



The economics of agriculture and nutrition: Theory, Evidence and Policy Implications

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Outline

1. Introduction
2. Theory & evidence on 6 causal pathways
3. Policy implications

1. Introduction

- I'll skip motivations, but outline a few key points
- First, economists have been working on nutrition for some time, but with limited focus on agriculture
- Second, much of this research was done prior to the more recent evidence on the 1000 days and the importance of dietary diversity, etc
- e.g. large literature using calorie availability
- Third, there are plenty of methodological caveats to consider (internal validity; external validity), which clearly qualify the evidence base for policymaking

1. Introduction

- Finally, my review will also have its caveats
- focus on economics more than nutrition or agronomics
- drawing substantively on literature from India, particularly a systematic review of Indian context and paper on ag-nutrition linkages in India (TANDI)
- recent draft papers for a planned special issue on agriculture and nutrition at the farm level
- Focus is mostly on chronic child malnutrition (stunting)

2. Theory

- Many nutrition frameworks, but in TANDI we focused on 6 ag-nutrition pathways

1. Agriculture → income → expenditure → nutrition
2. Agriculture → diets → nutrition
3. Agriculture → food prices → diets → nutrition
4. Agriculture → maternal care practices → nutrition
5. Agriculture → maternal health → nutrition
6. Agriculture → maternal empowerment → nutrition

(Let's define "agriculture" broadly: productivity, farm assets, agro-processing, markets, policies, institutions)

Pathway 1 → Income effects

- Large literature documenting that agricultural growth tends to be pro-poor (World Bank 2008)
- In a recent paper I revisit earlier cross-country evidence on this and find it to be robust:
- Elasticity between poverty and growth is **4→6 times higher** for agriculture relative to non-agriculture
- 1% increase in **agric. growth reduces inequality** by 0.3 points; non-agric growth has no systematic effect
- *Caveat*: this literature does not link agricultural growth to agriculture-specific policies – many factors can drive agricultural growth, including non-agricultural factors

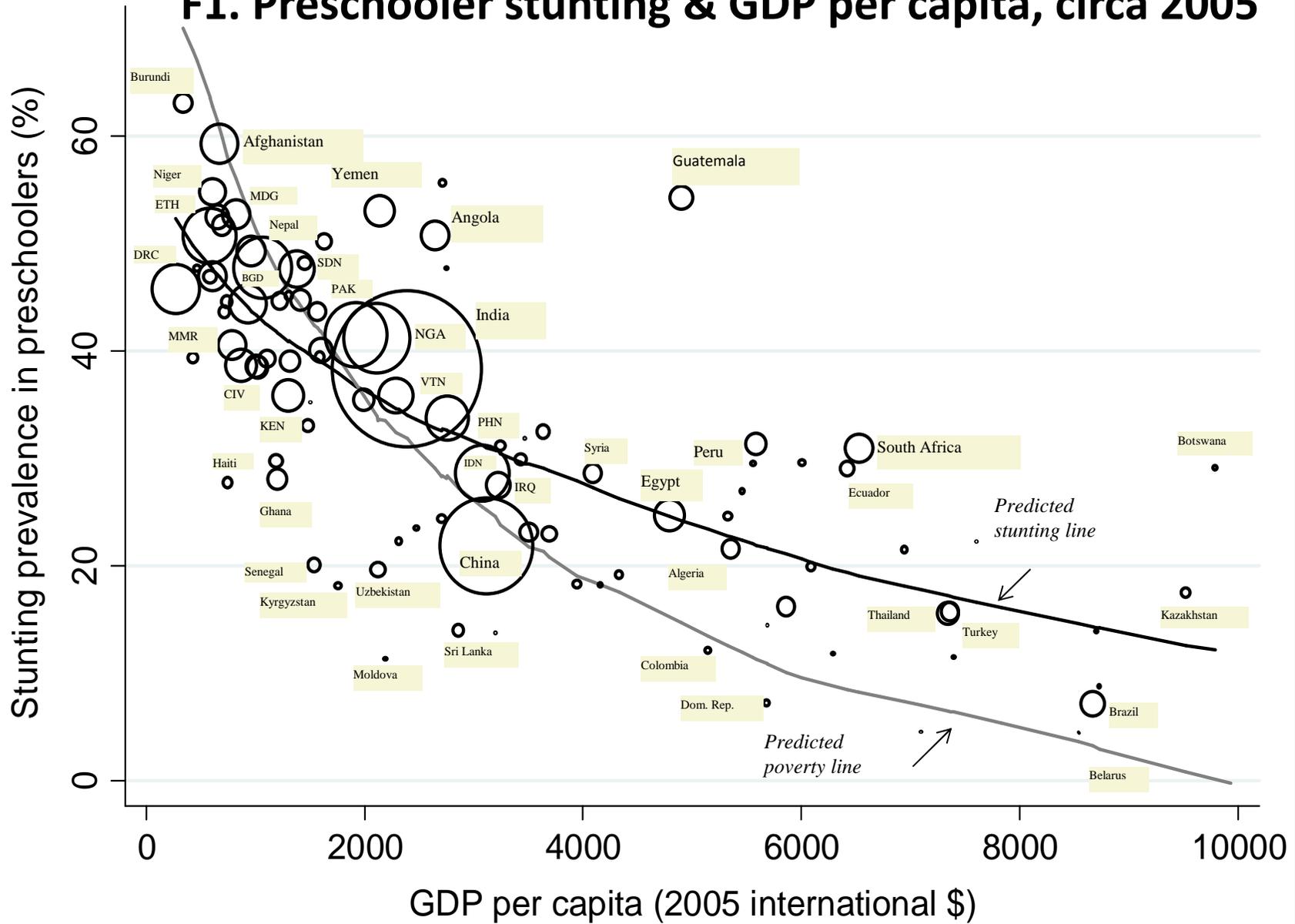
Table 1. Re-testing the CDK model with the robust regressor

