Population Projections and Demographic Knowledge in France and Great Britain in the Postwar Period

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Population projections are an important point of connection between demographers' expert knowledge, policymakers' applied knowledge, and the public's popular knowledge. They can influence family policy and migration policy, in addition to population policy, and are used for economic planning. They can also serve as potent symbols in public debates, providing concrete representations of the long-term effects of complex processes. For example, projections of the global population and the populations of poorer countries were often cited in warnings of the dangers of the "population bomb" in the 1960s and 1970s. Earlier, in the period between the two world wars, population projections featured prominently in public discussions of concern over declining birthrates in France and Great Britain: projections of steep population declines were cited repeatedly in political and media discussions of the time (Soloway 1990: 232–46; Winter 1990: 445–48; Spengler 1938: 63–64).[1]

Because population projections require the experts who make them to quantify their assumptions about an uncertain future, they provide insight into often-unstated subjective beliefs underlying quantitative analyses of demographic processes.[2] As the authors of official French national projections argued, projections require "knowing how to read the past" (Calot et al. 1970: 7). But the makers of projections do not read the past by mechanistically applying standardized procedures; the assumptions required to produce projections necessarily entail subjective judgments about future trends. Despite the fact that demographers often emphasize that their projections should be interpreted as hypothetical—mere demonstrations of what would occur if the given assumptions held—they know that projections are often interpreted as forecasts, seen as presenting the outcome that the authors think is most likely to occur (Keyfitz 1987: 241–3).[3] Furthermore, even hypothetical scenarios

require judgments that some futures are more likely than others. Since it is impossible to produce projections for every possible future scenario, the makers of projections, by including certain sets of assumptions rather than others, define a set of future trends that they believe are more likely than other possible trends. Since projections require their makers to formalize their subjective judgments, they provide evidence of these subjective judgments—a valuable resource for social scientists interested in observing them. Studying the assumptions used to produce projections thus provides scholars of the production of demographic knowledge with a unique opportunity to investigate how subjective beliefs influence the science of demography.

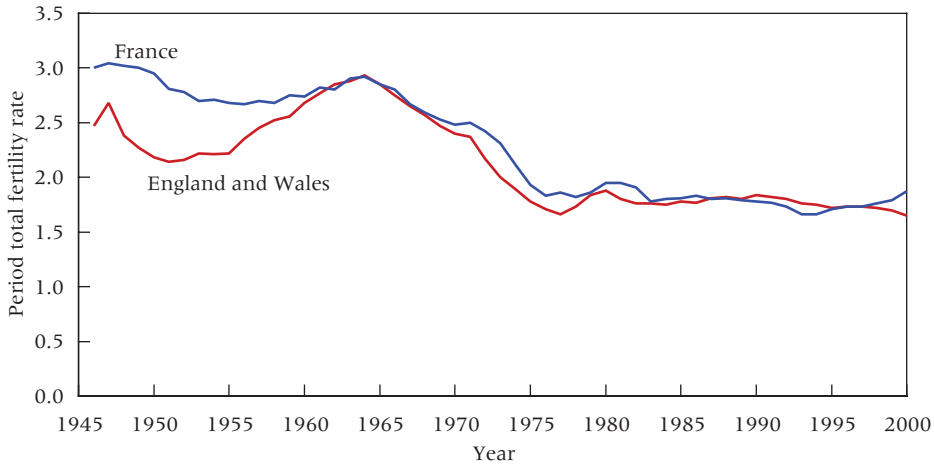
French and British views of fertility in the postwar twentieth century

The cases of France and Great Britain[4] in the postwar twentieth century (the 1950s through the 1990s) were chosen for this comparative case study because policymakers and publics in these two countries viewed national fertility rates very differently during this period. Among Western European nations, France was an outlier in discourse and policy for much of this period, both by virtue of the near-consensus across the French political spectrum that concern over birthrates was warranted, and through the consistent provision of initiatives thought to encourage childbearing (Gauthier 1996: 137). In contrast, Great Britain remained at the other end of the spectrum throughout the postwar twentieth century, distinguishing itself with an almost complete absence of explicit state and public attention to below-replacement fertility or population policy: the British government's approach to population policy has been characterized as "no problem—no intervention" (Gauthier 1996: 141).

These differences would not be so puzzling if French birthrates had been significantly lower than British birthrates during this period. However, the two countries' period total fertility rates were strikingly similar throughout the period in question (Figure 1).[5] When they differed, it was nearly always French birthrates that were higher.

To address the question of how such similar trends in postwar birthrates in these two countries came to be interpreted very differently, I focus on the construction of demographic knowledge through population projections. By the end of World War I, knowledge and beliefs about population were filtered through the disciplinary expertise of demographers and transmitted to wider audiences through population projections, among other mechanisms. Examining projections themselves and how they were made sheds light on the production of a consequential form of demographic knowledge, contributing to a better understanding of how concerns over low fertility were maintained in France, but not in Great Britain, over a long period of similar birthrates in the two countries.

FIGURE 1 Period total fertility rate, England and France, 1946–2000



SOURCES: UK Office of National Statistics (ONS 2011); Institut national de la statistique et des études économiques (INSEE 2014a).

Population projections as quantification

Most studies of European population projections have focused on the methods used for projection and the accuracy of projections (e.g., Hajnal 1955; Brass 1974; Shaw 1994, 2007; Keilman 1997, 2007; Keilman and Pham 2004). In addition, a smaller body of work has examined the historical development of European methods for population projections, exploring the social context and meaning of projections before World War II (e.g., Gans 1999; Fleishhacker, Gans, and Burch 2003). This study builds on the latter work, focusing on the contexts in which projections have been made since World War II, as well as their meaning as representations of possible demographic futures. In this study the methods and assumptions used to make projections are primarily considered not as sources of error, but as reflections of the assumptions (explicit or implicit) about population trends held by the parties making the projections.

Projections are also treated here as representations that can influence thinking and public discussion about population. This approach to projections is informed by a broader literature on quantification, which examines the process of creating numerical representations and the effects of this process (Espeland and Stevens 2008; Starr 1987). One central argument of this literature is that "measurement intervenes in the social worlds it depicts" (Espeland and Stevens 2008: 412). Theories of quantification, like theories of performativity (MacKenzie, Muniesa, and Siu 2008), emphasize that the creation of a representation, in and of itself, can have tangible effects on

the phenomenon it represents. In the case of population, academics and practitioners alike have recognized this possibility. Scholars have warned of the dangers of reification in academic demography, whereby "through repeated use, some indices become so familiar that their somewhat arbitrary nature is forgotten" (Wilson and Oeppen 2003: 121). In a more applied setting, the introduction to the 1975 British national projections notes that, "in some circumstances the publication of a projection can itself influence future events … so as to invalidate the assumptions on which the projection was based" (OPCS 1977: 2). This study considers national population projections an important example of quantification of expectations about the demographic future, as projections became part of national discussions about population and policy.

Analytic approach

This study has two main goals. The first is to compare the projections produced in France and Great Britain and to examine the nature and meaning of cross-national differences in projections, particularly differences in the fertility assumptions used to make projections. The second goal is to examine possible sources of differences in projections. I identify two key factors: different demographic histories in France and Great Britain and the distinct institutional configurations that affected who made projections in each country. I also consider the relationships between these factors, particularly the influence of demographic history on institutional structures.

To begin, an analysis of six sets of population projections from each country, covering a fifty-year period, examines how the methods used to make official national projections, and the projections themselves, differed in these two countries. The same method of projection was generally used in both countries, but a difference is observed in *how* it was used: multiple-variant projections were published in France, while single-variant projections were published in Britain. This difference is shown to have important implications for how the projections can be interpreted, with the publication of multiple variants highlighting future contingency, while the publication of a single variant presents an image of certainty. Next, assumptions about the future trend of fertility used to make these projections are examined.[6] Comparisons show that although recent trends were similar, British and French fertility assumptions were quite different for much of the study period, with British projections generally assuming higher future fertility than French projections.

