

# FINAL REPORT ON THE PROJECT: ECONOMIC AND CULTURAL FACTORS IN DEMOGRAPHIC BEHAVIOR R01 HD25841

Patrick R. Galloway

E. A. Hammel

R. D. Lee

## Introduction

The origins of this project were two-fold.

1. The general conclusions of the Princeton European Fertility Project (PEFP), to the effect that economic and structural factors cannot be shown to have important effects as determinants of the level of fertility or of its decline, are contrary both to intuition and to theoretical expectation.
2. The quality and local specificity of the data on Prussia c. 1849-1914 permit much closer testing of the determinants of fertility and of fertility decline than the PEFP was able to use. In order to achieve comparability across a broad range of countries with available data, PEFP was obliged to use major regional units, akin to provinces or states. However, for much of the late mediaeval and early modern periods such units were largely autarkic economies with substantial internal variation, such that the variance between such units was likely to be less than the variance within them, in respect of variables of interest. Thus, comparison between such units suffered from minimal variance in the variables of interest, other than those of national identity (including language). The data on Prussia, however, are at the Kreis level and permit much closer testing of hypotheses about the relationship between structural and demographic variables. Realization of the possibilities in the Prussian materials led Galloway to formulate an approach, which, implemented with the participation of Hammel and Lee, led to the UC Prussia Project (UCPP).

The general conclusions of the research are that so-called cultural variables, proxied by language and religion, are important determinants of the *level* of fertility but not of the *rate* of fertility decline. On the other hand, structural and economic variables are powerful determinants of the rate of fertility decline and thus in the long run must be determinants of ultimate levels of

fertility. This formulation, supported by sophisticated pooled time series analysis of data of impeccable quality, is an important refinement of the conclusions of PEFP by UCPP.

## Results

Six papers or presentations have resulted from UCPP to date. These are referred to as "Item *n*" in the discussion that follows.

1. Patrick R. Galloway, 1988, "Prussia vital registration and census data description tables 1849 to 1914 using Kreise and cities >20,000 as units of analysis," MS, Department of Demography, University of California, Berkeley.
2. Patrick R. Galloway, 1991, "Fertility decline in Prussia: a regional analysis," presented by Lee and Hammel at the International Union for the Scientific Study of , 1994 Population Seminar on Old and New Methods in Historical Demography. A Critical Appraisal. Mallorca.
3. Patrick R. Galloway, Eugene A. Hammel, and Ronald D. Lee, 1994, "Fertility decline in Prussia 1875 to 1910: a pooled cross-section time series analysis," *Population Studies*, vol. 48, no. 1, pp. 135-158, March.
4. Ronald D. Lee, Patrick R. Galloway, Eugene A. Hammel, 1994, "Fertility decline in Prussia: estimating influences on supply, demand and degree of control," *Demography*, vol. 31, no. 2, pp. 347-373.
5. Patrick R. Galloway, Ronald D. Lee, and Eugene A. Hammel, 1997, Infant mortality and the fertility transition: macro evidence from Europe and new findings for Prussia, in *From Death to Births: Mortality Decline and Reproductive Change*, (Washington DC: National Academy of Sciences), eds. Cohen, B. and Montgomery, M., Chapter 6, pp. 182-226, 1997.
6. Patrick R. Galloway, Ronald D. Lee, and Eugene A. Hammel, "Urban versus rural: fertility decline in the cities and rural districts of Prussia, 1875 to 1910," *European Journal of Population* 14:209-64, 1998.

Item 1 is a catalog of some of the data found in the 305 volumes of *Preussische Statistik*. Only those data that appeared to be of some value in the analysis of fertility decline were included.

Item 2 is an initial exploration of the problems raised by PEFP and presages a number of conclusions reached by later papers, especially Item 3, and both of these are described together here.

