Does economic development drive the fertility rebound in OECD countries?

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1) Motivation

1) Recent decade: reversal of fertility trends propagating to a growing number of countries?

2) Consequences of economic development on fertility? (in the medium-long term)

3) Controversial predictions: fertility pro-cyclical, contra-cyclical?

4) Which component of GDP matters?

Fertility trends in OECD countries

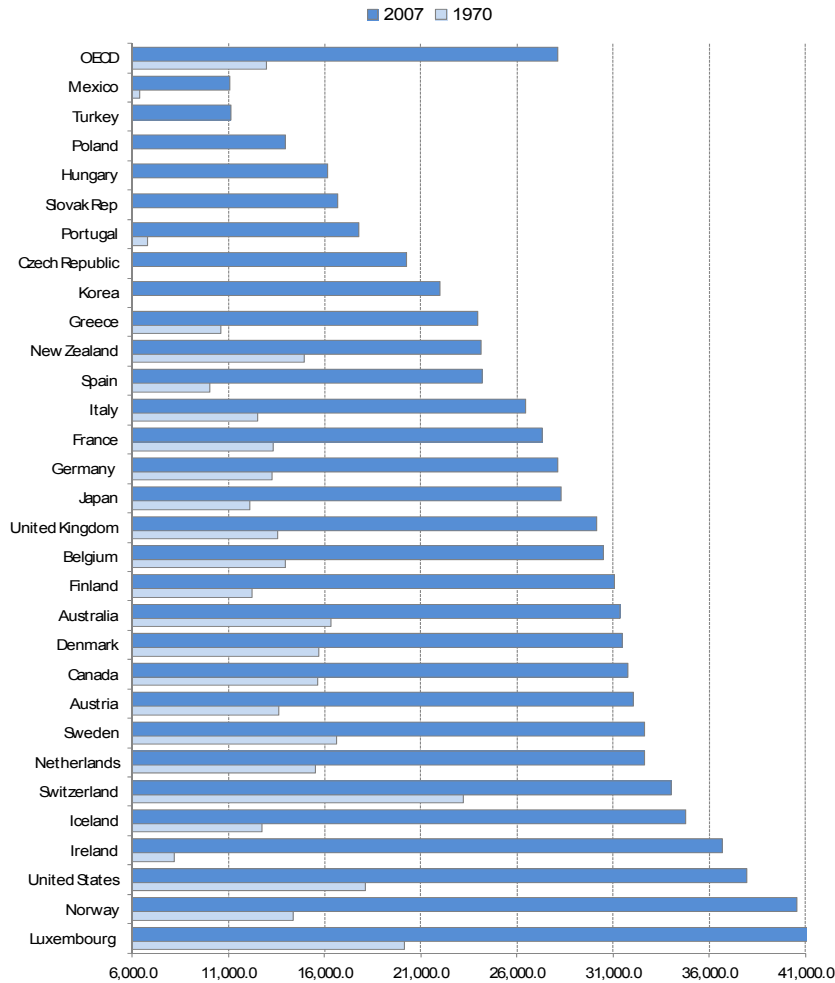**Panel 1: Total period fertility rate
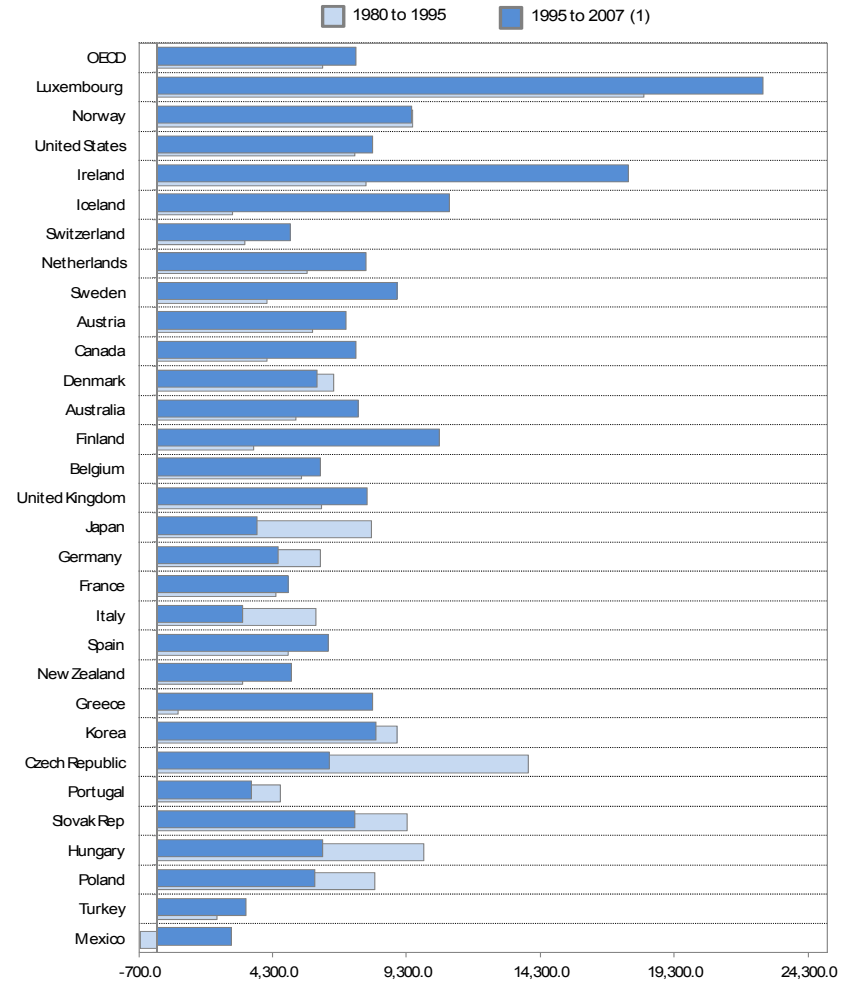1960 – 2008**

