Dynamic Agricultural Supply Response: Application to Ethiopian Agriculture using GMM

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Background
• This study estimates supply response of major cereal crops to price and non-price factors as well as government’s agricultural development policies intervention using Nerlovian adjustment cum adaptive expectation model.
• The estimation is based on dynamic panel model using the difference and system of generalized method of moments (GMM)

Empirical Model: linear dynamic panel

\[ Y_{it} = \alpha_{it} + \sum_{j=1}^{m} \beta_{ij} Y_{it-j} + \sum_{k=1}^{n} \beta_{ik} X_{it-k} + \eta_t + u_{it} + \varepsilon_{it} \]

Y: Crop yield (Qt/ha)
X: vector of current and lagged : Price of Cereal, Oilseed, Pulse ($$/Qt) ; Fertilizer; seed (Qt/ha), Draught animal power (animal/ha); HH size
\eta: time dummies [policy dummy]
\rho: short-run own price elasticity
\beta: supply responses for competing crop prices, input prices, and technology shifters
V:the fixed effects, e: idiosyncratic shocks

Econometric Estimation
Difference GMM (D-GMM) and System-GMM

\[ \Delta y_{it} = \rho \Delta y_{it-1} + \beta' \Delta x_{it} + \Delta \lambda_{it} + \Delta \varepsilon_{it} \]

Where \( \Delta y_{it} = y_{it} - y_{it-1} \quad \Delta \varepsilon_{it} = \varepsilon_{it} - \varepsilon_{it-1} \)

Data: Unbalanced panel from 50 Zones/Counties; Year 2003 thru 2010

Panel Unit Root: fisher
Variable | P-value
--- | ---
Cereal Yield | 0.011
Price of cereal | 0.012
Price of Pulse | 0.091
Fertilizer | 0.003
Draught animal | 0.000
Seed | 0.113

Panel Causality Test
Variable | P-value
--- | ---
Cereal yield to price | 0.009
Cereal price to yield | 0.543

Conclusion
• Yield positively responded to the price of cereal and pulse than the non-price technological shifters