One of the great achievements of modern demographic research has been the compilation of regional level fertility data over time within Europe under the auspices of PEFP. Less impressive have been the results of the many analyses dedicated to explaining the observed fertility decline. This lack has been generally attributed to either a lack of theory or, more usually, the inability to test existing theory adequately for a variety of reasons. Some of these include: overly large units of analysis, lack of useful socioeconomic measures (for example, direct income measures are never used), coarsely defined independent variables, insufficient sample size, inadequate methodology, and improperly specified models. Indeed, because of the magnitude of the problems found in previous research we observe that important elements of fertility transition theory have not yet been tested for historical Europe.

Using different methods and a more detailed data set, we address these problems. Our basic strategy revolves around examining in much greater depth and detail a number of theoretically relevant variables in relation to fertility level and pace of fertility decline in Prussia from 1875 to 1910 in 407 Kreise using pooled cross-section and time-series methods. Our primary unit of analysis, the Kreis, is a small Prussian administrative unit functionally equivalent to a modern census tract, although larger. It is on average only 1/15th the size of the typical unit of analysis used in the European Fertility Project.

No previous research on fertility decline in Europe approaches this analysis of Prussia in terms of the quantity, refinement and consistency of definition, and availability over time of theoretically important variables. No other European data set provides as much demographic and socioeconomic detail for such a vast number of people, some 40 million in 1910 or one-eighth the population of Europe, using such small units of analysis. Furthermore, no comparable multivariate analysis of all Europe has ever been undertaken, or is likely to be undertaken, due to the lack of both temporal and definitional comparability among independent variables.

This analysis is the first adequately comprehensive test of fertility transition theory within the European context. Much of that theory is derived from studies of fertility decline in contemporary less developed countries. As a consequence, many of our variables are the same as those used in such studies. Some of our variables are more appropriate theoretically. This

research sheds light on the mechanisms involved in the determinants of both historical and contemporary fertility levels and pace of fertility decline.

Significant heterogeneity is found within regions in terms of both fertility levels and pace of fertility decline (measured in terms of the general marital fertility rate, GMFR). The models used are powerful predictors of fertility level and decline in Prussia overall and in each of the nine regions of Prussia. In general, we test two kinds of model, examining respectively, level of fertility and pace of fertility decline.

1. The Level Model examines the association between the dependent variable, GMFR, and a set of independent variables, across Kreise, without respect to time. This model thus looks at the general difference between Kreis means.
2. The Pace Model examines the association between the changes over time in the dependent variable and the changes over time in the set of predictors, without respect to location.

The results from these models can be simply summarized in the following table. The expected direction of relationship is shown as "+" or "-". For each of the models, Level and Pace, "++" and "--" indicate an association significant at the 5 percent level and "+" and "-" indicate an association significant at the 10 percent level. No entry is made in the table for coefficients that were not statistically significant at the 10 percent level. (More detailed definitions of the variables are given in Item 2; for example "per capita" has different meanings for some variables, as in "Teachers/capita" which is actually teachers per persons aged 6-13.) The "Level" model accounts for about two-thirds of the variance in GMFR, the "Pace" model for about 90 percent.

<b>Predictors of GMFR</b>	<b>Expected Sign</b>	<b>Level</b>	<b>Pace</b>
Percent Catholic	+	++	--
Percent Slavic	+	++	
Church workers/capita	+		++
Teachers/capita	-	-	--
Health workers/capita	-	--	
Female Labor Force	-	-	--

Participation			
Income	-		
Mine workers/capita	+	++	++
Urbanization	-		
Bank workers/capita	-		--
Insurance workers/capita	-		--
Postal workers/capita	-		--
IMR (legitimate births)	+	-	++
Married males/married females	+	+	++

The important determinants of fertility level are both cultural/institutional and structural. All but one of the variables that are significant show the expected signs for fertility level. Catholic and Slavic populations have higher fertility. Structural factors associated with modernization (e.g., teachers, health workers, female labor force participation) have a negative effect on fertility level, while those associated with traditionality have a positive effect (e.g. prevalence of mining, and low rates of spousal separation). High levels of infant mortality are associated with low levels of fertility; this outcome is counterintuitive and the relationship is significant only at the 10 percent level.

