacement levels. The central demographic question today is no longer whether countries will move from high to low fertility, but whether low fertility itself will persist and deepen. The evidence points that way. Downward revisions in United Nations (UN) projections have become sizable, and many countries that were already below replacement a decade ago have since fallen further. The demographic transition may be entering a new phase: one defined not just by low fertility but by fertility collapse and population decline (Geruso and Spears, 2026).

This chapter is organized as follows. Section 2 explains how we measure demographic transitions and introduces the empirical characterization used throughout the chapter.

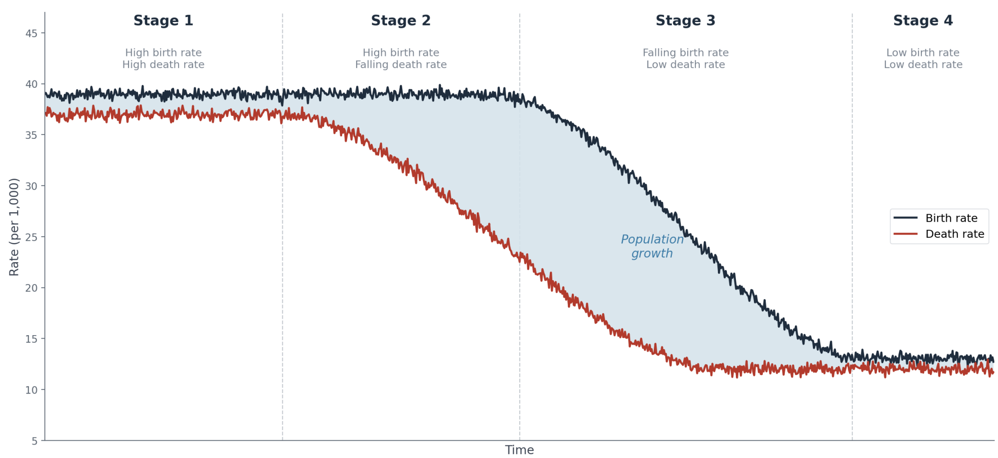
[1]For a recent review of the role of social norms in fertility choices, including fertility spillovers within families, workplaces, and social networks, see Nakakuni et al. (2026).

Section 3 documents the main comparative patterns in the timing, speed, and economic conditions of mortality and fertility decline. Section 4 examines demographic contagion and the role of geographic and cultural proximity in the spread of fertility transitions. Section 5 turns to the present: the emerging fertility collapse, its implications for long-run population dynamics, and the possibility that the world is moving into an era of sustained population decline.

2. Demographic Transition

The demographic transition is the shift from high fertility and high mortality to low fertility and low mortality. In the canonical pattern, mortality falls first, fertility follows with a lag, and population growth rises before slowing. This sequence is among the most robust regularities in economic and demographic history, and it is central to the transition from stagnation to sustained growth.

Figure 1: The canonical demographic transition



NOTES: The blue line shows the crude birth rate (CBR); the red line shows the crude death rate (CDR).

Figure 1 shows the pattern: the red line (mortality) begins to fall earlier, while the blue line (fertility) stays roughly flat for a long stretch before turning down. The gap between birth and death rates generates a temporary surge in population growth—a pattern found across countries and periods. What defines a demographic transition, then, is not that both rates fall, but that they fall at different times and often at different speeds.

For descriptive purposes, it helps to divide the transition into stages, from an initial high-high regime to a final low-low regime. In Delventhal et al. (2021), we propose a systematic and comparable method for identifying these stages, using a panel of crude birth rates (CBRs) and crude death rates (CDRs) for 186 countries over more than 250 years.[2] The method follows the textbook three-stage structure but casts it as an estimable statistical framework. For each country and each rate, we recover four objects: (i) the pre-transition level, (ii) the start of the decline, (iii) the end of the decline, and (iv) the post-transition level. Together, they summarize the timing, duration, and speed of the mortality and fertility transitions.

Formally, let y_t denote either the CBR or the CDR for a given country. Our statistical model assumes that y_t passes through three stages: an initial stationary regime, a transition, and a final stationary regime. Let τ_2 and τ_3 denote the start and end of the transition from the initial to the final stationary regime. Thus, the series y_t is modeled as:

$$y_t = \begin{cases} \alpha_1 + \varepsilon_t, & t \leq \tau_2, \\ \dfrac{\tau_3 - t}{\tau_3 - \tau_2}\alpha_1 + \dfrac{t - \tau_2}{\tau_3 - \tau_2}\alpha_3 + \varepsilon_t, & \tau_2 < t < \tau_3, \\ \alpha_3 + \varepsilon_t, & t \geq \tau_3, \end{cases}$$

where α_1 and α_3 are the pre- and post-transition levels. Before the transition, the rate fluctuates around a high plateau; between τ_2 and τ_3 it falls linearly; after τ_3 it fluctuates around a lower plateau.

Conditional on a candidate pair (τ_2, τ_3), the levels (α_1, α_3) are estimated by ordinary least squares, and the break dates are chosen by searching over admissible pairs. The piecewise-linear structure is deliberately simple, but it captures the objects of interest in a transparent, comparable form.

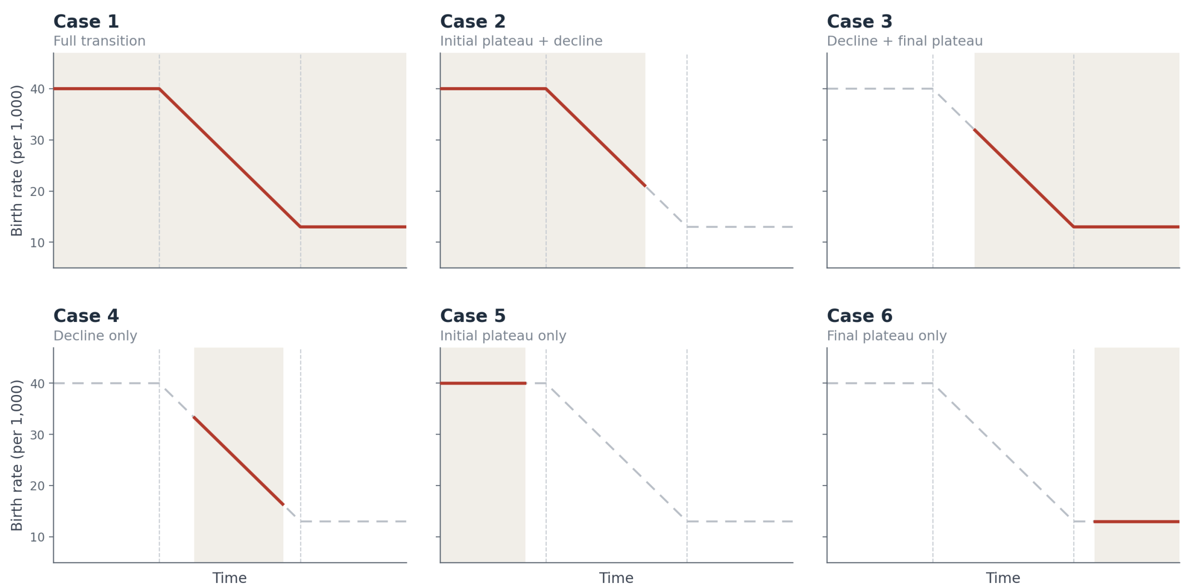
Several features of the methodology deserve emphasis. First, we do not impose that mortality decline before fertility: although this is the usual pattern, the estimation allows either rate to move first, and the data tell us whether the canonical sequence holds. Second, the pre- and post-transition levels of the CBR and CDR are not constrained to be equal, so population growth can be positive or negative in either regime. Third, the same statistical structure is applied, country by country, to both CBRs and CDRs, which makes the resulting transition dates comparable across countries and over time.

A central challenge is that the available data do not always cover the full transition.

[2] Here we work with CBRs and CDRs rather than total fertility rates and life expectancy because the former are available for a much longer historical span and a wider set of countries. The cost is that crude rates confound the underlying demographic behavior with age structure, but for identifying the timing, speed, and initial conditions of transitions over more than two centuries, the gain in coverage outweighs the loss in precision.

Some countries enter the sample after the decline has begun; others have not yet completed the transition by the end of the sample. To accommodate this, Delventhal et al. (2021) allow for six restricted cases, shown in Figure 2. Case 1 is the full three-stage transition. Cases 2 and 3 arise when one plateau is observed together with the decline. Case 4 arises when only the decline is observed. Cases 5 and 6 cover observations of a single plateau, before or after the transition. The last two are observationally equivalent in the regression and are distinguished using the historical levels of the CBR and CDR. The framework lets us keep countries with incomplete demographic histories rather than dropping them.

