

Fertility Decline in Africa: In What Sense “Exceptional”?

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Motivation and Aims

exceptional: adjective commonly applied to African fertility declines

But is this adjective correct ??

Undeniable that fertility declines in Africa have been

- late historically
- slow pace after onset

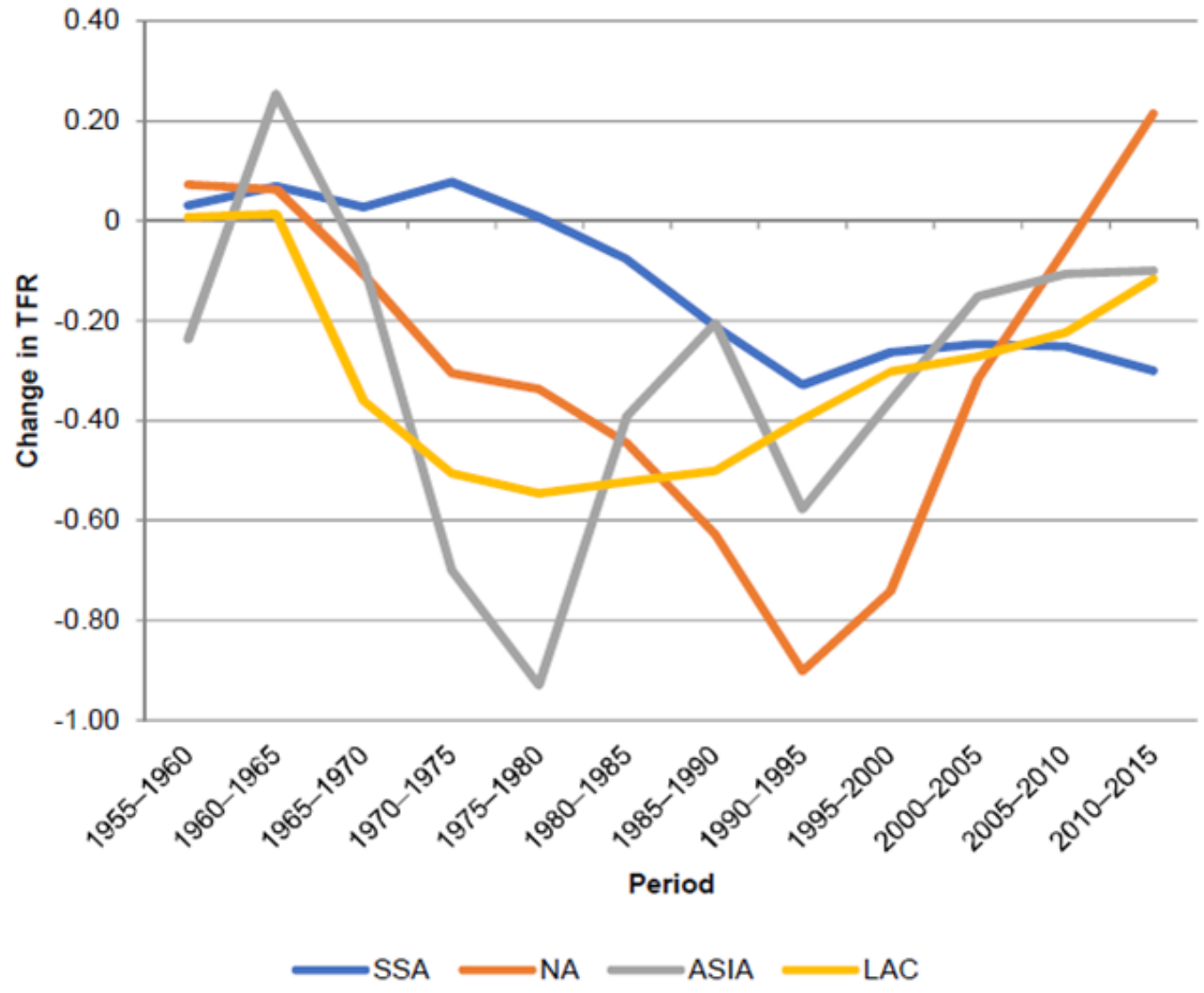
Motivation and Aims [cont]

