Methodology

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1 The Marginal Consumer Price Index

My paper follows Olivi et al. (2024) in defining the marginal consumer price index. Let $\frac{\partial e_{it}^n}{\partial e_t^n}$ denote the marginal budget share of household n on sector i in period t. The marginal budget share reflects the additional expenditure on a sector when a given household spends one additional dollar. Let p_t^n denote the sample weight of household n in period t, let E_t^n denote the total expenditure of household n in period t, and let E_t denote the aggregate total expenditure in period t. The marginal budget shares are then aggregated according to,

$$\overline{\frac{\partial e_{it}}{\partial e_t}} = \sum_n \nu_t^n \frac{\partial e_{it}^n}{\partial e_t^n}, \tag{1}$$

where $\nu_t^n = \frac{p_t^n \frac{E_t^n}{E_t}}{\sum_n p_t^n \frac{E_t^n}{E_t}}$. In this way, the aggregate marginal budget share is a representative expenditure weighted mean of the marginal budget shares of individual households. Now, let P_{it} denote the price level of sector i in period t. The Marginal Consumer Price Index is then finally defined as,

$$\text{MCPI} = \sum_i \overline{\frac{\partial e_{it}}{\partial e_t}} P_{it} \tag{2}$$

Note that for homothetic preferences, the marginal budget shares coincide with the average budget shares. Therefore, the marginal consumer price index would coincide with the conventional consumer price index. For non-homothetic CES preferences this is no longer the case in general.

2 Estimation Details

Let ω_{it}^n denote the expenditure share of household n on sector i in period t. Furthermore, let σ_t denote the elasticity of substitution in period t, and let η_{it} denote the income elasticity for sector i in period t. As presented in Hubmer (2022), we know that expenditure shares change over time according to,

$$d\ln\omega_{it}^n = (1-\sigma_t)d\ln\left(\frac{P_{it}}{P_t}\right) + (\eta_{it}-1)d\ln\left(\frac{E_t^n}{P_t}\right), \tag{3}$$

where P_{it} denotes the price level of sector i in period t, P_t denotes the overall price level, and E_t^n denotes the total nominal expenditure of household n in period t. We furthermore know that the budget constraint imposes the restriction,

$$\sum_i \omega_{it}^n \eta_{it} = 1 \tag{4}$$

Let ξ_{it} denote a sector-year fixed effect, and let b denote some baseline sector. To identify the income elasticity in period t for consumption goods in sector i, I again follow Hubmer (2022) and consider the expression,

$$\ln\left(\frac{\omega_{it}^n}{\omega_{bt}^n}\right) = \xi_{it} + (1-\sigma_t)\ln(\frac{P_{it}}{P_{bt}}) + (\eta_{it}-\eta_{bt})ln\left(\frac{E_t^n}{P_t}\right), \tag{5}$$

which uses expression (3) as a starting point. Assuming that prices do not vary across households conditional on demographic controls X_t^n, I can then estimate,

$$\ln\left(\frac{\omega_{it}^n}{\omega_{bt}^n}\right) = \xi_{it} + (\eta_{it}-\eta_{bt})\ln E_t^n + \Gamma_{it}' X_t^n + \epsilon_{it}^n, \tag{6}$$

In order to avoid measurement error in sectoral expenditures introducing bias, I use post-tax income to instrument total expenditure. This empirical specification allows me to estimate relative income elasticities, $\eta_{it} - \eta_{bt}$, with respect to some baseline sector. Restriction (4) allows me to recover the individual income elasticities from the relative income elasticities. I can finally directly recover the marginal budget shares from the individual income elasticities by noting that,

$$\eta_{it} = \frac{\partial \ln e_{it}^n}{\partial \ln E_t^n} \iff \frac{\partial e_{it}^n}{\partial E_t^n} = \frac{e_{it}^n}{E_t^n} \frac{\partial \ln e_{it}^n}{\partial \ln E_t^n} = \omega_{it}^n \eta_{it} \tag{7}$$

References

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