**Panel 2: relative change compared to 1995
1980-2008**
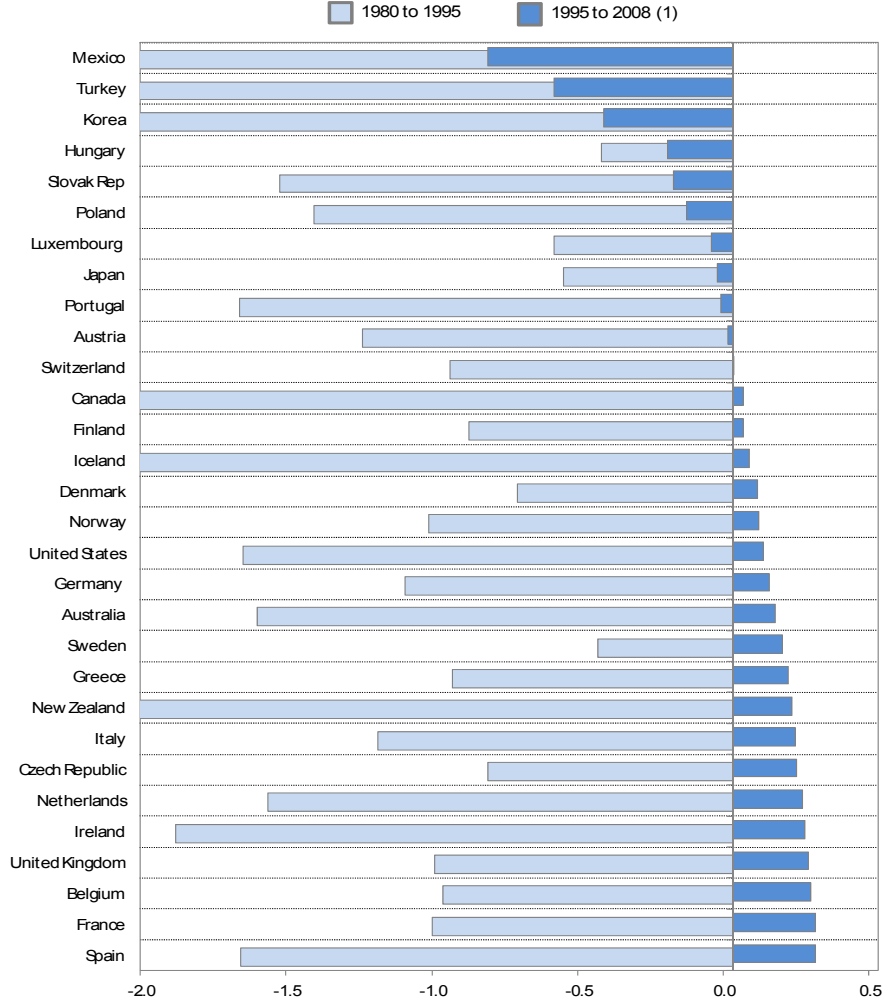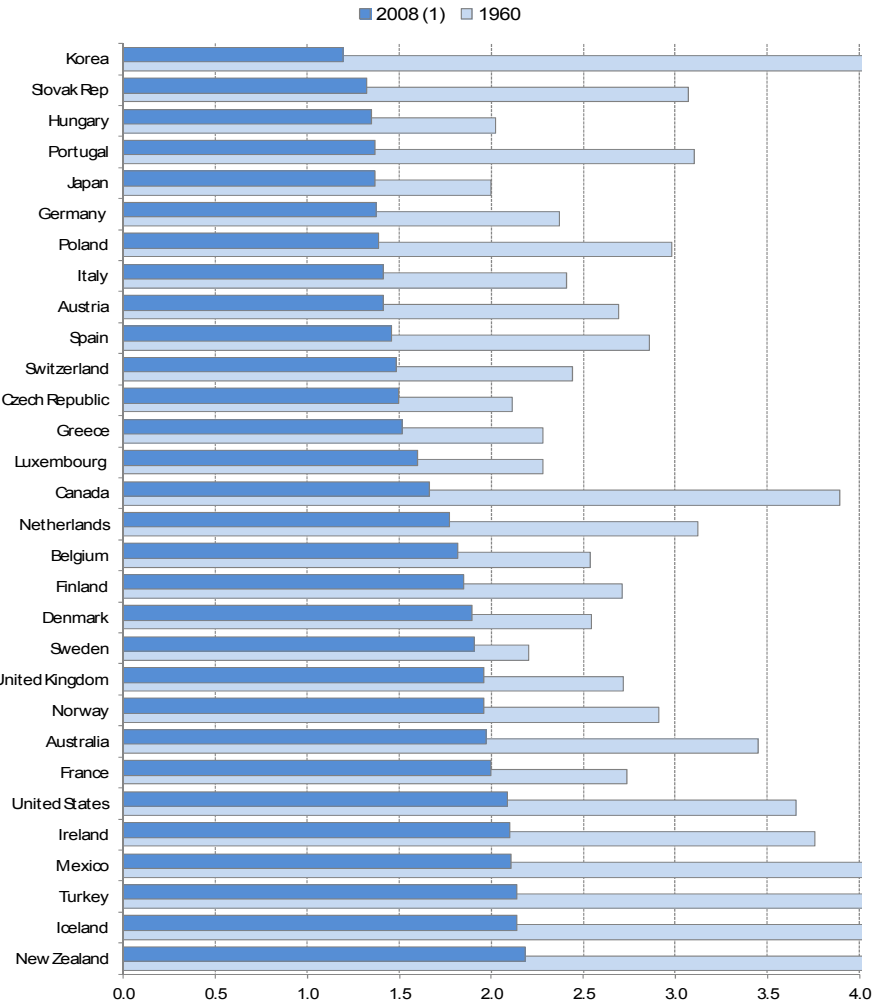
Source: OECD Family database

Trends in GDP per capita US$ (in constant 2005 prices, PPP)

