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Does Culture Affect Fertility in Europe?

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Abstract

Economic factors are rather an obvious determinant of fertility, as also suggested by "Beckerian" theory. However, culture is less tangible and less direct factor for fertility. In this paper, the main question is whether culture, as suggested by "Synthesis" among other theories, is a determinant of fertility in culturally diverse Europe. Using panel-data for 26 EU countries on 8 years (2000-2008), I estimate fixed effect models that provide quantitative evidence for the finding that along with diverse economic conditions across Europe, culture also stays behind country level fertility rate determination.

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1 Introduction

The decline in fertility in Europe is an ongoing problem with pervasive consequences that go beyond demography. Current levels of fertility - such as those recorded in several countries in Southern and Continental Europe - imply, for given mortality and migration rates, that the population of these countries may shrink to about a third of today's level in as little as one century. Some consequences of a rapidly aging population are increasing health and pension costs and growing burden on the younger working population. In the long run, low rates of fertility also correlate with diminished economic growth (Bloom *et al.* 2009).

Within an economic framework, Becker (1960) emphasized the connection between pure economic measures such as income and fertility as an outcome assuming that preferences are identical across households. Mixed empirical evidence from the sixties (Adelman 1963, Freedman 1963, Silver 1965, Freedman and Coombs 1966a, 1966b, Easterlin 1968 cited in Willis (1973)) on the fertility-income relationship led to the shift of emphasis from income to consideration also of the opportunity cost of the wife's time as measured by the wife's wage (Mincer 1962b cited in in Willis (1973)). Reinforcing micro-level empirical results like the ones mentioned, macro studies, such as Sobotka *et al.* (2011), show that in most developed countries economic downturns, as measured by various indicators - declining GDP levels, falling consumer confidence, and rising unemployment - bring a decline in the number of births and fertility rates. Adding to these results, Luci and Thevenon (2010) identify female employment as the main factor behind the impact of GDP variations on fertility.

Another theory of fertility - the"Synthesis Model" of Easterlin, incorporates concerns from the sociological and demographic literatures such as "endogenous tastes". Endogenous tastes refer to the determination of preferences of a particular household by the decisions of other households; this includes intertemporal and intergenerational influences such as the conditioning of adults' taste norms by their childhood experience, as well as intratemporal influences of the norms of their peers (Easterlin *et al.* 1980). Endogenous tastes could safely be defined as a subset of culturally determined preferences. But does culture affect fertility?

Several studies examine the impact of various measures of culture on fertility, and importantly, recent literature also demonstrates quantitatively that cultural differences could stay behind fertility variation. With a remarkable relevance for the European context is Van de Kaa's (1987) cultural explanation, i.e. the diffusion of individualism and secularization as a reason behind the persistent decline in fertility in industrialized countries. Fernandez and Fogli (2009) studies fertility of women immigrants in the US by proxying culture with past female labor force participation and total fertility rates from the woman's country of ancestry, and shows that these culture variables are economically and statistically significant (positive effects) in explaining how many children women have. Rehm (2014) demonstrates the validity of Fernandez and Fogli's (2009) results for immigrants in Germany. As the definition of culture is open to interpretation, Li Zhang *et al.* (2012) approximate cultural inheritance with inheritance of parents' religious traits and find that the persistence of religious affiliation in the family does have an effect on fertility. Using worldwide ethnographic data, Alesina *et al.* (2011) provide evidence that the form of agriculture traditionally practiced shapes historic norms and preferences about fertility, while the latter persist and affect observed fertility around the world today.

The goal of this paper is to disentangle an effect of culture on fertility in Europe. The abundance of socio-economic and cultural diversity permeating the continent makes it plausible that culture matters for varios economic outcomes, including fertility. Knowledge of the extent to which culture influences fertility would improve our understanding of the demographic changes taking place. Moreover, such knowledge would point at any limitations of policy interventions aimed at influencing fertility by focusing only on economic factors.

Unlike the typical empirical studies on fertility determinants, this paper undertakes a macro-level approach that will bring forward country-level implications. Fertility is measured at the national level as well as its economic and cultural determinants. The novelty of the paper is the use of marriage preferences (net marriage rate) and environmental attitudes (recycling of municipal waste) as measures of culture.

The rest of the paper proceeds as follows: Section 2 describes the empirical strategy, datasets and model, Section 3 discusses the results and Section 4 concludes.