Figure 2: Six cases of the CBR transition

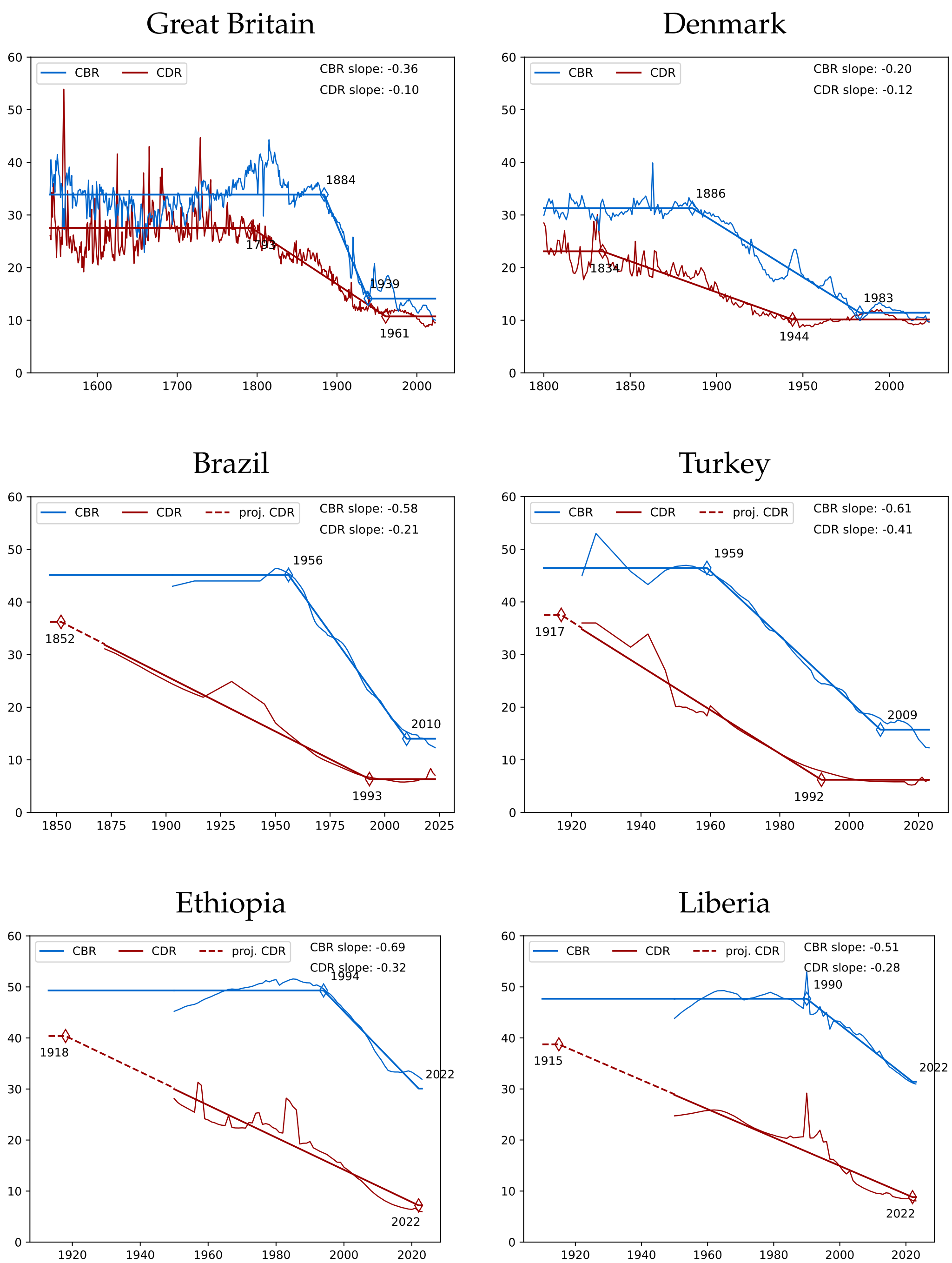


NOTES: The figure illustrates the six possible empirical cases for a crude birth rate transition. Case 1 corresponds to a complete three-stage transition, with an initial plateau, a declining segment, and a final plateau. Cases 2 and 3 correspond to cases where only one plateau and the declining segment are observed. Case 4 corresponds to a sample that captures only the declining segment. Cases 5 and 6 correspond to observing only a single plateau, either before or after the transition.

Model selection proceeds by estimating all six cases for each country and choosing the one that best trades off fit and parsimony. This is done with nested F-tests and a few auxiliary rules designed to keep short or noisy samples from being over-fit. The procedure is flexible enough to accommodate incomplete histories while keeping countries comparable.

Figure 3 shows how this characterization maps into actual histories for countries that entered the fertility transition at very different moments. The top row shows Great Britain

Figure 3: Six examples of demographic transitions



NOTES: Crude birth rates (CBR, blue) and crude death rates (CDR, red) for six countries, together with the estimated transition paths. Within each panel, the more irregular lines are the observed series; the smoother superimposed segments are the fitted piecewise-linear transitions. The annotated years give the estimated start and end dates of the mortality and fertility transitions, and the reported slopes measure the annual decline during the transition. Where a red segment is dashed, the early part of the mortality transition is projected because the start of the decline is not observed in the data.

and Denmark, where fertility decline began in the late nineteenth century and unfolded gradually over many decades. The middle row shows Brazil and Turkey, whose fertility transitions began in the mid-twentieth century, and where both fertility and mortality declines are much more compressed. The bottom row shows Ethiopia and Liberia, where fertility decline began only around 1990 and remains incomplete at the end of the sample period. These recent cases also illustrate the measurement issue raised above: when the full pre-transition history of mortality is not observed, the fitted path combines the observed series with a projected earlier segment for the CDR.

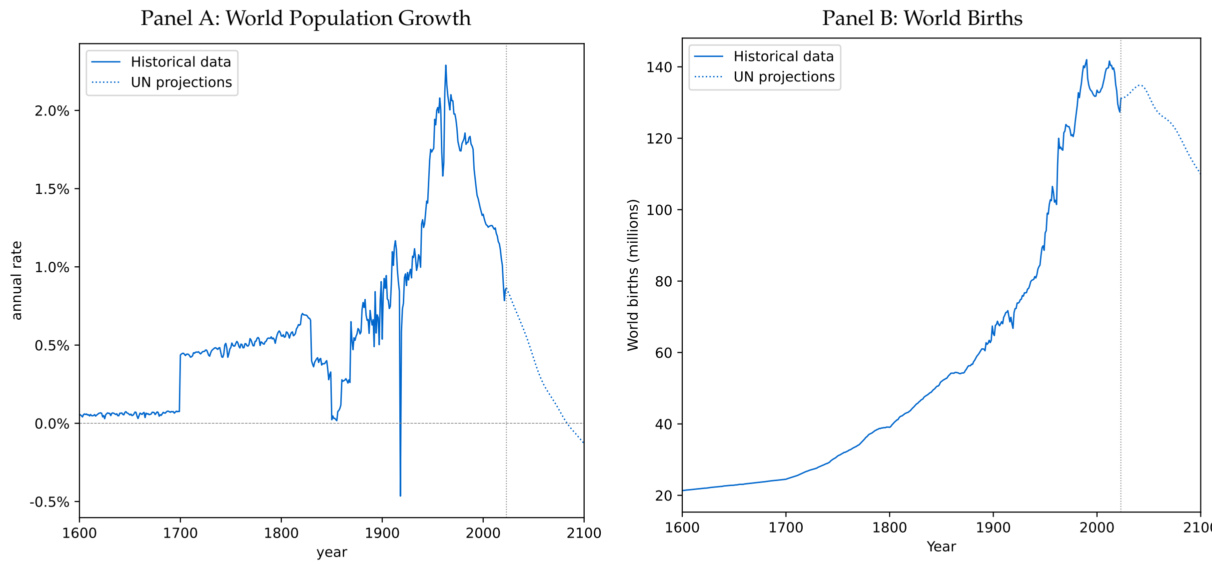
Taken together, the six panels foreshadow several patterns that recur in the full cross-country evidence. The same piecewise-linear framework summarizes very different historical experiences: early European transitions that are long and gradual, mid-century transitions that are steeper and faster, and recent transitions that begin from very high fertility rates and are still underway. The figure also makes clear that later fertility transitions are typically more compressed than earlier ones, and that the relative timing of mortality and fertility decline varies across countries even when the broad sequence is recognizable. The next section turns from these country narratives to the full sample and documents how the timing, initial conditions, income at the onset, and the speed of demographic transitions vary over time.

