



Advances in Development Reverse Fertility Declines

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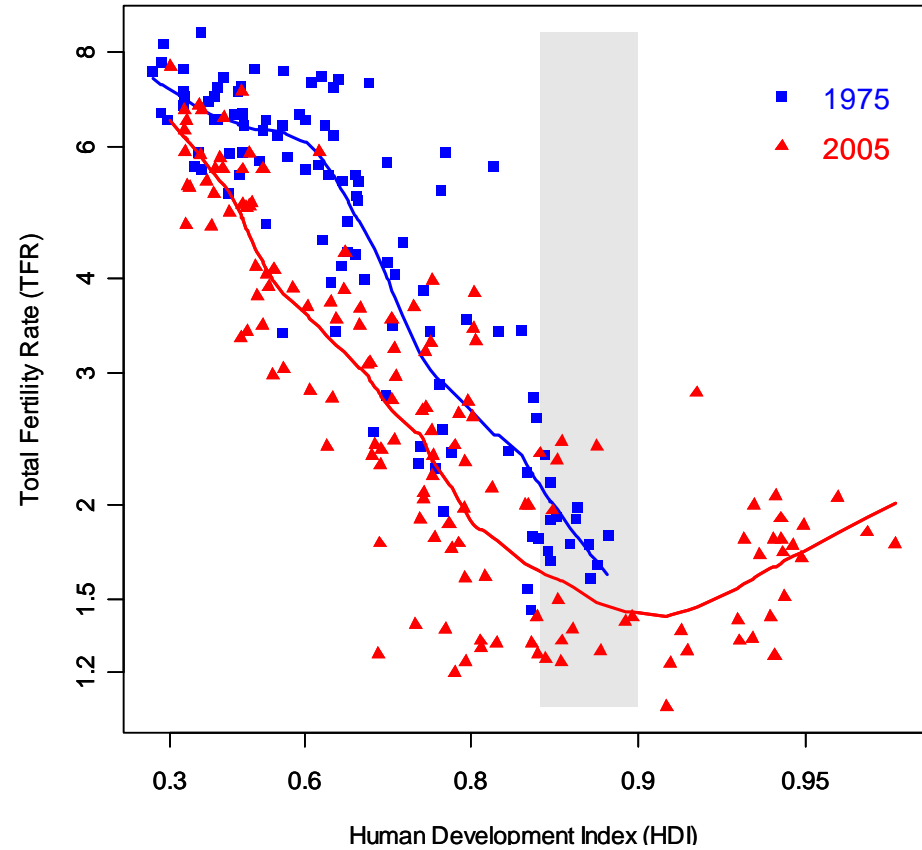
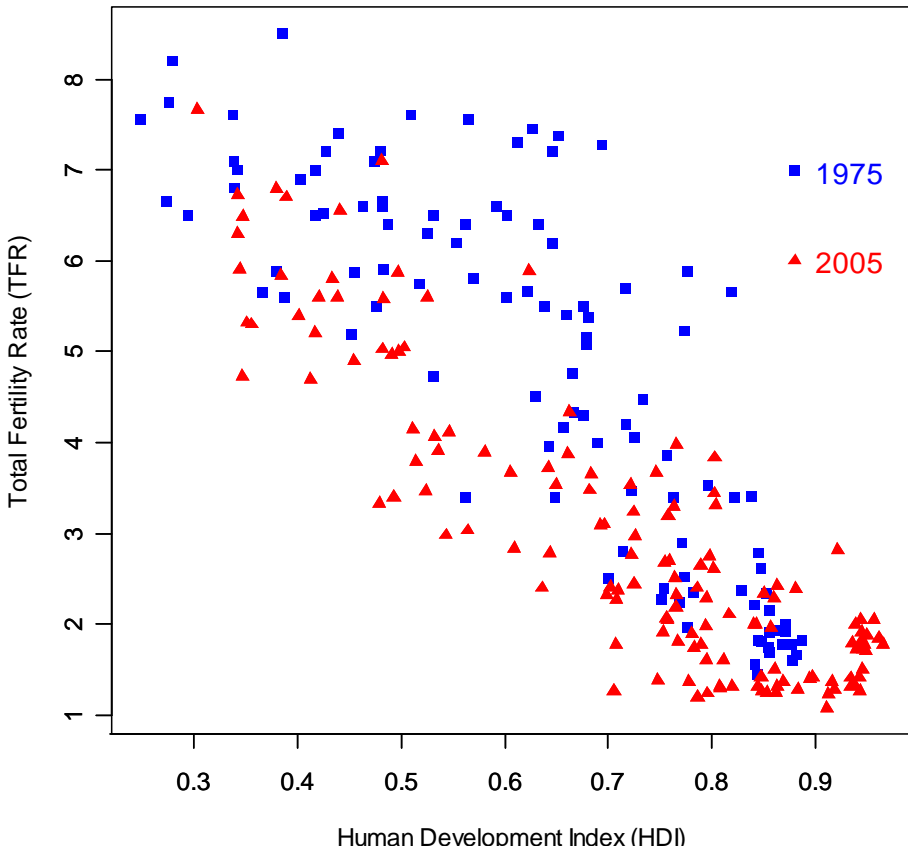
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Human Development Index and TFR: 1975 & 2005