Panel 1: GDP values in 1970 and 2007

■ 2007 ☐ 1970

Countries (top to bottom): OECD, Mexico, Turkey, Poland, Hungary, Slovak Rep, Portugal, Czech Republic, Korea, Greece, New Zealand, Spain, Italy, France, Germany, Japan, United Kingdom, Belgium, Finland, Australia, Denmark, Canada, Austria, Sweden, Netherlands, Switzerland, Iceland, Ireland, United States, Norway, Luxembourg

Axis: 6,000.0 11,000.0 16,000.0 21,000.0 26,000.0 31,000.0 36,000.0 41,000.0

Panel 2: variations compared to 1995

☐ 1980 to 1995   ■ 1995 to 2007 (1)

Countries (top to bottom): OECD, Luxembourg, Norway, United States, Ireland, Iceland, Switzerland, Netherlands, Sweden, Austria, Canada, Denmark, Australia, Finland, Belgium, United Kingdom, Japan, Germany, France, Italy, Spain, New Zealand, Greece, Korea, Czech Republic, Portugal, Slovak Rep, Hungary, Poland, Turkey, Mexico

Axis: -700.0 4,300.0 9,300.0 14,300.0 19,300.0 24,300.0

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2) Economic development and fertility: a two-way-relationship

The impact of fertility on economic outcomes:

Standard growth models:
-population growth leads to a "dilution" of capital if the economy is characterised by a fixed supply of capital and diminishing returns of labour

"**Demographic dividend**" of low fertility:
-reduction of family size increases private savings and enables households to invest in human capital that boost economic growth
-lower fertility enables women to participate in the labour market and therewith is positive for economic growth

Endogeneous growth theory rather anticipates positive impact of fertility on economic outcomes by:
- increased innovations, transfers of technologies and knowledge exchange
- young workers have higher productivity

2) Economic development and fertility: a two-way-relationship

The impact of economic growth on fertility:

Positive impact:

- microeconomic theory: **income effect** *(Becker, 1960)*

Negative impact:

- microeconomic theory: **substitution effect** *(Becker, 1960)*

- time allocation models: **women's wage employment as the opportunity cost of children**

- **quality** focus *(Willis, 1973)*

Net impact is <u>ambiguous</u>, but income effect is expected to dominate when wealth is sufficiently high and fertility low.
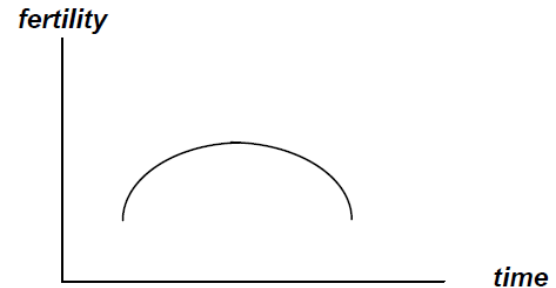
Prediction: U shape?
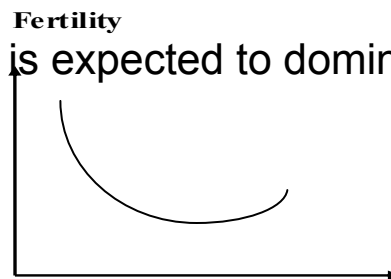
Fertility

GDP per capita

3) Previous empirical findings
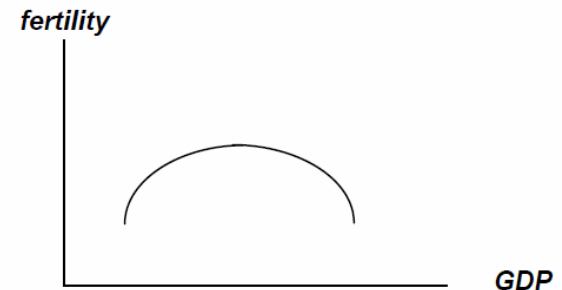
Concave impact of economic outcomes on fertility:

Butz and Ward (1979):
- time series USA

→ increase during 1960s,

decrease during 1970s

An and Seung-Hoon (2006):
- 25 OECD countries, 2000

→ inverted U-shaped relationship
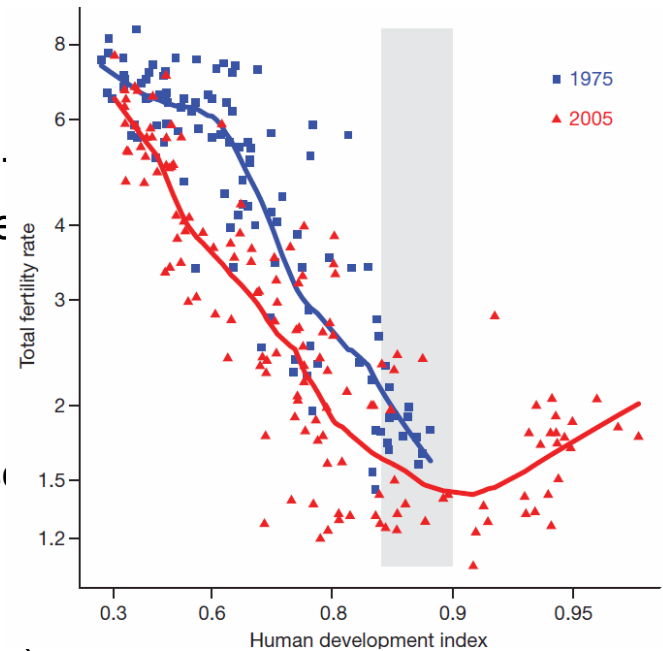
between GDP and fertility

3) Previous empirical findings

Convex impact of economic outcomes on fertility:

Myrskylä, Kohler and Billari (2009):

- +100 countries, 19
- difference-in-differe

estimator:

control for non-stationarity

- lagged exogenous

control for endogeneity fertility first decrease

increases with HDI

Norway, Ireland)

no one-step estimation model indicating an
explicit turning point

4) Data discussion

Objectives:

- designation of the **driving force** behind the **fertility rebound** (GDP per capita? If yes, what is behind GDP per capita?)
- One step estimation model indicating a **clear turning point** (level of GDP per capita? level of TFR?)
- Test robustness of results by using different indicators of fertility: TFR, tempo-adjusted TFR (Bongarts-Feeney)