Change in TFR,
1955-60 ----->
2010-15

Africa is slow
1960 - 2000

Shapiro & Hinde (2017)

Figure 1: Quinquennial changes in total fertility rates, 1955–2015

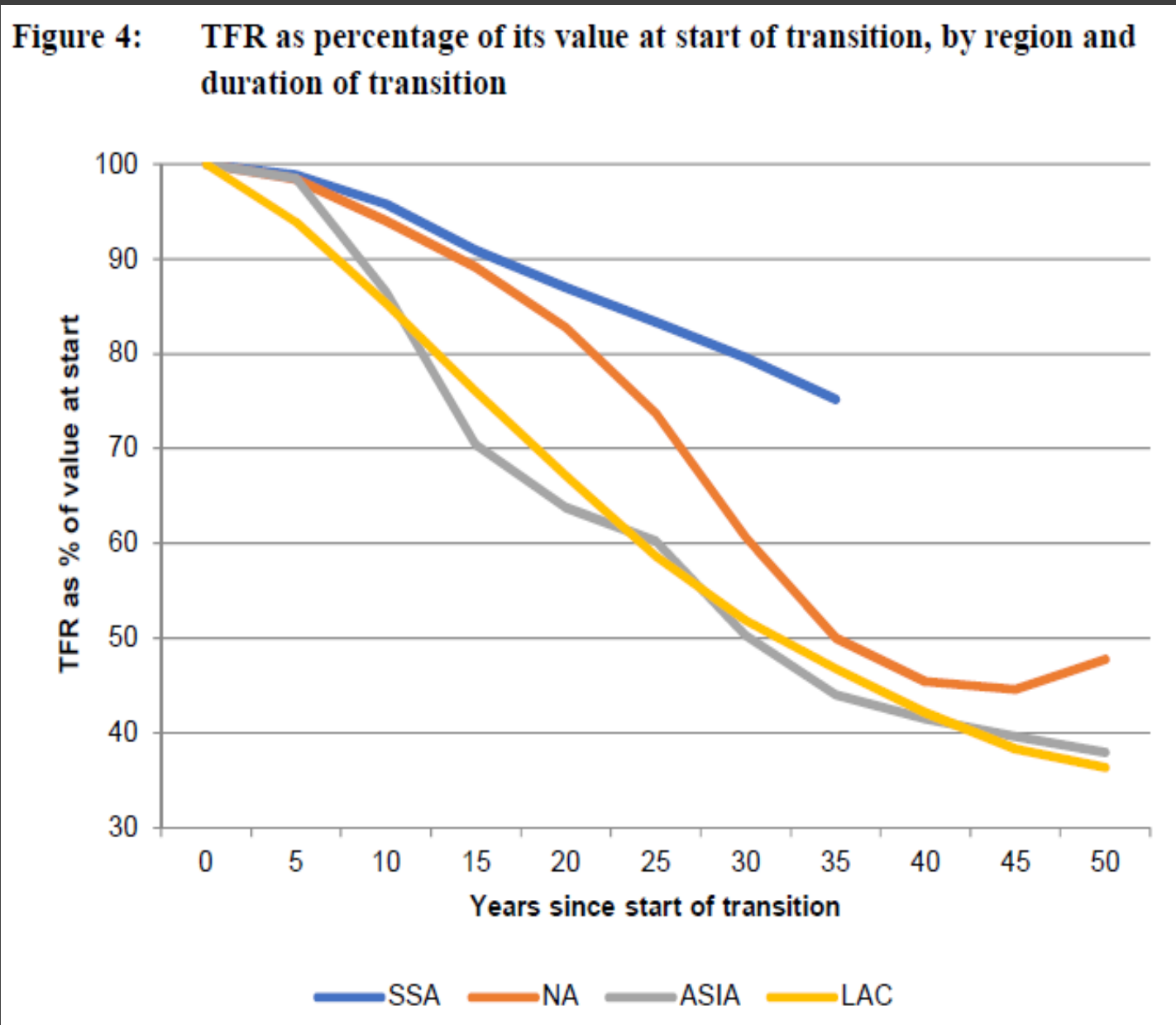


Motivation and Aims [cont]

