WORKING PAPER

Culture, Religion, and Fertility: A Global View

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Abstract

This study tries to assess the effects of culture and religion on fertility after accounting for a country's socio-economic standing. Analysis of covariance models are estimated for 128 countries with time-series covering the period 1950-75. The dependent variable is the gross reproduction rate; independent variables are the infant mortality rate, an aggregate indicator of female educational standing, and GDP per caput as well as categorial variables for religion and cultural region.

It turns out that the European countries have generally lower fertility than could be expected from their socio-economic standing. In the Arabic countries culture and religion tend to have strong positive effects on fertility. Across cultures Catholicism has a fertility-increasing effect but it is—like the effect of all religions except Islam—diminishing over time. In contrast, the effect of culture (as measured by a regional variable) on the level of national fertility has been increasing at the expense of socio-economic effects.

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INTRODUCTION

This paper analyzes the effect of religion and culture on national fertility levels after accounting for the societies' socio-economic standing as measured by selected indicators. Commonsense suggests that such "immaterial" factors play an important role in procreation but scientific literature on this issue is not very extensive. Mostly the analysis has been restricted to bivariate fertility differentials between ethnic groups or religions in a given country. Only a few studies (e.g. Kirk 1965 for Muslim fertility) tried to explain the implications of certain religious attitudes on fertility across countries. Assessments of the relative effects of religion and culture versus socio-economic development (e.g. Chaudhury 1984 for Hindu-Muslim differentials on the Indian subcontinent) are even less in number.

Under a cross-national perspective, Kuwait turns out to be one of the most obvious cases in which cultural and religious factors are more important than socio-economic ones in determining the level of fertility. Despite the generally negative association between fertility and socio-economic development, Kuwait proves to have both high fertility and a very good economic standing. The reason for this seems to lie in the mentality of the Kuwaitis, in their culture and religion. The following analysis will show that similar effects are also prevalent in many other countries, although their influence in fertility levels is often covered by socio-economic effects.

The question of the determinants of fertility is extremely complex. It involves factors from almost every aspect of human life: biology, medicine, environmental conditions, psychology, sociology, cultural anthropology, theology, economics, and many others. Knowledge from these disciplines can help to understand the variations in the level of fertility from one individual to another and from one population to another but it cannot fully explain (in a deterministic way) the causality that results in a certain number of children.

Scientists have tried to approach this question from very different angles. Some ask for the immediate causes that result in a birth. These proximate determinants involve medical aspects of fecundity, the probabilities of conception for certain coital frequencies, contraceptive effectiveness, spontaneous and induced abortion, etc. Bongaarts explains the total fertility rate of a population as the product of four indices: a marriage index C_m, a contraception index C_c, an index of abortion C_a, and an index of postpartum infecundability C_i. An application of this model to several developing and developed countries yields a relatively good fit to observed fertility rates. In a way this "explains" the level of fertility but it does not help us in our search for the "real" reason of a certain fertility pattern. Nevertheless, these findings modify our question somewhat: We should not only ask why women get a certain number of children but also ask, "Why do women use contraception or abortion or do not marry?" In traditional societies norms and practices concerning these proximate determinants are crucial in explaining differences in fertility levels. In modern societies, however, the desired family sizes tend to dominate childbearing and give the proximate determinants a more instrumental role.

The explanation of desired family sizes is the major goal of economic fertility analysis. This approach assumes couples to maximize their personal utility under a given income, given costs of children, and a given taste. The literature on this approach abounds and some rather sophisticated models have been produced, but they shall not be discussed in this paper. Sociologists argue that the economic approach is only very partial and does not explain some crucial factors like taste which, in the economic approach, determines the shape of the utility map. The sociological approach assumes social norms that regulate the proximate determinants as well as the family size desires (see e.g., Freedman 1975). In this view individual behavior is seen as social behavior in respect to the existing normative system.

Another scientific dichotomy in the field of fertility analysis is the distinction between micro-level and macro-level approaches. The macro-level approach observes differences between populations and characterizes populations usually by average values or aggregate distributions of certain indicators. This allows to make cross-national comparisons and to identify structural differences in the societies. The expense for it is the loss of information contained in individual variations.

For the present cross-cultural study of fertility variations the macro-level approach is clearly more appropriate because culture cannot be defined on an individual level. Furthermore, under a global perspective data can only be obtained for national aggregates. And even in that case many data remain to be estimated. Hence, the data underlying this study consist of national time-series data on various demographic and socio-economic indicators covering 128 countries in the world. For 69 countries the period 1950-1975 could be covered (in 5-year intervals), for 33 countries the period 1960-1975 (5-year intervals), and for 32 countries only the year 1975. The data stem from official UN publications or had to be estimated.[1] The selection of indicators for our model had to be based on both substantive considerations and the availability of data.[2]

ANALYTICAL FRAMEWORK

Since statistical findings are meaningless without consideration of the underlying causal model, we shall spend some time on specifying our analytical framework. Figure 1 depicts a macro-sociological model that tries to explain the sources of variations in fertility levels. The socio-economic indicators that stand for the structure of the society do not directly influence fertility, nor do they exert a direct effect on the proximate determinants. Money or education per se does not make any children and does not inhibit any births. For this reason an intermediate transformation process must be assumed that converts socio-economic conditions into fertility relevant behavior. Adopting sociological terminology we call this a normative transformation. Although we do not know much about its nature and have to treat it like a black box with certain input and output it might be helpful to assume a very crude structure. Already Freedman (1963, 1975) distinguished between norms about the proximate determinants and norms about family size.

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[1]The problem of data availability is also the reason for having time-series of different length. Generally not more than one point in time was estimated in the time-series. For the socioeconomic indicators usually linear interpolation was used. Missing values for the gross reproduction rate were estimated by taking account of trends in the crude birth rate which is available for all years. If the data given in the UN Statistical Yearbooks did not provide figures for exactly the years used in our time-series (years ending with 0 and 5), the indicators were adjusted by linear interpolation or extrapolation to refer to the same years in all countries. For more detail on data sources and estimation procedures, see Lutz (1980).

[2]The full reasoning of why certain indicators were selected cannot be given here (see Lutz 1980 and 1984).