3. Key Patterns

The aggregate consequences of demographic transitions are visible in two global series: world population growth and total world births. Figure 4 reports both. Panel A plots the annual growth rate of the world population from 1600 to 2100. For centuries, the world population grew slowly, with high birth rates and high death rates roughly offsetting each other. As mortality began to fall before fertility in country after country, world population growth accelerated, peaking above 2% in the early 1960s. As fertility transitions spread and birth rates fell, global population growth declined and is now below 1%. The UN projects that the trend will continue, with world population growth turning negative by 2084.

Panel B shows total world births. Births rose for most of the modern era, but they are already falling and are projected to keep falling for most of the rest of the century. This pattern underlies the phenomenon of the "peak child": once births stop rising, the number of children in the world eventually stops growing. The rest of this section turns from these aggregate outcomes to the country-level patterns behind them.

Figure 4: World Population Growth Rate and World Births



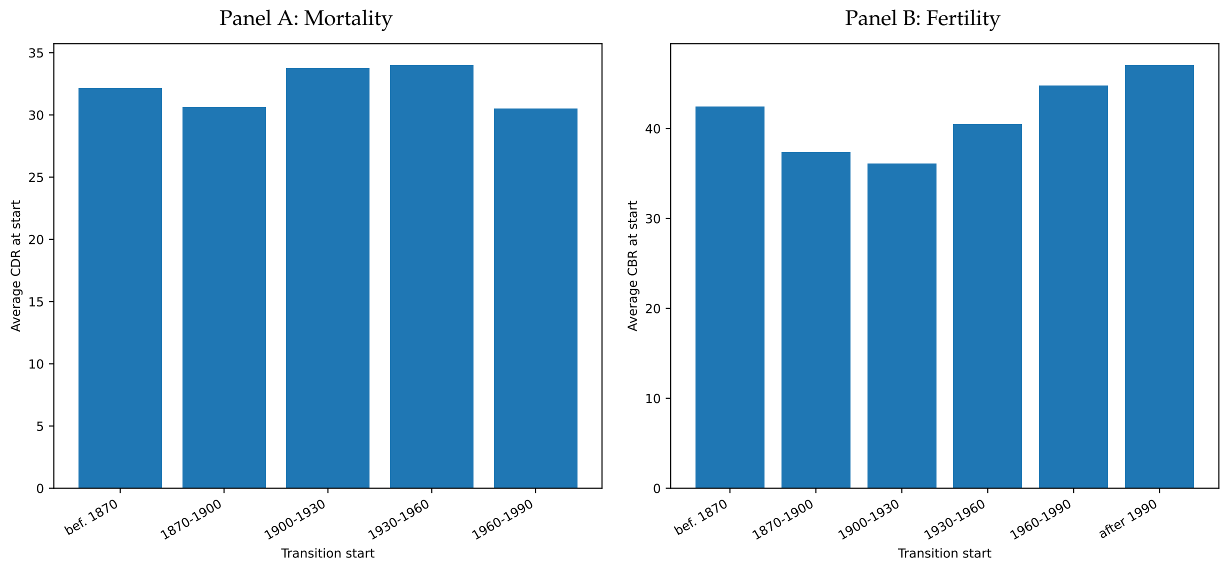
NOTES: Panel A plots the annual growth rate of world population from 1600 to 2100; Panel B plots total world births over the same period. Historical values are authors' calculations from country-level crude birth rates, crude death rates, and population data. Projected values are the UN World Population Prospects 2024 medium scenario.

To see the country-level forces behind this aggregate pattern, we use the methodology of the previous section to summarize each mortality and fertility transition by four estimated objects: the pre-transition level, the start of the transition, the end of the transition, and the post-transition level. These estimates let us compare transitions across countries and across cohorts of countries that entered at different dates.

The figures in this section use these objects in distinct but closely related ways. Figure 5 reports the pre-transition levels of mortality and fertility at the onset of each transition. Figures 6, 7, and 8 examine the level and dispersion of GDP per capita at the estimated start date. Figures 9 and 10 use the start and end dates to measure the duration of completed transitions, and Figure 11 uses the estimated slope to measure how fast demographic rates fall.

Four patterns emerge. First, the initial levels of mortality and, in particular, fertility at the onset of transitions vary systematically across cohorts. Second, the level of development at which transitions begin differs sharply between mortality and fertility. Third, the dispersion of income at the onset of the transition is much wider in later cohorts, especially for fertility. Fourth, both mortality and fertility transitions have accelerated markedly. Several of these patterns appear in Delventhal et al. (2021); here we revisit them with an updated sample and connect them to the historical literature.

Figure 5: Mortality and Fertility Levels at the Start of Transitions



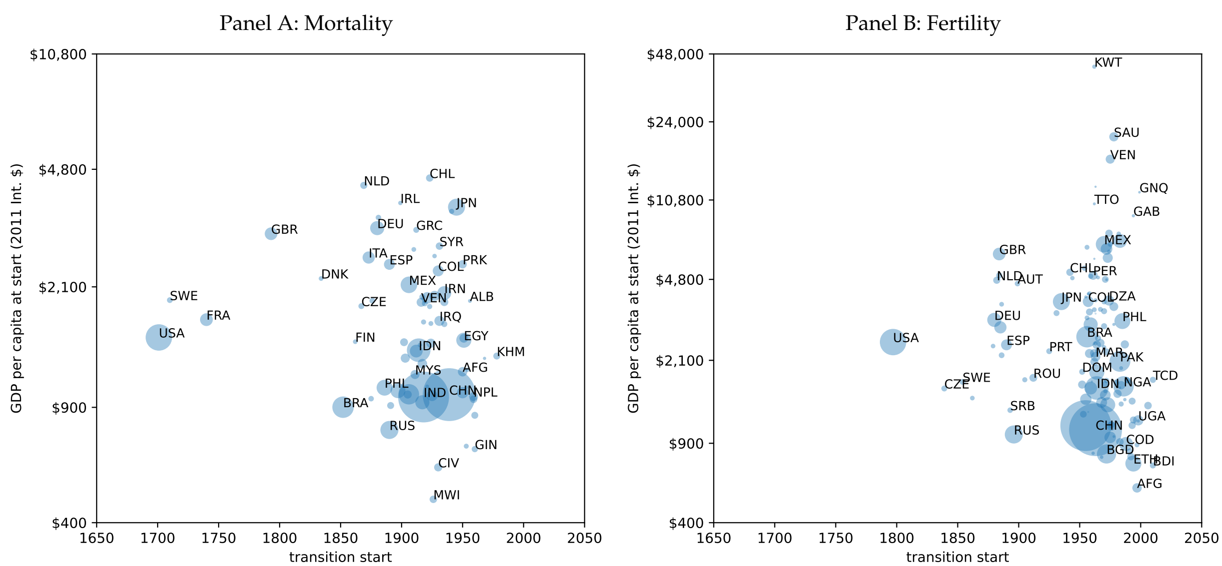
NOTES: Average crude death rate (Panel A) and crude birth rate (Panel B) at the start of the mortality and fertility transitions, by cohort. Cohorts are defined by the start year of the transition: before 1870, 1870-1900, 1900-1930, 1930-1960, 1960-1990, and after 1990. Start dates and pre-transition levels are estimated using the piecewise-linear method of Section 2.

Figure 5 reports the average CDR and CBR at the start of transitions by cohort. For mortality, the initial level is roughly constant. The average CDR at the start of the transition is 32.17 before 1870, 30.63 in 1870-1900, 33.79 in 1900-1930, 34.02 in 1930-1960, and 30.51 in 1960-1990. Mortality transitions begin from a narrow band of 30 to 34 deaths per thousand, with no trend in the initial level. Fertility shows a different pattern. The average CBR at the start is 42.42 before 1870, falls to 37.40 in 1870–1900, and 36.10 in 1900-1930, then rises to 40.48 in 1930–1960, 44.78 in 1960-1990, and 47.08 after 1990. Later fertility transitions begin from higher birth rates than earlier ones, and the spread of initial levels is much wider than for mortality. The variation reflects differences in pre-transition demographic regimes rather than a common threshold. It also cautions against viewing fertility transitions as a simple monotone decline from a uniform plateau: as Dyson and Murphy (1985) emphasize, the onset of fertility decline can in some cases follow a period of rising fertility.