Percentage fertility decline, by years since onset of decline

Africa is slowest

Shapiro & Hinde (2017)



But an important variant of the “African exceptionalism” argument is unconfirmed:

Fertility in Sub-Saharan Africa located differently *vis-à-vis* economic and social determinants

Bongaarts (2017): “Africa’s Unique Fertility Transition”

Questions:

1. Conditional on level of development, is fertility higher in Africa (i.e. “Africa Effect”)?
2. Has fertility in Africa been less responsive to the processes of economic and social development?

Motivation and Aims [cont]

These questions are prominent in recent public discussions:

The Economist, 22 Sep 2018, "Africa's Birth Rate is Keeping the Continent Poor: Why the Birth Rate Has Been Slow to Fall"

"After stagnating economically in the 1990s, countries like Nigeria and Tanzania grew wealthier in the 2000s. But their fertility rates hardly fell. Nor has urbanisation transformed family life as much as you might expect . . . a cause for optimism is education . . . several studies, in Africa and elsewhere, have found that schooling actually depresses fertility."

Motivation and Aims [cont]

Bill Gates, *Vox* (Ezra Klein), 15 Oct 2018

“... the dramatic decline of 26 percent of the world’s population being in extreme poverty down to 9 percent, a lot of that came because Asian countries — first China and then later India, Indonesia, and Pakistan and Bangladesh — did a reasonable job of governance. They invested in health. They invested in agricultural productivity. They improved their education systems . . . As you look at the projection out through 2050, the portion of people in extreme poverty will overwhelmingly be on one continent, which is Africa. It means that unless we do a good job in those countries where an increasing portion of the births are taking place, we won’t see anywhere near that decline that we saw over the last 25 years.”

Motivation and Aims [cont]

Ross Douthat, *NY Times*, 20 Oct 2018, "Fear of a Black Continent: Why European Elites Are Worrying about African Babies"

"... African birthrates haven't slowed as fast as Western experts once expected. In 2004, the U.N. projected that Africa's population would level off by 2100 around two billion. Today it projects that it will reach 4.5 billion instead. This change in the expected trend is more likely a result of sluggish economic growth than proof of an African exception ..."

Why is fertility high in Sub-Saharan Africa?

The Economist: Because African fertility unresponsive to income growth; female schooling is solution

Bill Gates: Governance (which determines health, schooling, etc.)

Douthat: Lack of income growth

Motivation and Aims [cont]

1. Conditional on level of development, is fertility higher in SSA (i.e. "Africa Effect")?
2. Has fertility in SSA been less responsive to the processes of social and economic development?

Addressing these questions demands comparative-historical research – comparison of experience to date in African societies with historical experience in other regions

====> Address questions #1 and #2 via country-level panel data analysis

Data

Unit:	country (Latin America, Asia, Africa)
Period:	1950 – 2015: annual (with some interpolation)
Excluded countries:	(i) Onset of fertility decline < 1950 (ii) Population < 1 million in 1970 (iii) Wealthy petroleum producers
Sample for analysis:	<i>Sub-Saharan Africa:</i> 37 countries 1450 country-years <i>Other regions:</i> 46 countries 2083 country-years

Measures

Source

Demographic:	Total Fertility Rate [<i>tfr</i>]	United Nations
	Life expectancy at birth [<i>e₀</i>]	United Nations
Socioeconomic:	GNP per capita, natural log [<i>GDP</i>]	Penn World Tables
	Percent urban residence [<i>urban</i>]	United Nations
	Percent females age 15-34 [<i>feduc</i>] >= primary schooling	Barro-Lee (2013) Wittgenstein Center (Vienna)

Is Fertility Higher in Africa Net of Development?

