The Changing Relationship between Fertility and Economic Development: Evidence from 256 Sub-National European Regions Between 1996 to 2010

Authors: Jonathan Fox, Freie Universitaet; Sebastian Klüsener MPIDR; Mikko Myrskylä, MPIDR

As the economic development of an area increases, the fertility of that area tends to decline. This had been an accepted demographic observation over most of the 20th century, and much research was devoted to understanding why. However, this observation has been challenged over the last few years, beginning with the Myrskylä, Kohler, and Billari (2009) paper which showed that at high levels of socioeconomic development, measured by the Human Development Index, the association between development and fertility changes from negative to positive. Luci and Thevenon (2010) analyze the association between GDP per capita and fertility and find a similar U-shaped association. They attribute the reversal in the fertility-development association to the changing relationship between female employment and fertility. However, so far little is known about whether the change in the association only occurs at the national level or whether it also emerges at the sub-national regional level. If the latter was the case, this would imply that highly developed countries not only experience fertility increases, but that within these countries the most developed regions are taking the lead in this processes. Another advantage of the regional perspective is that it allows singling out the most developed regions of a country as these might already be on an upward fertility trajectory while the national numbers still report a decline. Regional evidence on the U-shaped association would therefore deliver further support for the view that we are in fact witnessing at high levels of development a substantive change in how fertility and economic development are related.

We investigate whether the income-fertility association is reversing at the sub-national level by analyzing data from 19 European countries with at least 4 regions (app. NUTS-1-level) over the period 1996-2010.[1] We focus on Europe since both Myrskylä et al. (2009) and Luci and Thevenon (2010) have shown that most of the countries which have experienced the turn-around reside in Europe. In addition, the quality of the European data and the fact that it comes at the regional level allows us to control for those time-varying, country-level effects that so often confound other research. Our fertility measure is regional total fertility rate, and the measure for economic development is per capita real GDP.

Figures 1 and 2 show cross-sectional correlations between fertility and one-year lagged logged per capita income for each of the 19 European countries. For Western European countries (Figure 1), the evolution of the income-fertility correlation varied from country to country. For example in Spain, the correlation between income and fertility was strongly negative in the middle 1990s, became positive in the 2000s, then dipped again towards the end of the decade. The relationship in Portugal, on the other hand, increased nearly without exception. For the Netherlands and Finland, the correlations remained negative and relatively constant throughout the study period. In Eastern Europe (Figure 2), however, most countries had a rather strong and negative correlation between income and fertility in the 1990s but this correlation weakened markedly in the 2000s so that in all of the Eastern countries the correlations approached zero by the mid 2000s. For Poland and Croatia the correlations even become

[1] These countries are Austria, Belgium, Bulgaria, Czech Republic, Denmark, France, Finland, Germany, Greece, Hungary, Italy, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, and the United Kingdom. Countries part of Europe but which are omitted due having less than four NUTS-1-regions are Estonia, Croatia, Cyprus, Ireland, Latvia, Lithuania, Luxembourg, Malta, and Slovenia. Norway, Russia, and Ukraine are also left out due to regional income information begin still under development.

positive. The lessening of this strong negative relationship for these Eastern European countries is not particularly surprising, since for many of these countries the early 1990s were a period of declining fertility and economic growth. When the fertility decline – partially driven by postponement – slowed down, the negative correlation weakened. In addition, in these countries, the rural areas were not matching the growth in fertility seen in the urban areas. This, combined with the urban areas also growing faster economically (Macours and Swinnen 2008), helps explain the evolution of these fertility-income correlations.