Despite the use of similar techniques of demographic analysis, different fertility assumptions resulted in quantitatively different projections in each country. National projections are thus shown to have provided representations of distinct demographic futures in each country: a reassuring depiction of slow growth in Britain, and a picture of contingency in France that included the pos-

sibility of population decline. These analyses show how projections contributed to differences in understandings of the meaning of population trends.

To explore mechanisms that may have contributed to the observed differences in projections, I then use primary and secondary historical sources to examine the demographic histories and institutional configurations of the two countries. I argue that the two countries' different histories of population change that date back to at least the nineteenth century, particularly longstanding French concerns about low fertility and population decline, led to different postwar institutional configurations that gave French academic demographers much greater influence than their British counterparts. French projections were produced by demographers, while British projections were produced by actuaries with different disciplinary dispositions, and these intellectual and institutional differences had implications for the projections that were produced.

Methodological approaches to population projections

The first analysis is a comparison of the methods used to produce official national population projections in the two countries. Although the basic method used was quite similar for most of this period, as both the French and British projections used the cohort component method (with the exception of the early British projections), two differences in the ways that projections were made and presented had important consequences for their interpretation: the number of variants published in a projection and the assumptions made about future fertility levels.

Projections provide estimates for the possible future size of a population by taking the current population size as the starting point, then applying assumptions about population change over time to this starting population. The cohort component method, first developed at the end of the nineteenth century, became the dominant method of projection during the interwar period and has remained nearly unchallenged since (Fleishhacker, Gans, and Burch 2003). The method explicitly models the three processes by which population size can change: births, deaths, and migration. Thus the population at some time in the future can be thought of as the sum of the current population size plus the number of births, minus the number of deaths, plus the net number of migrants, which may be either positive or negative. In this method, the population is divided into age groups, and each group is treated as progressing through life in stages, experiencing a given set of mortality and fertility rates (usually assumed to vary with age) throughout its members' lifetimes. These calculations require detailed assumptions about age-specific fertility and mortality, as well as assumptions about the age structure of the starting population and the migrant population, if they are not known.

Data

In the following analyses I use French projections published by the National Institute of Statistics and Economic Studies (INSEE) and British projections prepared by the General Register Office (GRO) and the Office of Population Censuses and Surveys (OPCS) of the United Kingdom. While the British projections were at first produced every year, and later every other year, the French projections are usually produced either five or ten years apart. Projections for the two countries are compared for all existing French official projections from this period except one.[7] The British projections used for comparison are from the same year as the French whenever possible; of the six observations examined, there are two cases in which other nearby years must be used. The time points covered by this analysis are thus 1950–55, 1963, 1970, 1975, 1985, and 1989–91.

The main data source for Great Britain is the population projections made by the Government Actuary's Department (GAD), which produced the national projections from 1954 to 2006 (they are now produced by the Office for National Statistics (ONS)). Starting with the 1971 projections, a GAD database (available from the GAD on request) contains complete information on the projected numbers of births, deaths, and migrants used to project total population size, along with the total fertility rate (TFR) implied by the projections. For years before 1971, only total population projections are provided in the database. For these years, less complete information on the projected number of births and deaths used to calculate projected total population is published in the *Registrar General's Quarterly Return for England and Wales* and the annual *Registrar General's Statistical Review of England and Wales*. Mid-year population estimates for England and Wales in electronic form were requested from the ONS and supplemented with published figures in the *Registrar General's Statistical Review of England and Wales*. Vital statistics records including the yearly total fertility rates recorded in England and Wales, which I use to analyze the error rate in projections, are available online (ONS 2011). Separate projections were calculated for the separate regions of Great Britain. The analyses presented here are of the projections for England and Wales; projections that combined other regions of Great Britain were similar.

Data for the French projections, produced every five to ten years, are found in selected volumes in the series *Les Collections de l'INSEE.* A complete list of the volumes used is given in the source note to Table 1. They contain total population projections and the assumptions for fertility, mortality, and migration used to make the projections. For the first time period, the French data are taken from a 1953 article published in the French journal *Population*, which compares population projections for several European countries (Bourgeois-Pichat 1953). Data on actual population size and fertility rates for France were obtained from INSEE's online database (INSEE 2014a, 2014b).

Single versus multiple variants and the meaning of projections

There is a clear difference between the two countries in their use of variants in population projections. In Great Britain until the mid-1970s, only a single variant was published in each yearly projection. One hypothesis for the course of future mortality, one hypothesis for the course of future fertility, and one hypothesis for the course of future migration were selected and then applied to the current population estimate to produce a single projection of the total future population. Even when variations on these hypotheses began to be calculated, they were published separately at first (e.g., OPCS 1974) and were then confined to the final chapter of the publication, separate from the main results. An introduction to British projections that include variants even provides a caution that "these additional projections are not put forward with the intention that users should select the projection which conforms most closely to their own beliefs about the future; the principal projection should remain the focus of consideration for planning purposes, with the variants providing some measure of the uncertainties present" (OPCS 1987: 21).

In contrast, French projections were always published as a set of multiple variants, constructed from multiple hypotheses. Hypotheses about migration and mortality sometimes varied, but the greatest number of variants resulted from the use of multiple fertility hypotheses (Table 1). (The 1953 projection had too many variants to include in the table, but its central variant will be used in further analyses.) Notably, in many of the French projections, no central projection existed. Rather, there were a "low variant" and a "high variant," based on low or high fertility assumptions. As a result, the contingency of these population projections is inescapable: a reader who wished to make

TABLE 1 Variants of French population projections published 1963–1990

		Fertility variants						
Year	Total variants	High	Low	Central	Very high	Very low	Migration	Other variants
1963	6	✓	✓	✓			No	With constant mortality
1968	2	✓	✓				No	
1970	4	✓	✓				As a variant (through 1986)	
1975	4	✓	✓		✓	✓	No	
1985	6	✓	✓		✓	✓	Until 2000	With lower mortality
1990	5	✓	✓	✓			As a variant (+50,000/year)	Constant mortality

SOURCES: Febvay et al. 1964; Calot et al. 1970; Hémery et al. 1973; Dinh and Labat 1979, 1986; Dinh 1995.

use of these projections could not simply choose to use the central variant, ignoring other possibilities, but must consider how to handle the multiple variants provided. Unlike the British producers of projections, who admonished their users to focus on the central (or principal) variant, the French producers of projections with no central variant demanded consideration of multiple possible futures for the French population.

The reasons for this difference in the British and French approaches to variants are not directly stated in the explanations accompanying the projections. The British explanations express concern that the single variant may produce a false appearance of certainty, noting that the publication of a single variant "has led some commentators to conclude that the projection is a 'forecast' or 'prediction.'" Nonetheless, they conclude with the authoritatively uninformative assertion that "it has been considered more suitable to produce a single 'official' set of projections for common use to provide consistency between the many users of the projections" (OPCS 1977: 1). When the British projections include multiple variants at all, they are described as a way to address concerns about false appearances of certainty. By 1991, the title of the section on the projection variants was changed from "Variants" to "Uncertainty of Population Projections." In that section, variants are described as one of "a number of possible ways of indicating the inherent uncertainty in making population projections" (OPCS 1993: 27). The British publications thus present variants of population projections as a way to represent uncertainty around the central projection, rather than as alternate, equally valid possibilities for the future.

The French explanations for the choice to present multiple variants are similarly vague, although uncertainty also figures prominently in their accounts. The published introduction to the 1968 French projections cites uncertainty about the future trend of fertility, as a result of recent large changes in birthrates, as a justification for providing two sets of assumptions about future fertility—a high and a low variant (Calot et al. 1970: 13). The 1985 projections note that "among the factors driving the future of the population, the most uncertain is fertility. Therefore, four hypotheses of the evolution of fertility are considered, in order to cover a large range of possibilities" (Dinh and Labat 1986: 9). The French approach to this uncertainty differs from the British approach, however, in that the French projections present multiple variants as distinct possible future trajectories, rather than as a background of uncertainty unfolding about a central projection, as in the British case.