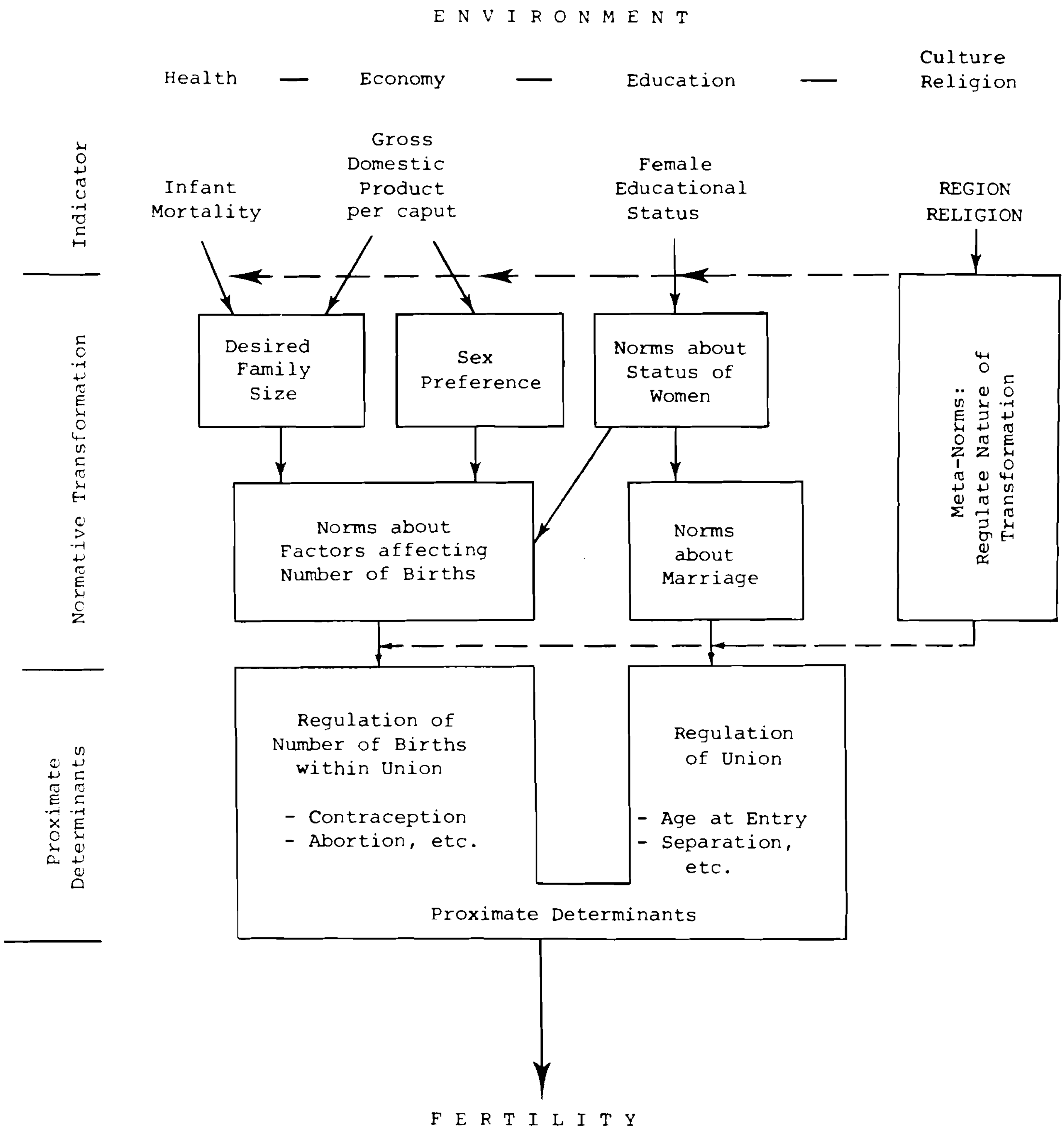

Figure 1. A macro-sociological model explaining differential fertility.

What is the role of culture and religion in this process? On the one hand, these "immaterial" factors may have direct effects on the norms about the proximate determinants (prohibiting contraception, foster early marriage, etc.). On the other hand, they may be assumed to govern the complete process in which the determination of fertility takes place. The mechanisms in which certain environmental conditions result in certain family sizes cannot be regarded as being identical across cultures and stable over longer periods of time that include social transitions. The mechanisms are themselves subject to variation and structural changes induced by different ways to think and feel and behave in respect to the family. Norms that govern these variations—we might call them meta-norms—depend mainly on the cultural and socio-religious climate in a given society. Those meta-norms also determine the extent to which reproductive behavior is governed by individual rationality (see economic fertility analysis) as opposed to social conformity (see sociological fertility analysis). In other words, culture and religion do not only determine the contents of norms but also the degree of their comprehensiveness.

How can we translate these rather abstract ideas into a quantitative model? Since we have no specific knowledge about the mechanisms of the normative transformation we can only define it in terms of input and output and observed changes in the input/output ratio which can be quantified by means of analysis of covariance. Culture and religion can be introduced as categorial variables into the model. They may be assumed to capture residual effects on the level of fertility (after accounting for socio-economic development) or, in addition to that, change the nature of the relationship between the socio-economic indicators and fertility (in a saturated model of analysis of covariance).

How can we categorize culture and religion? Religion is a characteristic that can be assigned to every individual. We can easily determine the church to which the person belongs but we can hardly measure the nature of his/her religiousness within a given church. However, the latter is increasingly important in industrialized societies: In Europe the traditional fertility differentials between Catholics and Protestants have clearly diminished or completely disappeared over the last two decades. In the Netherlands, for example, the 1960 census still showed a significantly higher number of children for Catholics than for Protestants (see Schubnell 1973) whereas the 1981 census shows a complete assimilation (see Central Bureau voor de Statistiek 1984). On the other hand an Austrian fertility survey indicates strong fertility differentials within the Catholic church: more traditionally religious women have clearly higher probabilities to have a third birth than liberal or indifferent Catholics (see Lutz 1985).

A similar phenomenon appears in the "World Fertility Surveys" for Belgium, France, Great Britain, Italy, and the USA, countries that show a strong positive correlation between the intensity of religious feeling within the Catholic church and the average number of live births (see Jones 1982). Protestants show a much weaker association between these two variables. For our categorial variable religion this tells us that a nominal classification by churches only covers part of the effect of religion on fertility.

