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Up in Smoke?: Tobacco Production's Effect on Childhood Stunting in Malawi

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Up in Smoke?: Tobacco Production's Effect on Childhood Stunting in Malawi

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Research Question:

How does cash crop adoption affect children's health?

Research Method:

- Casual model of adoption effects
- Predicted probabilities used as optimal instrument (Wooldridge)
- Two step GMM instrumenting for the cash crop adoption decision

Smallholder Adoption Constraints:

- Production:
- Minimum tobacco sales requirement for tobacco floors
 - Credit constraints preventing best farm practices

- Consumption:
- Volatile & relatively high recent maize prices

World Bank identified relationship between tobacco production & higher levels of stunting

Measuring Stunting



Measuring height for the IHS III, May 2010 (taken by presenter)

First Stage Probit

Predicting tobacco adoption:
 $P(D_i|z) = \Phi(\delta_1 z_1 + \delta_2 z_2)$

Optimal predicted probabilities instrument
 $P(D_i = 1 | z)$

Two Step GMM

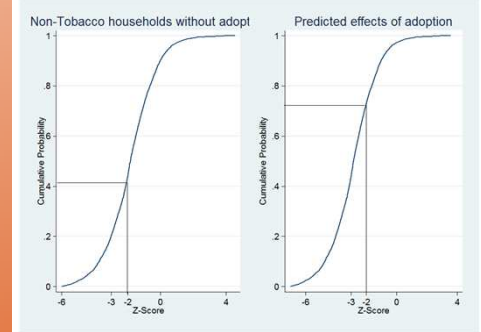
Moment Conditions:
 $E \left[\begin{matrix} 1 & \text{lagged maize price}' \\ 1 & \text{lagged \# '98 tobacco farmers}' \end{matrix} (y - x\beta) \right] = 0$

GMM criterion function:
 $\min_{\beta} (\sum_i z_i u_i)' \widehat{\Sigma}^{-1} (\sum_i z_i u_i)$

Dependent variable, z score

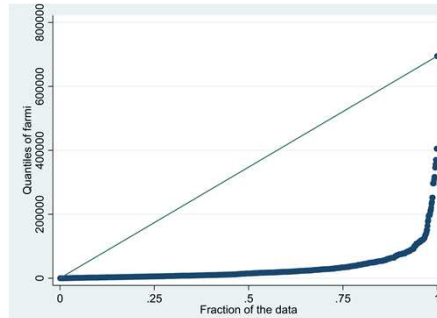
Results

- Average treatment effect reduces z-scores by 1 standard deviation
- If non-producers adopted, stunting increases

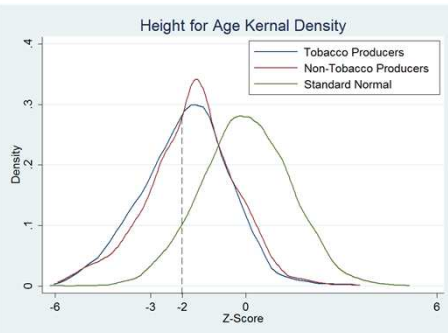


Estimated Average Treatment Effects of Adoption

Farm Income Distribution



Stunting



- Internationally long-term nutritional health indicator
- Large sample 2004-5 World Bank/Malawian Statistics Department Integrated Households Survey II (IHS)

Ideal Model

$y_i = \delta_0 + \delta_1 X_i + \delta_2 D_i + u_i$
 y_i : z score of children 6-60 months old
 D_i : burley adoption dummy
 X_i : Vector of observable control attributes

Endogeneity of D_i ,

Instruments from 1998 IHS I

- Average maize price by district
- Number of tobacco growing households by district
- Weak Instrument F-statistics of 359 & 254, both with p-values of 0
- C statistic of 0.172 and a p-value of 0.678 supports error term orthogonality

Variable	Adoption
# of Tobacco Farmers by 1998 district	0.00129*** (0.000189)
Maize price in 1998 by 1998 district	0.141*** (0.0416)
Observations	5,740
*** 0.001, ** 0.01, * 0.05	

GMM Results

Variable	Images TIEFs		
	OLS	Maize Only	Both IV
Tobacco Producer	-0.154*	-0.446	0.980***
Male	0.208***	0.210***	0.215***
Mother's Educ, high	0.153*	0.161*	0.176**
Bed Nets, always	0.205***	0.198***	0.185***
Permanent Floor	0.181**	0.175**	0.163**
Farm Income 2 of 5	0.0124	0.0133	0.0148
Farm Income 3 of 5	0.00367	0.0155	0.0372
Farm Income 4 of 5	0.0525	0.0989	0.184*
Farm Income 5 of 5	0.0924	0.229	0.479***
Regional Maize Price	-0.00893	-0.0113	0.0155*
Central Region	-0.279**	-0.298**	0.329**
Observations	5,740	5,740	5,740

Conclusions

- Tobacco adoption causes lower children's health outcomes
- Lower health outcomes appear concentrated in low income tobacco producers
- Policymakers should incentivize food crop production for the poorest households

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