The Myth of Post-Reform Income Stagnation in Brazil

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Carvalho-Chamon Story

- Biases in CPI in Brazil mean that real expenditure (and income) growth are understated
  - new goods included in CPI only after big price falls are done
  - substitution bias

- Infer true real expenditure growth from behaviour of food price share over time
  - Engel's law – food share declines with income
  - If average food share falls (controlling for relative price of food and real expenditure) then real expenditure growth is too low
  - Allow effect to vary by income level – implications for inequality too

- Key identifying assumption
  - No spatial variation in CPI measurement error

Thinking About Identifying Assumption

- Uncomfortable with assumption of no regional variation in CPI biases
  - could be weakened slightly? Mean CPI bias same across regions should be enough?
- Rural vs urban seems like natural candidate
  - if CPI by state by rural/urban available separately could split this way
- Bigger issue: different households face different relative prices
  - deviations from average relative prices probably correlated with incomes
  - risks confounding average CPI bias at different points in income distribution with average household-specific deviations from relative prices

Tricky Stuff with Price Indices, 1

- Engel curve for food share w given log prices p_F, p_N and log total expenditure y is:

$$w = \phi + \gamma \cdot (p_F - p_N) + \beta \cdot (y - p)$$

- Prices contain measurement error (suppressing constants)

$$p_F = \pi_F + e_F$$

$$p_N = \pi_N + e_N$$

$$p = \pi + e$$

- Key point: overall true and measured price indices depend on p_F and p_N , need to think through implications of this adding-up constraint

$$p = f(p_F, p_N) \qquad \pi = g(p_F, p_N)$$

Tricky Stuff with Price Indices, 2

- Suppose f()=g() and p=αp_F+(1- α)p_N, with α known (from CPI data), so that measurement error in aggregate price index is:

$$e = \alpha \cdot e_F + (1-\alpha) \cdot e_N$$

- This has implications for estimated bias. Suppose that e_F=ke_N with k<1 (less bias in food prices than non-food prices). Period dummies are:

$$\delta = \gamma \cdot (k-1) - \beta \cdot (\alpha \cdot k + (1-\alpha)) \cdot e_N$$

- No longer obvious that CC are underestimating aggregate CPI bias?

$$k = 1: \quad e = e_N = \frac{\delta}{-\beta} \qquad\qquad k = 0: \quad e = \frac{\delta \cdot (1-\alpha)}{-\gamma - \beta \cdot (1-\alpha)}$$

Tricky Stuff with Price Indices, 3

- Go back to Deaton and Muellbauer (1980), Equation (9): AIDS price index is

$$p = f(p_F, p_N) = \mu + \phi \cdot p_F + (1-\phi) \cdot p_N + \frac{\gamma}{2} \cdot \left(p_F^2 + p_N^2 - 2 \cdot p_F \cdot p_N\right)$$

- CPI observed in the data is (probably)

$$\pi = g(p_F, p_N) = \alpha \cdot p_F + (1-\alpha) \cdot p_N$$

- Need to work through potential biases this difference between f() and g() implies for estimates of CPI bias
  - OK to ignore second-order terms in errors?
  - OK to ignore difference between ϕ and α?

Looking Under the Hood

- Are there direct ways of finding evidence of CPI bias by looking directly at
  - changes in weights?
  - behaviour of prices of new and old items?

- Vaguely uneasy with implicit aggregation of mistakes in CPI
  - suppose all measurement error in subcomponents of p_N
  - under what circumstances will measurement error be additively separable so that $p_N=\pi_N+e_N$?