Incentives to labor migration and agricultural productivity: A Bayesian treatment analysis

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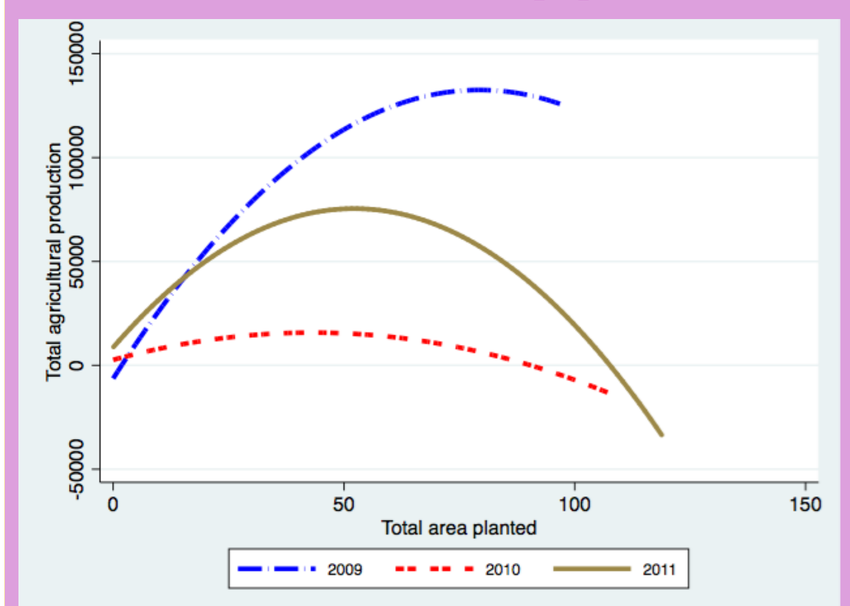
Objectives:

Estimate the distribution of the effect of internal labor migration on agricultural productivity of households living in the rural areas of Uganda. To that aim,

- ⋆ **I estimate simultaneously the likelihood of participating in migration and the agricultural production function;**
- ⋆ **I self-match each household under some assumptions and compute a mean effect for each household;**
- ⋆ **I investigate how the effect changes with the propensity of participating in migration;**
- ⋆ **I test the exclusion assumption on my set of instruments.**

Motivations:

- ⋆ **Internal labor migration does not lead to major transformation in the agricultural sector, instead it helps households in rural areas to maintain their basis life.**
- ⋆ **Since agricultural sector is more labor-intensive, labor cost induced by the migration can reduce the agricultural production if the return is not invested in the sector.**
- ⋆ **Given the growth of the population, it is important to know to what extent agricultural sector is affected: will we be more dependent on outside to feed our population?**



- ⋆ **The rate of labor migration increases over time.**
- ⋆ **So far, little is known about the effects of labor migration on agricultural productivity on households left behind in Uganda.**
- ⋆ **I close the gap of the literature and bring new insights into the effect of migration.**

Data and Preliminary analysis

- **Data cover the period 2009-2011 and 3220 households have been selected initially with around 75% living in rural areas (UNPS)**

Year	All	Rural	Urban	Center	East	North	West
2009	17.8	17.1	19.9	25.3	12.8	11.5	20.5
2010	23.9	23.3	27.2	27.6	20.7	19.9	31.0
2011	24.6	24.2	26.4	36.8	21.3	26.2	25.8
Total	22.3	21.8	24.1	23.3	18.5	19.3	26.2

	2009		2010		2011	
	MIG	Non-MiG	MIG	Non-MIG	MIG	Non-MIG
1^{st} Quartile	0.16	0.32	0.25	0.34	0.26	0.32
4^{th} Quartile	0.27	0.15	0.22	0.12	0.27	0.13
Ave. educ.of MIGs	3.86	.	11.29	.	17.52	.
Ave. educ.of non MIGs	2.39	2.60	6.91	6.91	11.13	11.13
log Prod.(kg/ha)	8.20	8.00	8.08	7.95	8.15	7.94
Area	4.71	3.97	4.98	4.18	2.90	2.50
Nb. crops	15.49	13.38	11.63	10.60	11.18	10.21
Labor Hired(Nb. days)	7.69	5.47	5.04	6.27	12.07	7.22

Identification strategy: Bayesian treatment analysis

The model is given by:

$$z_{it} = \begin{pmatrix} MU^*_{it} \\ Prod_{1it} \\ Prod_{0it} \end{pmatrix} \Bigg|_{\substack{B \\ \theta_i \\ \lambda_{it}}} \sim \mathcal{N}\left(\begin{bmatrix} Z_i\beta + W_{it}\alpha_m + \theta_i\gamma \\ X_{it}\alpha_1 + \theta_i\gamma_1 \\ X_{it}\alpha_0 + \theta_i\gamma_0 \end{bmatrix}, \lambda_{it}^{-1} \begin{pmatrix} 1 & 0 & 0 \\ 0 & \sigma_1^2 & 0 \\ 0 & 0 & \sigma_0^2 \end{pmatrix} \right)$$

Differences from common matching approach:

- ⋆ $P(LM_i = 1|Z_i, W_{it}, \theta_i) \Rightarrow cor(MU_i, Prod_i|Z_i, W_i, X_i) \neq 0$
- ⋆ **Households are self-matched**

From MCMC algorithm, I have a distribution of the contrefactuals of the production

