Wealthier is not healthier for children in Sub-Saharan Africa

Louise Grogan, University of Guelph, Canada and Luc Moers, International Monetary Fund

Monday June 6, 2016

Our contribution:

- Use commodity prices, and 1990 composition of exports in SSA countries to construct a counterfactual.
- Predict changes within countries over time in GDP per capita.
- Find causal effect of GDP per capita on health outcomes of children, infant mortality and adolescent fertility.

Literature:

- Pritchett and Summers (1996) "Wealthier is Healthier" *Journal of Human Resources*
- Dollar and Kraay (2002) "Growth is good for the poor" *Journal of Economic Growth*

Data:

- UNICEF-World Bank-World Health Organization (2014) child anthropometry database, 1990-2013
- Deaton (1999) Export composition of Sub-Saharan African countries in 1990
- World Bank Development Indicators (2014)

Figure 1: Agricultural prices 1990-2013

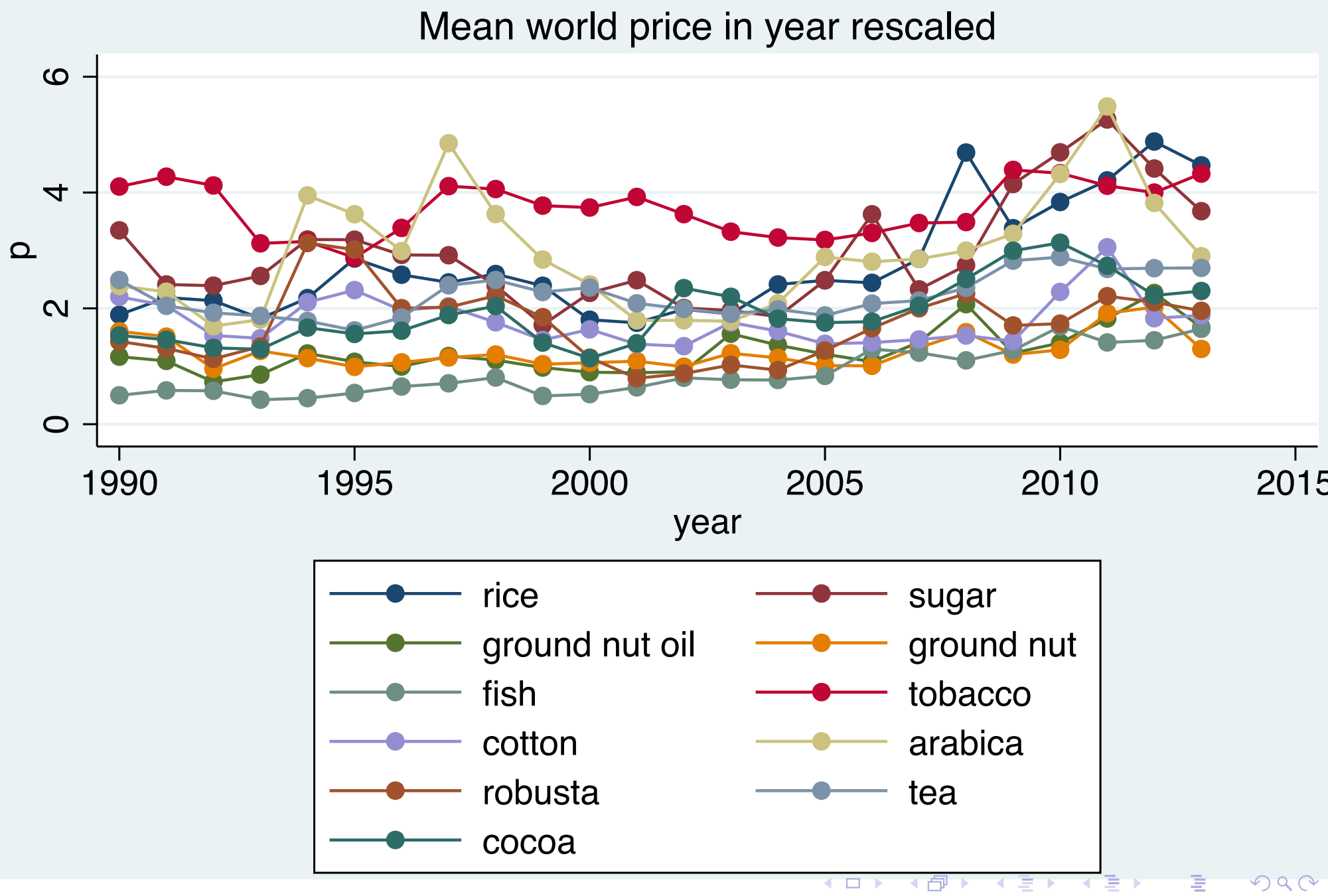

Table 1: Summary statistics for income and wellbeing Sub-Saharan Africa, 1990-2013