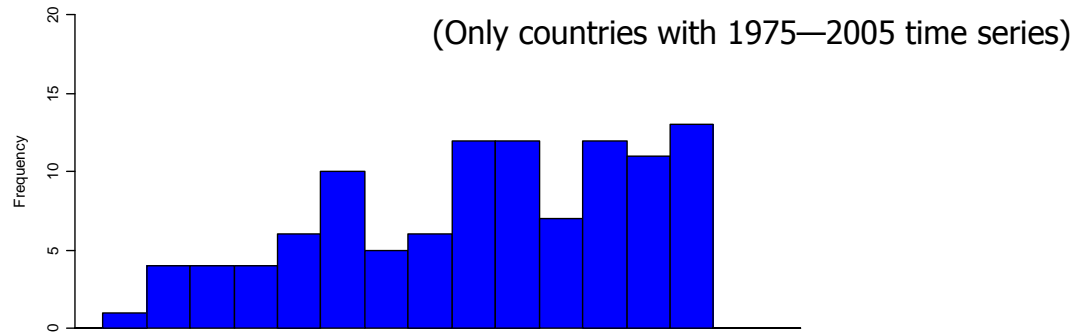


Human Development Index

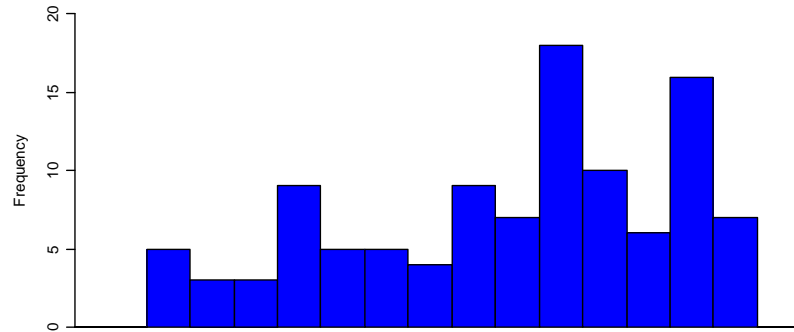
- Human Development Index (**HDI**)
 - *mortality conditions*: life expectancy at birth
 - *Knowledge*: adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio
 - *Standard of living*: gross domestic product (GDP) per capita at purchasing power parity (PPP) in USD
 - *Constant scaling values* to ensure intertemporal comparability (since year 2000)
 - Recompute based on *World Bank Development Indicators*
 - Longitudinal 1975–2005 data available for 100 countries