2 Empirical Strategy, Datasets and Model

While explaining fertility rates with economic measures is straightforward, proving empirically a relationship between fertility and culture needs a strong identification strategy. As Fernandez and Fogli (2009) argue, the main challenge of any cultural analysis is how to separate the effects of culture from the effects of strictly economic factors and institutions. Their approach is to exploit the difference in the "portability" of culture relative to economic and institutional conditions by focusing on emigrants' outcomes in the host country, i.e. outside of the home country institutional environment.

In this paper, the analysis is taken from the individual to the country level, and culture is proxied by aggregate measures that describe society within the limits of the nation state. As culture is inherent to a nation, this does not imply that it is inherent to all individuals in the nation equally. To illustrate it, the specific variables that proxy culture in my analysis are country-level variables for: 1) marriage preferences - quantitatively measured as a difference in marriage and divorce rates, and 2) environment attitudes - measured as a rate of recycling of municipal waste. Both reflect overall attitudes within a country, which however vary between countries. For example, in more individualized and secularized societies we would expect higher divorce rates, whereas marriage rates would be higher in societies with strong family traditions. Of course, marriage and divorce rates might vary because of purely economic factors such as the cost of formalizing the event or even economic problems that could have led to divorce. The advantage of using an aggregate measure for marriage and divorce rate difference is that the relevancy of economic explanations behind marriage and divorce decreases. Considering the possibility that the probability of divorce due to economic reasons could be smaller in more developed countries than in less rich countries, I will isolate the effect of culture by controlling for the economic measures of well-being. Crosignani *et al.* (2010) discusses preference theory according to which cultural factors are the key predictor to fertility changes in Europe. He explains that values or preferences as well as unstable partnerships are factors for fertility. According to preference theory there are three types of women: family oriented women (10-30%), adaptive women (40-80%) and career-oriented women (10-30%) (Hakim, 2010 ctd. in Crosignani *et al.* (2010)). Crosignani *et al.* (2010) argues that survey results confirm the relationship between preferences and actual fertility. As studied in this paper,

the net marriage rate reflects the instability of partnerships which is a determinant of delayed reproduction (Crosignani *et al.* 2010). Regarding the second cultural variable I utilize: as environment attitudes and behavior across countries could vary because of a country's economic resources and capacity, I will attribute any independent from economy effect as a cultural effect on fertility. Very relevant finding is that of Crociata et al. (2015) - namely, they find a strong positive relation between the propensity to take part in some cultural activities and the propensity to abide by waste recycling guidelines and prescriptions. Their study of cultural capital's relationship with waste recycling is novel in the literature on waste recycling but their findings are convincing and supportive of this paper's use of waste recycling as a proxy for culture.

I collect panel data with 226 observations on 8 years (2000-2008) for 26 EU countries. The main data source is the Statistical Office of the European Union (Eurostat) which provides statistics essential for decisions and evaluation at European level. I also use supplementary data from the UNECE Statistical Database, compiled from national and international (OECD, EUROSTAT, CIS) official sources.

The empirical model to be estimated is a fixed effect model of the form:

$FertRate_{it} = x'_{it}\beta + u_i + e_{it}$; (i=1, 2,...26, t=2000, 2001,...2008)

where u_i is fixed, independent of e_{it}, and may be correlated with x_{it}. In this setting, the country-fixed effect u_i could be treated as a parameter to be estimated for each cross section observation i. In practical terms, u_i could capture country-specific labor market institutional or legal characteristics, i.e. variables that could affect fertility rate but are not included as regressors. The vector x'_{it} includes the following economic variables: mean age of women at childbirth, employment in industry as a share of total NACE sectors, employment in agriculture as a share of total NACE sectors, Gross domestic product per capita in Purchasing Power Standards (PPS), Old-age-dependency ratio and Gross average monthly wage. Along with these, x'_{it} contains the variables that represent culture.

3 Estimation

I conduct panel data analysis testing sequentially several model specifications. To choose between a Fixed Effects and a Random Effects model I perform a test of over-identifying restrictions. This test checks whether the regressors are uncorrelated with the error term. The null hypothesis is that the orthogonality condition is respected. With the reported P value = 0.000 for the Sargan-Hansen statistic (Table I) I reject the null hypothesis and conclude that the regressors are endogenous.

Therefore, I estimate a fixed effect model which allows me to control for time-invariant differences between the countries. The advantage of this model is that the estimated coefficients cannot be biased because of omitted time-invariant characteristics. Essentially, the fixed effects model is designed to study the causes of changes within an entity - in this case, a country. Since a Wald test for groupwise heteroskedasticity (Table II) does not reject the null hypothesis of constant $sigma^2$ for all i, in the following specifications (Table III and Table IV) I report the estimation of a fixed effect model robust to heteroskedasticity.