The important determinants of change are more often structural than cultural. All variables that are significant have the expected signs. Increases in the numbers of teachers, bank workers, insurance workers, and postal workers, and in female labor force participation are associated with decreases in fertility. Decreases in the number of mine workers or church workers are associated with decreases in fertility. Increases in the proportion Catholic are counterintuitively associated with decreases in fertility, but this may result from the migration of Catholics into urban areas. As the IMR decreases, or as the ratio of married males to females decreases, so does fertility.

This analysis of Prussia from 1875 to 1910 suggests that the units of analysis used in most previous research on fertility decline within the Princeton European Fertility Project may have been too large, the variables too crudely defined, important variables too often omitted, and methods too simplistic to have elicited any consistently useful and substantive results. Our

analysis suggests that inferences drawn from previous research have resulted in a misunderstanding of the spatial heterogeneity of fertility decline, unwarranted rejection of the importance of economic factors, and over-emphasis of cultural or traditional factors. In fact there exists great heterogeneity in terms of fertility decline within as well as among regions and provinces of Prussia. While cultural proxies and education are important, structural and economic forces, especially the growth of financial institutions and communications and female labor force participation, are strongly associated with fertility decline in 19th century Prussia, mirroring those processes often associated with fertility decline in many less developed countries today.

Item 4 represents a more theoretical approach. Fertility change in 407 Kreise, 1875-1910, is modeled so as to depend on the gap,  $D$ , between two estimated quantities, the expected number of desired surviving children as dependent on child survival and the number of children that would be born under natural fertility. The first quantity is defined as desired surviving births,  $N^*$ , divided by child survival,  $s$ , thus  $N^*/s$ , and the number that would be born under natural marital fertility is defined as  $M$ . Some fraction of this gap  $G = M - N^*/s$  is averted, depending on the propensity to avert unwanted births,  $D$ . Although none of these components is directly observed, we can estimate each indirectly under strong assumptions. Decline in  $N^*/s$  accounts for twice as much of the decline in fertility as an increase in  $D$ . Natural fertility rose. Unwanted births increased slightly over the period, despite a tripling of births averted. The most important causes of decline in  $N^*$  were increases in female labor supply, real income, and number of health workers. Rising education is the most important cause of increasing propensity to avert births. Demand side changes ( $N^*/s$ ) were important causes of the transition, but changes in readiness to contracept ( $D$ ) were also important, as was the interaction of the two.

In Item 5 we examine the relationship between change in infant mortality and fertility. Most attempts to understand secular fertility decline include some allusion to the European historical experience. It is generally thought that little or no relationship existed between fertility decline and infant mortality decline in Europe, or that the findings from relevant studies are inconsistent. We believe that these common perceptions are mistaken. When more attention is given to the varying methods that have been used in these analyses, a more consistent picture emerges. We argue that it is particularly important to keep in mind whether studies are bivariate or also include socioeconomic influences in a multivariate context; whether studies estimate cross-sectional relations between levels of fertility and of infant mortality, or instead focus on the relation of changes in these variables; and whether studies take into account the possibility that causality flows in both directions -- from fertility to mortality as well as from mortality to fertility.

According to theory, fertility and infant mortality should affect each other simultaneously, and these effects should be positive. A review and assessment of published research on European marital fertility and infant mortality suggests that there is a generally consistent, significant, and positive association between infant mortality level and marital

fertility level. The evidence for this positive association of levels is stronger than has been realized. However, we argue that this association of levels is largely irrelevant for the policy issues of interest.

The evidence appears even stronger in studies that examine the association of changes in infant mortality with changes in marital fertility, which is more appropriate for examining secular fertility decline and the most relevant for policy issues. In every case, changes in infant mortality are positively associated with changes in fertility, and most are significant. However, there are important issues of causality that must be resolved before drawing conclusions. The few studies which attempted to disentangle the direction of causality using instrumental variables estimation found, as we did, that there was important causality operating in both directions.