HDI Distribution Over Time

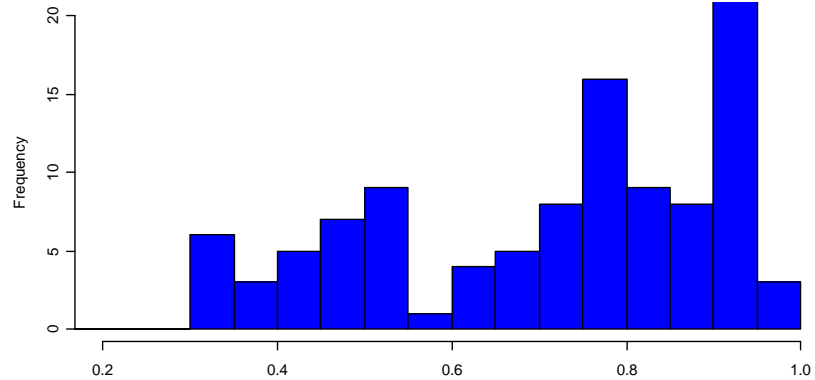
1975



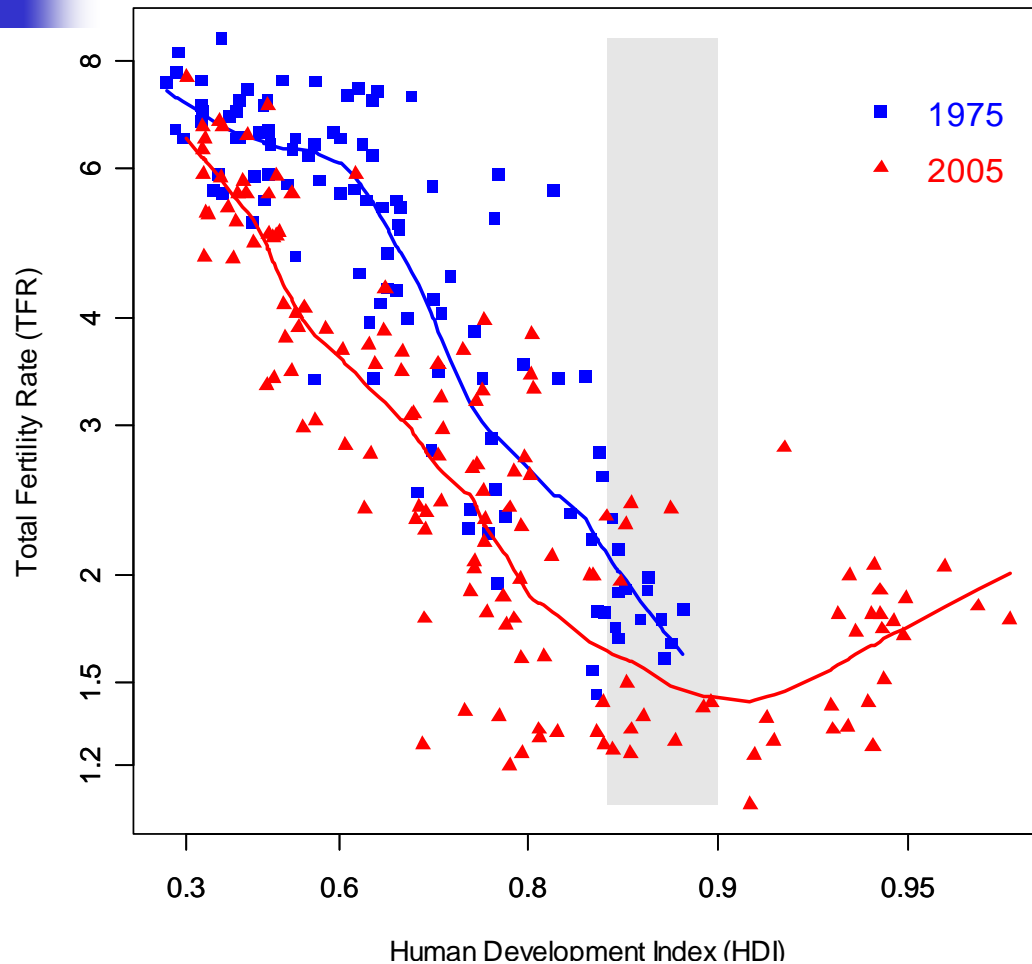
1990



2005



Reversal in HDI – TFR correlation