When we take the religious affiliation of the majority of the population as an aggregate national indicator this accounts even less for the degree of religiousness. On the other hand, this aggregate indicator reflects the religious tradition in which a society stands and in which the country's population predominantly thinks and behaves. A further problem arises with countries where the majority of the population does not belong to any church. This question was treated in two different ways: in some models those countries were assigned the religion that had traditionally been dominating; in other models an additional category was created for countries without religion.

In contrast to religion, culture may not be assigned to an individual. It is an aggregate phenomenon which is mainly established by a common history and may transcend national boundaries. For the present analysis the 128 countries represented in this study shall be grouped into 13 cultural-geographical regions. For the lack of other clear criteria geographical proximity—as defined by global regions that are often used in history, economy and cultural anthropology[3] —served as a proxy for cultural proximity. The variables REGION and RELIGION are of course correlated, but most regions consist of countries with different religions and there is no religion that appears exclusively in one region. Hence, the two variables can measure different effects.

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[3] A listing of the regions is given in Table 1. The classification of countries is a slight modification of that suggested by Millendorfer and Gaspari (1971).

STATISTICAL ANALYSIS

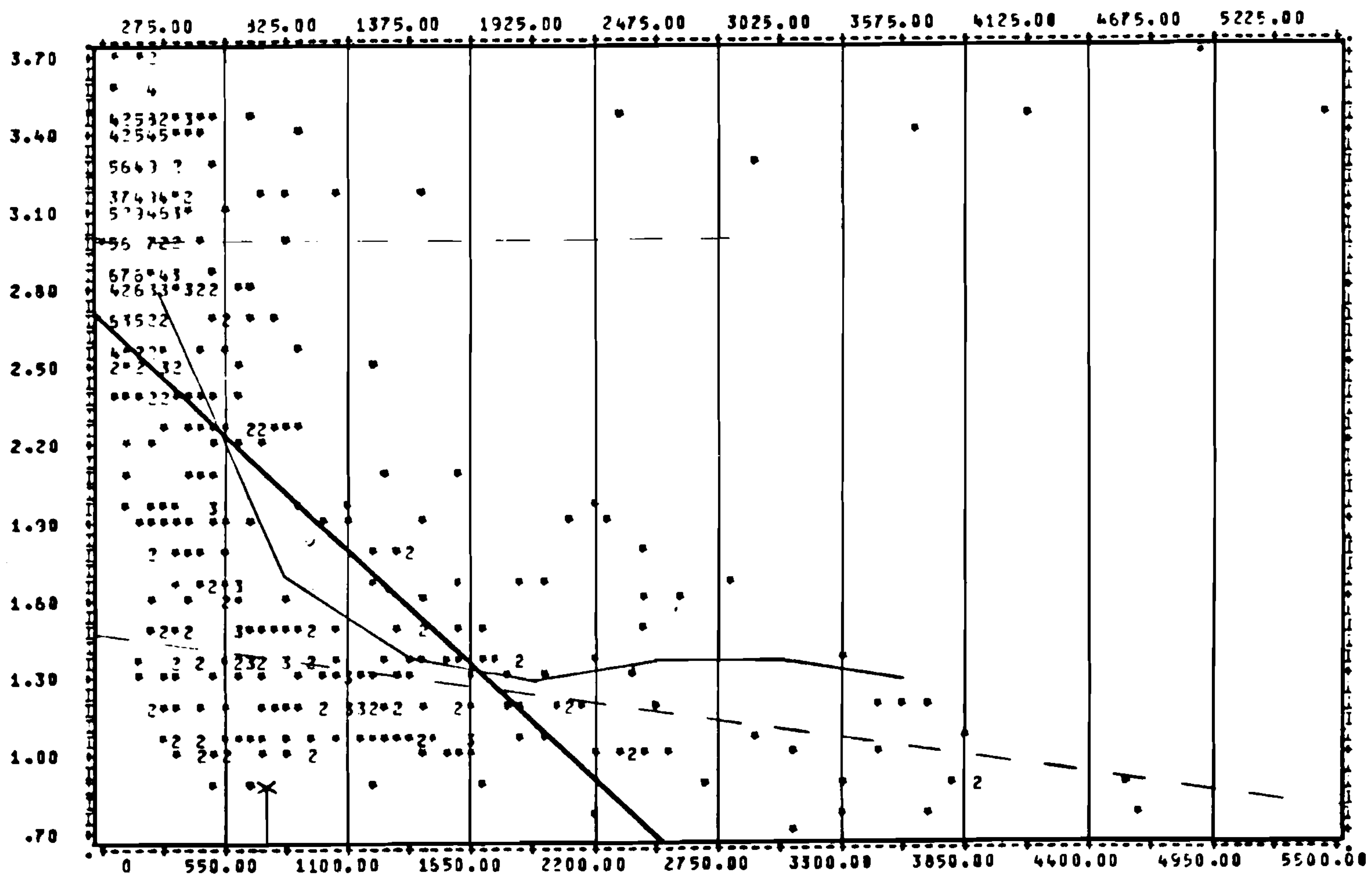
The nature of the data which consist of both time-series and cross-sections requires some special attention before the application of standard multivariate statistical procedures. Essentially two problems arise: How should the cases (= data for a certain year for a certain country) be weighted in order to give the appropriate weight to each country, and how can we account for the fact that the time-series data within each country are presumably correlated?

In choosing appropriate weights two different aspects must be considered: Shall each country be treated as an individual observation irrespective of its size or shall it be weighted by the size of its population; and should we compensate for the fact that the time-series have different lengths or not? The combination of these two aspects yields four different weighting schemes, the selection of which depends on the kind of question asked in the analysis.

		Considering Population Size?	
		No	Yes
Make countries equal in respect to numbers of years observed?	No	A	C
	Yes	B	D

For pooling cross-sectional and time-series data several methods have been suggested in the literature. However, all combinations of these two aspects are either cross-sectional studies extended to include time-series data or time-series with some cross-sectional extensions (see Intriligator 1978). In our case the cross-sectional aspect is clearly dominant. Hence, in the statistical analysis we assume that each group of culturally similar countries has a certain additive effect specific for this region. In some models we also allow for interactions between regional effects and other explanatory variables.