We think it is likely that the repeated estimation of positive associations, particularly with instrumental variables and fixed effects models, reflects a true and substantial effect of mortality change on fertility change. In the case of Prussia, we have been able to include an unusually extensive array of variables measuring differing aspects of socioeconomic change and we still find strong positive effects of mortality change on change in fertility. Uncertainty arising from possible unobserved time varying factors is a problem when making inferences from any time series analysis, not just this one, and there are corresponding problems with any cross-sectional analysis. On balance, then, we believe that there is substantial evidence that mortality decline was an important cause of fertility decline in Europe.

In Item 6 we examine marital fertility in 54 Prussian cities and 407 Prussian Kreise, again using pooled cross-section time series methods to examine influences on marital fertility level and on marital fertility decline, focusing particularly on fertility differences according to level of urbanization. Increases in female labor force participation rate and income, the growth of financial services and communications, improvement in education, and reduction in infant mortality account for most of the marital fertility decline in 19th century Prussia. In 1875, rural and urban fertility were similar but by 1910, urban fertility was far lower than rural in part because the values of some of these variables changed more rapidly in the cities, and in part because some of these variables had stronger effects in urban settings.

## **Conclusion**

Summing up, we find as follows:

1. The use of fine grained data at low levels of aggregation reveals relationships in the data that are obscured when research design is driven by the need to achieve

comparability across very large units of analysis, such as countries. The desire for international comparability characterizes much demographic analysis and is arguably responsible for the weakness of analytic results that is so common in demographic research. We find sufficient heterogeneity in the Prussian data set to permit theoretically relevant conclusions within a single nation-state.

2. The original formulations of theory regarding European fertility decline and by extension the process of fertility decline elsewhere contained notable kernels of truth about the influence of economic and structural factors. The wholesale rejection of those theories in favor of vague allusions to culture and language is unwarranted.
3. The Prussia analysis shows a consistent relationship between a cluster of variables that could be deemed "cultural" (Slavic vs. German-speaking, Catholic vs. Protestant, and geographical location, which may proxy unmeasured cultural elements) and the level of fertility. Conversely, there is a consistent relationship between economic and structural variables, most of these associated with what could be thought of loosely as "modernization", and the rate of change of fertility level. Distinguishing between level and rate of change is essential.
4. The direction of the relationships usually makes intuitive and theoretical sense. The institutional and moral structures of Catholicism encourage higher fertility, while the more modernizing attitudes of Protestantism discourage it -- a conclusion that emerges clearly from Weber's original formulations about the Protestant ethic. Slavic-speaking populations (almost entirely Catholic) have an ethos that encourages higher fertility, in addition to having economic and structural characteristics that independently have the same effect. Interestingly, the same conclusions are presaged by Weber's classic work on the condition of agricultural labor east of the Elbe. Those economic and structural conditions that are part of the process of economic and social modernization, such as the development of financial institutions, the spread of communications networks, the participation of women in economy beyond the household and farm, all speed the process of fertility decline. The inclusion of fertility within the "calculus of rational choice", the development of an ideal desired number of surviving children, perception of increased survivorship of children, rising levels of education and income, and value changes stressing individuality rather than collectivity -- all of these common-sense parts of the original formulations of the problem by Notestein and others, turn out to be largely right.
5. The strong distinction between "cultural" and "economic" factors posed by PEFP and other critics of economically oriented theories of demographic change may be largely a red herring. The original theoretical formulations by Weber, and the important contributions made by Lesthaeghe and his colleagues using data on historical changes in European values, show that in many respects economy and culture are inseparable. Culture and language cannot be used simply as dummy variables, because they may proxy important economic and structural elements. Culture and language, especially local culture and local language have two relevant characteristics. They proxy structures of institutions, and values that

guide behavior, and they facilitate communication, especially about intimate subjects. More careful analysis that examines detailed local structures, especially of language at the dialect level, would allow finer specification of micro-areas that are not necessarily correlated with the administrative units (Kreise) that accord more closely with economic and structural variables. Analysis using such data would allow more sophisticated discussion of the differences between cultural and economic factors.