	R1	R2
No. of obs.	294	294
Dependent variable	Change in \$1.25/day poverty	Change in Gini coefficient
Agric. growth*s_a	-2.19** (1.00)	-0.35*** (0.12)
Non-agric. growth*s_n	-0.55*** (0.18)	0.01 (0.02)
R-squared	0.08	0.23

Pathway 1 → Income effects

- So agricultural growth is pro-poor, but does nutrition also improve with income? 4 pieces of evidence
 1. DHS data for 60-odd countries show that richer households always have lower rates of stunting*
 2. Cross-country data show that stunting declines with GDP per capita (though poverty declines more)
 3. But cross-country regressions do not suggest that agricultural growth has any significant advantage over nonagricultural growth
 4. Plenty of examples where GDP growth hasn't translated into rapid nutritional improvements (India!)

F1. Preschooler stunting & GDP per capita, circa 2005



Pathway 1 → Income effects

- Implications?
 1. Could take a long time to reduce malnutrition if we only relied on income growth
 2. Perhaps surprising that agricultural growth isn't more nutrition-sensitive than nonagricultural growth
- One explanation could be that it is only growth in food production which is more nutrition sensitive
- Cross-country results suggest growth food production is a strong predictor of reductions in stunting, but only in low productivity countries
- But not clear why – food production has micro and macro linkages

Pathway 2 – Farming and diets

- One explanation could be that poor farmers make production decisions based on dietary considerations, not just on maximizing income
- Rational in the context of market failures:
- Eg 1. if you cannot buy milk in the village market because of lack of processing/storage technologies and high transport costs, then buy a cow
- Eg 2. If market imperfections induce sharp fluctuations in grain prices, then grow more grain and store some of it on the farm to protect your food supply

Pathway 2 – Farming and diets

- One explanation could be that poor farmers make production decisions based on dietary considerations, not just on maximizing income (separability)
- Rational in the context of market failures:
- Eg 1. if you cannot buy milk in the village market because of lack of processing/storage technologies and high transport costs, then buy a cow
- Eg 2. If market imperfections induce sharp fluctuations in grain prices, then grow more grain and store some of it on the farm to protect your food supply
- Eg 3. If local produce markets are thin, better to diversify farm production rather than specialize

Pathway 2 – Farming and diets

- Potentially this linkage is very important, because it renders agriculture a special sector, not just a generator of income
- But what kinds of agricultural assets and activities matter most for nutrition?
- Perhaps strongest evidence pertains to dairy, because:
 1. Biologically important for growth
 2. Highly perishable, so trade is sensitive to market failure
 3. Easily prepared (reduces time costs for mothers)
 4. Easily consumed by very small children (1000 days)
 5. Dairy animals often managed by women