These different approaches to variants of projections may reflect different approaches to statistical representation of social phenomena in each country. Desrosières distinguishes "two tendencies in the use and interpretation of social statistics" (1998: 43). The first tendency, which Desrosières notes arises from a tradition following Quetelet and Durkheim (of Belgian and French nationality, respectively), conceives of statistics as representations of social

realities, while the second tendency, from a tradition following the British statisticians Galton and Pearson, embraces the constructed nature of statistics. In this sense, multiple variants in the French projections could reflect dissatisfaction with single-variant projections as inadequate representations of possible future social realities.

Although the reasons for the use of single or multiple variants are difficult to identify definitively, the implications of this difference are clear. In the British case, as the authors of the projections acknowledge, the use of a single variant creates the impression of certainty about future population trends. The continued presentation of only a central variant in the main body of the British publications hides the contingency of the assumptions behind the projection, acting as a form of March and Simon's "uncertainty absorption" that characterizes quantification processes in which "the premises behind the numbers disappear" (discussion of March and Simon 1958 in Espeland and Stevens 2008: 422). In the French case, in contrast, the inclusion of multiple variants highlights the contingency of population projections by making the consideration of other possibilities unavoidable: readers are shown graphs with multiple lines illustrating different possibilities for the future size of the population. Contingency is particularly emphasized in the majority of the French projections in which there is no central variant at all. When there is no single "most likely" central variant, but rather a high and a low variant, it is impossible to represent the projections accurately with a simplification to a single variant and hide the uncertainty around the projections.

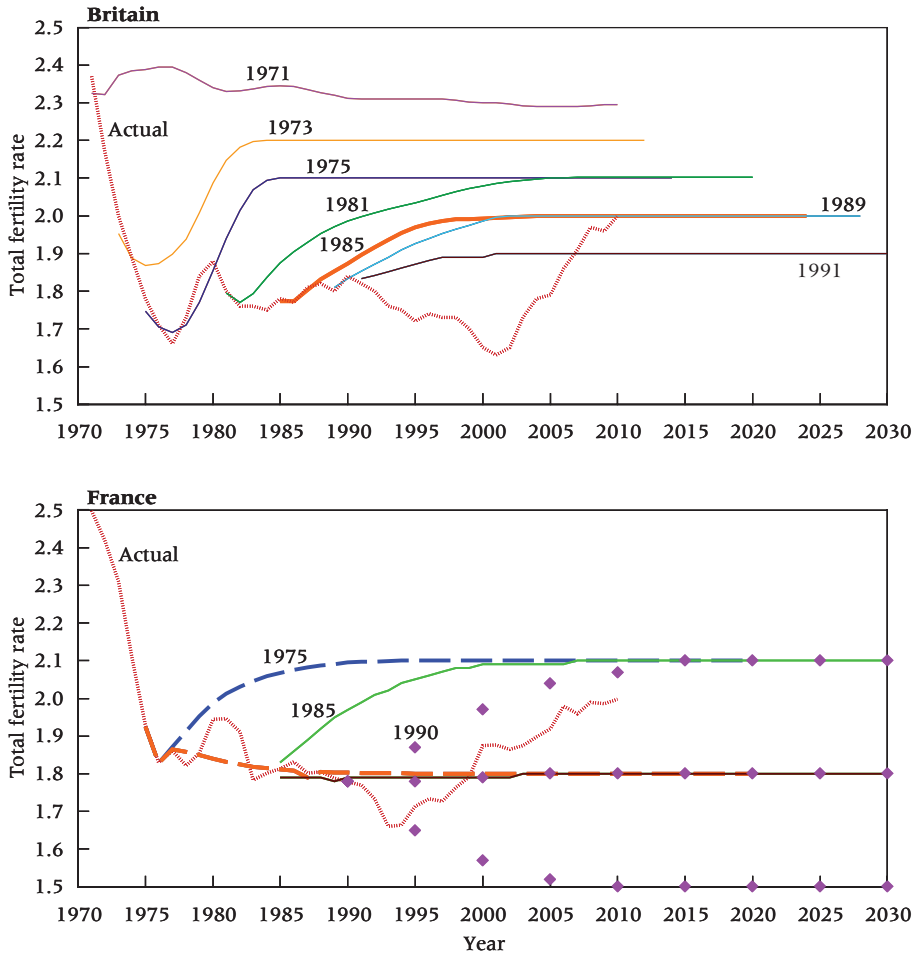
Another contingency highlighted by the multiple variants in the French projections is the uncertain course of migration, through the presentation of separate variants with and without migration in some years. In 1963 and 1970, each of the main variants was shown both with and without migration.[8] This format highlights how much of the projected total population is attributable to migration rather than to so-called "natural" increase (births and deaths among the native-born population), maintaining a distinction between new immigrants and their descendants and the rest of the population of France.

Assumptions about future fertility

Another critically important choice made by the authors of population projections is the choice of assumptions about future fertility. Figure 2 shows the assumed fertility rates for England and France used to produce projections throughout the period for which complete information is available.[9] The analysis starts in 1970 for France and 1971 for Britain, since British fertility assumptions in terms of TFR are not published for earlier years. For clarity, not every annual British projection is shown.

The most striking feature of the upper graph in Figure 2 is that the British assumptions uniformly predict that fertility will increase, regardless of

FIGURE 2 Fertility assumptions for Britain and France, projections published 1971–1991



SOURCES: UK Office of National Statistics (ONS 2011); Institut national de la statistique et des études économiques (INSEE 2014a).

the trends in preceding years. At every time at which projections are made, the British projections assume that fertility rates will rise above their current level, often above the average of the most recent several years. Furthermore, at nearly every point in time, the British fertility assumptions show strong confidence that fertility rates will reach equilibrium near the replacement rate of 2.1 children per woman. As late as 1985, when the TFR had been below replacement for over a decade, the British fertility assumption was that the TFR would return to, and remain at, a near-replacement level of 2.0.[10] If higher fertility rates were considered desirable, this would indicate remark-

able optimism. In any case, it seems to represent a strong belief, impervious to recent history, that the long-term trend of fertility would result in equilibrium at near-replacement levels. This belief appears to illustrate a culturally influenced assumption held by the makers of the projections, since it is unaffected by the empirical evidence of the demographic trends of preceding years.

Turning to the French assumptions in the lower graph in Figure 2, it is clear that the fertility assumptions used for the high variants are very similar to the British assumptions: here, too, fertility is expected to reach equilibrium at replacement level. However, each low variant represents the possibility that fertility rates could stay below replacement level over the long term. In the absence of migration, this would eventually result in population decline. In the French case, then, the high and low fertility assumptions illustrate two possible demographic futures: first, an optimistic high variant represents the possibility of replacement-level fertility maintaining population size in the long run (without migration); second, a pessimistic low variant represents the possibility of below-replacement fertility leading to eventual population decline in the absence of migration. The French projections thus provide the public with a representation of the possibility of population decline, a possibility that is absent from all but the latest British projections of this period. In the context of public debates over state support for families or state population policy, the French projections' presentation of multiple possible futures could be used as powerful support for the argument that the demographic future of France was facing diverging pathways, and that policy could determine which path would be taken. The British projections, in contrast, would offer no such opportunity to parties who might wish to make a similar argument for intervention. The causes contributing to this difference in fertility assumptions cannot be directly observed. As discussed earlier, the authors of the projections offered only vague justifications for their choice of fertility assumptions.

How do French and British projections differ?

