The Consumption Aggregate

LECTURE 2
Today’s agenda

- Lecture 1: consumption expenditure is our proxy for the standard of living.
- Today’s lecture has two goals:
  1) providing a working definition of consumption expenditure
  2) discussing a selection of adjustments that analysts need to implement once data have been assembled.
- 1) and 2) give the final form of the living standard indicator, which is used for inequality and poverty measurement.
It takes four to construct a living standard indicator

Living standard indicator = \[
\frac{\text{nominal household consumption expenditure}}{\text{household size} \times \text{temporal CPI} \times \text{spatial CPI}}
\]

Numerator
- Which expenditures, exactly?

Denominator
- Household size is not self-defining (boarders? guests? servants?...)
- How to account for inflation (temporal CPI) and differences in price levels across the national territory (spatial CPI)?
1. Which expenditures, exactly?
Analysts do not include everything

- Nominal household consumption expenditure should not be calculated by summing up all expenditures during the reference period.

- Why?
  1) We are interested in the use (consumption) of resources, not their purchase
  2) We want to capture consumption that enhances welfare. Think of expenditures related to funerals... would you include them?
  3) We are interested in what is “typical” consumption during the reference period (year) This leads as to exclude all infrequent, extra-ordinary expenses
  4) ...

- These examples imply that the choice of consumption expenditures to be aggregated is selective, not straightforward.
The nominal consumption aggregate

Nominal consumption aggregate =

- monetary expenditures on food and non-food non-durable goods and services consumed
- value of in-kind consumption
- value of use (not purchase) of durables
- value of use of owner-occupied housing.

No allowance for the value of time and leisure and no allowance for public goods.
Living standard indicator = \frac{\text{nominal household consumption expenditure}}{\text{household size} \times \text{temporal CPI} \times \text{spatial CPI}}
2. Adjusting for household size and composition
Total, per capita or per adult equivalent expenditure?

- Ultimate interest is on *individual* welfare, not the welfare of a household.
- Expenditure data, however, are typically collected at the household level.
- When we want to compare the standard of living of individuals in different households, *household* expenditures must be adjusted to account for differences in household *size* and *composition*.

- **Size**
  Does a household of 2 need twice as much as a household of 1?

- **Composition**
  Are children’s needs lower than adults’?
Adjusting for household size and economies of scale

- Larger households consume more, because there are “more mouths to feed”
- One possibility is to consider per capita consumption
- There is a subtler issue: housing, heating, transportation etc. are shared between members. Economists say that they are public goods
- Example: housing. Consumption by one member of the household does not necessarily reduce the amount available for consumption by another person within the same household. Economists say that there are significant economies of scale for housing.
- By failing to adjust for economies of scale, one might underestimate the wellbeing of large households (and overestimate that of small households).
Economies of scale: adjustment

- A popular strategy is to rescale household consumption expenditure as follows:

\[ \tilde{x}_i = \frac{x_h}{(n_h)\alpha} \quad \alpha \in [0,1] \]

- \( \alpha = 1 \) means we assume that no goods consumed are public in the household, in which case consumption is equally divided among household members. No adjustment for economies of scale is made.

- \( \alpha = 0 \) means we assume that all goods consumed are public in the household. This is a purely hypothetical situation in which each individual is assumed to consume the total consumption of the household.

- In practice, \( \alpha \) assumes conventional values. E.g. \( \alpha = 0.5 \) implies that a household of four persons needs twice as much as a single-person household.
Economies of scale: to adjust or not to adjust?

- When a high percentage of budget is devoted to public goods (that is, if price and quantity of housing, utilities, and durable goods are high), economies of scale are likely to be significant.

- Analysts look at the shares in the data, and decide whether to adjust.

- Rule of thumb: large share = adjust
  small share = do not adjust
Adjusting for household composition

- It is usually assumed that children and the elderly need less than working-age adults.