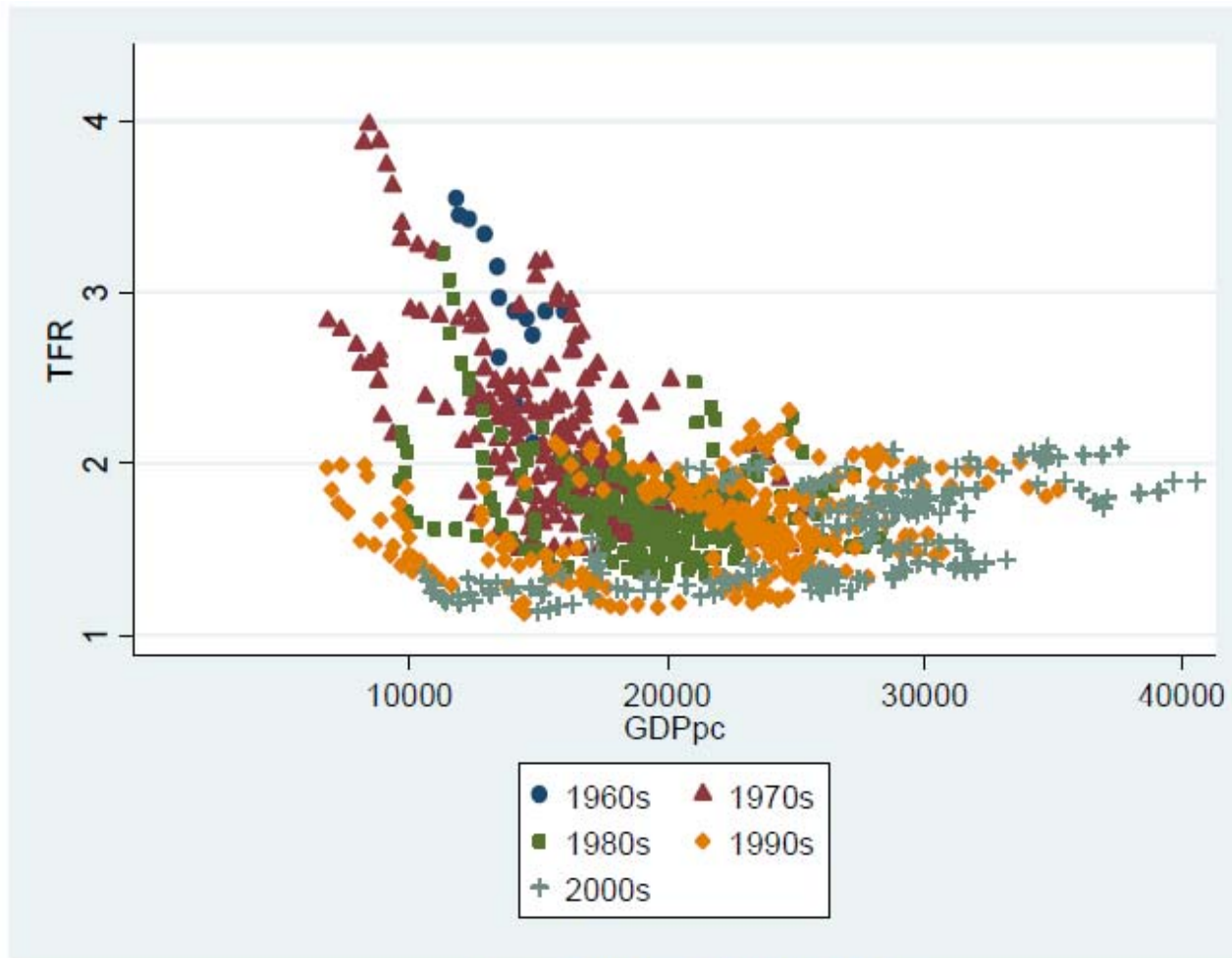**30 OECD countries, 1970-2007**

impact of GDP per capita (in US $, PPP) on total fertility rates (TFR)

decomposition of GDP per capita

4) Data discussion
Total fertility rates against GDP per capita (PPP)

Source: OECD Family Data Base (2009)

Hypothesis

Convex impact of GDP per capita on TFR

→ new estimations with **panel data**: 30 OECD countries, 1960-2007

→ allows to address **endogeneity** and **non-stationarity**

→ **one-step** estimation model: **U**-shaped pattern of fertility along the pr
of economic development: **clear turning point**