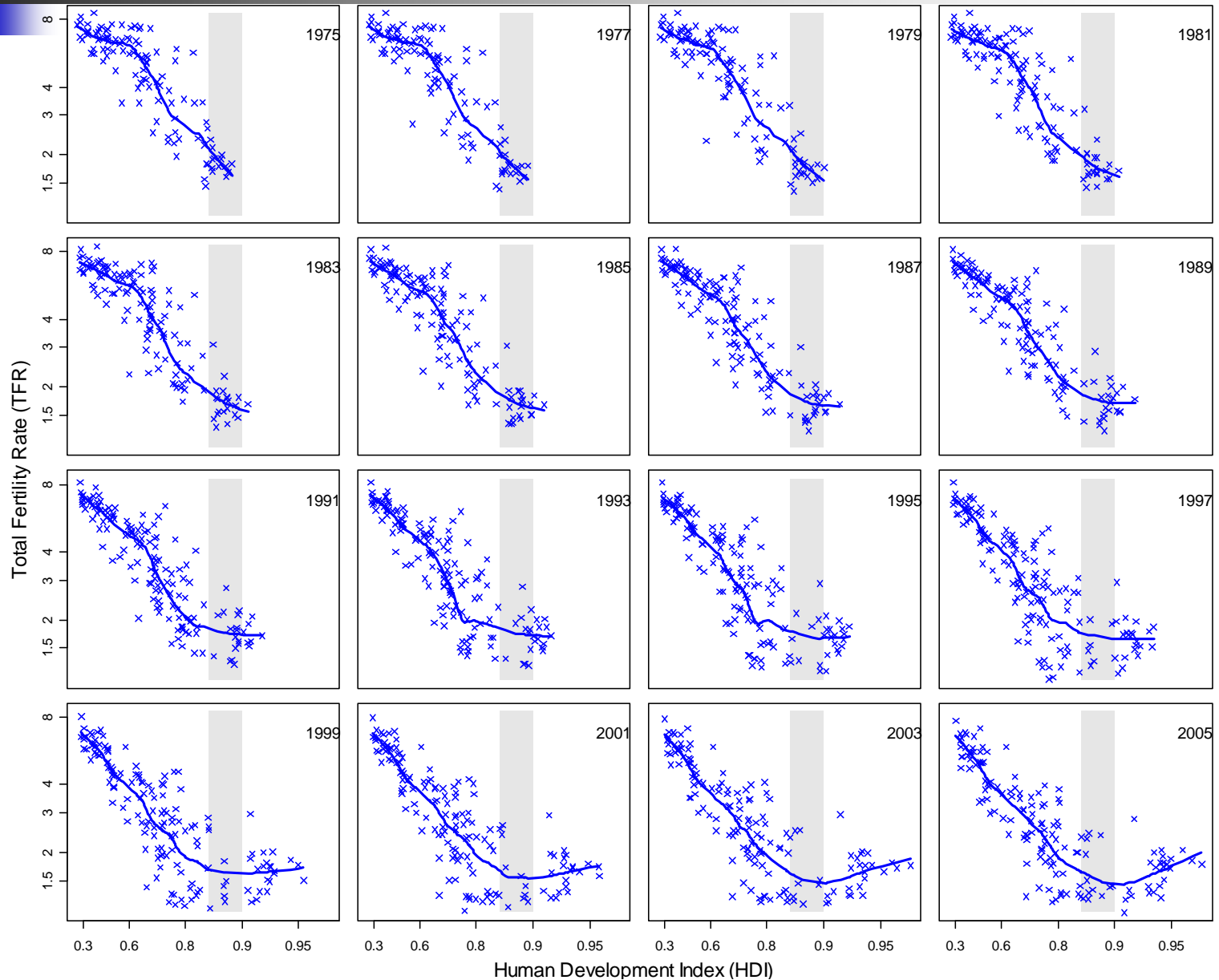
2005 correlations for countries with HDI $\geq .9$:

TFR – HDI rank correlation: $+0.55$ ($p < 0.01$)