- Similarly, it is thought that women need less consumption than men.

- If that is the case, our standard of living indicator should account for differences in household composition.
Equivalence scales: adjustment

- If adjustments are to be made, we use equivalence scales.
- An equivalence scale calculates the “number of equivalent adults” in the household.
- An equivalence scale typically looks as follows:
  \[ n_{AE} = (n_{males\ 15+} \times 1) + (n_{females\ 15+} \times 0.8) + (n_{kids\ 0-14} \times 0.5) \]
- Different categories have different “weights”: adults male count for 1, adult female for 0.8, …
- Once the “number of adult equivalents” \( n_{AE} \) has been calculated we rescale household consumption expenditure as follows:
  \[ \tilde{x}_h = \frac{x_h}{n_{AE}} \]
Equivalence scales: examples

**OECD equivalence scale (OECD-I)**

\[ AE = 0.3 + 0.7 \times A + 0.5 \times K \]

The first adult is given a weight of 1. Other adults are given a weight of 0.7, to reflect economies of scale. Children are given a weight of 0.5 to reflect their lower needs.

**OECD-modified scale (OECD-II)**

\[ AE = 0.5 + 0.5 \times A + 0.3 \times K \]

**National Research Council (1995)**

\[ AE = (A + \alpha K)^\theta \]

**AE** = # Adult Equivalents; **A** = # Adults; **K** = # children;\( \alpha \) in \([0,1]\) = cost of a child relative to that of an adult;\( \theta \) in \([0,1]\), \((1 - \theta)\) measures the extent of economies of scale.
Equivalence scales: to adjust or not to adjust?

- If children/elderly are as “expensive” as adults despite their lower nutritional requirement (e.g. because of very high costs for education or health), less need for adjustment.

- Rule of thumb: large differences in the “cost” of different household members = adjust small differences = do not adjust.
The international practice

Where do countries around the world fall when adjusting for household size and composition?
<table>
<thead>
<tr>
<th>Surveys</th>
<th>Consumption vs Income</th>
<th>Household Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia 2011</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Indonesia 2016</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Lao PDR 2012</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Malaysia 2016</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Mongolia 2016</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Myanmar 2015</td>
<td>Consumption</td>
<td>Per Capita Per Adult Equivalent</td>
</tr>
<tr>
<td>Philippines 2015</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Timor-Leste 2014</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Vietnam 2016</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
</tbody>
</table>
Europe and Central Asia

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Consumption vs Income</th>
<th>Household Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenia 2015</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Bosnia and Herzegovina 2004</td>
<td>Income</td>
<td>-</td>
</tr>
<tr>
<td>Kosovo 2015</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Kyrgyz Republic 2013</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Macedonia 2017</td>
<td>Income</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Moldova 2013</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Russian Federation 2008</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Tajikistan 2014</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
</tbody>
</table>
## Latin America & Caribbean

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Consumption vs Income</th>
<th>Household Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina 2016</td>
<td>Income</td>
<td>Per Capita Per Adult Equivalent</td>
</tr>
<tr>
<td>Bolivia 2015</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Colombia 2017</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Ecuador 2013</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Ecuador 2018</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>El Salvador 2015</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Guatemala 2014</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Haiti 2012</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Honduras 2016</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Mexico 2016</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Nicaragua 2014</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Panama 2008</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Paraguay 2017</td>
<td>Income</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Peru 2017</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
</tbody>
</table>
## Middle East & North Africa

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Consumption vs Income</th>
<th>Household Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt 2008</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Iraq 2012</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Jordan 2010</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Lebanon 2011</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Djibouti 2017</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Morocco 2013</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>West Bank and Gaza 2011</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Yemen 2005</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
</tbody>
</table>
## South Asia

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Consumption vs Income</th>
<th>Household Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Bangladesh 2016</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Bhutan 2017</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Sri Lanka 2016</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>India 2011</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Pakistan 2013</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Maldives 2016</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
</tbody>
</table>
# Sub-Saharan Africa