The original data set provides eight social and economic indicators that can be viewed as covariates of fertility, namely male and female illiteracy, percentage of a girl cohort attending secondary school, infant mortality rate, female life expectancy at birth, daily protein intake per caput, gross domestic product per caput, and the proportion of the population in nonagricultural activities. For the present study of cultural and religious factors effecting fertility we have to restrict ourselves to a few selected socio-economic covariates. This restriction is also necessary from a statistical point of view because of near to perfect collinearity of some of the indicators. At this point no references can be made to the very extensive literature on the causal relationships between fertility and various



Correlation

-.537

Dummy-Regression I

a	=	2.77
b2	=	-1.06
b3	=	-1.36
b4	=	-1.47
b5	=	-1.35
b6	=	-1.33
b7	=	-1.48
b8	=	-1.00
b9	=	-.97
b10	=	.73

R^2 = .476

Dummy-Regression II

R^2 = .515

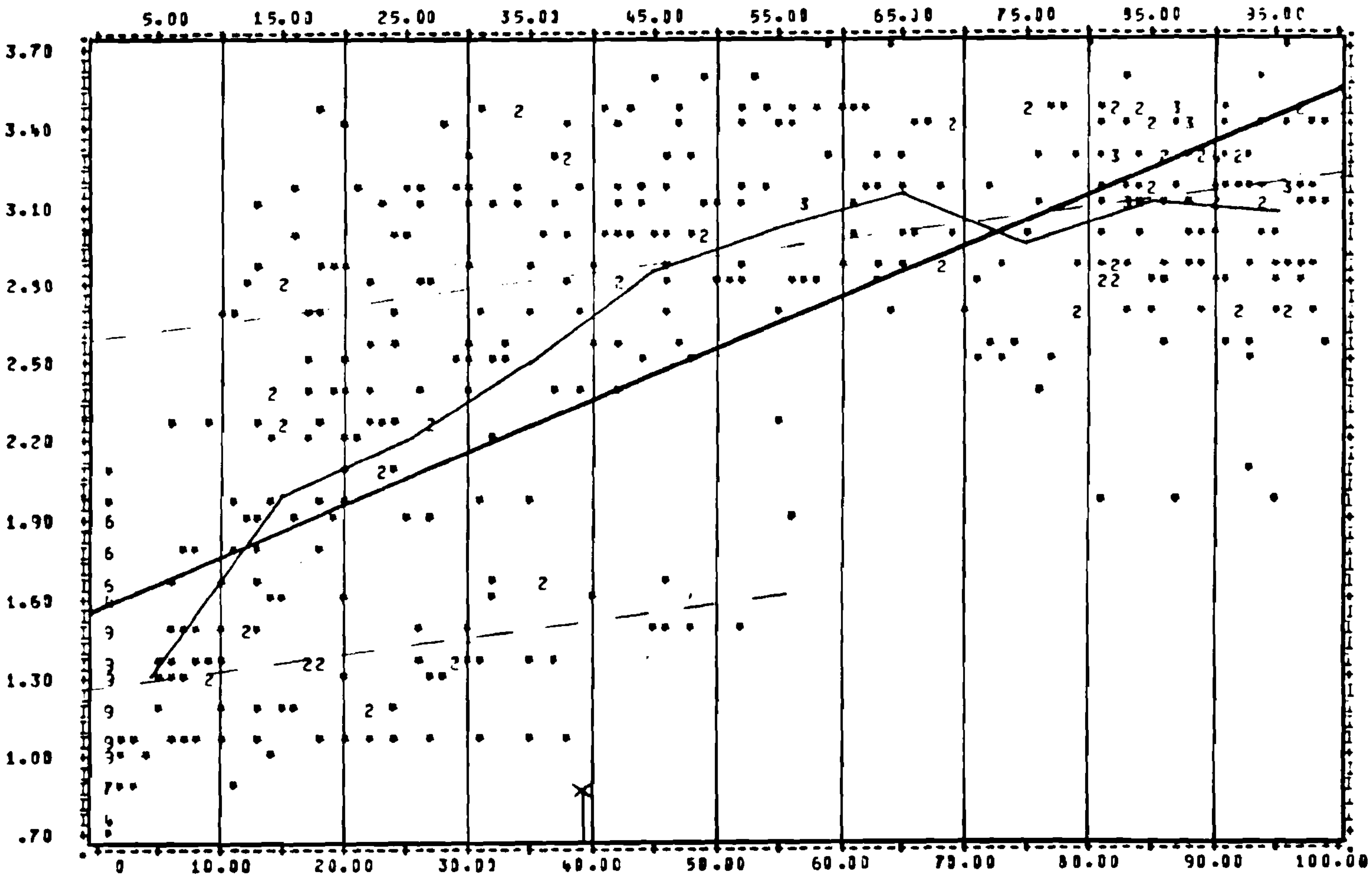
Difference in R^2 :

.515 - .288 = .227

Test for Curvilinearity :

F = 28.29

Figure 2. Scatterplot of Gross Domestic Product per caput in constant 1960 US Dollars (across).



Correlation

.778

<u>Dummy-Regression I</u>

a = 1.31
b2 = .7o
b3 = .91
b4 = 1.18
b5 = 1.57
b6 = 1.72
b7 = 1.85
b8 = 1.63
b9 = 1.82
b1o = 1.75

R^2 = .697

<u>Dummy-Regression II</u>

R^2 = .702

<u>Difference in R^2</u> :

.7o2 - .6o5 = .o97

<u>Test for Curvilinearity</u> :