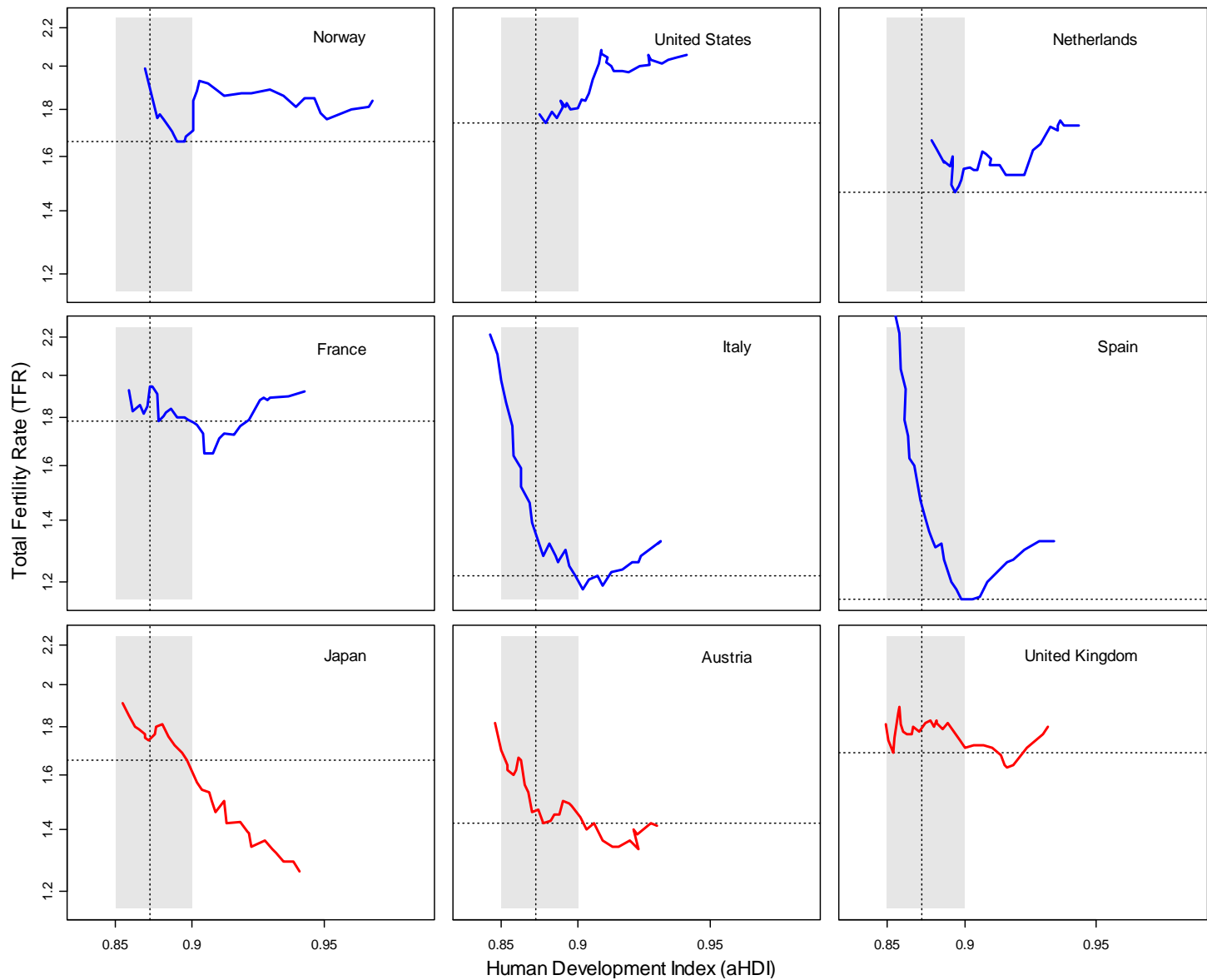
Transformed(TFR) – transformed(HDI) correlation: $+0.42$ ($p < 0.05$)