What kinds of differences in the French and British projections of total population resulted from the differences in how projections were produced? To compare the projections of future populations produced in France and Great Britain, the following analyses use the rate of growth of the projected populations, comparing the error in the rate of growth for France and Britain that characterizes each set of comparable projections. Using the rate of growth rather than total population size to calculate error simplifies the comparison of projections for populations of different sizes (Grummer-Strawn and Espenshade 1991). The rate of growth for the projected total population for each year included in the projection was calculated, using the standard formula for the growth rate r (Equation 1):

$$r = \frac{\ln(P(t_1)) - \ln(P(t_0))}{t_1 - t_0} \quad (1)$$

where $P(t)$ is total population size at time t, t_0 is the base year of the projection, and t_1 is the year for which the total population size is being projected. The results of these calculations are shown in the figures in the Appendix. They indicate that most variants project futures characterized by population growth, since the projected growth rates are above zero. After 1970, however, the French projections all include a low variant that shows an end to population growth, with the growth rate declining to zero or below. This inclusion in the French projections of an expectation of an end to growth within the foreseeable (or at least projectable) future is an important difference between the French and British projections. Notably, even in the 1991 British projection showing a declining growth rate, the rate stays positive throughout the period covered by the projections.

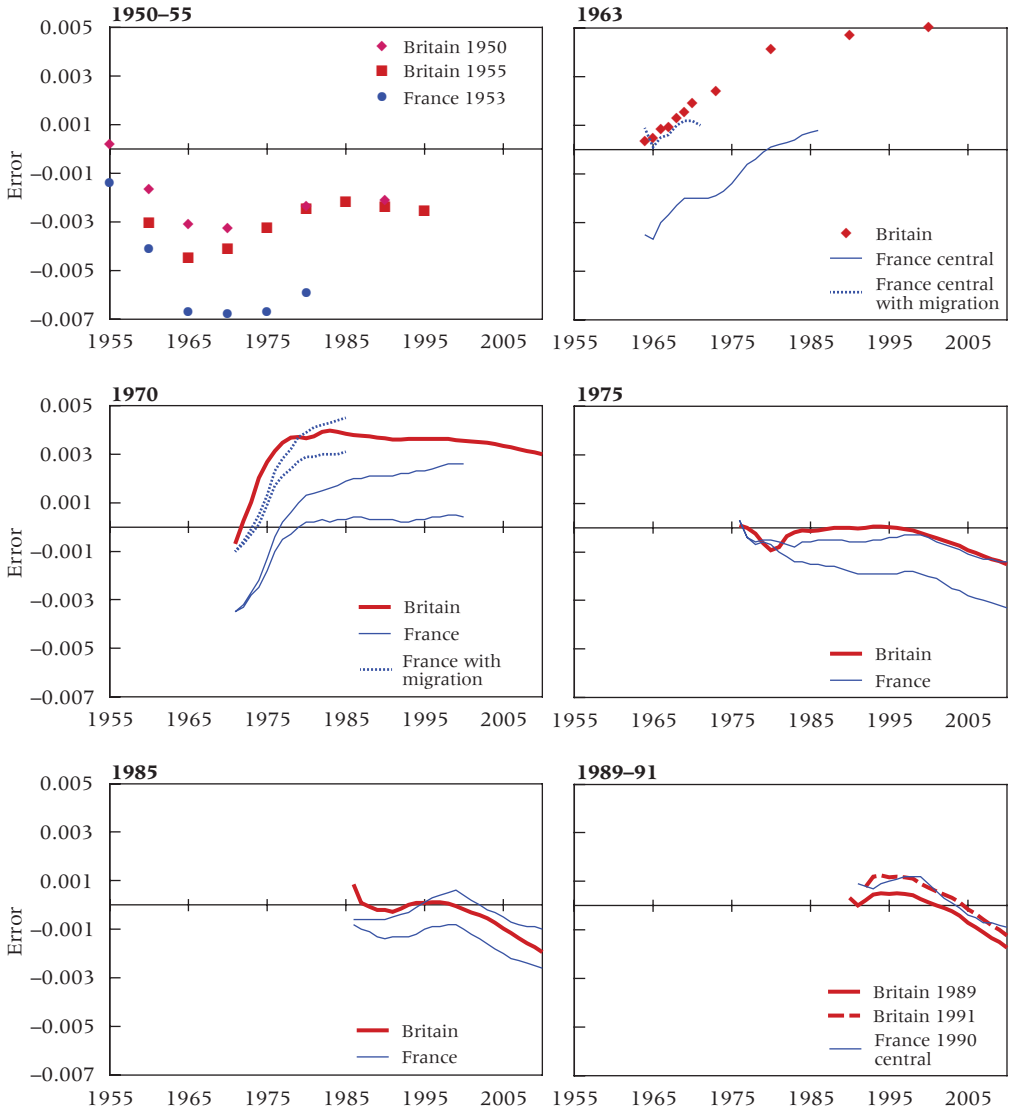
The figures in the Appendix also show that French projected growth rates were generally higher than British projected growth rates, but that the actual growth of the French population was also higher than that of Britain. To clarify this relationship, Figure 3 shows the error in the projected rate of growth (the difference between the assumed and observed growth rate) for each year of each variant of each projection, calculated using the formula given in Equation 2, following Grummer-Strawn and Espenshade (1991):

$$r_{error} = r_{proj} - r_{actual} = \frac{1}{t_1 - t_0} \ln\left[\frac{P_{proj}(t_1) \cdot P_{actual}(t_0)}{P_{proj}(t_0) \cdot P_{actual}(t_1)}\right] \quad (2)$$

In some cases in which the years do not match exactly, multiple years for Britain are compared on a single graph. For projections that include a central variant, only the central variant is shown. For years in which there is no central French variant, the low and high variants are shown instead. In addition, for the French projections for 1963 and 1970, variants both with and without migration are shown. Here negative values indicate under-prediction of growth (where actual growth rates exceeded projected growth rates) and positive values indicate over-prediction. The value zero represents exact accuracy.

Figure 3 reveals a pattern of three distinct periods in these projections. In the first period, the early 1950s, projections in both countries under-predict population growth. Much of this error was caused by under-prediction of births: the postwar baby boom was not anticipated in these projections, which instead assumed a return to the lower birthrates of the early 1940s. The 1950s graph also shows that British projections were closer to correct—they under-predicted by less—than the French central projection during this period. The 1950s graph in the Appendix shows, however, that this is not because the projected British growth rates were higher than the French. Rather, the

FIGURE 3 Error in projected growth rates for Britain and France, projections published 1950–1991



SOURCES: Calculations based on *Registrar General's Quarterly Return* (1950); *Registrar General's Statistical Review* (1957; 1965); OPCS (1971; 1977; 1987; 1991; 1993); ONS 2011; Bourgeois-Pichat 1953; Febvay et al. 1964; Hémery et al. 1973; Dinh and Labat (1979,1986); Dinh 1995; INSEE 2014b.

French projected higher growth rates for this period, but because their *actual* growth rates were higher than the British rates, their errors were of greater magnitude. In the second period (1963–1970), projections for both countries over-predict total population, partly because of a failure to anticipate the