If "Yes", this would be certain type of "Africa effect"

Multiple regression analysis:

Let F total fertility rate [*tfr*] j country
 D development indicator t historical year
 Y year (years since max *tfr*)
 R indicator variables for region
 k development indicator [*e₀*, *GDP*, *urban*, *feduc*]

$$F_{jt} = \alpha + \beta^k D_{jt}^k + \gamma Y_{jt} + \delta_r R^r + \varepsilon_{jt}$$

At issue are coefficients δ_r - regional effects net of D^k and Y

African fertility higher net of development? [cont]

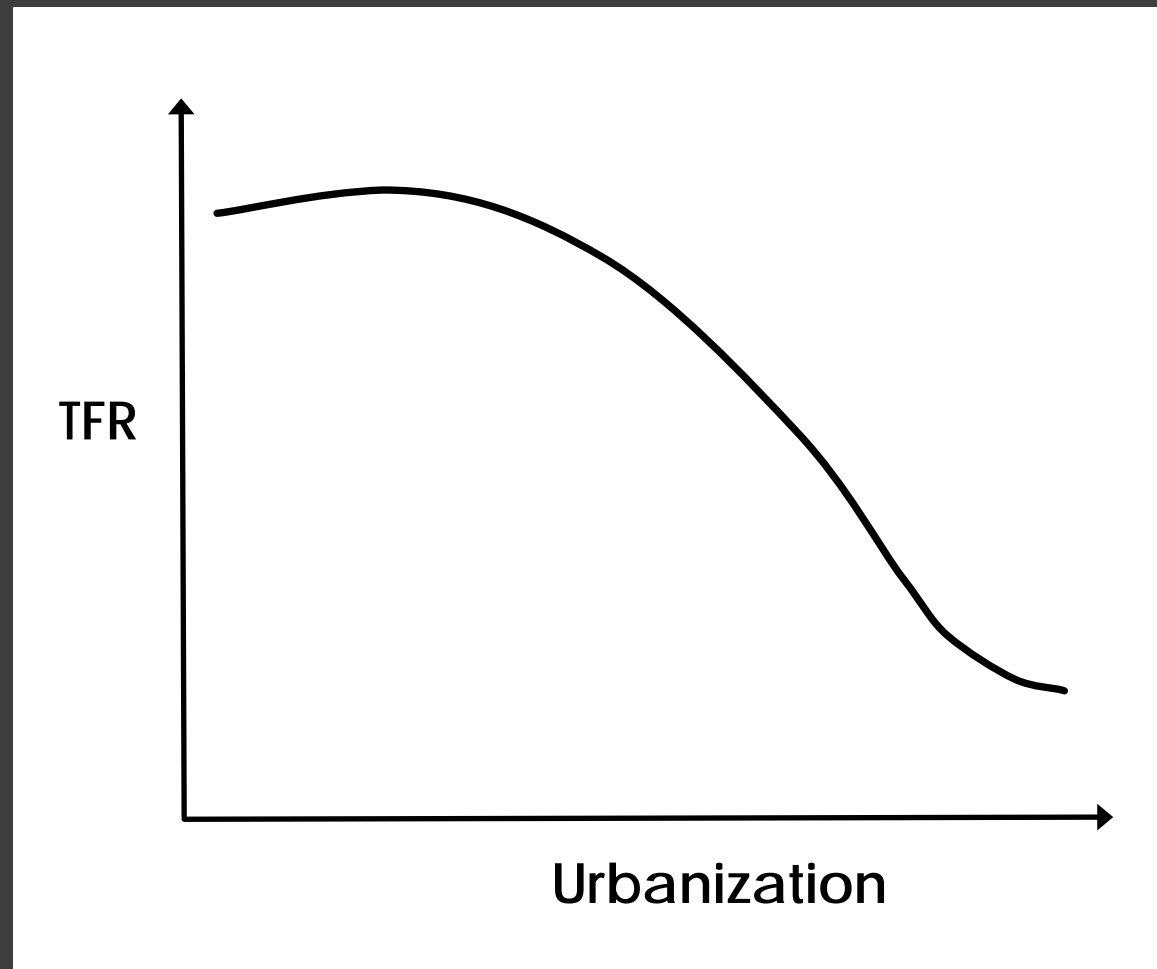
$$F_{jt} = \alpha + \beta^k D_{jt}^k + \gamma Y_{jt} + \delta_r R^r + \varepsilon_{jt}$$