	HDI	TFR
Australia	0.966	1.77
Norway	0.961	1.84
Iceland	0.956	2.05
Ireland	0.950	1.88
Luxembourg	0.949	1.70
Sweden	0.947	1.77
Canada	0.946	1.51
Netherlands	0.945	1.73
Finland	0.945	1.80
France	0.945	1.92
United States	0.944	2.05
Japan	0.943	1.26
Denmark	0.943	1.80
Switzerland	0.942	1.42
Belgium	0.940	1.72
New Zealand	0.938	2.00
Spain	0.938	1.33
United Kingdom	0.936	1.80
Italy	0.934	1.32
Austria	0.934	1.41
Israel	0.922	2.82
Greece	0.918	1.28
Germany	0.916	1.36
Slovenia	0.913	1.23
S. Korea	0.911	1.08

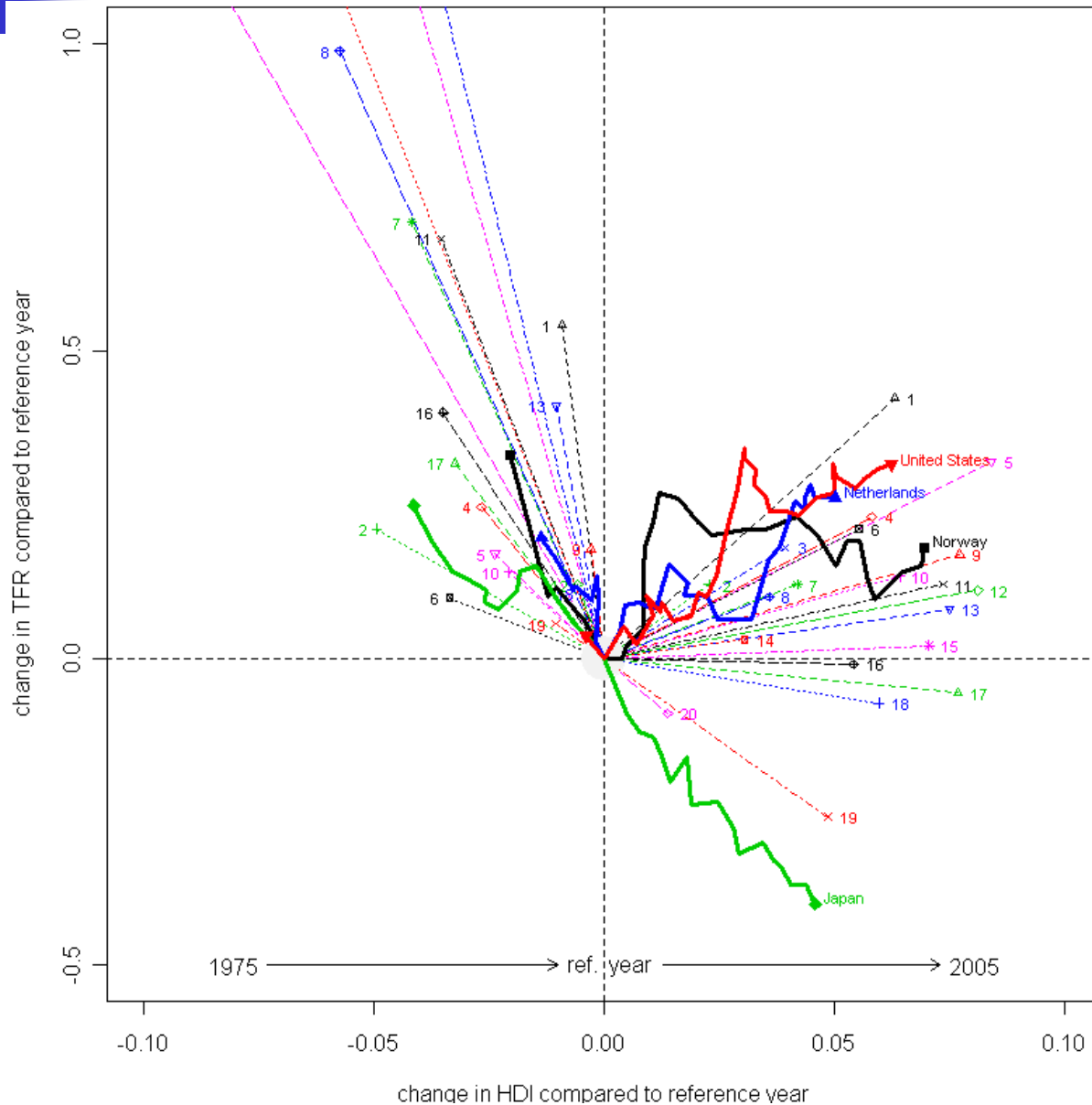
Emergence of positive TFR – HDI association