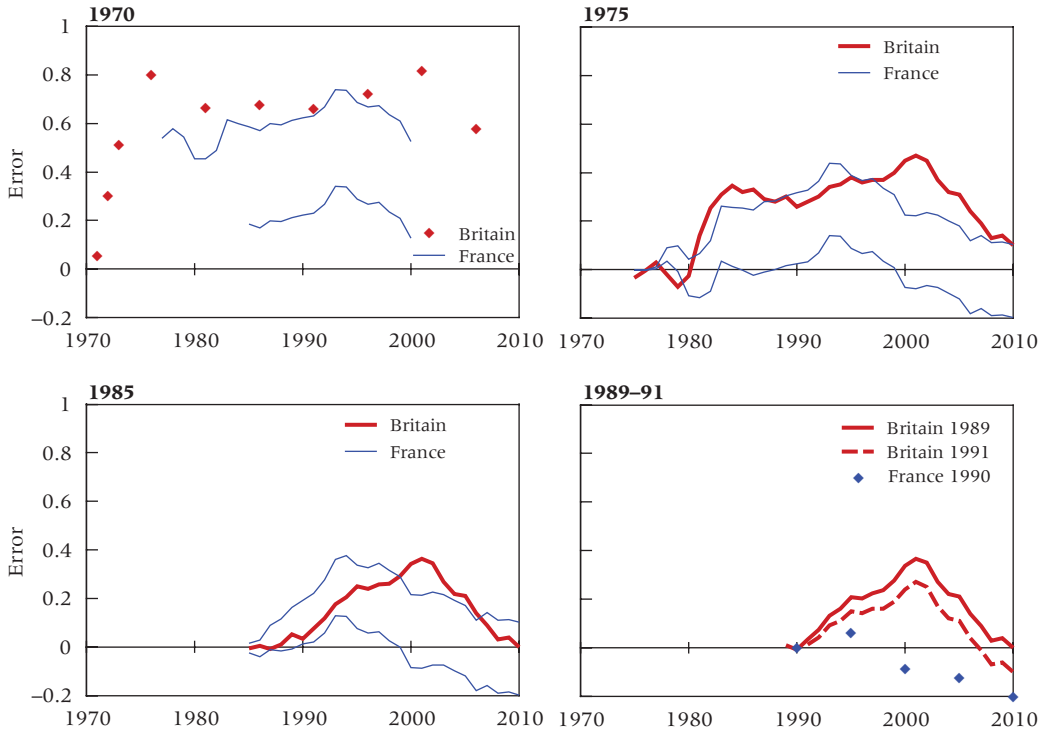
end of the baby boom. Here the patterns of errors are very similar for both the British projections and the French variants that include migration: they increasingly over-predict population growth over time. The third period, starting in 1975, represents a time of great uncertainty about future trends in fertility. Fertility rates and birthrates had been falling since the early 1960s, and several paths seemed possible: fertility might rise again to earlier levels, it might continue to fall, or it might remain stable at its current level. Here the projections in both countries are closer to accurately predicting total population. The British projections and the high variants of the French projections are much closer to accuracy, while the low French variants tend to under-predict population growth.

The effect of fertility assumptions on projections

As noted above, in this context fertility rates are the most important element of population projections for determining the long-term trend of population size. Comparing predicted trajectories of fertility levels (measured by the TFR) to the observed trajectory of fertility allows better understanding of how fertility assumptions contribute to errors in projections of total population size. Again, since British fertility assumptions for the earlier projections were based on the number of annual births, rather than the TFR, the analysis starts in 1970. Figure 4 shows the error in projected TFR (the difference between the assumed and observed TFR) by year; again, negative values indicate under-prediction of TFR, and positive values represent over-prediction. As this figure shows, the TFR was often over-predicted, sometimes by a substantial amount. In the 1970 projections, the TFR assumptions miss the mark by approximately 0.8 births. This is a large error, since the observed TFR during this period ranged between 2 and 3. The British projections, as well as the French high variants, consistently relied on assumptions about fertility that were above actual rates. The French low variants, on the other hand, were often higher than actual fertility rates in the earlier part of the projected period, but then under-predicted fertility rates in the later years of the projected period. These graphs highlight an important feature of the errors in projected growth rates shown in Figure 3: in 1975 and 1985, even projections that over-predicted fertility levels by a large amount produced only minor over-prediction of total population growth. In these cases, over-prediction of fertility was balanced by under-prediction of migration, as well as (to a lesser extent) over-prediction of mortality.

Nevertheless, most of the observed cross-national difference between projections was in fact due to differences in fertility assumptions. An additional analysis provides an example showing to what extent differences in the British and French projections are the result of differences in assumptions about fertility rather than about mortality or migration. This analysis

FIGURE 4 Error in projected total fertility rate for Britain and France, projections published 1970–1991



SOURCES: Calculations based on OPCS (1971, 1977, 1987, 1991; 1993); ONS 2011; Hémery et al. 1973; Dinh and Labat (1979, 1986); Dinh 1995; INSEE 2014b.

uses alternate fertility assumptions for the 1975 British projection, using the low and high variants of the French fertility assumptions for 1975 as comparisons.[11] While the British projection and the French high variant both assumed that the TFR would rise to a constant value of 2.1, the French low variant assumed that the TFR would decrease very slightly to reach a constant below-replacement value of 1.8.

This analysis used single-year age groups by sex and applied the published five-year mortality rates to the surrounding five-year age intervals (e.g., the mortality rate for 27-year-olds was used for ages 25–29). Future mortality rates were calculated using the published assumptions for annual improvement in mortality rates by age. For the mortality rates of one-year-olds, which were not published and are rather different from the rates at older ages, the rates from the actual period lifetable from 1975 (ONS 2011) were used, since the rates for infant mortality and two-year-old mortality closely matched the published assumptions for those ages. The mortality rate assumed for the oldest age category, ages 85 and over, was calculated using

the published results of the British projections and an assumption of no migration at those ages, then working backward to find the rate used to make the projections for that age.

The formulas used to calculate projected population size are taken from the published projections (OPCS 1977: 3–4). For each sex, the size of the population P for age x was calculated using Equation 3 below, for mortality rates q:

$$ {}_nP_x = {}_{n-1}P_{x-1} \cdot (1 - {}_{n-1}q_x) \tag{3} $$

The number of births in year n was calculated with Equation 4, using ${}_nP_x^F$, the number of women of age x in year n, and $ASFR_x$, the age-specific fertility rate for women age x, where x ranges from 15 to 44:

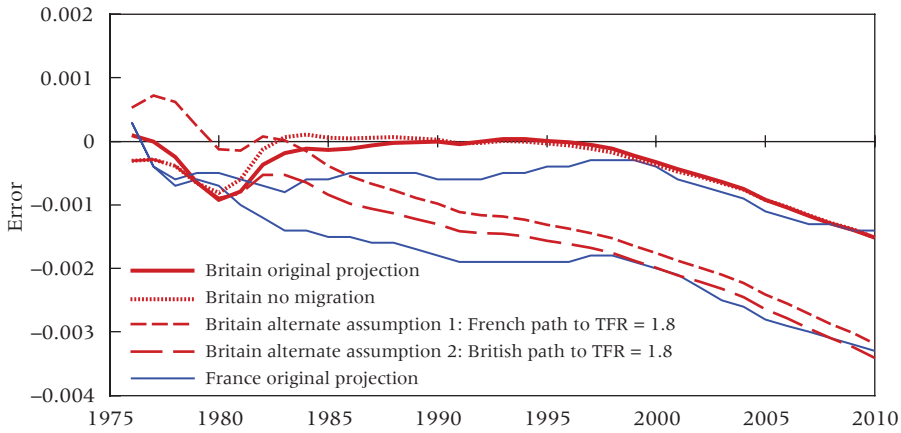
$$ B = \sum_{x=15}^{44} \tfrac{1}{2}({}_{n-1}P_x^F + {}_nP_x^F)ASFR_x \tag{4} $$

After births across all ages of women were summed, the published infant mortality rate was applied as in Equation 3 to derive the number of surviving children age less than one year. The normal sex ratio of 1.06 males to 1 female was then applied to find the size of this age group by sex.

The British projections were replicated using the age-specific fertility rates from the published projection (because fertility rates were given by calendar year, the mean of two calendar-year rates was taken to obtain each mid-year rate). For the first low-fertility British variant, fertility assumptions were changed so that fertility was projected to increase at the pace of, and with the age distribution assumed in, the official British projections, but would stop increasing at a TFR of 1.8, rather than at a TFR of 2.1. The second low-fertility British variant again assumed that fertility would stop increasing when TFR reached 1.8, but used the age distribution and pace of increase of fertility from the low variant of the French projection for 1975. The error in the growth rate was then calculated for these alternate British projections and compared to the errors for the original British projection and both variants of the French projection for 1975.

The results of the comparisons of alternate low-fertility British projections for 1975 are shown in Figure 5. The two dashed lines, representing the British projections recalculated for a TFR of 1.8, decline more steeply than the official British projection, and by the late 1990s are nearly the same as the French low variant. This analysis shows that in both alternate scenarios in which the TFR is assumed to reach equilibrium at 1.8, the growth-rate errors that result are virtually identical to the French low-variant errors by the end of the projection period. Thus it is indeed different assumptions about *fertility* that are driving the observed cross-national difference in the 1975 projections: if the same fertility assumptions had been used in both countries, their projections would have been quite similar. These analyses of population

FIGURE 5 Error in projected growth rates for 1975, alternate British fertility assumptions



SOURCES: Calculations based on OPCS 1977; ONS 2011; Dinh and Labat 1979; INSEE 2014b.

projections demonstrate how the different assumptions made about future fertility in France and Great Britain resulted in concrete and quantifiable differences in the projections made in the two countries.