F = 19.67

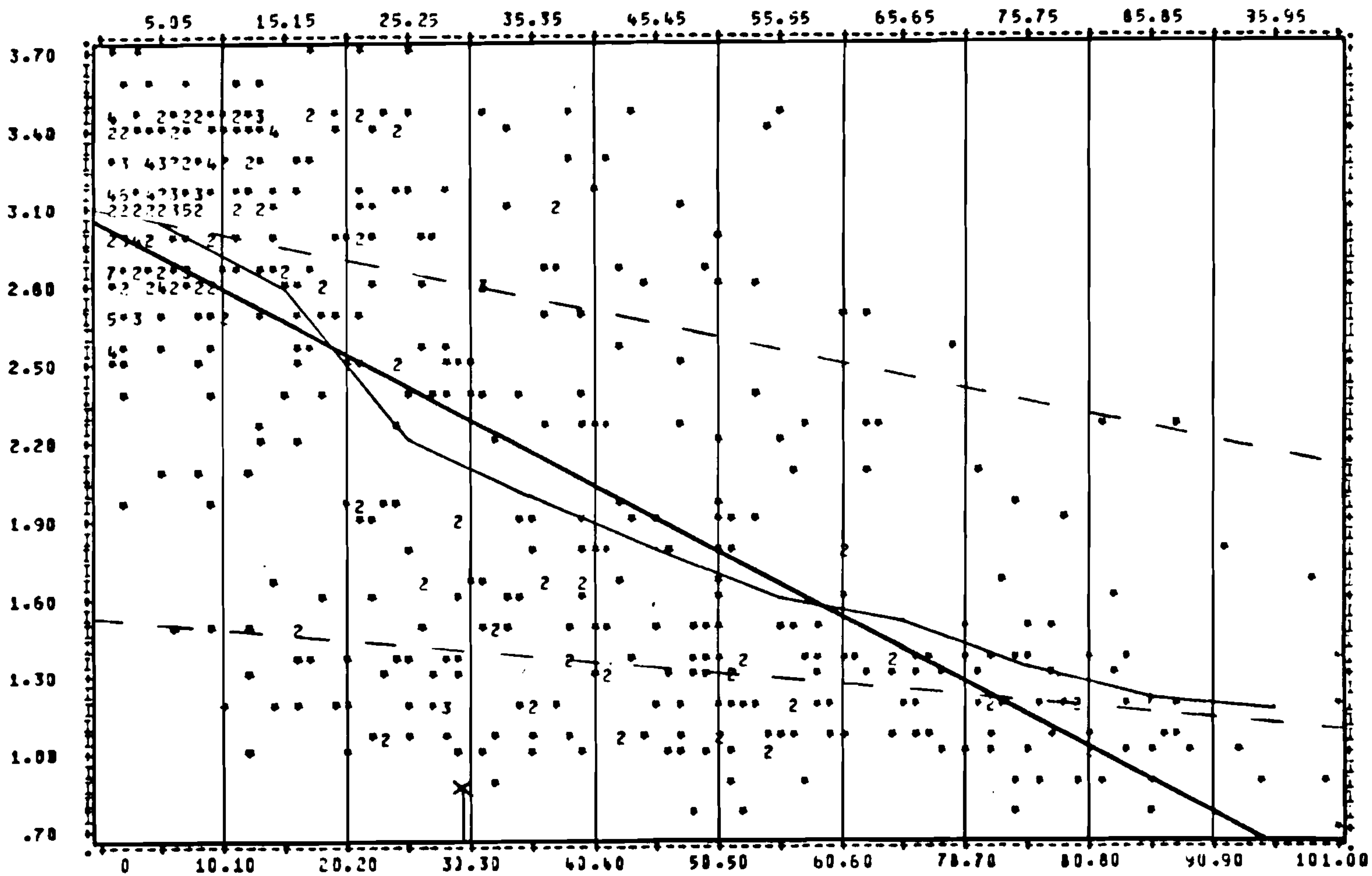
Figure 3. Scatterplot of Female Illiteracy in percent (across) against the Gross Reproduction Rate (down); weighting scheme A.

socio-economic indicators.

In the present context three indicators seem to be appropriate, one for female educational status, one for economic conditions, and one for the health sector of the society. Bivariate analysis of these indicators and fertility reveals interesting nonlinearities. In the bivariate scatterplots (see Figures 2-5) every case is assigned equal weight (= weight A). The unbroken line gives the regression line calculated for this bivariate association. The broken lines represent regression lines for two subgroups of cases: those with gross reproduction rates above and below 2.0. Furthermore, the horizontal axis (= independent variable) was cut into ten intervals of equal width. Based on this subdivision a multiple regression was calculated with nine dummy variables (standing for the categories) as independent variables (Dummy-Regression I). The given coefficients stand for the deviations from the reference category. To illustrate possible nonlinearity in the relationship a line was drawn that connects the means of the ten subgroups. A statistical test of nonlinearity can be performed by comparing the R^2 of the simple overall regression to the R^2 of another multiple regression that includes the independent variable itself in addition to the nine group-specific dummy variables (Dummy Regression II). Finally, the mark (↟) indicates the turning point of a logistic regression calculated for the bivariate association.

For all variables studied in Figures 2 to 5 the relationships are significantly nonlinear—for GDP and female illiteracy much more so than for infant mortality and female enrollment in secondary schools. In respect to per caput income countries are very heavily concentrated in the lowest category, i.e., with incomes of less than 550 constant 1960 US dollars. In the second category the mean is already more than one daughter per mother less than in the lowest income group. The cases in the upper right corner with high fertility and very high income stand for some Arabic oil exporting countries. This illustrates the fact that higher income does not automatically lead to lower fertility on the aggregate. Some of the multivariate models in fact yield positive coefficients for income. A logarithmic transformation of GDP makes the relationship significantly more linear. For this reason GDPLN will be the variable used as covariate in our study.

Female educational status has traditionally been regarded as one of the key variables associated with declining fertility. Not only does more education lead to a change in the woman's own values, it also strengthens the woman's position to get only the number of children she wants because the woman's own desire is mostly lower than the husband's and the kin group's expectations in traditional societies.



Correlation

-.712

Dummy-Regression I

a = 3.04
b2 = -.24
b3 = -.82
b4 = -1.03
b5 = -1.25
b6 = -1.42
b7 = -1.52
b8 = -1.68
b9 = -1.81
b10 = -1.84