The descriptive correlations shown in Figures 1 and 2 may be confounded by unobserved country differences or time trends. These unobserved effects may include aspects such as national welfare state setups (e.g. family and child care policies), the level of female education or labor force participation, or tempo-effects in fertility. To evaluate whether the change in the fertility-income relationship exists net of such confounders, we specify a panel model that controls for country-level differences and country-specific period effects in fertility. In particular, the model controls for country-specific period effects (not just linear trends), which account for period shocks that could be driven by, for example, a recession or policies that are implemented at the national level. The model is:

$$TFR_{t,r_c} = \chi_c * \lambda_t + \beta_1 \ln(rgdp_{t-1,r_c}) + \beta_2 \ln(rgdp_{t-1,r_c})^2 + \varepsilon_{t,r_c}, \quad r_c \in c \tag{1}$$

where TFR is total fertility rate at time t in region r_c (c denotes the country for region r), $\chi_c * \lambda_t$ controls for country-by-year effects, rgdp is real per capita GDP, and ε_{t,r_c} is the error term. This model assumes that unobserved effects correlated with both income and fertility do not vary across regions within the same country in the same year. Considering that the mechanisms most commonly associated with the relationship between income and fertility, such as female labor force participation, institutions that promote a work-family life balance, and female educational enrollment, are for Europe generally administered at the national level, our assumption is preferable to the standard fixed effects framework which assumes that these types of mechanisms do not vary through time. Equation 1 is estimated for the full set of countries and separately for West and East Europe; Table 1 shows the results.

The results from Equation 1 are fairly consistent across samples; the full sample, Western sample and Eastern sample all show convex relationships between income and fertility. The coefficient estimates for the sample of Western countries are, however, not statistically significant. From the full sample, the coefficient estimates indicate that at per capita income levels of about 20,000 Euros, a 1 percent change in per capita real GDP results in about a 0.19 drop in a region's TFR. However, if per capita income grows to 40,000 euros, then a 1 percent change in per capita GDP results in about a 0.12 increase in a region's TFR. Figure 3 plots the change in fertility implied by these coefficients, as well as the estimated level of fertility, for different levels of logged real GDP. Using the coefficient estimates from the model given in Equation 1 and the full set of European Regions, the relationship between income and fertility should reverse from negative to positive when per capita real GDP is about 25,000 Euros. Adjusted to dollars, this estimate is relatively close to that given in Luci and Thevenon (2010). Additionally, our estimates also suggest that it would take extremely high levels of per capita real GDP to reach replacement levels of fertility.

We remain ambivalent as the specific mechanisms causing the relationship between fertility and income and its apparent reversal among European regions, however the effect does seem to exist at the sub-national level as well. These findings support the existence of this convex fertility-income relationship, but suggest that it takes very high levels of per capita income to reach it. Preliminary steps

have been taken to also evaluate the effect separately for different age groups, with results suggesting that it was the older age groups driving this fertility rebound.

References

Myrskylä, Mikko, Hans-Peter Kohler, and Francesco C. Billari. (2009) “Advances in development reverse fertility declines.” Nature, vol. 460, 741-743.

Luci, Angela and Olivier Thévenon. (2010) “Does economic development drive the fertility rebound in OECD countries?” INED Working Paper 167.

Macours, Karen and Johan F.M. Swinnen. (2008) “Rural-urban poverty differences in transition countries.” World Development, vol. 36(11), 2170-2187.