This difference between early and late fertility transitions is closely related to the historical distinctiveness of Europe, and echoes the broader contrast between earlier and later transitions in Reher (2004). Early fertility transitions occurred disproportionately in countries shaped by the European Marriage Pattern (Hajnal, 1965; Clark et al., 2024):

late marriage, non-negligible celibacy, and other nuptiality margins kept pre-transition fertility comparatively low. Europe entered the modern fertility transition from a lower starting point than later-transitioning societies in Asia, Africa, and Latin America. Many post-1950 transitions, by contrast, began in countries where marriage was earlier and more universal and where birth rates were correspondingly higher. The upward shift in the initial level of fertility transitions in Figure 5 is consistent with the view that early European fertility was historically low in comparative perspective, reflecting institutions rather than biology or technology.

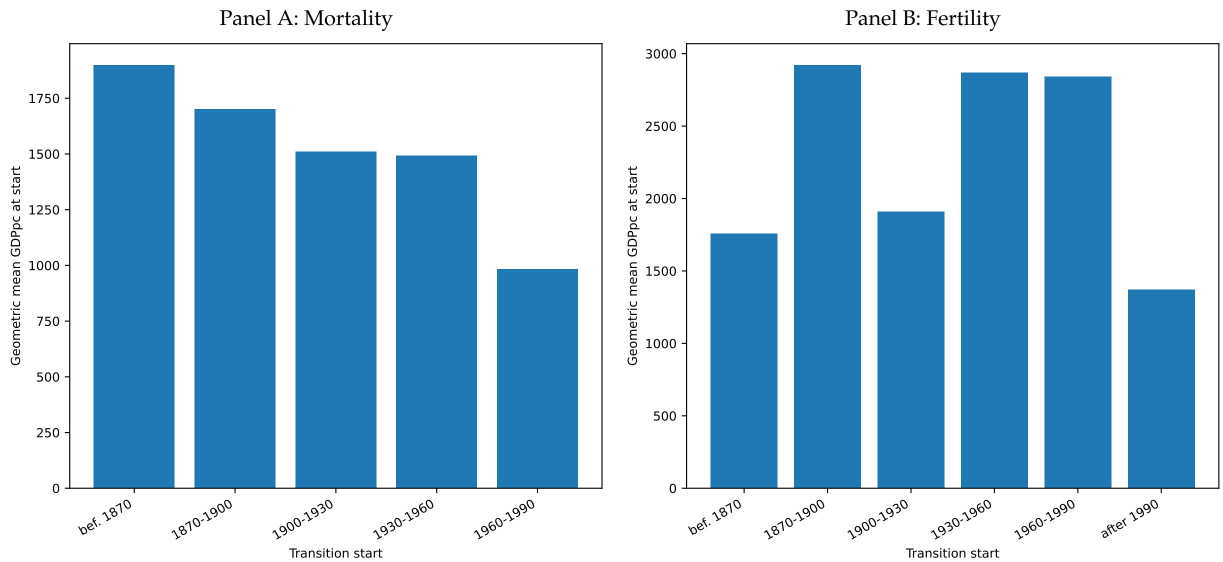
Figure 6: GDP per capita at the Start of Transitions



NOTES: GDP per capita at the start of mortality transitions (Panel A) and fertility transitions (Panel B) against the corresponding start year, by country. GDP per capita is in 2011 international dollars. Country labels identify selected countries; marker sizes are proportional to the 2016 population. Start dates are estimated using the method of Section 2.

Figures 6 and 7 turn from demographic levels to economic conditions at the onset of transition. Figure 6 plots GDP per capita against the estimated start year for each country; Figure 7 summarizes the same information by cohort, using the geometric mean of GDP per capita at the start. The contrast between mortality and fertility is striking. For mortality, the geometric mean falls across cohorts: $1,900 before 1870, $1,702 in 1870–1900, $1,510 in 1900–1930, $1,492 in 1930-1960, and $984 in 1960-1990. Later mortality transitions begin at markedly lower income levels, as Panel A of Figure 6 shows: later transitions are increasingly observed in poorer countries. The pattern is consistent with a view stressed by Delventhal et al. (2021): that mortality decline became less tightly linked to domestic income and more to the international diffusion of medical knowledge, vaccines, sanitation, and public health practices.

Figure 7: GDP per capita at the Start of Transitions – Geometric Means



NOTES: Geometric mean of GDP per capita at the start of mortality transitions (Panel A) and fertility transitions (Panel B), by cohort. GDP per capita is in 2011 international dollars. Cohorts are defined by the start year of the relevant transition. Countries with missing start dates are excluded.

Fertility transitions show a different pattern. The geometric mean of GDP per capita at the start of fertility transitions is \$1,760 before 1870, \$2,923 in 1870-1900, \$1,910 in 1900-1930, \$2,871 in 1930-1960, and \$2,844 in 1960-1990. Across these cohorts, the variation is modest: fertility transitions before 1990 begin at income levels that are much more stable than mortality transitions. Only for the latest cohort, after 1990, does the geometric mean fall sharply, to \$1,371. Panel B of Figure 6 makes the same point: fertility transitions before 1990 are spread across a wide range of dates but at similar income levels.

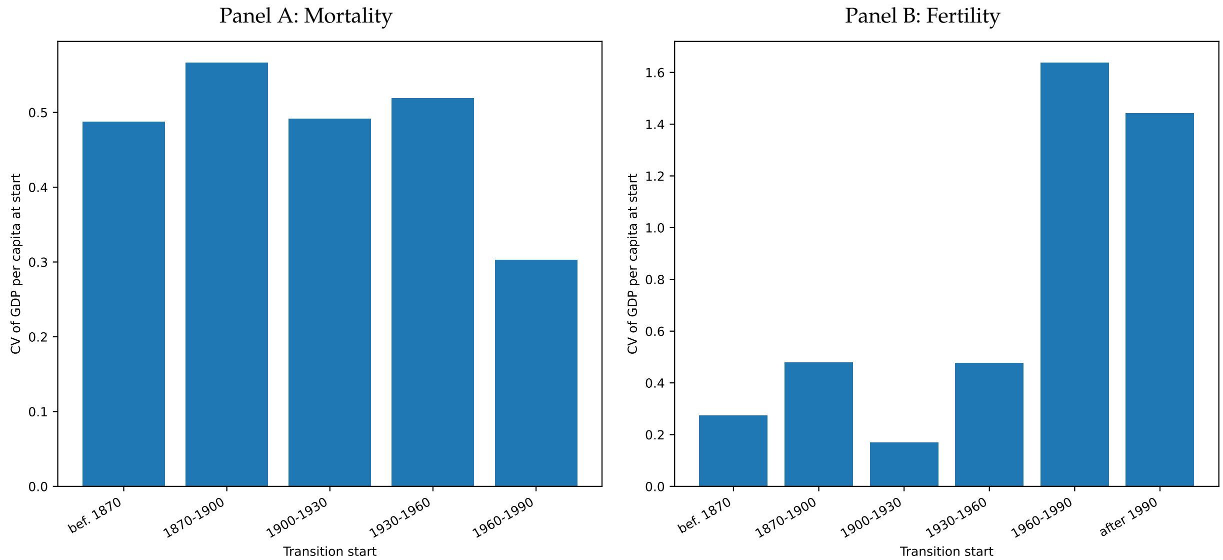
The contrast between mortality and fertility matters. Mortality decline became progressively less tied to local development; fertility decline remained closely associated with economic development until recent decades. Fertility transitions, unlike mortality transitions, appear to have required a certain level of development to begin.[3]

This is especially relevant for late fertility transitions. The drop in GDP per capita at the onset of fertility transitions after 1990 suggests that some countries have entered fertility transitions at much lower income levels than earlier cohorts. The pattern is one that de Silva and Tenreyro (2017, 2020) emphasize, arguing that fertility decline in many developing countries after the 1960s cannot be understood solely through rising income,

[3] A regression of log GDP per capita at the start of the transition on the start year yields a small, statistically insignificant coefficient for fertility and a significant negative coefficient for mortality.

education, or mortality decline.[4] In their account, population policies, family planning programs, and shifts in norms about desired family size played a central role in the onset and speed of fertility decline. Our figures do not identify these mechanisms, but they are consistent with the view that fertility transitions have become less dependent on reaching a specific income threshold.

Figure 8: Dispersion of GDP per capita across Countries at Transition Start



NOTES: Coefficient of variation of GDP per capita at the start of mortality transitions (Panel A) and fertility transitions (Panel B), computed across countries within each cohort. Cohorts are defined by the start year of the relevant transition.