GNI PPP	GDPPC	Export %	stunting	wasting	underweight	births to <20	mortality <5s	<12 mos. mortality	imports %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
means 1990-2001									
53258.7280	0.4381	23.4759	29.4547	11.2095	48.0082	145.0297	170.0410	102.4854	27.6161
(27505.376)	(0.059)	(3.657)	(2.323)	(1.160)	(2.179)	(6.498)	(8.827)	(4.911)	(2.344)
means 2002-2013									
158916.7249	0.5585	26.7491	22.9989	10.0942	39.7250	128.4643	108.9997	70.2394	32.8019
(90712.611)	(0.088)	(2.678)	(1.787)	(1.284)	(1.244)	(5.327)	(8.170)	(4.847)	(2.518)
Difference: means (2002-2013)- means(1990-2001)									
105657.9969	0.1204**	3.2733*	-6.4558***	-1.1153	-8.2832***	-16.5655***	-61.0413***	-32.2460***	5.1857*
(63290.517)	(0.045)	(1.879)	(1.381)	(0.710)	(1.458)	(2.658)	(4.768)	(2.686)	(2.575)

Table 2: Summary statistics for prices of major export commodities of Sub-Saharan Africa, 1990-2013

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
phosph	gold	copper	alumin	bauxite	cobalt	plywood	wood p.	
means 1990-2001								
0.4784	0.4029	2.5395	1.7357	2.4967	1.9217	5.5956	7.0929	
(0.019)	(0.012)	(0.126)	(0.059)	(0.075)	(0.178)	(0.307)	(0.405)	
means 2002-2013								
1.1567	0.8884	5.7375	2.1344	2.6067	1.8940	5.8084	7.4408	
(0.245)	(0.119)	(0.639)	(0.113)	(0.111)	(0.253)	(0.140)	(0.233)	
Difference: means (2001-2013)- means(1990-2000)								
0.6783**	0.4855***	3.1980***	0.3987***	0.1100	-0.0277	0.2128	0.3479	
(0.246)	(0.120)	(0.652)	(0.128)	(0.134)	(0.309)	(0.337)	(0.467)	
cocoa	arabica	robusta	tobacco	sugar	rice	fish	gnutoil	gnuts
means 1990-2001								
1.5258	2.8552	1.7815	3.7207	2.6488	2.2198	0.5727	1.0154	1.1727
(0.073)	(0.285)	(0.213)	(0.136)	(0.136)	(0.104)	(0.032)	(0.043)	(0.058)
means 2002-2013								
2.3194	3.0845	1.6441	3.7321	3.2667	3.2955	1.1888	1.5003	1.3345
(0.132)	(0.307)	(0.145)	(0.135)	(0.342)	(0.314)	(0.097)	(0.116)	(0.098)
Difference: means (2001-2013)- means(1990-2000)								
0.7936***	0.2292	-0.1374	0.0114	0.6179	1.0757***	0.6162***	0.4849***	0.1618
(0.151)	(0.419)	(0.258)	(0.192)	(0.368)	(0.331)	(0.102)	(0.124)	(0.114)

Commodities model

$$\begin{bmatrix} m_{11} \cdots & m_{1d} \\ \vdots & \\ m_{c1} \cdots & m_{cd} \end{bmatrix} \begin{bmatrix} p_{11} \cdots & p_{1t} \\ \vdots & \\ p_{d1} \cdots & p_{dt} \end{bmatrix} = \begin{bmatrix} h_{11} \cdots & h_{1t} \\ \vdots & \\ h_{c1} \cdots & h_{ct} \end{bmatrix}$$

for countries 1 to c and for d different commodities, where m refers to the commodity. The matrix of predicted export revenue in each year is employed as exogenous variation in predicting GDP per capita in a country in a year.