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Consumption vs Income</th>
<th>Household Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Côte d’Ivoire 2015</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Kenya 2015</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Malawi 2010</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Mozambique 2014</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Nigeria 2010</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>South Africa 2014</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
<tr>
<td>Tanzania 2014</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Uganda 2011</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Zambia 2015</td>
<td>Consumption</td>
<td>Per Adult Equivalent</td>
</tr>
<tr>
<td>Zimbabwe 2011</td>
<td>Consumption</td>
<td>Per Capita</td>
</tr>
</tbody>
</table>
Living standard indicator = \( \frac{\text{nominal household consumption expenditure}}{\text{household size} \times \text{temporal CPI} \times \text{spatial CPI}} \)
3. & 4. Adjusting for purchasing power
Nominal vs. real expenditure
useful vocabulary

- In real life, it is always the case that different households face different prices when purchasing the same exact good.

- Differences can arise over time (inflation) or across geographical areas (cost-of-living differences).

- In this context, nominal expenditure simply means unadjusted for price differences.

- Real is the opposite of nominal. A real expenditure is one adjusted for purchasing power.
Is nominal consumption expenditure a good measure of the living standard?

- In general, no.
- When the price level of commodities and services changes over time, so does the purchasing power of money.
- Welfare comparisons must be carried out keeping constant the purchasing power of households.
Adjusting for differences in purchasing power terminology

- A consumer price index (CPI) measures changes in the prices of goods and services that households consume.
- CPIs are commonly referred to as deflators.
- A CPI (or deflator) is typically used to convert nominal consumption expenditures (or incomes) into real terms.
Temporal and spatial deflators

1) Inflation (time)
   Temporal (monthly, yearly) price index

2) Cost-of-living differences across the national territory (space)
   Spatial price index

Price indices are typically expressed as a proportion of some reference price level:
- **Price index = 1** (or 100) → current price level is the *same* as the reference level
- **Price index > 1** (or 100) → current price level is *higher* than the reference level
- **Price index < 1** (or 100) → current price level is *lower* than the reference level
Example: inflation matters

- Assume all households in the country are identical (same size, composition, etc.)
- Assume consumption expenditure \( x = $1,000 \) for all households
- Assume inflation = 5% per month during the survey year
- Note: this is a high inflation rate... what would that be on a yearly basis?
- Assume that each month 1/12 of the households are interviewed
- Assume that the poverty line equals $750
No adjustment for inflation

**Question:** how much is the incidence of poverty?

**Answer:** if no action is taken to adjust for month-to-month inflation rates, then the headcount poverty rate equals 0%.
Nominal to real

- Now let us adjust for within-the-year inflation
- We divide nominal expenditures by the monthly CPI.
- We obtain real expenditures
Adjustment for inflation

Question: how much is the incidence of poverty?

Answer: if we adjust for the month-to-month inflation rates, then the headcount poverty rate equals 50% (remember that the poverty line is 750 in our example).
Households interviewed in the first half of January faced a price level 4% higher than average.

Households interviewed in the first half of April faced a price level 2% lower than average.
What are price indices (or deflators) exactly?

- Many indices exist:
  - Laspeyres
  - Paasche
  - Fisher
  - Törnqvist
  - ...

- We focus on Laspeyres and Paasche.

- Q. Why?