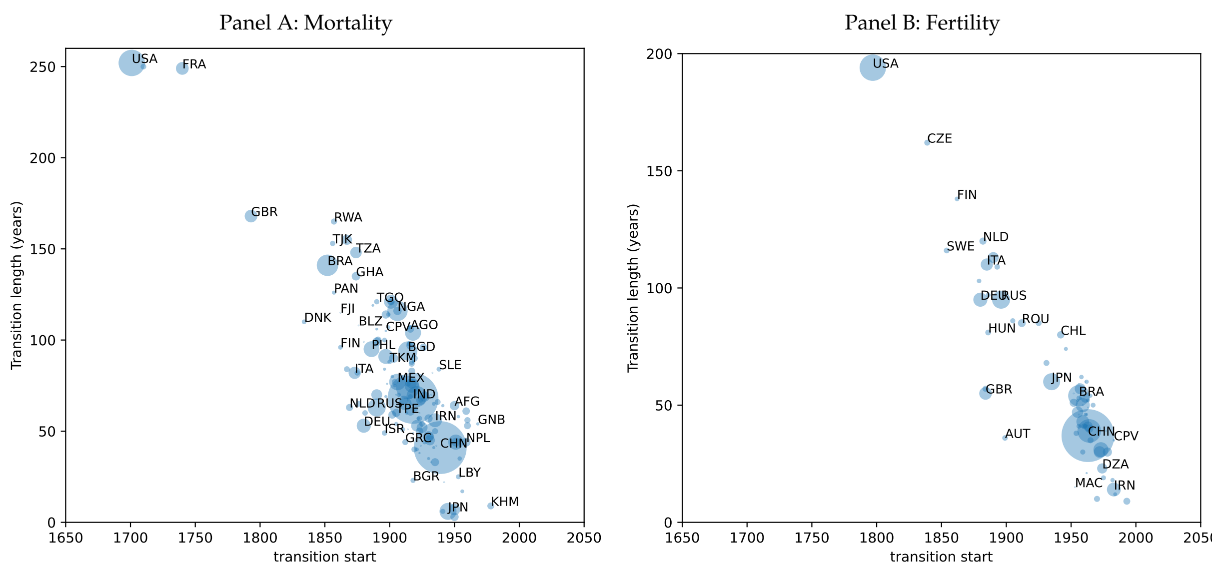
Figure 8 reinforces this reading by showing the cross-country dispersion of GDP per capita at the start of transitions. For mortality, the coefficient of variation is 0.49 before 1870, 0.56 in 1870-1900, 0.49 in 1900-1930, 0.52 in 1930-1960, and 0.30 in 1960-1990. The dispersion is moderate and shows no clear trend. For fertility, the picture is different: 0.27 before 1870, 0.48 in 1870-1900, 0.17 in 1900-1930, 0.48 in 1930-1960, then 1.64 in 1960-1990 and 1.44 after 1990. The last two cohorts indicate that fertility transitions in the later twentieth century and beyond began under highly heterogeneous income conditions: in some countries, fertility decline began at low levels of development; in others, at much higher levels. The same heterogeneity is not present for mortality. The pattern is consistent with the view that fertility transitions increasingly reflect a mixture of forces, including economic development, education, urbanization, access to contraception, and public policy, rather than a single development threshold.

Finally, Figures 9, 10, and 11 show that transitions have become substantially faster

[4]For long-run cross-country evidence linking education and fertility decline, see Murtin (2013).

over time. For fertility, the pattern complements the emphasis in Casterline (2001) on wide cross-country variation in the pace of post-1950 fertility transitions and extends it to a longer horizon. Figures 9 and 10 focus on completed transitions and measure duration as the difference between the estimated end and start dates. The scatter plots in Figure 9 show that later-starting completed transitions are systematically shorter. Figure 10 summarizes the same pattern by cohort. Panel A reports completed mortality transitions of about 150 years for the earliest cohort, 90 years in 1870-1900, 70 years in 1900-1930, 45 years in 1930-1960, and a little over 40 years in 1960-1990. Fertility transitions fall faster: more than 150 years for the earliest cohort, 90 years in 1870-1900, 85 years in 1900-1930, 50 years in 1930-1960, 35 years in 1960-1990, and about 10 years after 1990.

Figure 9: Duration of Mortality and Fertility Transitions

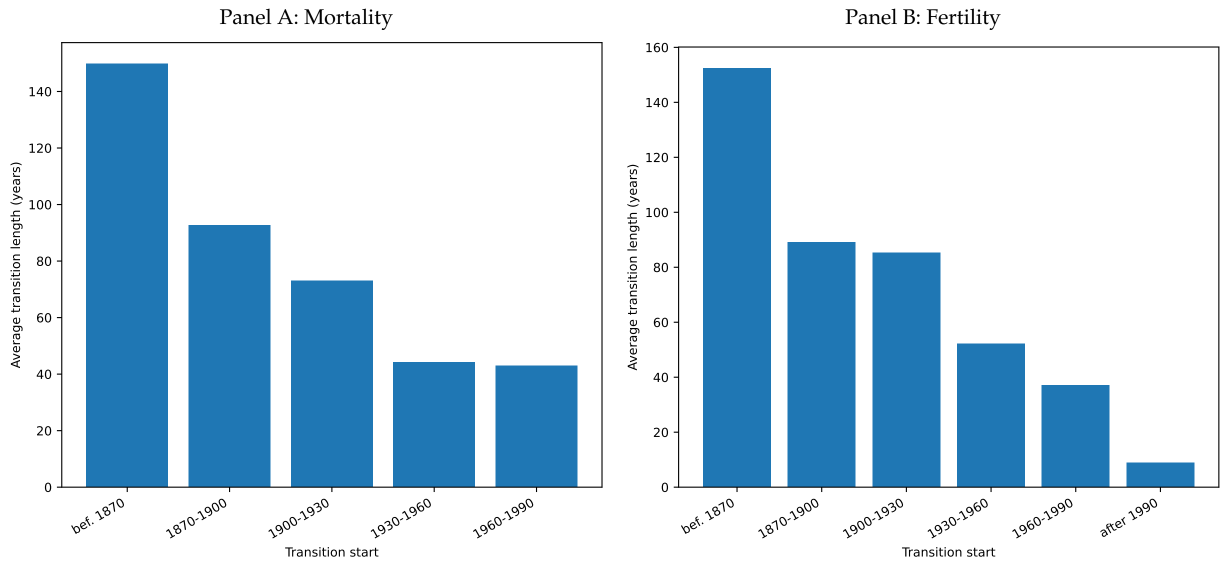


NOTES: Completed transition duration against the start year, by country. Duration is the number of years between the estimated start and end dates of the corresponding mortality or fertility transition. Only countries with observed start and end dates are included. Marker sizes are proportional to the 2016 population.

Because many recent transitions are still incomplete, Figure 11 extends the analysis to a broader set of countries by replacing completed duration with a slope-based measure: the number of years the estimated transition slope implies it would take for the rate to fall by 20 points from its start. This measure is directly tied to the piecewise-linear specification in Section 2 and does not require observing the end of the transition. It confirms the message of Figures 9 and 10: later transitions are markedly faster. Whether one measures speed by completed durations or by the time implied to produce a 20-point decline, the evidence points in the same way.

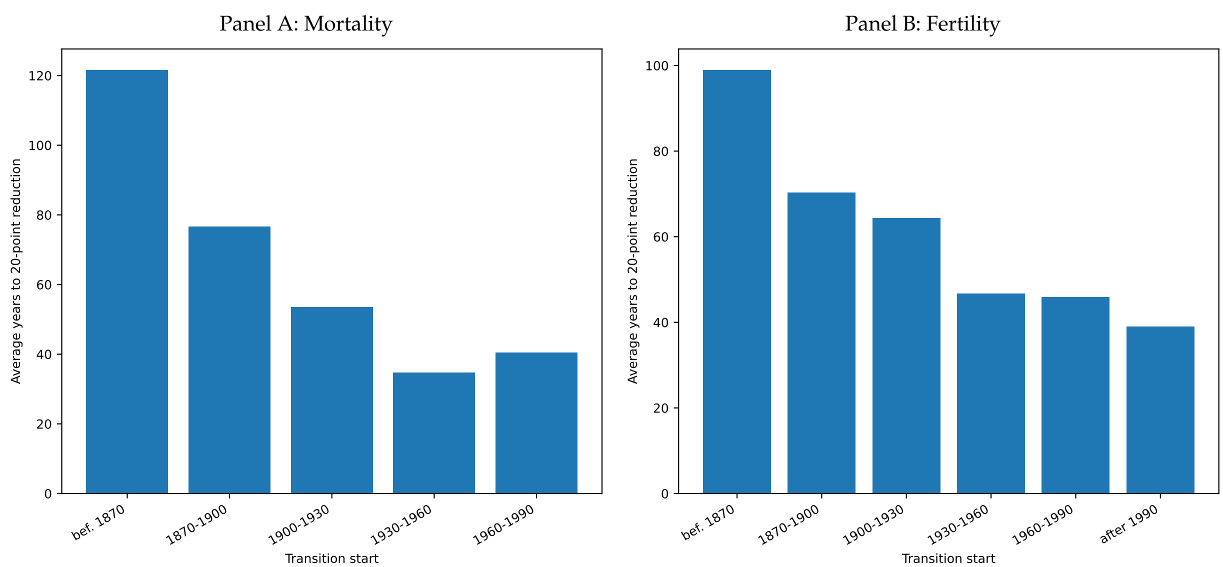
The visual patterns in Figures 9, 10, and 11 are reinforced by simple population-

Figure 10: Duration of Mortality and Fertility Transitions – Completed Transitions



NOTES: Average duration of completed mortality transitions (Panel A) and completed fertility transitions (Panel B), by cohort. Duration is the difference between the estimated end and start dates of the corresponding transition. Cohorts are defined by the start year of the transition.