Estimation Equation

$$\ln TFR_{i,t} = \beta_1 + \beta_2 * \ln GDPpc_{i,t} + \beta_3 * \ln(GDPpc_{i,t})^2 + \varepsilon_{i,t}$$
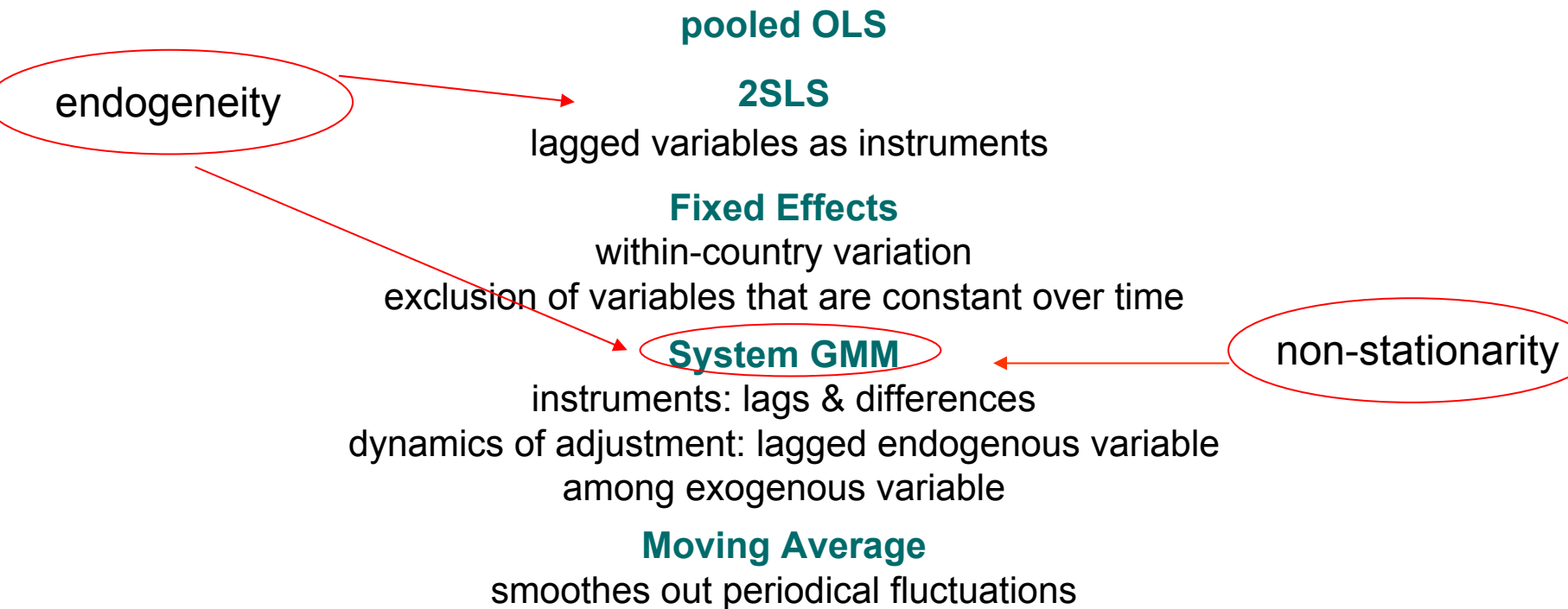
coefficient of (*lnGDP*)² β_3 **significantly positive**:

→ indicates curve's **convexity**

→ coefficient allows **calculation** of **low point** in the data area

5) **Empirical analysis**
Estimation methods

The econometric methods:

pooled OLS

2SLS
lagged variables as instruments

Fixed Effects
within-country variation
exclusion of variables that are constant over time

System GMM
instruments: lags & differences
dynamics of adjustment: lagged endogenous variable
among exogenous variable

Moving Average
smoothes out periodical fluctuations

endogeneity

non-stationarity

5) Empirical analysis
Estimation results

Endogenous variable:	total fertility rate (*TFR*)					
Type of regression:	Pooled OLS	IV (2SLS)	Fixed Effects	Between Effects	Random Effects	First Difference Estimator
Regressors:						
lnGDPpc	-15.63***	-12.36***	-16.94***	-19.14*	-16.89***	-13.75***
	(-14.91)	(-11.15)	(-20.87)	(-2.05)	(-20.86)	(-11.18)
lnGDPpc²	0.760***	0.608***	0.815***	0.960	0.813***	0.716***
	(13.95)	(10.47)	(19.45)	(1.98)	(19.45)	(11.10)
constant	81.92***	64.39***	89.54***	97.10*	89.14***	-0.0362***
	(16.27)	(12.19)	(22.76)	(2.18)	(22.72)	(-11.12)
N	1050	900	1050	1050	1050	1020
nb. of countries:	30	30	30	30	30	30
time period:	1960-2007	1960-2007	1960-2007	1960-2007	1960-2007	1960-2007
R^2:	0.460	0.35	0.542 (within)	0.327 (between)	0.4580 (overall)	0.110
R^2 adj.:	0.459	0.349	0.542	0.327		0.108
nb. of instruments:		1 (5 year-lags)				
nb. of estim. param.:	3	3	3	3	3	3
Hausman (p-value):					0.0371	
estim. minimum GDPpc $ (PPP):	29 200	26 000	32 600			
estim. minimum TFR:	1.56	1.57	1.51			

t statistics in parentheses, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