Key design features:

- 3-year lag (all D^k)
- Omit country-year if $TFR < 2.2$
- non-linearity in effects of D^k via fractional polynomials
[Royston & Sauerbrei (2008)]

African fertility higher net of development? [cont]

- Allowing for **non-linearity** is consequential for estimates: in mid- and late-transition, fertility can fall rapidly with little change in development indicators



African fertility higher net of development? [cont]

Additional (and more complicated) regression specifications:

- Include random intercepts for countries [ζ_j]

$$F_{jt} = (\alpha + \zeta_j) + \beta^k D_{jt}^k + \gamma Y_{jt} + \delta_r R^r + \varepsilon_{jt}$$

- Allow for country random effects [τ_j] on coefficient γ – becomes “Growth Curve Model”

$$F_{jt} = (\alpha + \zeta_j) + \beta^k D_{jt}^k + (\gamma + \tau_j) Y_{jt} + \delta_r R^r + \varepsilon_{jt}$$

African fertility higher net of development? [cont]

Regression estimates: regional difference in TFR (births per woman), net of development indicators D

	SSA vs.	
	Asia & N. Africa	Latin America
Model 1: Ordinary Least Squares	0.41	0.23
Model 2: Random Intercepts (country)	0.41	0.16
Model 3: Random Intercepts (country) & Random Slope (Year)	-0.10	0.07

African fertility higher net of development? [cont]

Result: higher fertility in Sub-Saharan Africa, net of development indicators; however . . .

- only marginally higher with control for only four factors
- minimally different from Latin America
- no regional difference with random effect on slope of *Year*

Preceding result averaged across level of development:

Further insight if we condition estimates on level of development

African fertility higher net of development? [cont]

Conditioning on level of development:

1. Estimate regression for pooled Latin America and Asia & North Africa
2. Use equation to obtain *predicted TFR* for SSA country-years
3. Calculate discrepancy [*actual TFR* - *predicted TFR*] in SSA
====> "how does African TFR depart from what would be expected if development indicators performed the same as in other regions?"
4. Examine [*actual TFR* - *predicted TFR*] in SSA by level of development
[Principal Components score constructed from four *D* indicators]

Africa Effect?