Figure 11: Duration of Mortality and Fertility Transitions – Time until 20-point Decline



NOTES: Average number of years implied by the estimated transition slope for a 20-point decline in the crude death rate (Panel A) and the crude birth rate (Panel B). Unlike Figures 9 and 10, this measure does not require observing the end of the transition and can be computed for a larger set of countries. Cohorts are defined by the start year of the transition.

weighted regressions of the estimated transition slope on the start year, GDP per capita at the start, and the initial crude rate. Table 1 reports the results separately for fertility and mortality.[5] In both cases, the coefficient on the start year is negative and significant: later transitions have steeper slopes (i.e., faster declines) even after controlling for income at onset and initial demographic conditions. The coefficient on the start year is -0.003 for both fertility and mortality transitions. GDP per capita and crude rates at the start of the transitions are not significant.

Table 1: Transition Slopes, Start Year, and GDP per Capita at Onset

	(1) CBR slope	(2) CDR slope
Transition start year	-0.003***	-0.003***
	(0.001)	(0.001)
ln GDP per capita at start	-0.048	-0.290
	(0.096)	(0.202)
Initial level at start	0.004	-0.003
	(0.008)	(0.005)
Constant	4.514*	7.439***
	(2.369)	(2.562)
R^2	0.171	0.308
Observations	128	71

NOTES: Population-weighted OLS regressions of the estimated transition slope on the start year, log GDP per capita at the start, and the initial level of the corresponding crude rate, using 2016 population weights. More negative slopes imply faster transitions. Heteroskedasticity-robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2 summarizes the same evidence by replacing the linear time trend with broad historical periods. Panel A uses three period dummies, with transitions starting after 1960 as the omitted category. For both fertility and mortality, the coefficients on the pre-1900 dummy are positive and significant: early transitions had less negative slopes (and were therefore slower) than those starting after 1960, even after controlling for log GDP per capita and the log initial crude rate. The coefficients on the 1900-1960 period are smaller and insignificant for the mortality transitions. Because the number of observations within each period is small, Panel B reports a simpler two-period split. The late-period dummy is negative and significant for both fertility and mortality transitions, again indicating that later transitions were faster.

Taken together, these patterns point to a common conclusion: demographic transitions

[5] In Tables 1 and 2, CDR regressions exclude North and South Korea. The vital statistics data for these two countries start in 1950, coinciding with the Korean War, and high initial mortality levels and rapid post-war mortality recovery imply extremely fast CDR transitions, biasing the estimated coefficients.

Table 2: Transition Slopes across Historical Periods

	Panel A: Three periods		Panel B: Two periods	
	(1) CBR slope	(2) CDR slope	(3) CBR slope	(4) CDR slope
D(before 1900)	0.361***	0.934*		
	(0.089)	(0.550)		
D(1900–1960)	0.151**	0.583		
	(0.059)	(0.545)		
D(late)			-0.207***	-0.334***
			(0.065)	(0.085)
ln GDP per capita at start	-0.046	-0.177	-0.024	-0.206
	(0.086)	(0.165)	(0.082)	(0.186)
ln initial level	0.148	0.365	0.194	-0.084
	(0.262)	(0.248)	(0.266)	(0.357)
Constant	-0.853	-1.173	-0.981	1.397
	(1.511)	(0.959)	(1.511)	(1.650)
R^2	0.210	0.336	0.162	0.256
Observations	128	71	128	71

NOTES: Panel A replaces the linear start-year effect with period dummies; the omitted category is transitions starting after 1960. Panel B reports a simpler two-period specification: the late-period indicator equals one for fertility transitions starting in or after 1960 and for mortality transitions starting in or after 1930. More negative slopes imply faster transitions. Heteroskedasticity-robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

have become decoupled from local economic conditions and shaped by the global diffusion of technologies, institutions, and policies. Mortality decline began at progressively lower income levels and ran faster, consistent with the diffusion of health technologies and practices. Fertility decline also accelerated, but in a way that looks more historically contingent. Early fertility transitions emerged from the distinctive low-fertility regime of the European Marriage Pattern; later transitions began from much higher birth rates and under much more heterogeneous economic conditions. The growing dispersion of income at fertility onset, together with the appearance of low-income fertility transitions after 1990, suggests that policy and changes in norms have become central to understanding the modern fertility transition.

4. Demographic Contagion

One reading of the previous section is that demographic transitions do not occur in isolation. Once fertility decline begins in some countries, it may become more likely elsewhere through geographic, cultural, and informational proximity. The idea goes back at least to the Princeton tradition, which emphasized the diffusion of fertility decline across socially connected populations in Europe, and has been restated more recently in work on the role of linguistic and cultural distance (Coale and Watkins, 1986; Spolaore and Wacziarg, 2022). Following Delventhal et al. (2021), we ask whether the timing of fertility transitions is better explained by income alone or by diffusion from countries that have already transitioned.

The starting point is a discrete-time logit hazard for the probability that country i starts its fertility transition in year t, conditional on not having started earlier. Let T_i denote that year. The hazard is

$$\Pr(T_i = t \mid T_i \geq t) = G\left(\sum_{l=0}^{k-1} x_{l,it}\beta_l + A_{it}\right), \tag{1}$$

where $G(\cdot)$ is the logistic cdf, $x_{l,it}$ collects domestic covariates such as ln GDP per capita, and A_{it} captures exposure to past transitions in other countries. The narrow question is whether GDP per capita alone accounts for the timing of fertility transitions. The broader one is whether countries become more likely to start their own once others have done so.

To capture contagion, the exposure term A_{it} is

$$A_{it} = \delta_0 \sum_{j=1}^{N} p_{t,j} I_{j,t-1} + \delta_1 \left(\sum_{j=1}^{N} p_{t,j} I_{j,t-1}\right)^2 + \sum_{z \in Z \setminus z_0} \gamma_z \sum_{j:(i,j) \in z} p_{t,j} I_{j,t-1}, \tag{2}$$

where $I_{j,t-1}$ indicates whether country j had started its transition by year $t-1$ and $p_{t,j}$ is country j's population weight at time t. The first two terms capture global exposure to past transitions; the last allows exposure to depend on whether two countries are geographically close, linguistically close, or both. Country pairs are grouped into four mutually exclusive categories, indexed by z, with z_0 the omitted category: neither close, geographically close only, linguistically close only, and close on both dimensions.

Table 3 reports a simplified, population-weighted version of the results. Column (1) shows that a specification with GDP per capita alone fits poorly, with a pseudo-R^2 of 0.079. Column (2) adds a global contagion term and substantially improves the fit: the coefficient on global transitions is positive and highly significant, and the quadratic term is negative, indicating diminishing marginal effects as more countries have transitioned. Column (3) lets spillovers differ by proximity. The strongest effect comes from transitions in countries that are both geographically and linguistically close; the coefficients on

Table 3: Determinants of the Start of the Fertility Transition

	(1)	(2)	(3)	(4)
constant	-44.254	-56.679	-122.085**	55.965
	(32.366)	(37.596)	(42.311)	(74.160)
ln GDP pc	5.148	6.319	14.948**	-2.320
	(4.266)	(4.962)	(5.579)	(5.038)
(ln GDP pc)^2	-0.202	-0.379	-0.966**	0.128
	(0.274)	(0.318)	(0.361)	(0.320)
global transitions		0.388***	0.340***	
		(0.045)	(0.044)	
(global trans.)^2		-0.005***	-0.005***	
		(0.001)	(0.001)	
year				-0.018
				(0.033)
phys. *and* ling. close trans.			1.089***	
			(0.217)	
phys. close, ling. far trans.			0.022	
			(0.078)	
ling. close, phys. far trans.			0.008	
			(0.097)	
ln dist from GBR				-5.997***
				(1.814)
ln dist from GBR × year				0.011**
				(0.004)
ling. prox. to GBR				31.073***
				(9.167)
ling. prox. to GBR × year				-0.063**
				(0.022)
log-likelihood	-335.2	-232.9	-219.6	-214.1
Pseudo-R^2	0.079	0.360	0.397	0.412
N. obs.	23,080	23,080	23,080	23,080