These results of quantitative analyses of population projections show that cross-national differences in the number of variants and fertility assumptions had important implications for the projections produced in the two countries. To better understand the sources of the observed differences in projections, I now turn to the contexts in which these projections were produced. Starting with the different demographic histories of France and Great Britain, the following sections discuss mechanisms that shaped cross-national differences in population projections.

The weight of history: Concerns about population before World War II

The demographic histories of Great Britain and France are essential to understanding later views of population in these countries. In Britain, Malthus's fears of unchecked population growth were highly influential. Before Malthusian thought dominated the field of British political economy at the beginning of the nineteenth century, a number of British authors debated whether population decline presented a threat to British society (Glass 1973). By the late nineteenth century, however, improved systems for collecting information about births and deaths showed that in Britain, as in much of Western Europe, the population had increased greatly during that century.

Total population in England and Wales nearly doubled from about 18 million in 1851 to over 32 million in 1901 (Mitchell 1988: 9).

In contrast, the population of France was about 36.5 million in 1851 (about twice that of England and Wales), but grew only to about 40.5 million in 1901 (INSEE 2014b). The French census of 1872 reported that the population had actually decreased since the previous census in 1866 (Spengler 1938: 23). Together with the French defeat in the Franco–Prussian war in 1870, this decrease in population led to widely discussed fears that the French nation itself was in decline, as the French population was becoming outnumbered by its rivals. This line of thought provoked an impressive array of French intellectuals to propose theories of fertility decline and population decline, often treating them as symptoms of general decay in society (Spengler 1938, ch. 6). This history of nineteenth-century fertility decline exacerbated the effects of France's high mortality and its steep drop in fertility during World War I, as well as public concerns about those effects, as described in Spengler's contemporaneous account of French fertility decline (Spengler 1938, ch. 6), as well as in more recent histories (e.g., Teitelbaum and Winter 1985, ch. 2).

France's unique position in initiating fertility decline in Europe, along with the accompanying stalling of its population growth in the nineteenth century, is sometimes invoked by demographers today as sufficient explanation of French concerns over low fertility, in a conventional wisdom that sees French pronatalism as a form of national exceptionalism. This history undoubtedly had a lasting influence on views of population in France, and could well have influenced events after World War II. However, this explanation is incomplete as a historical account: certainly, events of the nineteenth century affected events of later years, but they cannot provide a sufficient explanation for those later events without some understanding of the mechanisms by which their influence operated many decades later. In the following section, I use historical sources to explore how institutional configurations related to population projections may have served as such mechanisms.

Supporting the need for such analysis, further evidence that nineteenth-century demographic differences did not lead directly to post–World War II differences is found in the fact that, despite these countries' different histories, public debates over population between the two world wars reveal a period of shared concern over low fertility and population decline (Pedersen 1993). These debates make postwar divergence in interpretations of fertility rates even more surprising. As noted above, French concerns over low fertility before World War II are well documented. Discussions of the dangers of low fertility in interwar Britain are less often remembered, despite some compelling accounts by historians (Lewis 1980; Soloway 1990). Even after the start of the baby boom in the 1940s, concerns over birthrates and fertility decline did not simply disappear at the end of World War II. Concern over

population was so strong in both countries that a British Royal Commission on Population was appointed in 1944, and a French High Consultative Committee on Population and the Family in 1945, to examine the issue and make recommendations for state action on the matter. Furthermore, in a speech at the end of the war, Charles de Gaulle famously declared that France needed "twelve million beautiful babies" over the next ten years (Weiner 2001: 23). Similarly, in a speech given near the end of the war, Winston Churchill proclaimed, "One of the most somber anxieties which beset those who look thirty or forty or fifty years ahead … is a dwindling birth rate … our people must be encouraged by every means to have larger families" ("Mr. Churchill on Post-War Policy" 1943: 6).

As these events indicate, at the end of World War II it was far from obvious that fear of population decline would remain an issue of public concern in France, but not in Great Britain, for the rest of the century. The first part of this study has shown that national population projections after World War II presented very different conceptions of the demographic future of each country, with French projections presenting a possible future of long-term population decline, while British projections did not support such an interpretation. In the following section, I will argue that these different postwar projections were influenced by the different demographic histories of France and Great Britain. Different institutional arrangements led different kinds of demographic experts to produce official projections in each country, influencing the projections themselves and supporting continued attention to low fertility in France, but not in Britain.[12]

Institutional configurations and the production of projections

French demographers and family associations

At the end of World War II, new institutions proliferated in both France and Great Britain. Powerful and far-reaching state organizations that shaped the rest of the century were created, including the British National Health Service, the French Social Security program, and many others (Nord 2010; Glennerster 2000, ch. 1 and 3). This institution-building period benefited French academic demographers, but not their British counterparts. In France, new state research organizations employed demographic and other academic experts. These institutes, founded at the beginning of the Fourth Republic, include the National Institute for Demographic Studies (INED—*Institut national d'études démographiques*) and the National Institute of Statistics and Economic Studies (INSEE—*Institut national de la statistique et des études économiques*). These organizations provided demographers with a new base of institutional support. The institutions themselves drew heavily on the

material and organizational structures of research institutes founded and sponsored by the Vichy regime: when the French demographer Alfred Sauvy became director of INED, he brought to the new organization personnel and computational equipment of the Vichy-era *Fondation Carrel*, where he had worked during the war (Nord 2010; Rosental 2003). Historical accounts have shown that the groundwork for these and other postwar measures to address demographic issues grew out of prewar concerns over demographic decline (Nord 2010; Reggiani 1996).

These research institutes, supported by the state and headed by professional researchers, gave French demographers greater autonomy and a larger public stage on which to promote their ideas. In addition, the French High Committee on Population, a permanent government council, provided more opportunities for advocacy and publicity on matters relating to population. Sauvy, as the first director of INED, was able to pursue his agenda for demographic research with greater autonomy than he had enjoyed during the interwar and Vichy periods (Rosental 2003, ch. 6). The agenda these demographers pursued was generally pronatalist. The most prominent demographers of this era—Adolphe Landry, Alfred Sauvy, Jean Bourgeois-Pichat, and Gérard Calot—were all supporters of pronatalist policies (Le Bras 1991). Sauvy, for example, used his column in *Le Monde* to advocate for higher birthrates even at the peak of the French baby boom (e.g., Sauvy 1965).

In fact, during the immediate postwar years, academic demographers engaged in a power struggle with representatives of French family associations, civic organizations that had formed a strong social movement to advocate for the interests of families during the interwar period. The rift came after they had joined in common cause in interwar struggles for a comprehensive family policy, when the family associations wielded great influence (Pedersen 1993). Their disagreements are detailed in Rosental's account of the founding and early history of INED, which describes how the increasing complexity of the formal models used to study fertility in the research institutes allowed demographic experts to make arguments that could not be countered effectively by the family associations (Rosental 2003). Although the most prominent leader of the family associations, Fernand Boverat, authored a chapter on the consequences of population decline in a popular text on the French demographic situation in the interwar period (Huber, Bunle, and Boverat 1937), after the war he found himself out of his depth, admitting to the Secretary of the French High Committee on Population that the work of the INED researchers was beyond him: "Their graphs which seem very simple to them are often very difficult to understand for non-initiates" (cited in Rosental 2003: 164).