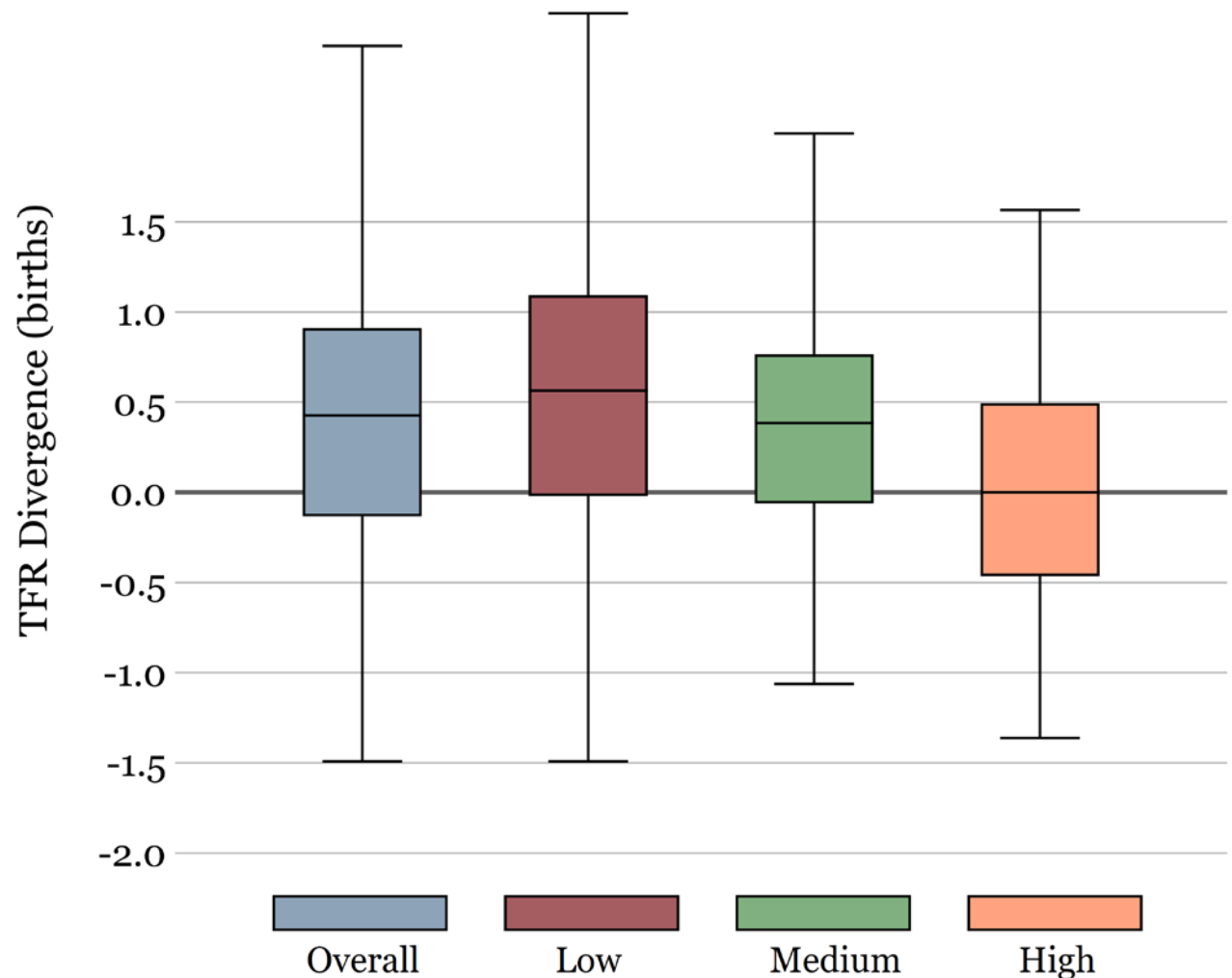
Notes:

(i) 0.4 birth = overall "Africa Effect"

(ii) Size of effect inversely related to level of development – disappears at higher level of development

Divergence of SSA Fertility from Prediction, by Development Level

Prediction based on $D \rightarrow$ TFR in Asia & Latin America



African fertility higher net of development? [cont]

Question #1: Conclusions

Conditional on level of development, is fertility higher in SSA (i.e. "Africa Effect")?

Answer: Slightly

And only at lowest levels of development

note: there is considerable evidence that

- pre-transition reproductive regimes in SSA were highly pro-natalist
- realized fertility relatively high in pre-transition Africa

Some persistence of SSA pro-natalism in early transition stage . . .

Is African Fertility Less Responsive to Development?

2. Has fertility in SSA been less responsive to the processes of economic and social development?

Elementary question, with clear implications for development and population policy

To address question, I use historical experience of non-African countries as standard of comparison

We estimate equation that contains interactions between development indicators D^k and region R^r

$$F_{jt} = \alpha + \beta^k D_{jt}^k + \gamma Y_{jt} + \delta_r R^r + \lambda (D_{jt}^k * R^r) + \varepsilon_{jt}$$

Is African fertility less responsive to development? [cont]

$$F_{jt} = \alpha + \beta^k D_{jt}^k + \gamma Y_{jt} + \delta_r R^r + \lambda^{rk} (D_{jt}^k * R^r) + \varepsilon_{jt}$$

At issue are coefficients λ^{rk} – differences in effects of development indicators D^k among regions r

note: these are interactions between R and the multiple variables – the fractional polynomials – representing each development indicator D^k
i.e. effects of D^k are allowed to be non-linear

====> By region, we evaluate slopes at selected values of each D^k

note: the values of slopes are to some degree arbitrary – scaling of variables; regional differences are the concern

Is African fertility less responsive to development? [cont]

Life Expectancy at Birth [e_0]: regression slope, evaluated at selected values
by Region