Figure 1

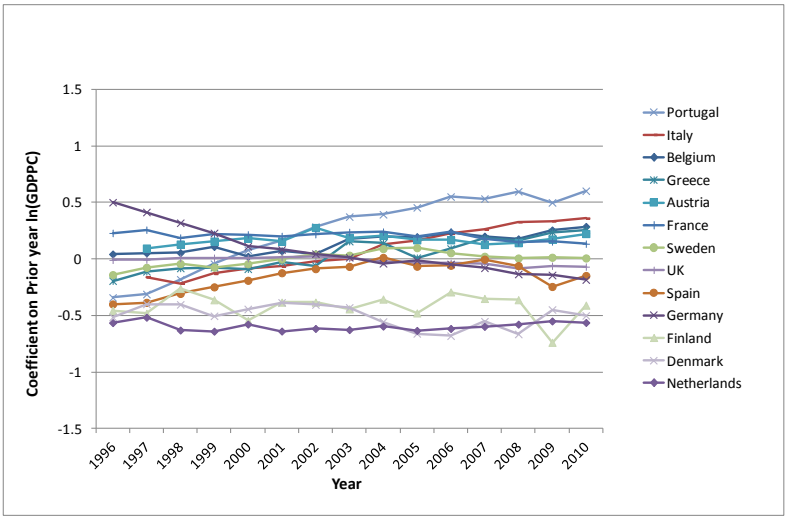

Figure 2

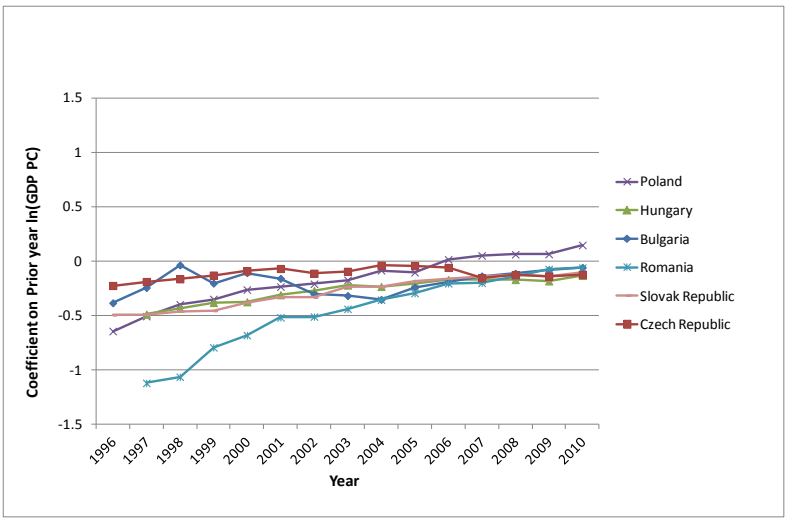

Figure 3

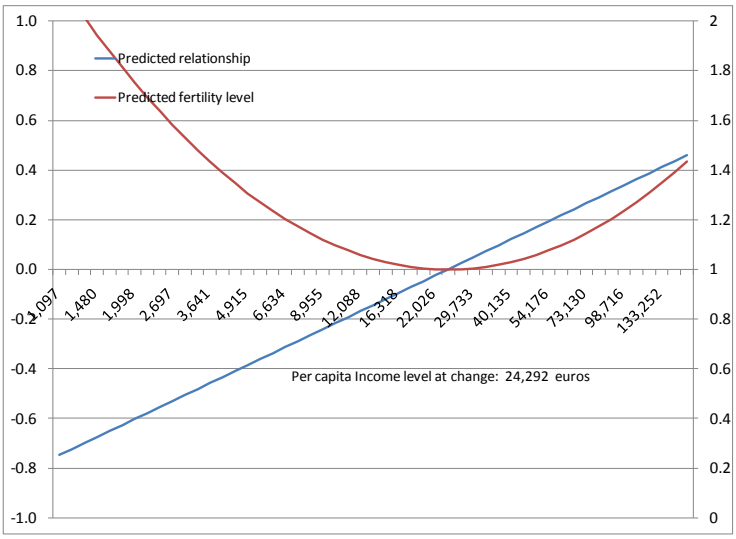

Table 1

	Full Sample	Western European Regions	Eastern European Regions
Variables	(1)	(2)	(3)
Prior year ln(RGDP)	-2.436***	0.1009	-3.125***
	0.277	(0.492)	(0.336)
Prior year ln(RGDP) squared	0.121***	-0.0042	.1539***
	0.014	(0.024)	(0.018)
Constant	14.155**	1.531	17.220***
	(1.354)	(2.474)	(0.764)
Regional Fixed Effects	N	N	N
Year Fixed Effects	N	N	N
Country-year interacted fixed effects	Y	Y	Y
Observations	3,747	3,019	728
R-squared	0.7727	0.7539	0.6477

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1