NOTES: The dependent variable is an indicator for the start of the fertility transition in a given year. Explanatory variables include log GDP per capita, the cumulative number of past transitions worldwide (first block), measures of past transitions among countries that are geographically and linguistically close (middle block), and geographic distance and linguistic proximity to Great Britain, GBR (bottom block). In the bottom block for Equation (3), the time variable t is centered at 1500. All relevant variables are population-weighted. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

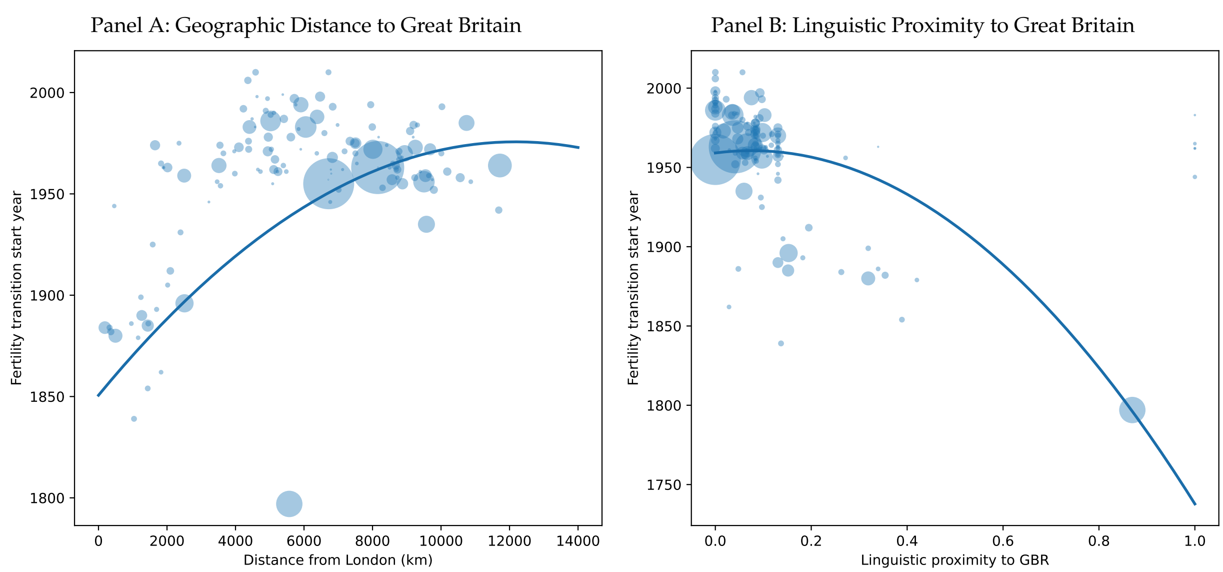
countries that are only geographically close or only linguistically close are near zero and imprecisely estimated. What matters most is not global exposure but exposure mediated by proximity in both space and culture.

A more parsimonious way to summarize the same idea is to replace the full network with a single-source specification centered on Great Britain, one of the earliest countries to undergo both industrialization and sustained demographic change. The contagion term becomes

$$\tilde{A}_{it} = \nu_P d_i^P + \nu_L d_i^L + \eta_P d_i^P \times t + \eta_L d_i^L \times t, \tag{3}$$

where d_i^P is log geographic distance from Great Britain and d_i^L is linguistic proximity to it. Column (4) shows that this specification fits the timing of fertility transitions slightly better than the full network, with a pseudo-R^2 of 0.412. The coefficient on geographic distance is negative and significant, and its interaction with time is positive: countries farther from Great Britain started later, though the gradient weakens over time. Linguistic proximity enters positively, with an interaction with time that is negative.

Figure 12: Contagion and Proximity to Great Britain



NOTES: Start date of the fertility transition against geographic distance from Great Britain with London as the reference location (Panel A) and against linguistic proximity to Great Britain (Panel B), in the population-weighted data. In Panel B, higher values indicate greater linguistic closeness. Each observation is a country; marker sizes are proportional to the 2016 population; the solid line is a quadratic fit. Countries farther from Great Britain tend to experience later fertility transitions, consistent with spatial diffusion. Countries with greater linguistic proximity tend to experience earlier transitions, consistent with cultural and informational proximity facilitating the spread of fertility decline.

Panel A of Figure 12 is the visual counterpart of this specification. Over most of the support, countries farther from London begin their fertility transitions later. The relationship is not deterministic, and it flattens at very large distances, but the gradient is clear: proximity to Great Britain is associated with earlier fertility decline. Read as diffusion, the figure shows demographic transition spreading outward in space, with countries closer to the early leader moving first and more remote countries following later.

Panel B shows the analogous relationship for linguistic proximity. The sign is reversed relative to a distance measure: countries linguistically closer to Great Britain begin their transitions earlier, and those farther begin later. Cultural and informational proximity also facilitated the spread of low-fertility behavior. The pattern connects to Beach and Hanlon (2023), who show that fertility norms can move through culturally linked populations and shift sharply once new behaviors become socially visible. Geographic and linguistic proximity need not work through the same channels, but both are consistent with a view in which demographic change diffuses through interaction, communication, and social learning.

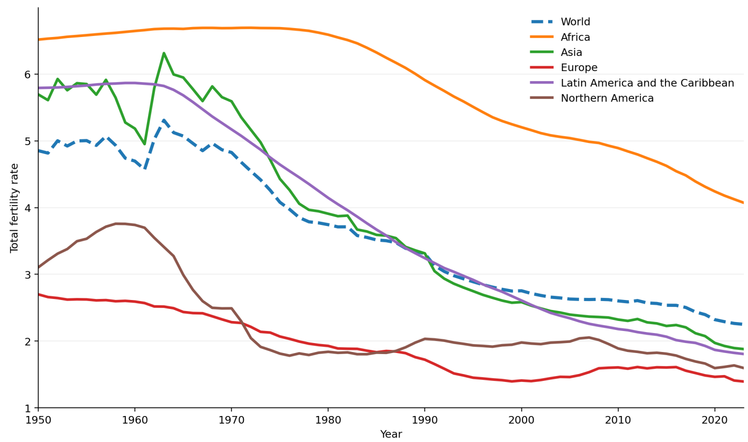
Taken together, the table and figures imply that fertility transitions were not a sequence of isolated national events. They formed part of a broader international process in which transitions in nearby, culturally connected countries increased the likelihood of transitions elsewhere.

5. The Fertility Collapse

A natural next question is what the world looks like once many countries have completed the transition and moved below replacement. The canonical pattern has fertility falling with a lag behind mortality, bringing population growth down. What distinguishes the current moment is that fertility has continued to fall even in countries already at or below replacement. Recent work suggests that sustained low fertility is a plausible long-run scenario rather than a temporary deviation and that its consequences in high-income societies extend from population aging to labor supply, public finance, and long-run growth (Geruso and Spears, 2026; Bloom et al., 2024). The central demographic question is no longer whether the transition to low fertility will occur but how far fertility will fall and what its consequences will be for long-run population dynamics.