Values of Life Expectancy	Sub-Saharan Africa	Asia & N. Africa	Latin America
Life expectancy = 50 years	-.01	-.05	-.05
Life expectancy = 60 years	-.04	-.08	-.08
Life expectancy = 70 years	n.a.	-.11	-.09
<i>statistical test: slopes differ by Region</i>	***		

Is African fertility less responsive to development? [cont]

Urbanization: regression slope, evaluated at selected values
by Region

Percentage Urban	Sub-Saharan Africa	Asia & N. Africa	Latin America
Urbanization = 20%	-.02	.03	.05
Urbanization = 40%	-.01	.05	-.03
Urbanization = 60%	-.01	.03	-.03
<i>statistical test: slopes differ by Region</i>	***		

Is African fertility less responsive to development? [cont]

GDP per capita: regression slope, evaluated at selected values
by Region

note: slopes are effects on $\ln(\text{GDP})$

GDP per capita	Sub-Saharan Africa	Asia & N. Africa	Latin America
GDP per capita = \$1000	-.20	-.04	n.a.
GDP per capita = \$2500	-.20	-.26	.26
GDP per capita = \$5000	-.20	-.49	.26
<i>statistical test: slopes differ by Region</i>	***		

Is African fertility less responsive to development? [cont]

Female Schooling: regression slope, evaluated at selected values
by Region

Primary+ Schooling	Sub-Saharan Africa	Asia & N. Africa	Latin America
primary+ schooling = 15%	-.01	-.02	-.02
primary+ schooling = 40%	-.02	-.01	-.03
primary+ schooling = 65%	-.02	-.01	-.01
<i>statistical test: slopes differ by Region</i>	***		

Is African fertility less responsive to development? [cont]

Summarizing these results . . .

- Regional differences are highly variable – no uniform pattern
- Effects of some development indicators distinctly non-linear
- Effects in the “wrong” direction are evident, e.g. urbanization in Asia and GDP in Latin America; note that these are net of the other three development indicators
- In general, SSA slopes are closer to 0 – weaker response to development

More parsimonious approach: one index of development indicators instead of multiple D^k

We construct index via Principal Components Analysis

Is African fertility less responsive to development? [cont]

Development Index: regression slope, evaluated at selected values
by Region

note: Development Index is Principal Components Score

Development Index	Sub-Saharan Africa	Asia & N. Africa	Latin America
25 th Percentile	-.42	-.24	-.32
Median	-.56	-.15	-.71
75 th Percentile	-.52	-.14	-.86
<i>statistical test: slopes differ by Region</i>	***		

Is African fertility less responsive to development? [cont]

Results:

- Sub-Saharan Africa vs. Latin America: fertility less responsive to economic and social development; however . .
- Sub-Saharan Africa vs. Asia: fertility more responsive to economic and social development

These results are consistent with notions that

- Fertility decline in Asia: over-achieved in relation to development, due to strong state and strong state action
- Fertility decline in Latin America: tightly linked to development processes

Concluding Comments

Pre-transition fertility relatively high in Sub-Saharan Africa

Esp. highland East Africa and Sahelian West Africa

Explanation: not conventional features of economic and social development

Rather, reproductive regime part-and-parcel of “traditional” systems of property, labor, kinship, religion, etc. – disrupted, to greater or lesser extent, by contemporary development

====> Pre- and early-transition associations between fertility and development: not informative about how African reproductive regimes will respond/adapt to development

Must be cautious about inferring “African exceptionalism” !!

Concluding Comments [cont]

Is fertility in African societies located differently *vis-à-vis* economic and social determinants as compared to other regions ? ?

NO: not to a substantial extent

- *African fertility higher net of development indicators?*

Slight: less than 0.5 birth and disappearing as development proceeds

- *African fertility less responsive to development?*

Yes: if Latin America is the standard

No: if Asia is the standard

Concluding Comments [cont]

One can doubt potential for countries in Sub-Saharan Africa to achieve

- high quality and relatively equitable social and health services
- meaningful economic development

But if one or the other can be achieved, judging from these results we can be optimistic about fertility response

Most importantly . . .

====> no basis for expecting "African exceptionalism" in returns on investments in

- schooling
- health and family planning services

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