Pathway 2 – Farming and diets

- A number of recent papers emerging
- Iannotti (2013) review nutrition impacts of dairy programs & find plausible impacts on nutrition, but inadequate data on cost-effectiveness
- For India, Bhagowalia, Headey and Kadiyala (2012) find cow/buffalo ownership predicts milk consumption, and milk consumption predicts higher HAZs
- For Rwanda, Pimkina et al. (2013) evaluate Heifer International programs, to find similar results
- For Ethiopia, Hodidinott, Headey and Dereje (2013) find similar results, but also that nutritional impacts of cow ownership decline with better access to markets

Table 1. Cow ownership seems to matter less with local food markets

	Food Market in village			No food market in village		
	Any milk	# days milk (0→7)	Stunted 12→24m	Any milk	# days milk (0→7)	Stunted 12→24m
Household owns cow	0.19*	0.70*	0.11	0.22*	1.27*	→0.12*

Table 2. More cows in a village reduce the impacts of household cow ownership

	Any milk consumption		# days milk consumed		HAZ 12 – 24m		Stunted 12→24m	
Household owns cow	0.22*	0.20*	1.26*	1.10*	0.32*	0.23*	→0.099	→0.08*
No. of cows in village, log	→	0.058*	→	0.362*	→	0.22		→0.032

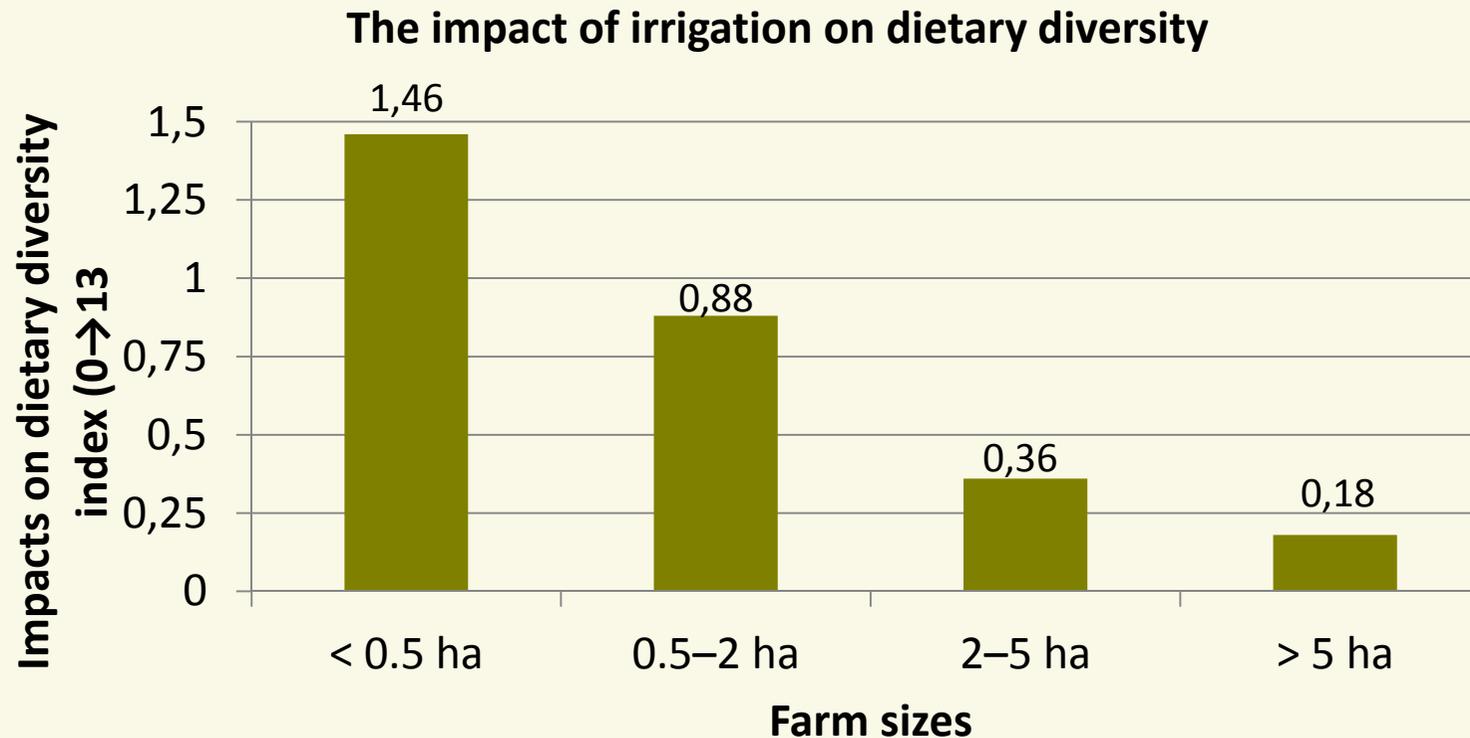
* Indicates significance at 5% level or higher

