Feed the Future Policy Workshop – Measurement Issues

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Tinbergen on Policy

1. Ascertain the state of affairs in the economy.
2. Determine what the desired state of the economy is and whether the current state of the economy diverges from that state.
3. Estimate the effects of possible alternative policies.
4. Make a choice – decide between alternative policies (including the possibility of no action).
5. Implement or execute the chosen policy.

Formulation of Policy Analysis

- The economist employed by the planner identifies measures of general interest – y_k.
- Next, the economist identifies policy variables that effect these target variables – x_j.
- Finally, the economist estimates the relationships between these target variables, the policy variables, and other endogenous variables in the economy.

$$y_t = \Gamma_z z_t + \Gamma_x x_t \Rightarrow \Omega(y_t) \tag{1}$$

Impact Studies

- Oehmke, Weatherspoon, Moss, and Mabiso provide an overview of several impact studies conducted between 2008 and 2012 in Sub-Saharan Africa for USAID projects.
- The objectives of these impact studies were to
  1. Quantify the effect of USAID supported projects on smallholder income and poverty status or child nutritional status;
  2. Provide empirical validation or falsification of the causal pathways from intervention to poverty reduction, by which the projects operate; and
  3. Learn lessons about what has made the projects most successful in augmenting smallholder income, particularly with respect to new activities to be funded under FtF.

- These studies applied quasi-experimental modeling methods relying largely on difference-in-difference specifications to estimate the effect of specific policies on smallholder income and child nutritional status.
- In Ghana the program focused on the value chain for pineapple and mango.
- In Kenya the focus was on the value chain for dairy.
- The Kenyan value chains were for horticulture and maize.
- The Rwanda program improved the value chain for coffee.

Development of Traditional and Non-Traditional Measures

- Most of the studies examined the impact of these programs using fairly standard measures:
  - Changes in household income,
  - The incidence of poverty, and
  - Changes in income inequality.

Other Less Traditional Measures of Program Impact

- Extension of the Working's model to analyze food insecurity – $w_F = \alpha_F + \beta_F \ln(E)$.
- Analysis of the effect of value chains on the distribution of returns focusing on smallholder agriculture.
- Changes in the distribution of employment at the village level.

Statistical Considerations of Measures

- Most of these applications are quasi-experiemental.
- The most common adjustment for this consideration is the use of difference-in-difference methods.
- The difference in difference methodology involves estimating two relationships

$$\begin{aligned} \Delta x_{it} &= \alpha_{01} + \alpha_{11} z_{it} + \epsilon_{it} \; i \notin T \\ \Delta x_{jt} &= \alpha_{02} + \alpha_{21} z_{jt} + \epsilon_{jt} \; j \in T \end{aligned} \tag{2}$$

Reformulation of the Difference in Difference Approach

- An alternative approach involves estimating the model with multiple dummy variables

$$x_{it} = \tilde{\alpha}_0 + \tilde{\alpha}_1 D_{1t} + \tilde{\alpha}_2 D_{2i} + \tilde{\alpha}_3 z_{it} + \tilde{\alpha}_4 D_{1t} z_{it} + \tilde{\alpha}_5 D_{2i} z_{it} \quad (3)$$

where D_{1t} is a dummy variable that is 1 if $t = 1$ and 0 if $t = 0$, D_{2i} is a dummy variable which is a 1 if $i \in T$ and 0 if $i \notin T$, and the remaining variables remain unchanged.

Logit Formulation of the Difference in Difference

- Other applications such as the estimation of the change in the poverty rate can be implemented using a modification of Equation 3.
- In the Logit specification, the dependent variable is a binary variable that takes on a value of 1 if the household is in poverty and a 0 otherwise.
- This probability of being in poverty is then parametrized using a Logit function

$$y_{it} \propto f\left(x_{it}, \beta\right) = \frac{\exp\left[z_{it}'\beta\right]}{1 + \exp\left[z_{it}'\beta\right]}. \tag{4}$$

The difference-in-difference specification for this Logit without repeated observations then follows the linear specification in Equation 3.

Information Specification of Value Chain

- Moss, Mbaye, and Oehmke propose an information approach to inequality for applications such as change in output resulting from investment in the value chain.
- Assume that different types of producers can be segregated into groups - $g = 1, 2, 3$ where group 1 is smallholders, group 2 are intermediate producers, and group 3 are larger commercial farmers.
- Before the investment in value chains, we assume that either the quantity of high valued output or value of high valued output sold can divided into shares for each group – s_1, s_2, s_3.
- After the implementation of a value chain investment we compute the same values – $\tilde{s}_1, \tilde{s}_2, \tilde{s}_3$.

Information Specification of Value Chain – Continued

- The statistical information in the change in production can then be expressed as

$$I = s_1 \ln\left(\frac{s_1}{\tilde{s}_1}\right) + s_2 \ln\left(\frac{s_2}{\tilde{s}_2}\right) + s_3 \ln\left(\frac{s_3}{\tilde{s}_3}\right). \tag{5}$$

- If there are no changes in the shares produced $I \to 0$.
- To define whether I is statistically different from zero Moss, Mbaye, and Oehmke suggest jackknifing.