Firststage regression

$$H_{ct} = \begin{bmatrix} h_{11} \cdots & h_{1t} \\ \vdots & \\ h_{c1} \cdots & h_{ct} \end{bmatrix}$$

The first-stage regression equation is:

$$GDPPC_{ct} = \alpha + \gamma * \widehat{H_{ct}} + \delta * CONTROLS + \mu_c + \lambda_t + \epsilon_{ct}$$

Table 3: Firststage regression predicting GDP per capita in Sub-Saharan African countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Homoscedastistic standard errors							
	Child anthropometry observations				**All 1990-2013 included**		
$\widehat{exportrevenue_{ct}}$	0.1085***	0.1080***	0.1244***	0.1245***	0.0946***	0.1009***	0.1009***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.020)	(0.020)	(0.020)
popu5		0.0000*	0.0000**	0.0000**			
		(0.000)	(0.000)	(0.000)			
civil war or conflict			0.2632***	0.2620***		0.0981*	0.0904
			(0.100)	(0.100)		(0.057)	(0.058)
new oil				0.1157			0.0405
				(0.151)			(0.066)
constant	1.4081***	0.3188	0.2307	0.2243	0.3200***	0.2978***	0.2995***
	(0.143)	(0.266)	(0.262)	(0.263)	(0.087)	(0.088)	(0.088)
R^2	0.986	0.986	0.987	0.987	0.975	0.975	0.975
No. obs.	162	162	162	162	816	816	816
F-statistic first stage	25.92	33.79	33.80	32.34	18.41	18.57	20.31

	Child anthropometry observations				**All 1990-2013 included**		
$\widehat{exportrevenue}_{ct}$	0.1085*	0.1080*	0.1244*	0.1245*	0.0946***	0.1009***	0.1009***
	(0.062)	(0.063)	(0.069)	(0.069)	(0.027)	(0.028)	(0.028)
popu5		0.0000*	0.0000***	0.0000***			
		(0.000)	(0.000)	(0.000)			
civil war or conflict			0.2632**	0.2620*		0.0981***	0.0904**
			(0.133)	(0.133)		(0.030)	(0.039)
new oil				0.1157***			0.0405
				(0.033)			(0.119)
constant	1.4081***	0.3188	0.2307	0.2243	0.3200***	0.2978***	0.2995***
	(0.034)	(0.240)	(0.181)	(0.182)	(0.101)	(0.103)	(0.104)
R^2	0.986	0.986	0.987	0.987	0.975	0.975	0.975
No. obs.	162	162	162	162	816	816	816
F-statistic first stage	4.08	4.10	3.68	3.81	11.72	11.89	12.53
controls:							
country dummies	yes	yes	yes	yes	yes	yes	yes
year dummies	yes	yes	yes	yes	yes	yes	yes

Weak Instrument Problem?

- F$<$10 for anthro. observations with heteroscedasticity-robust standard errors.
- Anderson-Rubin-Wald Test

Table 4: Exports as a percentage of GDP explained by the counterfactual

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Child anthropometry observations				**All 1990-2013 included**		
$\widehat{exportrevenue}_{ct}$	0.3146**	0.3145**	0.2585***	0.2600***	0.1821***	0.2081***	0.2112***
	(0.122)	(0.124)	(0.097)	(0.099)	(0.061)	(0.061)	(0.059)
popu5		-0.0000	-0.0000	-0.0000			
		(0.000)	(0.000)	(0.000)			
civil war or conflict			-0.9011*	-0.9119*		0.4007*	0.0448
			(0.518)	(0.517)		(0.209)	(0.267)
new oil				0.9088***			1.8783***
				(0.280)			(0.501)
constant	1.8151***	5.7190***	5.7478***	5.7531***	2.0461***	1.9546***	2.0411***
	(0.210)	(0.214)	(0.220)	(0.220)	(0.284)	(0.285)	(0.268)
R^2	0.928	0.928	0.931	0.932	0.859	0.860	0.871
No. obs.	140	140	140	140	728	728	728
controls:							
country dummies	yes	yes	yes	yes	yes	yes	yes
year dummies	yes	yes	yes	yes	yes	yes	yes

Income and health outcomes

The second stage regression is:

$$ANTHRO_{ct} = \alpha + \beta * \widehat{GDPPC}_{ct} + \delta * CONTROLS + \mu_c + \lambda_t + u_{ct}$$

The *ANTHRO* outcomes considered are: moderate to severe stunting, moderate to severe wasting and moderate to severe underweight. Also infant mortality rates, adolescent fertility.