R^2 = .531

Dummy-Regression II

R^2 = .541

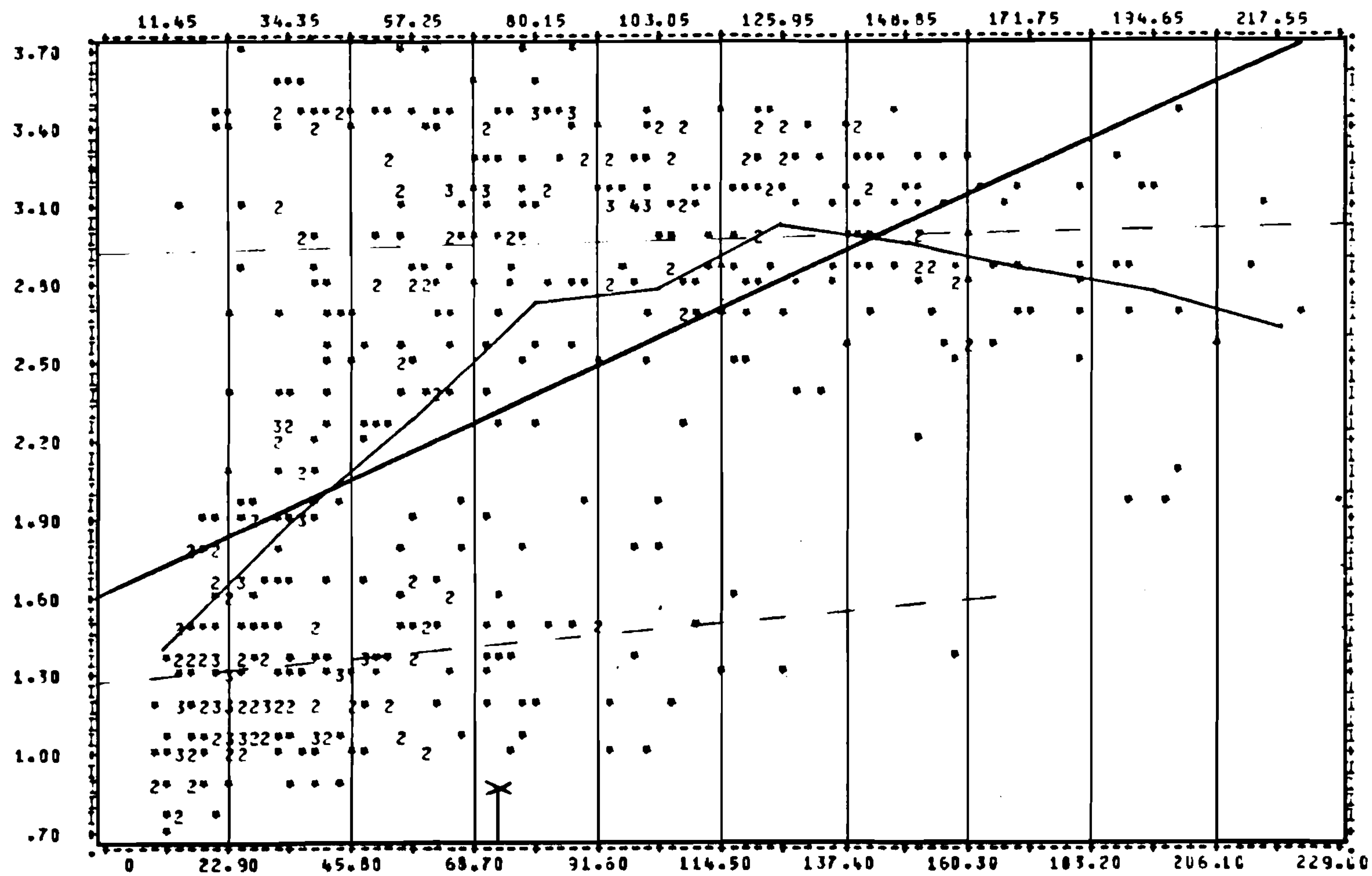
Difference in R^2 :

.541 - .508 = .033

Test for Curvilinearity

F = 4.35

Figure 4. Scatterplot of Female Enrolment in secondary schools in percent (across) against the Gross Reproduction Rate (down); weighting scheme A.



Correlation

.533

Dummy-Regression I

a = 1.41
b2 = .47
b3 = .87
b4 = 1.3o
b5 = 1.36
b6 = 1.58
b7 = 1.55
b8 = 1.47
b9 = 1.36
b1o = 1.25

R^2 = .357

Dummy-Regression II

R^2 = .37o

Difference in R^2 :

.37o - .284 = .o86

Test for Curvilinearity :

F = 8.25

Figure 5. Scatterplot of the Infant Mortality Rate (across) against the Gross Reproduction Rate (down); weighting scheme A.

When analyzing a cross-section of industrialized and less developed countries we also have difficulties in choosing an appropriate indicator for female educational status. In industrialized countries illiteracy obviously is not very indicative, whereas in the bulk of LDC's, secondary school enrollment for girls is not a sensitive indicator. To overcome this measurement problem the two variables are combined to an indicator that is responsive to variations at higher and lower stages of development. Let ILF be the percentage of female and ILM the percentage of male illiteracy and SEF the percentage of a girl of the relevant age group enrolled in secondary schools, then the new aggregate indicator of women's relative educational status AFES is defined as AFES = ILF+(ILF-ILM)-SEF. This new indicator shows a rather linear relationship to fertility, the correlation coefficient being 0.8.

Infant mortality is regarded to be rather sensitive to improvements in the health care system and changes in parental child care practices. There are direct causal relationships between infant mortality and fertility through child replacement strategies, shorter birth intervals due to truncation of breastfeeding and other mechanisms. But it is also plausible to assume an association between those two variables via the often observed simultaneousness of changes in child care practices and the onset of conscious family planning.

Tables 1-3 give the results from various analysis of covariance models. They show the effects of RELIGION and REGION on the gross reproduction rate after having accounted for the effect of the three covariates IM, GDPLN, and AFES. The results are presented in the form of a multiple classification analysis (MCA) table. The first column gives the unadjusted deviation of the category means from the grand mean. The three remaining columns give the deviations which were adjusted for the effects of the three covariates and (in the last column) also for the other main effect considered. The Eta and the Betas represent the standardized regression coefficients of bivariate (η) and multivariate (β) regressions of fertility on REGION and RELIGION. Hence, they indicate the overall effect of the given factor on the level of fertility. Since the covariates were entered into the equation before the main effects, their coefficients do not change. The effects of infant mortality and female educational status are highly significant in case of using weight D. For the unweighted analysis (A), income per caput also has a significant effect on the level of fertility. The signs all go in the expected direction.

Table 1. Analysis of covariance, weighting scheme B, 128 countries, 1950-1975.