- A. In lecture 1 we concluded that our best strategy for proxying living standard is either $x/P$ or $x/L$, with a preference for the former.
The Laspeyres index

- The single **most popular** index among both economists and international statistical agencies.
- According to the ILO Bureau of Statistics, **114 out of 187 countries** use the Laspeyres formula.
The Laspeyres index: definition

- The Laspeyres index answers the question:

  “what is the cost of a fixed basket of commodities purchased in the base period relative to its cost at the base period market prices?”

\[
L^t = \frac{p^t \cdot q^0}{p^0 \cdot q^0}
\]

- \(p^t\) vector of prices faced in period \(t\);
- \(p^0\) reference set of prices
The Laspeyres index: interpretation

- When applied to bundles of individual households, a Laspeyres index that equals 1 (or 100) implies that the household in the current period can afford to buy the same bundle as she consumed in the previous period.
### Example of Laspeyres Index

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>10 kg</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Shoes</td>
<td>1 pair</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Cost of the basket</td>
<td></td>
<td>16</td>
<td>20</td>
</tr>
</tbody>
</table>

- To calculate the index, divide the cost of the basket in **2019** by its cost in **2015** giving $\frac{20}{16}=1.25$.

- This says that prices have risen by 25% over the period.
The Laspeyres index: comment

- A key feature of the Laspeyres formula is that it tends to overstate the rise in the cost of living by not allowing any substitution between goods to occur (Diewert, 2001).

- To the extent to which price and demanded quantity are negatively correlated, the Laspeyres index provides an upper bound to the “true cost of living” faced by a household.
The Paasche index

- The Paasche index is the one that most welfare analysts opt for.
The Paasche index: definition

- The Paasche index:
  “what is the cost of a fixed basket of commodities purchased in period t relative to its cost at the base period market prices?”

\[ P_t = \frac{p_t^t q_t^t}{p_0^0 q_t} \]

- \( q_t^t \) vector of quantity purchased in period t;
- \( p_t^t \) vector of prices faced in period t;
- \( p_0^0 \) reference set of prices
The Paasche index: interpretation

- When applied to bundles of individual households, a Paasche index that equals 1 (or 100) states that an household could have consumed the same bundle in the base period as she is consuming in the current period.
The Paasche index: comment

- The Paasche formula does not allow for the substitution of products or services at the base period prices.

- To the extent to which price and demanded quantity are negatively correlated, it provides a lower bound to the “true cost of living” faced by the household.
Paasche vs. Laspeyres

- While calculating the Laspeyres index for a new period requires only new price data, calculation of the Paasche index for a new period requires new price data and new quantity data (or alternatively new price data and new expenditure data) for each new period.

- The Paasche index is rarely calculated by statistical agencies because it is data demanding.

- Given the poverty analyst’s preference for Paasche, it is common to estimate it based on household budget surveys.

- This is not as straightforward as it might seem.
Measuring prices

- A beautiful and useful paper
- It reviews the academic literature about prices for poverty measurement in Africa
Market prices are not unit values (and viceversa)

- Unit values are defined as the ratio of expenditure to quantity.

- **Unit value** for household $h$, good $j$, at time (or region) $r$: $\text{uv}_j^h(r) = \frac{x_j^h(r)}{q_j^h(r)}$

- Unit values suffer from **quality bias**: richer households tend to buy higher quality foodstuffs, for instance.

- Hence, unit values cannot be treated as if they were market prices.
Kenya 2015
KIHBS 2015/16, Price deflator by Country

- Light to dark green = low prices
- Light to dark purple = high prices
Lessons learned

▪ Data providers should be mindful of the definition of household membership, because of the importance of adjusting for household size.

▪ Household characteristics (gender, age, etc.) are key for the computation of equivalence scales.

▪ Adjustment for cost-of-living differences:
  ▪ temporal CPI is needed to adjust for within-survey inflation;
  ▪ spatial CPI is typically computed from household surveys, which must allow for it.

▪ Market prices (collected through price surveys) are different from unit values (calculated on the basis of household budget surveys).
References

Required readings:


Suggested readings:


Thank you for your attention
Homework
Exercise 1 – Engaging with the literature


▪ Write a short essay (not to exceed 3000 characters) where you summarize their main findings.
Exercise 2 – A guide to using prices in poverty analysis

Read Gibson (2007), and write a short essay where you summarize, even schematically, the main recommendations.