significantly positive coefficients of *(lnGDPpc)²* confirms convex impact

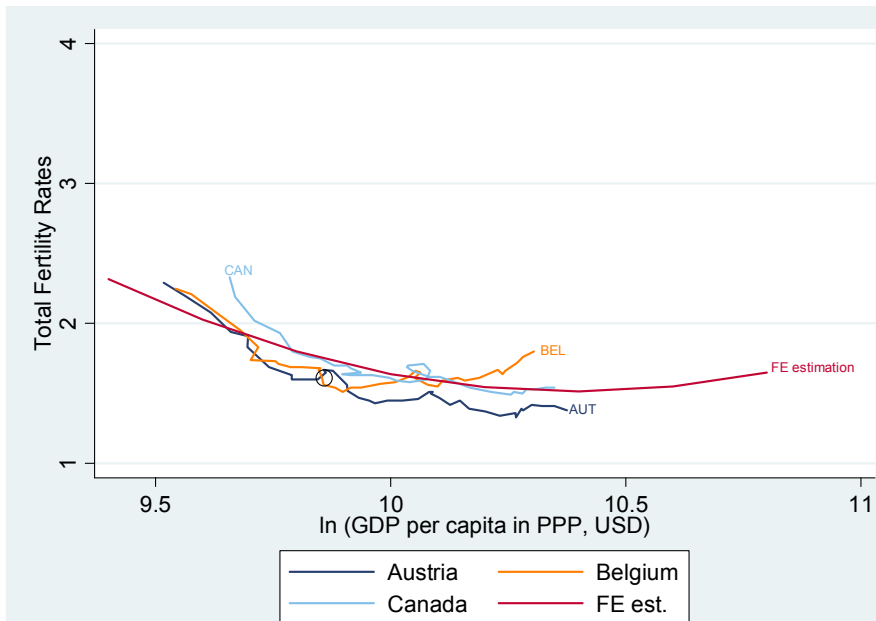# 5)   Empirical analysis

FE estimation against actual values (2006):
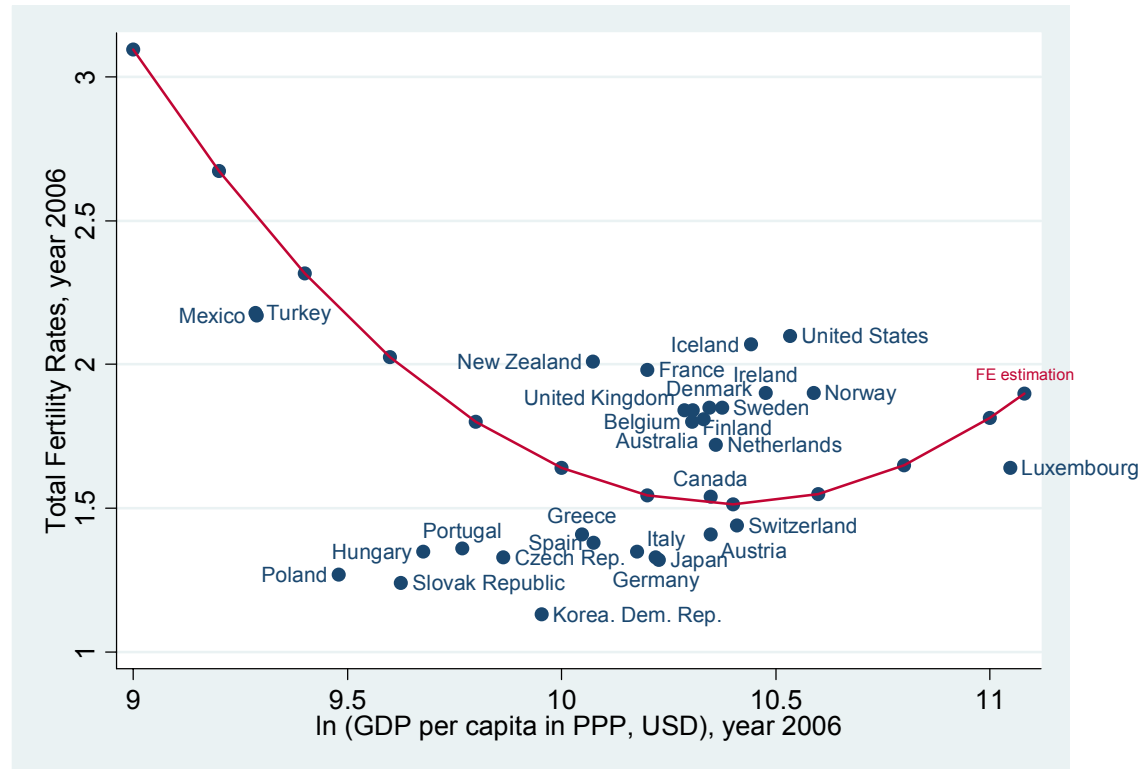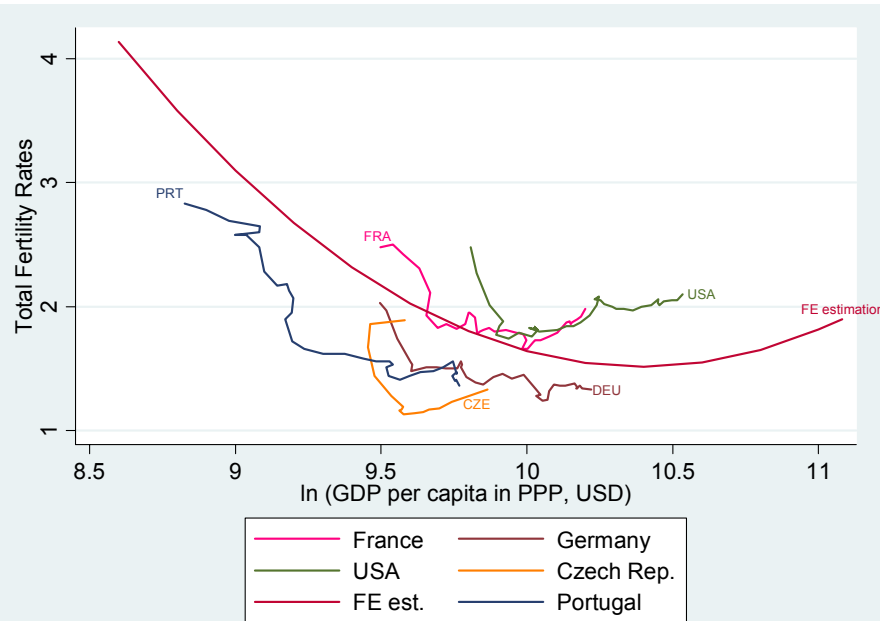

calculation red line: *TFR* = 89.,54 – 16.84 x *lnGDP* + 0,815 x (*lnGDPpc*)²

minimum: GDP per capita = 32 600 USD (PPP), TFR=1.51

5) Empirical analysis
Estimation results

FE estimation against real within-country variations:

- inverse J shape confirms a change in the medium-term relationships between economic development and fertility

- Nordic and English-speaking countries, Netherlands, Belgium, France and New Zealand have much higher fertility levels as their income levels indicate => economic development only a partial explanation of fertilty re-increase

- TFR/GDP patterns on a lower fertility level in Germany, Austria, Japan, Southern and Eastern Europe => resistance of low fertility despite economic growth

economic development is likely to induce fertility rebound, but is **NOT sufficient** to lift fertility on a significantly higher level in all OECD countries

driving factors behind fertility rebound? what is behind GDP per capita?

