Discussion of "The Digital Economy, GDP and Consumer Welfare"

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New Goods: Treatment in the Literature

- Assume that good 0 appears in period 1 as new good

- Hicksian reservation price p_0^{0*} serves as the period 0 price

- Area under the (compensated) demand curve from p_0^{0*} down to p_0^1 gives the consumer surplus

  - Consumer surplus equals $q_0^1 \times$ difference between price paid, p_0^1, and an average willingness-to-pay in between p_0^1 and p_0^{0*}

- Therefore an approximation for the surplus from new good is:

$$S = (\bar{p}_0 - p_0^1)q_0^1$$

Economic price and volume indexes

- Compensated demand curve with u=f($\mathbf{q}^1$) gives *equivalent variation* (*EV*) as the change in the expenditure function:

$$EV = c(u^1,\mathbf{p}^0) - c(u^1,\mathbf{p}^1)$$

- The change in the money metric utility function at prices of period 0 (Y being held constant) also equals *EV*:

$$EV = c(u^1,\mathbf{p}^0) - c(u^0,\mathbf{p}^0)$$

- Konus *cost of living index* with reference utility u^1 is:

$$K(\mathbf{p}^0,\mathbf{p}^1,u^1) = Y^1/(Y^1 + EV)$$

- Allen *standard of living index* with reference prices $\mathbf{p}^0$ is:

$$A(u^0,u^1; \mathbf{p}^0) = (Y^t/Y^0)/K(.,u^1) = (Y^t + EV)/Y^0$$

Deriving a formula for new goods bias

- Bennet decomposition of $Y^t - Y^0$:

$$\Delta(\mathbf{p} \cdot \mathbf{q}) = \overline{\mathbf{p}} \cdot \Delta\mathbf{q} + \overline{\mathbf{q}} \cdot \Delta\mathbf{p}$$

- Diewert decomposition (based on $Y^1/Y^0 = P^F Q^F$) is:

$$\Delta Y = Y^0\{½(1+Q^F)(P^F - 1) + ½(1+P^F)(Q^F - 1)\}$$

- Set the quantity change terms equal to each other:

$$\overline{\mathbf{p}} \cdot \Delta\mathbf{q} = ½Y^0(1+P^F)(Q^F - 1)$$

$$Q^F \approx 1 + (\mathbf{p}_0 + \mathbf{p}_1) \cdot \Delta\mathbf{q} / Y^0(1+P^F)$$

Deriving a formula for new goods bias

- Assume that the new good (good 0) is omitted from the deflator used to find Q^F

- Nominal consumption in period 1 includes $p_0^1 q_0^1$

- Q^F values new good at price p_0^1, and therefore misses the consumer surplus from the entry of the new good

- Adjusting Q^F to include the omitted consumer surplus gives:

$$Q^A = Q^F + (p_0^{0*} - p_0^1)q_0^1 / Y^0(1+P^F)$$

Example

- In period 0, goods 1 and 2 have equal market share. Then good 0 enters. It takes half the market share of good 2, for which it is a close substitute, even though good 2's price falls.

- Price of new good is half of previous price of good 2

- $Q^F = 4/3$, $Q^A =$ or 1.476 or 1.48, depending on choice of P^F

- True index equals 1.414, so dividing by 2 rather than $1+P^F$ gives a closer approximation of 1.458

period	p_1	q_1	p_2	q_2	P_0^{0*} or p_0^1	P^F	$\Delta p_0 / Y_0(1+P^F)$
0	2	1	2	1	2		1/(4*1.75)=0.143
1	2	1	1	1	1	0.707	1/(4*1.707)=0.146

Comment

- An exact decomposition of Q^F averages period 0 and period 1 prices with the latter deflated by P^F :

$$Q^{\mathrm{F}} = \frac{(\mathbf{p}_0 + \mathbf{p}_1/P^F) \cdot \mathbf{q}_1}{(\mathbf{p}_0 + \mathbf{p}_1/P^F) \cdot \mathbf{q}_0}$$

Suggests the approximation:

$$Q^A \approx Q^F + (p_0^{0*} - p_0^1/P^F)\, q_0^1/Y^0(1 + P^{Lasp}/P^F)$$

This approximation would still work even if inflation were high

Free goods bias

- If **z** is amount of free goods rationed to consumers and **w** is their shadow prices (or virtual prices), then the change in surplus from continuing free goods $\approx \overline{\mathbf{w}} \cdot \Delta\mathbf{z}$.

- With entry of new free good z_0^1, adjusting Q^F for the changing surplus from continuing free goods:

$$Q_{FG}{}^A \approx Q^F + (\overline{\mathbf{w}} \cdot \Delta\mathbf{z} + w_0^1 z_0^1)/0.5Y^0(1+P^F)$$

- Need to also add $(w_0^{0*} - w_0^1)z_0^1/ Y^0(1+P^F)$ to incorporate surplus from entry of new free good

Comments

- Useful expression to help us think about shadow value of amount of free goods rationed to consumers

- If consumers can have the free good in unlimited amounts, then $w_0^t = 0$, and the free good doesn't matter for growth

- But if quality improves, the marginal willingness to pay for the improved quality (w_0^{0*}) would be positive even if w_0^0 was 0,

- <u>Entry</u> of new free good also generates surplus

Comments

- Constraint on consumption of free media from digital platforms is time, but time expenditures don't belong in GDP

- Range of free goods goes beyond digital platforms and smartphone apps, so looking only at them overstates growth

- Some have suggested that to value free goods we must move beyond the marginalist theory of value – perhaps back to something like the labor theory of value – but no alternative frameworks for valuation have been put forward for consideration