Dependent variable: Gross Reproduction Rate Grand Mean = 1.96	Unadjusted Deviation η	Adjusted for covariates Deviation β	Adjusted for covariates Deviation β	Adjusted for other factor and covariates Deviation β
REGION				
1 North America	-.59	.03		.08
2 Oceania	-.47	-.12		-.08
3 Europe - Northwest	-.78	-.43		-.46
4 Europe - South	-.70	-.67		-.85
5 Europe - East and Soviet Union	-.67	-.41		-.54
6 Asia - West	1.45	.89		.88
7 Africa - North and certain Arabic countries	.96	.58		.54
8 Central America and Southeast America	.67	.54		.35
9 Southamerica - West	.90	.77		.57
10 East Asia	-.36	-.42		-.11
11 Central and South Asia	.97	.46		.61
12 Central Africa - North	1.05	.43		.35
13 Central Africa - South	1.36	.70		.68
	.92	.56**		.57**
RELIGION				
1 Catholic Christians	.10		.11	.19
2 Protestant Christians	-.69		.08	-.00
3 Orthodox Christians	-.63		-.22	.15
4 Islam	1.17		.23	-.01
5 East-Asian Religions	.08		-.19	-.32
6 Various Natural Religions	1.05		-.01	.03
	.73		.19**	.22**
				Two-way interactions Group-Religion**
COVARIATES				
IM Infant Mortality Rate			-.002**	
GDPLN Log of Gross Domestic Product p. capita			-.042	
AFES Aggregate Indicator of Female Educational Status (neg.)			.011**	
R^2		.896**	.769**	.904**

**significant .99 probability level

Table 2. Analysis of covariance, unweighted (scheme A), 128 countries, 1950-1975.

Dependent variable: Gross Reproduction Rate Grand Mean = 2.31	Unadjusted Deviation η	Adjusted for covariates Deviation β	Adjusted for covariates Deviation β	Adjusted for other factor and covariates Deviation β
REGION				
1 North America	-.86	.00		.08
2 Oceania	-.71	-.05		.04
3 Europe - Northwest	-1.05	-.43		-.39
4 Europe - South	-1.02	-.90		-.79
5 Europe - East and Soviet Union	-.89	-.50		-.36
6 Asia - West	.75	.26		.13
7 Africa - North and certain Arabic countries	.82	.18		-.11
8 Central America and Southeast America	.34	.42		.43
9 Southamerica - West	.56	.54		.56
10 East Asia	-.29	-.29		-.26
11 Central and South Asia	.61	.32		.22
12 Central Africa - North	.61	.10		.15
13 Central Africa - South	.70	.08		-.01
	.83	.44**		.40**
RELIGION				
1 Catholic Christians	-.02		.16	-.01
2 Protestant Christians	-.89		-.18	-.15
3 Orthodox Christians	-.95		-.71	-.42
4 Islam	.88		.20	.34
5 East-Asian Religions	-.01		-.05	-.01
6 Various Natural Religions	.57		-.14	.00
	.70		.28**	.22**
				Two-way interactions Group-Religion**
COVARIATES				
IM Infant Mortality Rate			-.004**	
GDPLN Log of Gross Domestic Product p. capita			-.156**	
AFES Aggregate Indicator of Female Educational Status (neg.)			.011**	
R^2		.803	.712**	.825

**significant .99 probability level

Table 3. Analysis of covariance, weighting scheme B, 128 countries, 1975 only.

Dependent variable: Gross Reproduction Rate Grand Mean = 2.14	Unadjusted Deviation η	Adjusted for covariates Deviation β	Adjusted for covariates Deviation β	Adjusted for other factors and covariates Deviation β
REGION				
1 North America	-1.24	-.55		-.41
2 Oceania	-.92	-.39		-.23
3 Europe - Northwest	-1.16	-.61		-.55
4 Europe - South	-.92	-.59		-.71
5 Europe - East and Soviet Union	-.97	-.53		-.63
6 Asia - West	1.27	.92		.79
7 Africa - North and certain Arabic countries	.79	.69		.51
8 Central America and Southeast America	.43	.55		.45
9 Southamerica - West	.60	.70		.62
10 East Asia	-.43	-.49		-.53
11 Central and South Asia	.78	.47		.58
12 Central Africa - North	.99	.57		.56
13 Central Africa - South	1.08	.74		.65
	.95	.63**		.65**
RELIGION				
1 Catholic Christians	-.05		.34	.08
2 Protestant Christians	-1.22		-.14	-.24
3 Orthodox Christians	-.30		-.33	-.09
4 Islam	.99		.35	.13
5 East-Asian Religions	.42		-.02	-.14
6 Various Natural Religions	.94		.20	.09
7 Atheists	-.47		-.31	.06
	.79		.31**	.15**
				Two-way interactions Group-Religion**
COVARIATES				
IM Infant Mortality Rate			-.002**	
GDPLN Log of Gross Domestic Product p. capita			-.041	
AFES Aggregate Indicator of Female Educational Status (neg.)			.012**	
R^2		.931	.879	.942

**significant .99 probability level

In addition to the nine models presented here various other models have been specified and calculated taking the time dimension into account and modifying the religious categories. Table 4 gives an analysis of residuals over time for three selected countries.

SUMMARY OF FINDINGS

The results presented in the tables and some further calculations with slightly modified models yield an abundance of specific results. The following paragraphs try to structurize and summarize the major findings:

1. In all models there are significant effects of both REGION and RELIGION on fertility, even after controlling the socio-economic standing of the country. This is also true when REGION and RELIGION are considered simultaneously and when more socio-economic indicators than the three given covariates are included as controls.
2. Different methods of weighting make a difference in the results. Weighting generally changes only the magnitude of the effect and not its direction. The explanatory values of the models (as measured by R^2) are higher when countries are weighted by their population sizes. The values of R^2 range from .7 to .9.

In the following we will refer to the models in Table 1 that use weighting scheme B (taking account of population size).