5) **Empirical analysis**
Control for birth postponement and income distribution

Endogenous variable:	tempo-adjusted total fertility rate (*adjTFR*)				
Type of regression:	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
Regressors:					
lnGDPpc	-12.39***	-12.96***	-12.25***	-15.95***	-16.28***
	(-7.89)	(-8.49)	(-7.71)	(-9.91)	(-11.68)
lnGDPpc²	0.608***	0.621***	0.605***	0.770***	0.805***
	(7.69)	(8.10)	(7.56)	(9.55)	(11.43)
p90_p10	0.129***				
	(4.86)				
p90_p50		1.109***			
		(6.29)			
p50_p10			0.307***		
			(4.20)		
p90_p30				0.732***	
				(8.51)	
low_pay_incidence					0.0495***
					(9.67)
constant	64.46***	67.28***	63.23***	82.66***	83.15***
	(8.27)	(8.88)	(8.02)	(10.31)	(12.10)
N	242	242	242	226	171
nb. of countries:	15[+]	15[+]	15[+]	14[++]	13[+++]
time period:	1960-2007	1960-2007	1960-2007	1960-2007	1960-2007
R² within:	0.315	0.356	0.298	0.468	0.594
R² adj.:	0.263	0.308	0.245	0.428	0.555

t statistics in parentheses, * $p<0.05$, ** $p<0.01$, *** $p<0.001$

[+] OECD countries without: Australia, Belgium, Canada, France, Germany, Greece, Iceland, Ireland, Korea, Luxembourg, Mexico, New Zealand, Portugal, Switzerland, Turkey ,

[++] OECD countries without 15 countries listed above and Spain.

[+++] OECD countries without 15 countries listed above and Italy and Norway.

6) Decomposition of GDP per capita

1 **GDPpc = interaction term 3**

labour productivity x avrg. working hrs per worker x employment ratio

with:
labour productivity = GDP/ sum of working hours
avrg. working hrs per worker = sum of working hours / active population
employment ratio = active population / total population

2 **Employment ratio (25-54)=**

employment rate (ages 25-54) x ratio active population

with:
ratio active population = active population (ages 25-54)/ total population (ages 25-54)

3 **Disaggregation men / women =**

avrg. working hrs per men, per women

employment rates (ages 25-54) men, women

ratio active population men, women

6) Decomposition of GDP per capita

Endogenous variable:	tempo-adjusted total fertility rate (adjTFR)			
Type of regression:	Pooled OLS	IV (2SLS)	Between Effects	System GMM
Regressors:				
ln(labour productivity)	0.0465	0.354*	0.416	0.152
	(0.31)	(2.20)	(1.40)	(1.78)
ln(avrg. hrs. per worker men)	1.289*	2.412***	2.108	0.917*
	(2.11)	(4.12)	(2.28)	(2.17)
ln(avrg. hrs. per worker women)	-0.874**	-1.369*	-0.841	-0.430*
	(-2.83)	(-2.48)	(-1.66)	(-2.01)
ln(employment rate 25-54 men)	-0.357	-1.369*	-1.422	0.947
	(0.52)	(2.48)	(-1.36)	(1.63)
ln(employment rate 25-54 women)	0.601**	0.904***	1.039*	0.377***
	(3.30)	(5.02)	(3.32)	(3.58)
ln(ratio active population men)	-5.360	-3.031	-8.782	0.542
	(-1.31)	(-0.82)	(-1.12)	(0.22)
ln(ratio active population women)	3.797	-0.690	5.860	-3.263
	(0.82)	(-0.16)	(0.60)	(-1.20)
lagged adjTFR				0.692***
				(7.94)
constant	3.910	9.378	4.756	1.671
	(0.58)	(1.31)	(0.36)	(0.41)
N	44	30	44	39
nb. of countries:	16[+]	16[+]	16[+]	16[+]
time period:	1980-2005	1980-2005	1980-2005	1980-2005
R^2:	0.451	0.677	0.816 (between)	
R^2 adj.:	0.344	0.574	0.655	

OECD countries without AUS, BEL, CAN, FRA, GER, GRE, JAP, KOR, LUX, MEX, NZ, SWI, TUR

- Fertility recovery goes hand in hand with the increase in female employment rates

- However, an increase in women's average working hours have a significantly negative impact on fertility.

⇒ Thus, while the diffusion of female labour market participation is positive for fertility, working too many hours still curb fertility increase: working more than the current average (less than 40 hours per week in our sample) is likely to alter fertility increase.

- By contrast, men's working hours have a significantly positive impact on fertility.

⇒ fertility still increases in a gender-unbalanced context of division of work.