Table 5: The causal impact of GDP per capita on stunting in Sub-Saharan Africa, 1990-2013

	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP pc at PPP	-2.2648	-2.6984	-2.0271	-2.6497	-2.1940	-1.6430	-2.1849	-1.6459
	(1.923)	(3.638)	(1.787)	(3.582)	(1.867)	(2.939)	(1.874)	(2.936)
popu5			-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
civil war or conflict					1.7950	1.7239	1.7971	1.7282
					(1.217)	(1.125)	(1.223)	(1.125)
new oil							-0.2763	-0.3359
							(1.663)	(1.470)
constant	21.4359***		40.6822***		40.1040***		40.1167***	
	(1.290)		(5.894)		(5.781)		(5.809)	
R^2	0.882	0.456	0.882	0.458	0.883	0.461	0.883	0.018
No. obs.	160	160	160	160	160	160	160	160
controls:								
country dummies	yes	yes	yes	yes	yes	yes	yes	yes
year dummies	yes	yes	yes	yes	yes	yes	yes	yes

Table 6: The causal impact of GDP per capita on wasting in Sub-Saharan Africa, 1990-2013

	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)	OLS (7)	IV (8)
Panel A: Dependent variable is fraction of under-5s wasted in country in year								
GDP pc at PPP	-1.3097	-1.9019	-2.1128	-2.4329	-2.4593	-1.2561	-2.4537	-1.2902
	(1.449)	(3.910)	(1.669)	(4.993)	(1.752)	(3.144)	(1.760)	(3.126)
pop. under 15			-0.0799	-0.0950	-0.1232	-0.0632	-0.1306	-0.0727
			(0.216)	(0.305)	(0.239)	(0.261)	(0.241)	(0.261)
civil war or conflict					1.9625	1.7311	1.9907	1.7673
					(3.223)	(2.991)	(3.238)	(2.988)
new oil							-1.1914	-1.2055
							(1.069)	(0.887)
constant	9.8135***		7.9283*		8.6403*		8.7429*	
	(0.853)		(4.238)		(4.551)		(4.583)	
R^2	0.714	0.142	0.747	0.137	0.750	0.143	0.750	0.144
No. obs.	158	158	131	131	131	131	131	131

Table 9: The causal impact of GDP per capita on fertility in Sub-Sah

	OLS (1)	IV (2)	OLS (3)	IV (4)	OLS (5)	IV (6)
Panel A: Adolescent fertility						
GDP pc at PPP	-2.1457	-26.4052***	-2.2316	-24.9091**	-2.1991	-25.6337***
	(1.707)	(9.995)	(1.665)	(9.709)	(1.671)	(9.467)
new oil			11.5588***	12.3187***	12.2895***	12.7246***
			(1.747)	(4.191)	(1.830)	(4.570)
civil war or conflict					-2.0491	-1.0686
					(1.699)	(1.660)
constant	210.0114***		210.7965***		210.8137***	
	(1.817)		(1.825)		(1.829)	
R^2	0.969	0.449	0.969	0.484	0.969	0.473
No. obs.	701	701	701	701	701	701
Panel B: Crude birth rate per 1000						
GDP pc at PPP	-1.1698***	2.5675	-1.1542***	2.3288	-1.1605***	2.5059
	(0.260)	(1.742)	(0.237)	(1.670)	(0.236)	(1.666)
new oil			-1.4226***	-1.5478***	-1.5265***	-1.6212***
			(0.461)	(0.381)	(0.517)	(0.448)
civil war or conflict					0.4084	0.2628
					(0.652)	(0.631)
constant	44.6400***		44.4600***		44.4993***	
	(1.738)		(1.600)		(1.594)	
R^2	0.941	0.483	0.941	0.501	0.941	0.492
No. obs.	724	724	724	724	724	724
controls:						
country dummies	yes	yes	yes	yes	yes	yes
year dummies	yes	yes	yes	yes	yes	yes
F-statistic first stage						

Conclusions

- No causal impact of growth on infant mortality or child wellbeing outcomes.
- Adolescent fertility much less dependent on group of coincident factors than health.
- Child anthropometry data decomposed by quintiles could be important to finding which subpopulations benefit most from growth.
- Why has growth not reduced these measures of deprivation? What better policies might do so?