Table IV presents the richest estimation framework as it includes a measure of average individual income (i.e. gross average monthly wages) in addition to the log of a country's Gross domestic product per capita in PPS. Since in some European countries income inequality is more pervasive than in others, I find a measure of average individual income indispensable for modelling the diversity of economic conditions across Europe. In other words, the combination of a country's wealth (as measured by log of GDP per capita) with individual income captures to an extent the distribution of wealth among individuals. I find that both the log of gross average monthly wage and the log of GDPpc (PPS) affect a country's fertility rate. The negative effect of wealth is bigger in absolute value (38%) than the positive effect of average individual monthly income (22%). There is plenty of empirical evidence on the negative relationship between wealth/GDPpc and fertility (See Jeon and Shields 2005, Moffitt 1984). Also, there is evidence that fertility is sensitive to relative income measures in aggregate data (Easterlin 1973) which reinforces the result here that reducing income inequality (as captured by juxtaposing two income measures) might help to increase a country's fertility rate. In line with Jeon and Shields' (2005) result, I find that the age structure represented by the old age dependency ratio has a negative though small effect on a country's fertility rate. A similar measure to a country's rate of female labor force participation (See Jeon and Shields 2005, Alesina et al. 2011), the unemployment rate of females shows a negative relationship with countries' fertility rates in Europe. Malthusians emphasize that changes in the economy (including the capital-labor ratio) affect fertility and other components of population growth. To give a glimpse of this theory in the panel regression I estimate, I include as control variables the percentage employed in industry (as a share of total employment in all sectors) and the percentage employed in agriculture (as a share of total employment in all sectors). The evidence suggests that an increase in employment in agriculture decreases by 2.5%-3% a country's fertility rate while changes in employment in industry do not have any significant impact.

Regarding the proxies for culture, the estimated positive and significant coefficients for these variables suggest that both collective marriage preferences and environmental behavior affect a country's fertility rate. European countries with marriage rates higher than divorce rates, ceteris paribus, tend to have on average a 2% increase in fertility rates. Countries with stronger traditions for waste recycling, i.e. environment-friendly behavior, also gain an increase of 0.3%-0.5% in fertility rates. These effects stay robust across the fixed effect model specifications - thus, demonstrating that along with economic factors cultural differences in Europe matter for cross-country variations in fertility.

4 Conclusions

The analysis in this paper has demonstrated that a nation's cultural attitudes represented by marriage preferences and environmentally-conscious behavior affect positively a country's fertility rate. Since economic factors influence directly fertility rates, with the proxies for culture I capture an isolated culture effect. This result sheds light to the demographic processes taking place in Europe. Within the theoretical framework of "Beckerian" and "Synthesis" models, the evidence here confirms both theories while it also shows that culture matters while fertility rates are only partially affected by changes in economy such as changes in employment, GDPpc and wages. Regarding these economic determinants of fertility, I show that results are shaped a lot by including in the analysis a variable for country's wealth together with the

average income received by a country's citizen. The gap between these two measures captures differences in income distribution and as shown accounts for cross-country fertility variations. In terms of methodology, the advantage of the panel-data analysis used here is to solve the omitted variable problem. Still, it should be underlined that culture studied in this framework is a short-term phenomenon, and hence, it would be interesting to repeat the analysis with longer time series.

Appendix

Table I: Random Effects Model

Random-effects GLS regression	N of obs.	226	
Group variable iid	N of groups	26	
R-sq: within= 0.5745	Obs per group: min	6	
between = 0.4509		avg = 8.7	
overall = 0.4615		max = 9	
		Wald chi2(11) = 103.37	
		Prob >chi2 = 0.0000	

Std. Err. Adjusted for 26 clusters in id

Fert rate	Coef.	Robust Std. Errors	t	P >|t|
MarrDiv	**0.0188**	**0.0056**	**3.32**	**0.001**
Recycl	**0.0049**	**0.0021**	**2.34**	**0.019**
Mean Agef birth	-0.0328	0.4382	-0.08	0.94
Mean Agef birthsq	0.0013	0.007	0.17	0.864
Empl industry	-0.0037	0.0052	-0.72	0.474
Empl agriculture	**-.0319**	**0.0115**	**-2.76**	**0.006**
Old Age Dependency	-0.0067	0.0077	-0.87	0.384
Log GDP pc (PPS)	-0.1183	0.1044	-1.13	0.257
Unempf	**-0.037**	**0.0108**	**-3.41**	**0.001**
Unempfsq	**0.0009**	**0.0004**	**2.4**	**0.017**
Educf	0.0005	0.0021	0.24	0.806
const	2.377	5.978	0.4	0.691
$sigma_u$	.1599			
$sigma_e$	.0519			
rho	0.9045			