⇒ The finding of a positive impact of female employment and a negative impact of female working hours on fertility suggests that reconciliation issues play an important role for women's decision to have children.
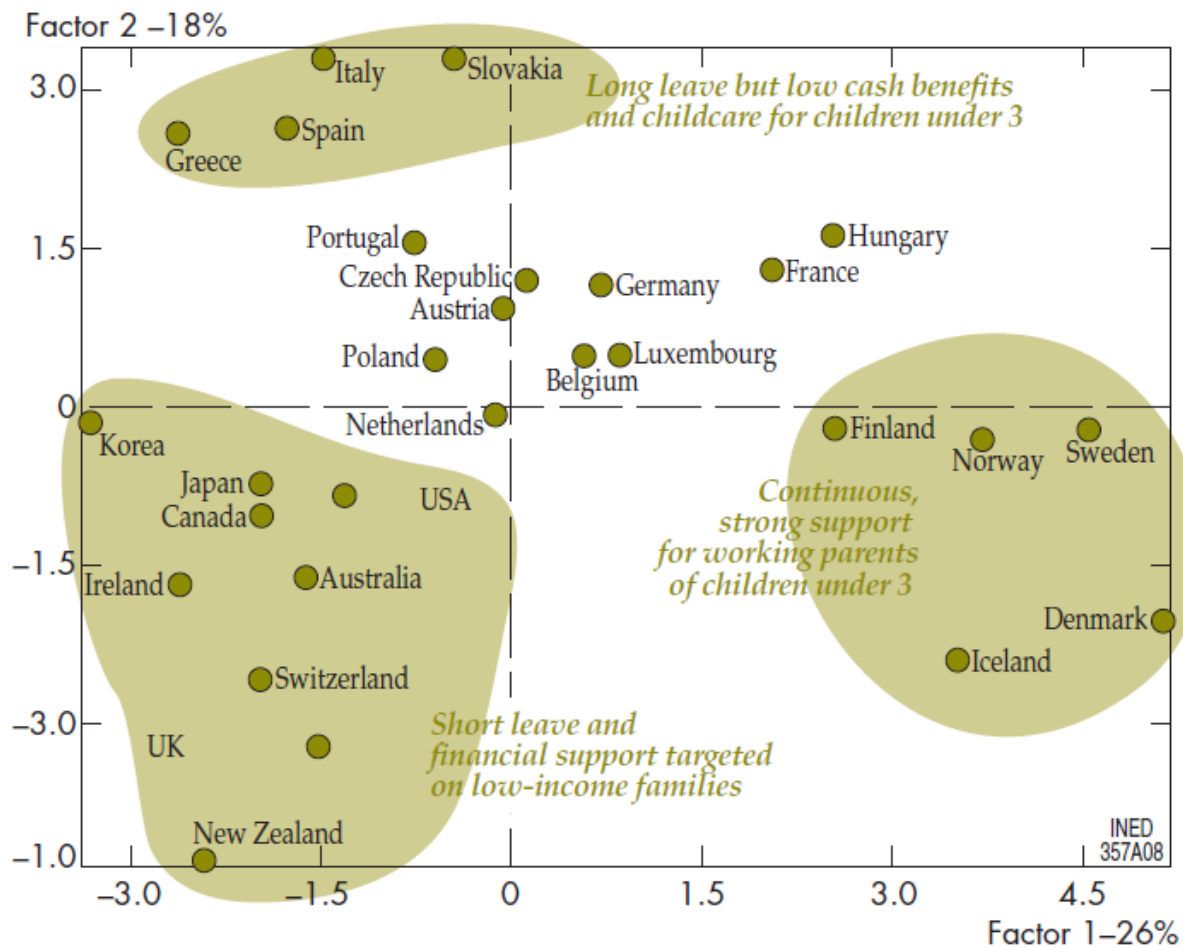
Total fertility rates and female employment rates in OECD countries in 2005
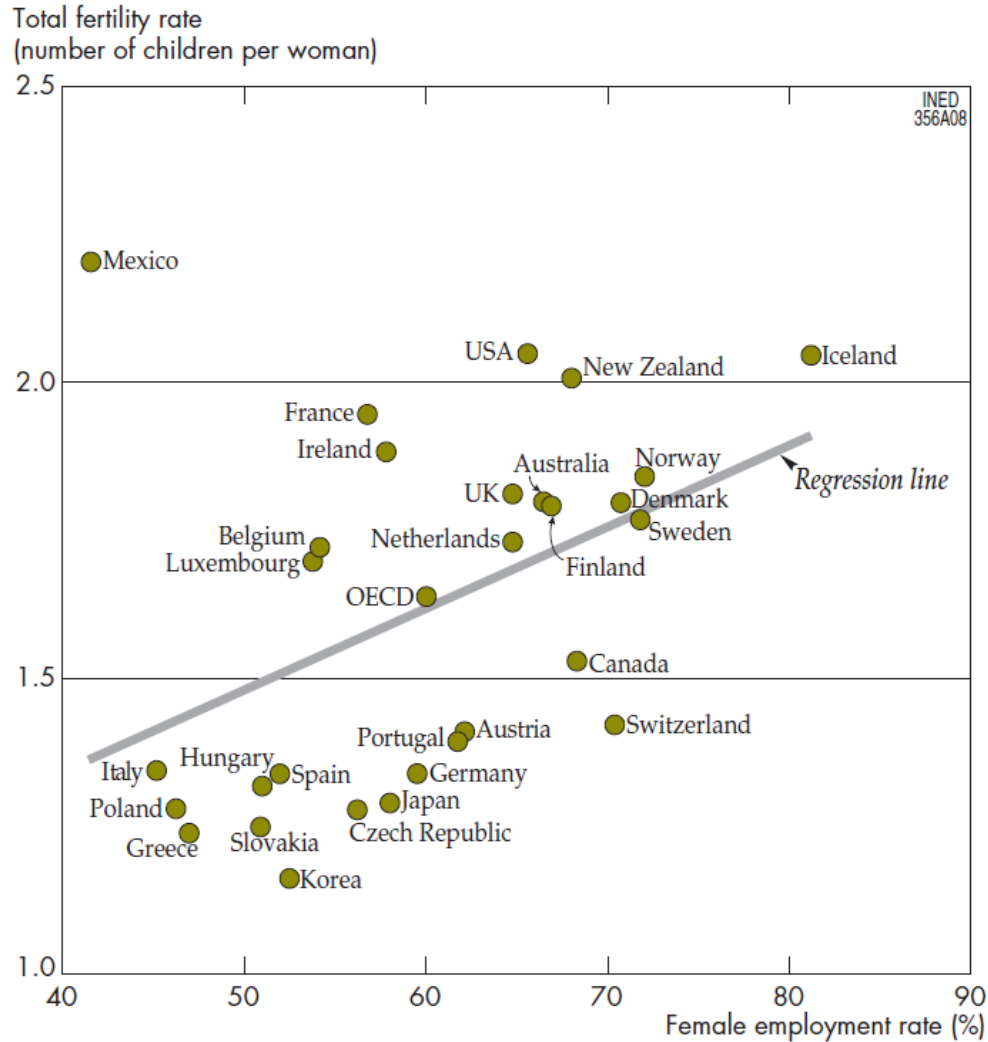
Source: OECD

(Olivier Thévenon, *Population & Societies*, 448, INED, September 2008)

OECD countries by family policy

Source: OECD

(Olivier Thévenon, *Population & Societies*, 448, INED, September 2008)

7) Conclusion

- Changing nature of the impact of economic development on fertilty is confirmed
  - within country trends stronger than cross-country variations
  - holds even when adjusted-tempo TFR are considered
  - (future development: test results using age-specific fertility rates)

- But economic development is not sufficient to lift fertility on a significantly higher level in all OECD countries

  => unobserved factors beyond growth encourage or restrain fertility

- Female employment is positively correlated with fertility i => economic advancement not only increases women's labour market opportunities, but also increases reconciliation possibilities for parents (public / private services) ?

  => to be investigated in the future