Pathway 2 – Farming and diets

- So dairy seems to be a highly nutrition-sensitive subsector, but there are policy-relevant caveats
- First, cow ownership could have other links to nutrition (e.g. cows as wealth) so some scope for bias
- Second, cost-effectiveness not yet established
- Third, not entirely clear what policymakers should do
- increase cow ownership, productivity or market access?
- And sequencing may be important;
- E.G. farmers have little incentive to increase production without better access to markets

Pathway 2 – Farming and diets

- Less evidence on other assets and production decisions
- For India, Bhagowalia et al (2012) find dietary diversity is influenced by farm sizes and access to irrigation



Pathway 2 – Farming and diets

- Another market failure worth exploring is inadequate access to insurance markets, or exposure to risk:
- Possible responses include:
 - less specialization (more diversification)
 - more focus on non-perishable grains, rather than perishable vegetables
 - Underinvestment in higher return but riskier crops (cash crops)

Pathway 3 – Agriculture and food prices

- Agriculture affects the relative prices of different foods
- A particularly interesting question is to what extent CGIAR investments have impacted nutrition via relative price changes
- Economic theory is ambiguous because of substitution and income effects
- For example, investments in rice decrease relative price of rice, suggesting that rice consumption would increase, possibly reducing dietary diversity
- But since rice is a major share of HH budgets in Asia, real incomes rise, allowing people to diversify

Pathway 3 – Agriculture and food prices

- Evidence from price shocks suggests that income effects dominate
- In Indonesian financial crisis, huge increases in price of rice reduced dietary diversity (Block et al. 2004)
- Similar effects in Bangladesh over 1990s (Torlesse et al. 2002)
- So it seems probable that increasing productivity of staples ultimately allows greater diversity, not less
- Nevertheless, Green Revolution has been cited for declining consumption of coarse grains and pulses in India, and fish in Bangladesh

Pathway 3 – Agriculture and food prices

- Moreover, even if agricultural investments generally improve dietary diversity, in some countries the transition seems too slow
- In Bangladesh major gains in rice productivity have not translated into rapid dietary diversification. Why?
- Country is self-sufficient in rice, but rice still ties up vast majority of land and other resources
- Thin international rice markets, so large Asian countries are wary of relying on them
- Culture, lack of nutritional knowledge? In Thailand the govt had introduced subsidized imported milk to encourage a dairy consuming culture

Pathways 4→6. Agric. & maternal conditions

- While I listed 3 specific linkages related to women/mothers, the evidence is weak in terms of nutritional indicators
- We know women perform a huge amount of the work in agriculture, but benefit less from agric interventions
- We know there's evidence that empowering women in agriculture (via improved access to assets and inputs) can accelerate poverty alleviation & improve intrahousehold distribution of resources
- Some evidence on gender-specific ag interventions of nutritional relevance, such as homestead gardening intervention by HKI+ in Bangladesh.

Pathways 4→6. Agric. & maternal conditions

- We also know that women working in agriculture tend to have poor nutrition outcomes, and face severe time constraints, which affects things like childcare
- But we don't know about nutritional relevance of gender-targeted agricultural interventions
- Policy question is “What can agricultural sector do about these problems?”
- First, eliminate gender biases in agricultural policies, (i.e. make agriculture gender-sensitive)
- Second, more evaluation of nutritional outcomes of programs targeted at women (**but track effects on women's time and nutrition, not just empowerment)

Concluding remarks

Areas of progress

- Generated much more interest
- Emerging knowledge of links between farm production, diets and nutrition (e.g. importance of livestock)

Knowledge gaps

- Everything
- Cost-effectiveness
- Being diagnostic: e.g. low consumption of dairy: is the real constraint income, knowledge, assets, or poor access to markets?

Concluding remarks

Partnerships (research side)

- Important to inculcate nutritional knowledge in non-nutrition policymakers and researchers (e.g. Thailand)
- In poorest countries the focus is on food security; this is actually a barrier to promoting nutrition, not an aid
- More intra-CGIAR partnerships

Innovations

- More systems-wide research & monitoring, especially as our understanding of ag & nutrition links improves
- Is CGIAR R&D portfolio well positioned for addressing global burden of malnutrition?
- Are country expenditures well positioned?

- Thank you