Excess Sensitivity of Consumption to Sentiment of India: Examining the Role of Households' Network- Online Appendix

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I Derivation of the Household Specific Expenditure Minimizing Consumption Bundle and the Price Index

We minimize the total expenditure, $e^j_{h,t} = \sum_{i=1}^{n} p^j_{i,t} c^j_{i,ht}; \quad j = rural, urban$

subject to,

$$c^j_{h,t} = \prod_{i=1}^{n} (c^j_{i,ht})^{\alpha^j_{i,ht}}; \quad \sum_{i=1}^{n} \alpha^j_{i,ht} = 1; \quad 0 < \alpha^j_{i,ht} < 1$$

$$L = \sum_{i=1}^{n} p^j_{i,t} c^j_{i,ht} + \lambda^j_{h,t} \left[c^j_{h,t} - \prod_{i=1}^{n} (c^j_{i,ht})^{\alpha^j_{i,ht}} \right]$$

$$\frac{\partial L}{\partial c^j_{i,ht}} = p^j_{i,t} - \frac{\lambda^j_{h,t} \alpha^j_{i,ht} c^j_{h,t}}{c^j_{i,ht}} = 0; \quad i = 1, 2, \ldots, n$$

$$\Rightarrow c^j_{i,ht} = \frac{\lambda^j_{h,t} \alpha^j_{i,ht} c^j_{h,t}}{p^j_{i,t}} \tag{A.1}$$

$$\frac{\partial L}{\partial \lambda^j_{h,t}} = c^j_{h,t} - \prod_{i=1}^{n} \left(c^j_{i,ht} \right)^{\alpha^j_{i,ht}} = 0 \tag{A.2}$$

Equation (A.1) gives,

$$c^j_{i,ht} = \frac{\lambda^j_{h,t} \alpha^j_{i,ht} c^j_{h,t}}{p^j_{i,t}}$$

Equation (A.2) and $\sum_{i=1}^{n} \alpha_{i,ht}^{j} = 1$ gives,

$$\Rightarrow \prod_{i=1}^{n} \left(c_{i,ht}^{j}\right)^{\alpha_{i,ht}^{j}} = c_{h,t}^{j} = \frac{\lambda_{h,t}^{j} \prod_{i=1}^{n} \left(\alpha_{i,ht}^{j}\right)^{\alpha_{i,ht}^{j}} c_{h,t}^{j}}{\prod_{i=1}^{n} \left(p_{i,t}^{j}\right)^{\alpha_{i,ht}^{j}}}$$

$$\Rightarrow \lambda_{h,t}^{j} = \frac{\prod_{i=1}^{n} \left(p_{i,t}^{j}\right)^{\alpha_{i,ht}^{j}}}{\prod_{i=1}^{n} \left(\alpha_{i,ht}^{j}\right)^{\alpha_{i,ht}^{j}}} \tag{A.3}$$

Note, equation (A.1) also gives,

$$\sum_{i=1}^{n} p_{i,t}^{j} c_{i,ht}^{j} = e_{h,t}^{j} = \lambda_{h,t}^{j} c_{h,t}^{j} \sum_{i=1}^{n} \alpha_{i,ht}^{j} = \lambda_{h,t} c_{h,t}^{j}$$

Substituting, $\lambda_{h,t}^{j}$ from equation (A.3) gives,

$$c_{h,t}^{j} = \frac{k_{h,t} e_{h,t}^{j}}{p_{h,t}}$$
$$p_{h,t}^{j} = \prod_{i=1}^{n} (p_{i,t}^{j})^{\alpha_{i,ht}^{j}}$$
$$k_{h,t}^{j} = \prod_{i=1}^{n} (\alpha_{i,ht}^{j})^{\alpha_{i,ht}^{j}}$$

We obtain, $e_{i,ht}^{j}$ from CPHS, and calculate – (i) $e_{h,t}^{j} = \sum_{i=1}^{n} e_{i,ht}^{j}$; and (ii) $\alpha_{i,ht}^{j} = \frac{e_{i,ht}^{j}}{e_{h,t}^{j}}$ from the data for food bundle, and food & fuel bundle. This implies, $0 < \alpha_{i,ht}^{j} < 1$. We obtain $p_{i,t}^{j}$ from MoSPI (mospi.gov.in)

II Rational Expectations-Based Permanent Income/Lifecycle Hypothesis (PIH)

$$\begin{aligned}
&\underset{\{c^j_{h,t}\}_{t=0}^{\infty}}{\text{maximize}} \quad && E_0 \sum_{t=0}^{\infty} \beta^t u\left(c^j_{h,t}\right) \quad u'(c^j_{h,t}) > 0; \quad u''(c^j_{h,t}) < 0 \\
&\text{subject to} && a^j_{h,t} - c^j_{h,t} = \frac{a^j_{h,t+1}}{R}, \quad \text{for all } t \geq 0, \\
& && a^j_{h,0} \quad \text{given}, \\
& && \lim_{T\to\infty} R^{-(T+1)} a^j_{h,(T+1)} = 0 \quad \text{(No Ponzi Game Condition (NPG))}
\end{aligned}$$

Choose $a^j_{h,(t+1)}$ to maximize:

$$E_0 \sum_{t=0}^{\infty} \beta^t u\left(a^j_{h,t} - \frac{a^j_{h,(t+1)}}{R}\right)$$

Euler Equation:

$$E_t\left(\frac{u'(c^j_{h,(t+1)})}{u'(c^j_{h,t})}\right) = \beta R$$

Assuming $\beta R = 1$ and $u(c^j_{h,t}) = \ln(c^j_{h,t})$, we obtain:

$$\ln \Delta c^j_{h,(t+1)} = \delta^j_{h,(t+1)}; \quad E_t(\delta^j_{h,(t+1)}) = 0$$

III Construction of the Combined Price Index

To consolidate nominal consumption expenditure for food groups, we have grouped some categories for convenience for example Meat, Fish and Egg, Vegetables and Spices and Sweets and Snacks. We need to calculate the combined price index, for these categories. The Consumer Pyramids Household Survey (CPHS) provides combined expenditure shares for meat, fish, and egg. However, the Ministry of Statistics and Programme Implementation (MoSPI) provides separate price indices for meat and fish ($p_{mf,t}$) and egg ($p_{g,t}$). We compute the combined price index for meat, fish, and egg ($p_{mfg,t}$) as follows:

$$p_{mfg,t} = p_{mf,t}^{\omega_{mf}} \times p_{g,t}^{\omega_g}$$

Where:

$$\omega_{mf} = \frac{w_{mf}}{w_{mf} + w_g}; \quad \omega_g = 1 - \omega_{mf}$$

Here, w_{mf} and w_g represent the weights of meat and fish, and egg, respectively, as provided by MoSPI. Similarly, we calculate the combined price index for Vegetables and Spices and Sweets and Snacks.