Notes. Test of overidentifying restrictions: fixed vs random effects:
Sargan-Hansen statistic 50.709 Chi-sq(11) P-value = 0.0000

Table II: Fixed Effects Model

Fixed-effects (within) regression		N of obs	226	
Group variable: id		N of groups	26	
R-sq: within = 0.5792		Obs per group: min	6	
between = 0.3472			avg = 8.7	
overall = 0.3700			max = 9	
corr(u_i, X_b) = -0.0764			F(11,189) = 23.65	
			Prob >F = 0.0000	
	Std. Err. Adjusted for 26 clusters in id			
Fert rate	Coef.	Std. Err.	t	P >|t|
MarrDiv	**.0181**	**.0048**	**3.77**	**0.000**
Recycl	**.0057**	**.0012**	**4.51**	**0.000**
Mean Agef birth	-.0204	.3361	-0.06	0.951
Mean Agef birthsq	.0011	.0058	0.19	0.850
Empl industry	.0013	.0044	0.31	0.759
Empl agriculture	**-.0 334**	**.0122**	**-2.73**	**0.007**
Old Age Dependency	-.0067	.0058	-1.15	0.251
Log GDPpc (PPS)	**-.1675**	**.0894**	**-1.87**	**0.063**
Unempf	**-.0350**	**.0072**	**-4.81**	**0.000**
Unempfsq	**.0009**	**.0002**	**3.21**	**0.002**
Educf	.0004	.0018	0.22	0.827
cons	2.054	4.609	0.45	0.656
$sigma_u$	.1829			
$sigma_e$	.0519			
rho	.9253 (fraction of variance due to u_i)			
F test that all u_i=0:	F(25, 189) = 59.92	Prob >F = 0.0000		

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model

H0: $sigma(i)^2 = sigma^2$ for all i

$chi2(26) = 918.44$

$Prob>chi2 = 0.0000$

Notes.

Table III: Fixed Effects Model. Robust to Heteroscedasticity

Fixed-effects (within) regression		N of obs	226	
Group variable: id		N of groups	26	
R-sq: within = 0.5792		Obs per group: min	6	
between = 0.3472			avg = 8.7	
overall = 0.3700			max = 9	
corr(u_i, X_b) = -0.0764			Prob >F = 0.0000	
	Std. Err. Adjusted for 26 clusters in id			
Fert rate	Coef.	Robust Std. Err.	t	P >|t|
MarrDiv	**.0181**	**.0064**	**2.81**	**0.010**
Recycl	**.0057**	**.0021**	**2.67**	**0.013**
Mean agef birth	-.0204	.6235	-0.03	0.974
Mean agef birthsq	.0011	.0110	0.10	0.921
Empl industry	.0013	.0048	0.28	0.782
Empl agriculture	**-.0334**	**.0133**	**-2.51**	**0.019**
Old Age Dependency	-.0067	.0108	-0.62	0.539
Log GDPpc (PPS)	-.1675	.1610	-1.04	0.308
Unempf	-.0350	**.0113**	**-3.08**	**0.005**
Unempfsq	**.0009**	**.0004**	**2.19**	**0.038**
Educf	.0004	.0032	0.13	0.898
Const	2.054	8.396	0.24	0.809
$sigma_u$	.1829			
$sigma_e$	.0519			
rho	.9253 (fraction of variance due to u_i)			

Table IV: Fixed Effects Model. Robust to Heteroscedasticity

Fixed-effects (within) regression		N of obs.	211	
Group variable: id		N of groups	25	
R-sq: within = 0.6337		Obs per group: min	6	
between = 0.2382		avg=8.4		
overall = 0.2763		max=9		
F(12,24) =18.22				
corr(u_i, X_b) =-0.1246			Prob >F =0.0000	
	(Std. Err. Adjusted for 25 clusters in id)			
Fert rate	Coef.	Robust Std. Errors	t	P >|t|
MarrDiv	**.0207**	**.0048**	**4.31**	**0.000**
Recycl	**.0037**	**.0019**	**1.88**	**0.072**
Mean Agef birth	-.2026	.7772	-0.26	0.796
Mean Agef birthsq	.0027	.0136	0.20	0.841
Empl industry	-.0013	.0046	-0.30	0.767
Empl agriculture	**-.0255**	**.0121**	**-2.10**	**0.047**
Old Age Dependency	**-.0162**	**.0084**	**-1.93**	**0.065**
Log GDP pc (PPS)	**-.3844**	**.1577**	**-2.44**	**0.023**
Log Avg Income	**.2162**	**.0457**	**4.73**	**0.000**
Unempf	**-.0329**	**.0108**	**-3.03**	**0.006**
Unempfsq	**.0008**	**.0004**	**2.23**	**0.036**
Educf	-.0040	.0033	-1.20	0.243
const	6.040	10.618	0.57	0.575
$sigma_u$	.1981			
$sigma_e$	.0464			
rho	.9478 (fraction of variance due to u_i)			

