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 $p_{0*}$ serves as the period 0 price
- Area under the (compensated) demand curve from $p_{0*}$ down to $p_{01}$ gives the consumer surplus
  - Consumer surplus equals $q_{01} \times$ difference between price paid, $p_{01}$, and an average willingness-to-pay in between $p_{01}$ and $p_{0*}$
- Therefore an approximation for the surplus from new good is:

$$ S = (\bar{p}_0 - p_{01})q_{01} $$
Economic price and volume indexes

- Compensated demand curve with $u = f(q^1)$ gives equivalent variation (EV) as the change in the expenditure function:
  \[ EV = c(u^1, p^0) - c(u^1, p^1) \]

- The change in the money metric utility function at prices of period 0 (Y being held constant) also equals EV:
  \[ EV = c(u^1, p^0) - c(u^0, p^0) \]

- Konus cost of living index with reference utility $u^1$ is:
  \[ K(p^0, p^1, u^1) = \frac{Y^1}{Y^1 + EV} \]

- Allen standard of living index with reference prices $p^0$ is:
  \[ A(u^0, u^1; p^0) = \frac{Y^t/Y^0}{K(., u^1)} = \frac{Y^t + EV}{Y^0} \]
Deriving a formula for new goods bias

- Bennet decomposition of $Y_t - Y^0$:
  \[ \Delta(p \cdot q) = \bar{p} \cdot \Delta q + \bar{q} \cdot \Delta p \]

- Diewert decomposition (based on $Y^1/Y^0 = P^FQ^F$) is:
  \[ \Delta Y = Y^0\left\{\frac{1}{2}(1+Q^F)(P^F - 1) + \frac{1}{2}(1+P^F)(Q^F - 1)\right\} \]

- Set the quantity change terms equal to each other:
  \[ \bar{p} \cdot \Delta q = \frac{1}{2}Y^0(1+P^F)(Q^F - 1) \]
  \[ Q^F \approx 1 + \left(p_0 + p_1\right) \cdot \Delta q / Y^0(1+P^F) \]
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 $p_0^1q_0^1$
- $Q^F$ 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
- \( Q_F = 4/3, Q_A = \text{or 1.476 or 1.48, depending on choice of } P_F \)
- True index equals 1.414, so dividing by 2 rather than 1+\( P_F \) gives a closer approximation of 1.458

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<tr>
<th>period</th>
<th>( p_1 )</th>
<th>( q_1 )</th>
<th>( p_2 )</th>
<th>( q_2 )</th>
<th>( P_0^{0*} ) or ( P_0^1 )</th>
<th>( P_F )</th>
<th>( \Delta p_0 / Y_0(1+P_F) )</th>
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<td>( 1/(4*1.75) \approx 0.143 )</td>
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<tr>
<td>1</td>
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<td>1</td>
<td>0.707</td>
<td>( 1/(4*1.707) \approx 0.146 )</td>
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Comment

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

$$Q^F = \frac{(p_0 + p_1/P^F) \cdot q_1}{(p_0 + p_1/P^F) \cdot q_0}$$

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 \( \approx \bar{w} \cdot \Delta z \).

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

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

- 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,
- **Entry** 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.