Treatment effects:

$$\rho_{it} = \begin{cases} Prod_{1it} - Prod^*_{0it} \ \ if \ \ LM_{it} = 1 \\ Prod^*_{1it} - Prod_{0it} \ \ if \ \ LM_{it} = 0 \end{cases} \tag{1}$$

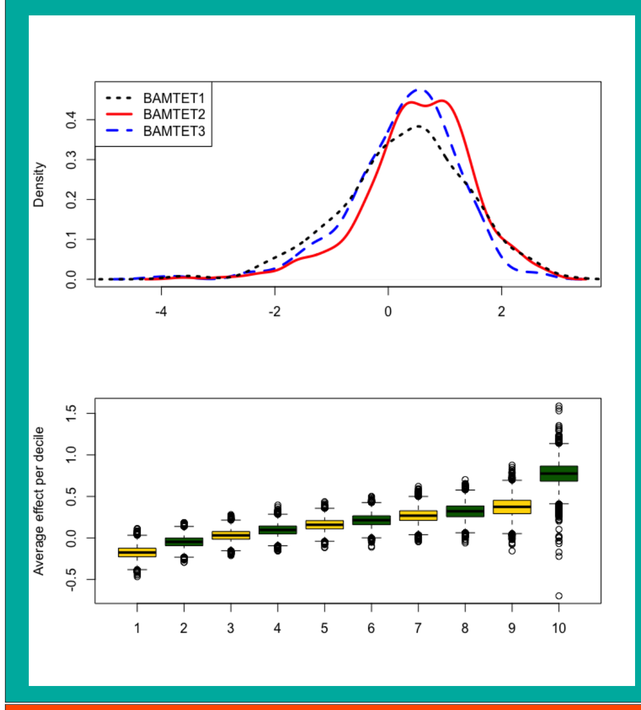
If the convergence is reached after Q iterations, a mean effect for household i, respectively for period t and over the entire period, is:

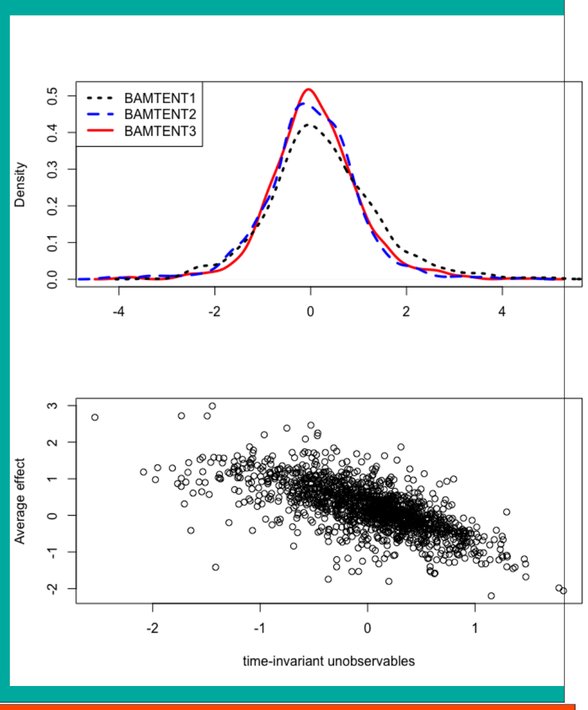
$$\begin{aligned} \rho_{\mathrm{it}} &= \frac{1}{\mathrm{Q}} \sum_{\mathrm{q}=1}^{\mathrm{Q}} \rho_{\mathrm{it}}^{\mathrm{q}} \\ \bar{\rho}_{\mathrm{i}} &= \frac{1}{3} \sum_{1}^{3} \rho_{\mathrm{it}}, \end{aligned} \tag{2}$$

The average effect regarding the probability of participating in migration:

$$\begin{aligned} \mathrm{P}_{\mathrm{it}} &= \Phi(\mathrm{Z}_{\mathrm{i}}\beta + \mathrm{X}_{\mathrm{it}}\alpha_{\mathrm{m}} + \theta_{\mathrm{i}}\gamma, \lambda_{\mathrm{it}}^{-1}) \\ \mathrm{D}_{\mathrm{ht}}^{\mathrm{q}} &= \left\{ \mathrm{i} | \mathrm{P}_{\mathrm{it}}^{\mathrm{q}} \in \left(\frac{\mathrm{h}-1}{10}, \frac{\mathrm{h}}{10} \right) \right\}, for\, h = 1, \cdots, 10 \\ \delta_{\mathrm{h}} &= \frac{1}{3\mathrm{Q}} \sum_{\mathrm{t}=1}^{3} \sum_{\mathrm{q}=1}^{\mathrm{Q}} \frac{1}{\mathrm{M}_{\mathrm{h}}^{\mathrm{q}}} \sum_{\mathrm{i} \in \mathrm{D}_{\mathrm{ht}}^{\mathrm{q}}} \rho_{\mathrm{it}}^{\mathrm{q}} \end{aligned} \tag{3}$$

Main Results:





Conclusion:

1. **The relationship between migration decision and welfare is convex.**
2. **The effect of labor migration is heterogeneous among households.**
3. **The average effect is positive although some households are negatively affected.**
4. **Households who are more likely to participate in migration also have higher return in terms of agricultural productivity.**
5. **The previous migration rate used as an instrument for migration does not verify the exclusion assumption. Fortunately, the model corrects for that bias.**

References

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