Longitudinal HDI-TFR trends



TFR trend reversal around HDI \approx .85-.9



Countries ending in top right quadrant in 2005:

- Norway,
- Netherlands,
- United States,
- (1) Denmark,
- (2) Germany,
- (3) Spain,
- (4) Belgium,
- (5) Luxembourg,
- (6) Finland,
- (7) Israel,
- (8) Italy,
- (9) Sweden,
- (10) France,
- (11) Iceland,
- (12) United Kingdom,
- (13) New Zealand,
- (14) Greece,
- (15) Ireland,

Countries ending in bottom-right quadrant in 2005:

- Japan,
- (16) Austria,
- (17) Australia,
- (18) Switzerland,
- (19) Canada,
- (20) S. Korea,



Regression Analysis

- Estimate *Differences-in-Differences regression* model of TFR on HDI using longitudinal data for all countries attaining HDI > .85

$$\Delta \text{TFR}_{it} = \alpha \Delta B_{it}^{post} + \beta^{pre} \Delta \text{HDI}_{it}^{pre} + \beta^{post} \Delta \text{HDI}_{it}^{post} + \Delta \gamma_t + \Delta v_{it},$$

- Accounts for country fixed-effects and unit-root residual
- Include calendar year dummies
- Allow for structural change of coefficient at HDI = .86 (estimated from data)
- Effect of increases of HDI on TFR
 - at HDI levels below .86: $\hat{\beta}^{pre}$
 - at HDI levels above .86: $\hat{\beta}^{post}$

Results

Model	Description		Coef.	<i>p</i> -value
(M.1)	Preferred estimates: Differences-in-differences model (Eq. S.3)			
	<i>Data:</i> all countries with HDI $\geq .85$ in 2005 ($N = 37$ countries; 1,051 observations)	$\hat{\beta}^{pre}$	-1.59	0.042
		$\hat{\beta}^{post}$	4.07	< 0.001
(M.2)	Differences-in-differences model with lagged HDI (Eq. S.4)			
	<i>Data:</i> all countries with HDI $\geq .85$ in 2005 ($N = 37$ countries; 1,014 observations)	$\hat{\beta}^{pre}$	-1.07	0.177
		$\hat{\beta}^{post}$	4.17	< 0.001
(M.3)	Differences-in-differences model (Eq. S.3), using the tempo-adjusted total fertility rate as dependent variable			
	<i>Data:</i> all countries with HDI $\geq .85$ in 2005 for which the tempo-adjusted TFR can be calculated ($N = 37$ countries; 1,051 observations)	$\hat{\beta}^{pre}$	-1.55	0.106
		$\hat{\beta}^{post}$	2.84	< 0.001
(M.4)	Differences-in-differences model (Eq. S.3), with adjustment for changes in mean age of mothers at first birth			
	<i>Data:</i> all countries with HDI $\geq .85$ in 2005 for which data on mean age at childbearing is available ($N = 37$ countries; 1,051 observations)	$\hat{\beta}^{pre}$	-1.62	0.037
		$\hat{\beta}^{post}$	4.02	< 0.001



Conclusions

- **Reversal of cross-sectional HDI – TFR association**
 - Positive HDI – TFR association for advanced countries in 2005
 - Heterogeneity among high-HDI high-TFR-countries
- **Reversal of TFR declines around HDI \approx .85-.9 in many countries**
 - Reversal driven by changes in *TFR – health* and *TFR – education* relations
 - Reversal is “robust” across several specifications, including TFR adjustment
 - Importance of institutional context: e.g., Japan is an important outlier
 - Different pathways to high fertility in advanced societies
 - Human development an important contributor to *fertility increases* in advanced societies?



Many thanks!