As Rosental recounts, Boverat's exclusion and relative loss of stature were made painfully clear in a 1954 dispute over population projections for a demographic report that the government requested from INED (Haut

Comité de la Population 1955). Sauvy favored one set of assumptions to be used in making the projections; Boverat thought Sauvy's assumptions understated the danger of future population decline and would harm public support for family policies. In the end, despite a series of letters from Boverat expressing his concerns in increasingly urgent terms, Sauvy's projections remained in the report and Boverat resigned from the project, giving Sauvy a clear victory (Rosental 2003: 165). Although both men were pronatalists, Sauvy's belief that recent increases in birthrates should be reflected in the new projections conflicted in this case with Boverat's sole focus on advocacy: Boverat did not argue that Sauvy's projections were inaccurate, but that they would be politically damaging. As Rosental points out, it was Sauvy's position at INED that allowed him to prevail in the conflict with Boverat. More generally, this position allowed Sauvy to set the terms of his research, such as the assumptions used to make population projections, unlike in his work during the interwar period, when he was commissioned to produce projections following assumptions chosen by his funders, including Boverat's organization (Rosental 2003: 165).

Professional demographic researchers at INED and INSEE thus benefited from the institutional reconfiguration of the postwar period. As a result of their institutional position and resources, demographers at state research institutes in France were able to make prominent contributions to public debates over fertility trends and population growth. Projections were made by researchers at INSEE and INED: INSEE published all of the French projections made after 1950 (INED published the 1950 projections), but there was a great deal of overlap between the two organizations. Sauvy was a member of INSEE, even while he was director of INED, and the authors of the INSEE projections included two future directors of INED, Bourgeois-Pichat and Calot.

British demographers and government actuaries

British demographers, many of whom had argued that fertility declines warranted public concern and state intervention in interwar Britain, were left with a much weaker institutional position after World War II, compared to their French counterparts. Their institutional position had also been precarious before the war: between the world wars, no university position in demography existed until 1938, when the Rockefeller Foundation in the United States funded a readership in demography at the London School of Economics (Grebenik 1991: 8). Some demographers in the interwar period received support from the Population Investigation Committee (PIC), founded as part of an attempt by the Eugenics Society (which was also concerned about the dangers of low fertility, particularly among the middle and upper classes) to gain legitimacy through an emphasis on science (Soloway 1990: 247–49). Its beneficiaries included the leading British demographer of the postwar period,

David Glass, whose position as research secretary with the PIC allowed him to develop his doctoral dissertation into the large volume *Population: Policies and Movements in Europe*, published in 1940 (Langford 1988: 5, 9).

At the end of World War II, however, no stable institutional structures for demographic research were created in Britain, despite recommendations from the British Royal Commission on Population that a state research institute for the study of demography be founded (Royal Commission on Population 1949: 25). The Royal Commission itself disbanded when it completed its investigation in 1949. The postwar decline of the eugenics movement (Soloway 1990: ch. 14) reduced another source of support for British academic demographers, who were left with, at best, positions scattered across departments and disciplines at various universities. Thus British demographers lacked both the autonomy to allocate funds for research to projects of their choosing and an institutional platform to provide the kind of prominence in the public sphere that French demographers attained.

With no state institute for the study of demography, responsibility for producing official British national population projections stayed with government officials whose training and disciplinary identity was actuarial, rather than demographic. Projections were produced first at the General Register Office (GRO), and after 1954 at the Government Actuary's Department (GAD) "in consultation with" the GRO (*Registrar General's Statistical Review* 1957). The civil servants in these government offices had earlier had several contentious exchanges with prominent British demographers over methodological disagreements regarding population projections (*Current Trend* 1942; Kuczynski 1942; Glass 1944). These disagreements over methods had a substantive component as well: the GRO officials argued that concern over British fertility decline was exaggerated and unwarranted, while academic demographers, among the leading advocates of concern over low fertility during the interwar period, argued that it was a serious problem. Clashes between these two professional groups continued throughout the 1940s, with the GRO's representatives on the Royal Commission on Population declining to endorse its final report in 1949.

The GRO's early postwar projections reflect the disciplinary distance between the makers of British projections and academic demographers. As late as 1957, projections did not yet use the cohort component method, but rather projected constant numbers of annual births (*Registrar General's Statistical Review* 1957), despite the fact that cohort component analysis had become the international standard for projection by that time (Gans 1999) and the British Royal Commission on Population had introduced the method to British demographers and government officials alike through the work of its Statistics Committee in the 1940s (Grebenik 1991). Although the government offices employed workers with statistical training, department leadership was recruited from elites from the classical educational system, lacking

specialized technical training (Fourcade 2009: 42), a problem that was not addressed until the 1960s (Benjamin 1982: 222).

The institutional configurations of postwar France and Great Britain led to very different outcomes in terms of who made the official national population projections during the crucial early postwar years, when it was unclear whether recent increases in fertility rates were a short-term change (similar to the short-lived increase in fertility following World War I) or part of a longer-term trend. In France, academic demographers who had long promoted concern about low fertility made the projections, enabled by their position in state research institutes. In Great Britain, civil servants with statistical, not demographic, training, who had long argued that concern over low fertility was exaggerated, made projections while academic demographers were sidelined.

Conclusion

This study has shown how population projections, a key mechanism for the production and dissemination of demographic knowledge, differed in France and Great Britain in the fifty years following World War II. I used official national population projections to examine how very different interpretations of fertility trends were maintained in France and Great Britain throughout the second half of the twentieth century, despite their similar trends in observed fertility rates during this period. Two important cross-national differences in the production of projections were identified. One is the publication of single-variant projections in Britain, which facilitated interpretation of the British projections as predictions of the most likely future and made them seem more certain, versus the publication of multiple variants for each projection in France, which emphasized the contingency of the French population projections and uncertainty about the demographic future of France. The second cross-national difference identified is the use of different fertility assumptions, which in France included a variant with long-term below-replacement fertility, and in Great Britain assumed that fertility would remain at or near replacement level in the long term.

An analysis of projections of total population showed that, although the technical methods used to make them were quite similar, these cross-national differences in fertility assumptions led to important differences in the projections of total population. British projections and the high variants of French projections, which assumed fertility levels at or near replacement, projected low to moderate growth throughout the period in question. The French low variants, which assumed continuing below-replacement fertility, by 1975 projected that total population would begin to decline during the projected period. Additional analyses showed that, as expected, differences in fertility assumptions account for nearly all of the cross-national differences in long-