Variable descriptions

Total Fertility Rate: Number of children per woman. The mean number of children that would be born alive to a woman during her lifetime if she were to pass through her childbearing years conforming to the fertility rates by age of a given year. This rate is therefore the completed fertility of a hypothetical generation, computed by adding the fertility rates by age for women in a given year (the number of women at each age is assumed to be the same). The total fertility rate is also used to indicate the replacement level fertility; in more highly developed countries, a rate of 2.1 is considered to be the replacement level fertility rate. Eurostat

Mean Agef Birth: Mean age of women at childbirth (years). The mean age of women when their children are born. For a given calendar year, the mean age of women at childbearing is calculated using the fertility rates by age as weights (in general, the reproductive period is between 15 and 49 years of age). When calculated in this way, the mean age is not influenced by a specific population structure (number of mothers in each age group) and is therefore better for geographical and temporal comparisons. Eurostat

Empl agric: Employment in agriculture, hunting and forestry as a percentage of total employment in all NACE sectors. Eurostat

Empl industry: Employment in industry and services as a percentage of total employment in all NACE sectors. Eurostat

GDPPC (PPS): Gross domestic product per capita in PPS - international comparison - EU27 = 100. Eurostat

Marriage rate: Crude marriage rate. The ratio of the number of marriages during the year to the average population in that year. The value is expressed per 1000 inhabitants. Eurostat

Divorce rate: Crude marriage rate. The ratio of the number of divorces during the year to the average population in that year. The value is expressed per 1000 inhabitants. Eurostat

MarrDiv: difference between marriage rate and divorce rate

Educf: Percentage upper secondary, post-secondary non-tertiary, tertiary. The educational attainment level is defined as the highest level of education successfully completed. The expression "level successfully completed" must be associated with obtaining a certificate or a diploma, when there is a certification. unit of measure: percentage. Eurostat

Unemplf: Unemployment rate of females (%) Unemployment rates represent unemployed persons as a percentage of the labour force. The labour force is the total number of people employed and unemployed. Unemployed persons comprise persons aged 15 to 74 who were: a. without work during the reference week, b. currently available for work, i.e. were available for paid employment or self-employment before the end of the two weeks following the reference week, c. actively seeking work, i.e. had taken specific steps in the four weeks period ending with the reference week to seek paid employment or self-employment or who found a job to start later, i.e. within a period of, at most, three months. Eurostat

Recycl: Recycling rate of municipal waste (%). The recycling rate is the tonnage recycled from municipal waste divided by the total municipal waste arising. Eurostat

Old-age-dependency: This indicator is the ratio between the total number of elderly persons of an age when they are generally economically inactive (aged 65 and over) and the number of persons of working age (from 15 to 64). Eurostat

Avg Income: Gross Average Monthly Wages, US$, current exchange rates. UNECE Statistical Database

Country List: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia,

Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom

Table V: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
year	234			2000	2008
TFR	234	1.500	0.235	1.15	2.06
Mean agef birth	234	28.956	1.408	25	31.3
Empl agric	229	2.535	1.604	.444	7.216
Empl industry	230	65.805	4.210	57.301	75.004
GDPpc	234	96.659	45.409	26	279
Marriage rate	231	5.101	1.447	2.9	15.1
Divorce rate	234	2.133	0.713	0.7	3.8
MarrDiv	231	2.974	1.593	0.900	13.4
Educf	234	66.670	12.372	22.9	83.4
Unempf	234	8.658	4.197	2.4	21
Recycl	234	23.135	18.715	0	64.3
Old Age Dependency	234	22.859	3.322	15.6	30.7
Avg income	219	2208.285	1422.609	133.4	6081.9
Log (GDPpc)	234	4.464	0.475	3.258	5.631
Log (Avg income)	219	7.412	0.856	4.893	8.713
Mean agef birthsq	234	840.448	80.347	625	979.690
Unempfsq	234	92.494	92.884	5.76	441

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