Figure 13 shows total fertility rates across major world regions since 1950. The pattern is one of pervasive decline. Europe and Northern America reached low fertility decades ago; Latin America and Asia followed with rapid declines after 1960. Africa remains the exception: fertility there is still substantially higher than in the rest of the world, though it

Figure 13: Total Fertility Rates across Major World Regions



NOTES: Regional average total fertility rates for the world and major regions since 1950. Source: UN World Population Prospects and authors' calculations.

has begun to fall too. At a glance, the figure shows what this section is about: one region of the world still has high fertility; the rest is at or below replacement.[6]

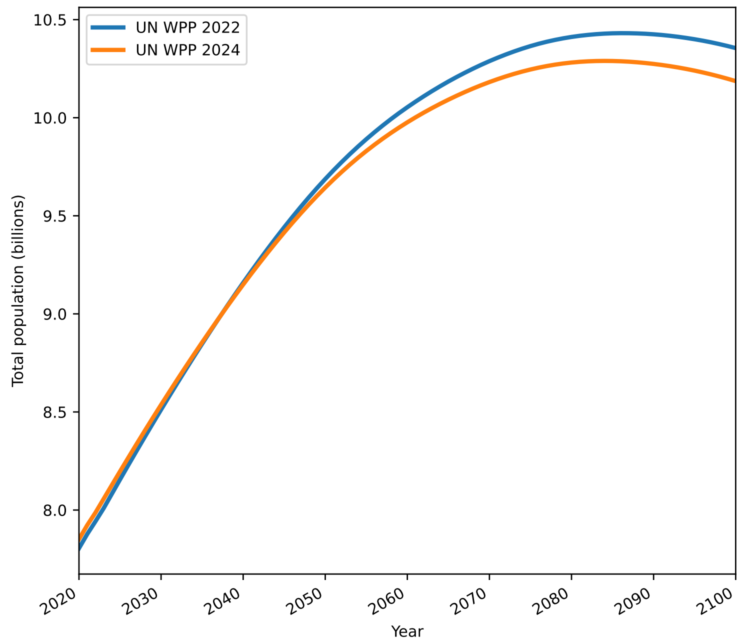
The demographic transition is now nearly universal, and the world is increasingly divided between one region where fertility remains high and the rest, where fertility is at or below replacement. Convergence toward replacement is not automatic: as Bongaarts (2002) emphasizes, late-stage fertility decline can slow, stall, or settle at very different levels. And replacement fertility is not 2.1 everywhere; it depends on the sex ratio at birth and on the probability that women survive to reproductive ages; for the world as a whole, a number closer to 2.2 is more appropriate. The current global slowdown is, therefore, even more consequential than the headline figures suggest.

These patterns imply a major change in the future path of the world population. Growth has already slowed sharply from its mid-twentieth-century peak, and the next stage is global population decline. Figure 14 compares the 2022 and 2024 revisions of the UN world population projections. The 2024 revision implies a lower path than the 2022 revision, reflecting fertility falling faster than previously anticipated. Falling fertility does not imply an immediate decline; however, demographic momentum means that births can still exceed deaths for some time after fertility falls below replacement, as large cohorts born in the past remain in their childbearing years. The projections in Figure 14

[6] Fertility data for much of Africa rest on a thinner statistical base than for other regions, and recent survey evidence suggests that fertility in some African countries may already be lower than the figures imply. The broad regional contrast is unlikely to change, but the precise level for Africa should be read with caution. See Schoumaker (2014, 2019).

raise an obvious question: what is fertility doing now?

Figure 14: The Future of World Population

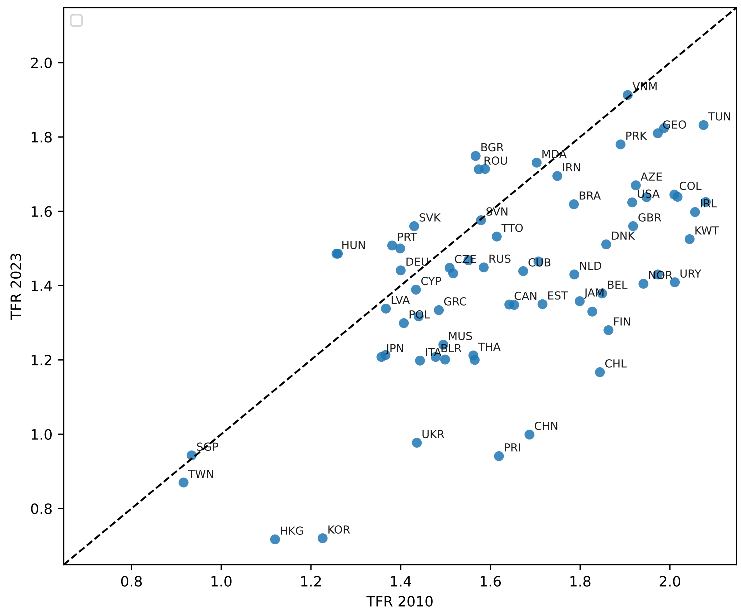


NOTES: World population projections from the 2022 and 2024 UN World Population Prospects. The 2024 revision implies a lower path than the 2022 revision, reflecting faster-than-expected fertility decline.

A striking feature of the recent period is that fertility has continued to fall even in countries that were already below replacement in 2010. This is not a continuation of the classic transition from high to low fertility. Instead, many countries have moved into a regime of *fertility collapse*, in which already low fertility is followed by further rapid declines. Figure 15 illustrates this with countries that had a total fertility rate of 2.1 or less in 2010. Most of them lie below the 45-degree line: fertility in 2023 is lower than in 2010. The declines are substantial. China fell from 1.687 to 0.999, Puerto Rico from 1.619 to 0.941, Chile from 1.844 to 1.167, and Uruguay from 2.011 to 1.409. In Europe, Finland fell from 1.863 to 1.280, Sweden from 1.973 to 1.430, Norway from 1.941 to 1.405, and France from 2.017 to 1.639. East Asia is the frontier: Korea dropped from 1.226 to 0.720, Hong Kong from 1.120 to 0.717. The figure documents not merely low fertility but also a further, and in some cases very rapid, decline after countries had already entered a low-fertility regime.

A simple way to see the long-run implications of these declines is to approximate a stationary population. If life expectancy is 85 years (roughly the highest currently ob-

Figure 15: Fertility Collapse: Total Fertility Rate in 2010 and 2023



NOTES: Total fertility rates in 2023 against total fertility rates in 2010, for countries with a TFR of 2.1 or less in 2010. The 45-degree line corresponds to no change. Source: UN World Population Prospects 2024.

served, in countries such as Japan and Spain) and annual births stay constant, the long-run population is approximately $N \approx 85B$, where N is the long-run population and B is annual births. Equivalently, $1000/85 \approx 11.76$: once a country's crude birth rate falls below roughly 11.8 per thousand, births are no longer enough to sustain the population.

This back-of-the-envelope calculation is not a forecast: actual population paths are shaped by demographic momentum, migration, and changes in longevity. But it is a useful diagnostic of the population implied by current birth rates. Applying it to current data yields stark results. Among countries of more than one million, the largest implied long-run declines are concentrated in East Asia and Europe. Korea stands out, with an implied decline of 61.2%, followed by Hong Kong (52.8%), Ukraine (52.2%), Taiwan (51.7%), Puerto Rico (50.6%), Japan (48.8%), China (46.8%), Italy (45.1%), and Spain (40.2%). These gaps do not imply that the population will fall immediately (many countries still have substantial demographic momentum), nor that the economic consequences of low fertility are catastrophic. These economic consequences depend on the margin one emphasizes and remain debated (Weil, 2026). They do show how far current fertility has moved below the level required to sustain the existing population. Outside Africa, and especially in East Asia and much of Europe, current fertility implies a future of population decline unless births recover or are offset by large immigration.

6. Conclusions

This chapter has documented the broad empirical patterns of demographic transitions across countries and over time. Using a common characterization of CBR and CDR transitions, we summarize each country's mortality and fertility transitions by their pre-transition levels, start and end dates, and post-transition levels. The framework lets us compare transitions across space and historical time, moving beyond descriptive narratives toward a unified empirical view.

Several conclusions emerge. First, demographic transitions are regular in their broad structure but heterogeneous in their timing, speed, and initial conditions. Mortality typically falls before fertility. Second, transitions have become substantially faster over time: later countries compressed changes that earlier countries spread over much longer periods into a few decades. Third, the economic conditions at the onset of transition have also changed. Mortality transitions began at progressively lower income levels; fertility transitions, especially in the later twentieth century, began under much more heterogeneous conditions. Demographic change has become less tightly linked to any single threshold of development and more shaped by the diffusion of technologies, institutions, and policies.

A further conclusion is that demographic transitions do not occur in isolation. Countries are more likely to begin fertility decline when geographically and culturally close countries have already done so. The evidence is consistent with a view in which demographic change spreads through interaction, communication, and social learning rather than only through domestic economic development. Contagion also helps explain why later transitions often started at lower income levels and ran faster than earlier ones.

Finally, the demographic transition is not a historical process that has already run its course. It continues to shape the contemporary world. Fertility has fallen nearly everywhere, and in many countries it has kept falling even after reaching low or below-replacement levels. The central demographic question today is no longer only how countries move from high to low fertility, but whether very low fertility will persist and what it implies for long-run population dynamics. Current birth rates in much of East Asia and Europe are consistent with substantial long-run population decline unless fertility recovers or is offset by immigration.

The main lesson is that the demographic transition should be understood as both a completed transformation in some places and an ongoing global process in others. Its past reveals a set of robust regularities; its present reveals new forms of heterogeneity; its future will depend not only on development but also on institutions, culture, and the diffusion of demographic behavior. Any successful theory of demographic change must account for all three.

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