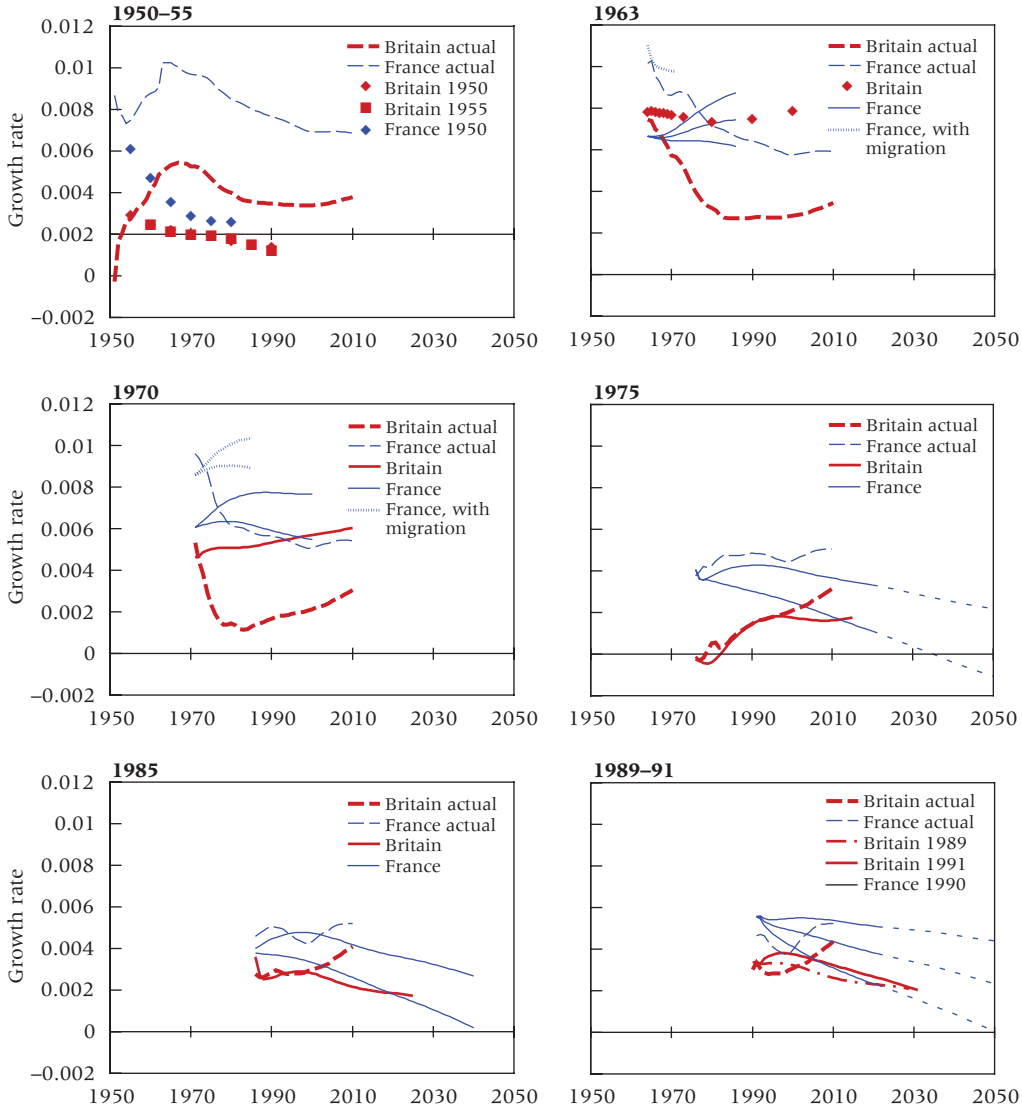
term outcomes in these projections. The possibility of a demographic future of population decline was articulated and visually represented in the French projections, but was not admitted in the British projections. The differing projections produced in these two countries thus created opportunities for the use of official state projections to justify concern over population decline in France, but not in Britain.

I examined two mechanisms that contributed to the observed cross-national differences in population projections: demographic history and institutional configurations. Longstanding French concerns over low fertility and population decline, which led to a pronatalist consensus across the political spectrum, facilitated the founding of research institutes in the postwar period that increased the influence of academic demographers. Demographers concerned with low fertility produced official projections at these research institutes in postwar France, while their British counterparts did not hold institutional positions that would allow them to perform that function. British population projections were instead produced by government actuaries with different disciplinary and intellectual commitments.

National population projections created divergent representations of the two countries' demographic futures: an ever-present threat of decline in France, and a reassuring image of stability in Britain. Population projections in France and Great Britain thus contributed to differing interpretations of population and fertility trends, as concern over low fertility continued to be a notable feature of expert and public discussion in France, but not in Great Britain.

Appendix

Projected growth rates for Britain and France, projections published 1950–91



SOURCES: Calculations based on *Registrar General's Quarterly Return* (1950); *Registrar General's Statistical Review* (1955; 1963); OPCS (1971; 1977; 1987; 1991; 1993); ONS 2011; Bourgeois-Pichat 1953; Febvay et al. 1964; Hémery et al. 1973; Dinh and Labat (1979, 1986); Dinh 1995; INSEE 2014b.

Notes

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1 Alfred Sauvy's projections for France are credited by some French demographers with changing policy: "The first demographic projections were made in France by Alfred Sauvy in 1928. They … contributed … to the adoption of the *Code de la Famille*"—the legislation of 1939 that served as the blueprint for French family policy in the postwar period (Calot et al. 1970: 5). All translations from French sources are the author's own.

2 As noted by Romaniuc, the salience of uncertainty for projections grew with the rise of the cohort component method: earlier methods, which sought to extrapolate trends in total population size using mathematical formulas, were often thought of as searches for a "law" of population growth, and thus were not subject to concerns about uncertainty. The cohort component method, on the contrary, relies on explicit assumptions about each of the factors that contribute to total population size (fertility, mortality, and migration), and, with its use, "uncertainty as an inherent feature of the future entered the consciousness of forecasters" (Romaniuc 2003: 23).

3 For example, when Enid Charles published projections that included a scenario in which the English population declined to below 20 million by the year 2000, she clearly stated that her projections represented possible scenarios, not predictions (1938: 75). However, when her work was cited in public and political debates, it was often presented as a forecast of what would happen to the future population, unless something were done (Grebenik 1991: 8).

4 For simplicity I refer to Great Britain or Britain throughout rather than to the United Kingdom as the country or to England and Wales as the relevant statistical unit.

5 Although problems with period TFR as a summary measure of fertility are well known to demographers, it was the fertility indicator most widely used by demographers and policymakers during most of the period under study.

6 In low-mortality populations like those of twentieth-century Western Europe, assumptions about fertility are especially important for projections, since mortality, particularly at childbearing ages, is relatively low under all assumptions.

7 Projections for 1968 also exist, but are not included here since they are very similar to the 1970 projections. The 1970 projections retain the assumptions of 1968 and merely adjust the size of the initial population. The 1968 version does not include variants with migration, since migration projections were not yet available.

8 In later French projections, separate variants without migration are not published, but projected migration is much lower: while projected net migration varied from 125,000 to 210,000 annually in the 1963 and 1970 projections, it was assumed to be zero in the 1975 and 1985 projections, and only 50,000 annually in the 1990 projections.

9 Assumed TFR is shown for England only, as aggregated figures for England and Wales are available only for 1971. Comparison of the observed TFR for England versus England and Wales (not shown) indicates, however, that English TFR is quite similar to aggregate TFR, since the population of England is so much larger than that of Wales.

10 It is also noteworthy that, when the British did publish multiple variants, as in the 1989 projections, the low-variant TFR stabilizes at 1.8 (well above the French 1990 low variant of 1.5), and the high variant is 2.2, above the French 1990 high variant of 2.1 (OPCS 1991; Dinh 1995).

11 Replication with migration is not possible, because details of the assumed age

structure of migration for Britain were not published. A replication of the British projection without migration (shown in Figure 5) found only very minor differences from the official projection, which assumed low levels of emigration for most of this period.

12 Intellectual traditions may also have contributed to the differing approaches taken by British actuaries and French demographers. The most prominent theory in demographic research is demographic transition theory, which in its archetypal form is usually credited to scholars including Frank Notestein (1945), Kingsley Davis (1945), and Dudley Kirk (1946). Their accounts describe a process by which populations shift from a demographic equilibrium with high mortality and high fertility to an equilibrium with low mortality and low fertility. In its present form, the theory posits that the transition ends with fertility levels at, or with minor fluctuations around, replacement level (Van Bavel 2010: 2). This is the demographic future represented in the British projections analyzed above, as well as in the high variants of the French projections, with their assumptions that fertility will remain constant at or near replacement level. An important alternate account of demographic change is found in a 1934 monograph by the French demographer and statesman Adolphe Landry, entitled *The Demographic Revolution* (*La révolution démographique*). Landry describes the final stage of demographic change as a demographic regime in which the use of marital birth control leads to populations in which "there is no longer an equilibrium" (Landry 1934: 53; Landry 1987 [1933]: 738). This lack of equilibrium means that fertility decline can continue below replacement level and remain below replacement indefinitely, eventually leading to population decline in the absence of migration. It is intriguing that in their low variants the French projections conform to Landry's theory of demographic revolution while the British projections conform to conventional demographic transition theory. Many early statements of demographic transition theory, including Notestein's, allowed for the possibility of long-term below-replacement fertility and eventual population decline. If it could be shown that the notion of eventual population equilibrium took form in Anglo-American scholarly circles as early as the late 1940s, one could argue that this, as well as institutional factors, contributed to the contrast between the French and English approaches to population projection. The issue of when the currently conventional assumption of eventual equilibrium emerged is worth exploring further. Until more is known, a more prudent explanation of the differing French and British approaches is simply the long-established fear of population decline in France. This intellectual tradition had no counterpart in Britain.

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