3. The European countries have generally lower fertility than could be expected from their socio-economic standing. This judgement is based on the global association between fertility and socio-economic development. In other words, under global standards European culture seems to have a fertility-depressing effect. This is more so in north-western Europe than in southern Europe.
4. For North America, on the other hand, the level of fertility is pretty well explained by its socio-economic standing. Put in a different way, there is no strong cultural effect.
5. Arabic countries in western Asia and northern Africa have together with the southern part of central Africa the highest fertility observed. For western Asia which includes many high fertility oil-exporting countries, fertility is higher by almost one daughter per woman than should be expected from the

	Year	GRR observed	GRR estimated	Deviation
Austria	1950	1.00	1.35	-.35
	1955	1.10	1.29	-.19
	1960	1.30	1.26	.04
	1965	1.30	1.21	.09
	1970	1.10	1.19	-.09
	1975	.90	.97	-.07
Tunesia	1950	3.50	3.42	.08
	1955	3.40	3.47	-.07
	1960	3.30	3.41	-.11
	1965	3.30	3.31	-.01
	1970	3.10	3.18	-.08
	1975	3.00	3.12	-.12
USA	1950	1.50	1.50	0
	1955	1.60	1.74	-.14
	1960	1.70	1.59	.11
	1965	1.40	1.34	.06
	1970	1.20	1.15	.05
	1975	.90	.98	-.08

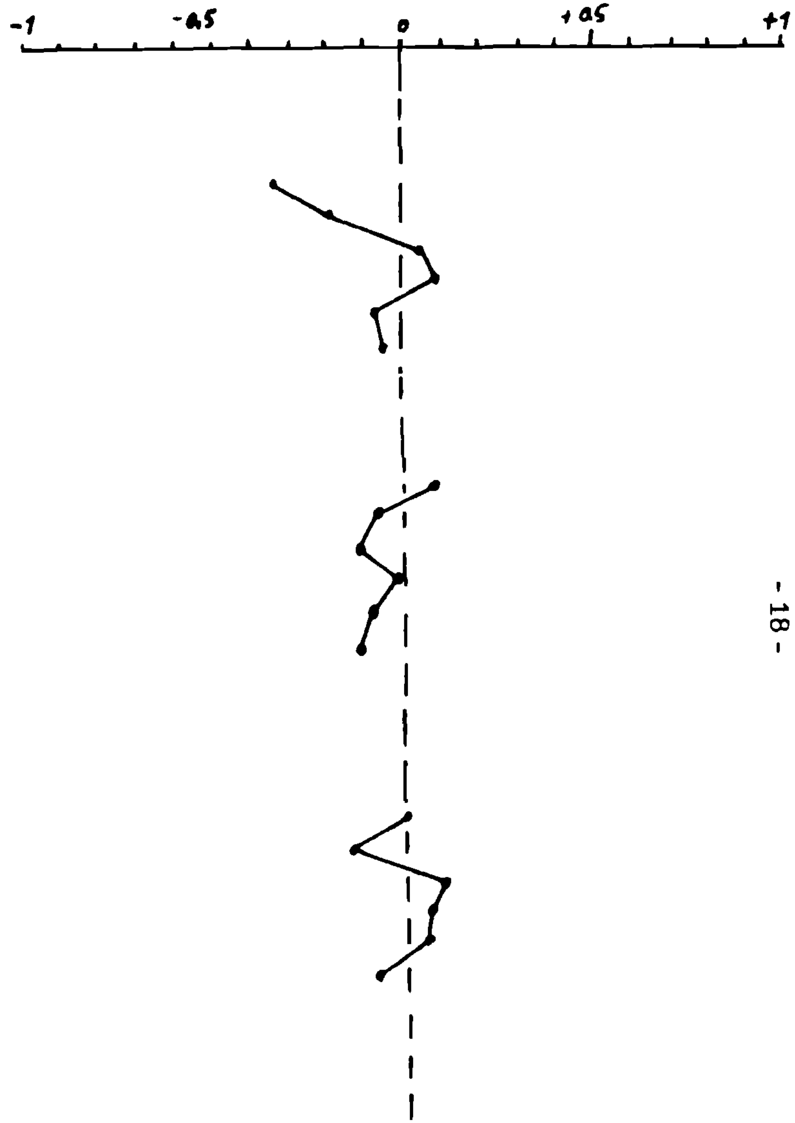


Table 4. National time-series of residuals after accounting for the socio-economic variables, REGION, and RELIGION.

level of socio-economic development. As stated before, the answer for this lies in the traditional Islamic culture in those countries.

6. In eastern Asia the socio-economic indicators alone cannot explain the relatively low level of fertility, but the cultural and religious variables together can.

7. In central Africa the very high level of fertility can be explained to a large extent by the generally low level of development, but still culture and religion have an incremental effect on the explanatory value.

8. If a nation consists predominately of Roman Catholic Christians, the level of fertility tends to be well above average. This effect becomes even stronger once we control the covariates and the cultural variable REGION. In other words, once the fertility-depressing cultural effects of Europe and the fertility-increasing effects of being part of the Latin American culture, etc., are controlled for, the positive effect of Catholicism on fertility is even reinforced.

9. A similar effect into the other direction can be observed for the East-Asian religions that tend to depress fertility after controlling for the other factors.

10. Protestant countries have the lowest fertility on average; but after holding other effects constant the negative influence of Protestantism on fertility virtually disappears. In the case of weighting scheme A where the European countries dominate the Protestant group, the negative effect remains very significant, however.

11. As could be expected, Islam has a heavily positive effect on fertility in most models. Kirk (1965) identified three major reasons for this: subordination of women, emphasis on sexuality, and marriage institutions. Only if both REGION and RELIGION are introduced into the equation, the positive effect of the Islamic countries is mainly captured by the REGION categories of western Asia and northern Africa which include only Islamic nations.

12. Although countries with natural religions have fertility levels far above average, no significant effect of religion remains when their socio-economic standing is taken into account.

13. Two-way interactions between REGION and RELIGION are significant under all weighting schemes. This means that the pattern in which religion affects fertility is different in different cultural regions, and vice versa.

14. An alternative classification of countries by religion, namely the inclusion of a category for countries without religion, does not change the results significantly. The new category seems to be relatively neutral in respect to fertility after the regional and socio-economic factors have been accounted for.

15. Separate analyses for individual years in the time series generally indicate that over time the influence of culture as measured by REGION increased at the expense of socio-economic variables. The additional effect of RELIGION on top of these other factors also clearly diminished over time. This supports the findings from several other national studies that religious fertility differentials are decreasing over time. Only in the Islamic world the relative effect of religion has increased.

16. The analysis of residuals suggests that despite the high proportion of variance explained, country-specific features pertain. As shown in Table 4 for three selected countries, the longitudinal pattern of residuals also allows to assess a country's fertility trends relative to its socio-economic standing and the level of fertility in culturally similar countries of the same region. Austria, for example, was in 1955-59 well below the expected value until it caught up with a relatively late baby boom.

Many of the results stated above depend on the perspective taken and on the weight assigned to countries which in consequence determines the standards relative to which effects are assessed. But there remains no doubt that culture and religion are factors that matter and should be considered in every comprehensive study of fertility determinants.

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