

The Consumption Aggregate

LECTURE 2

1

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.

2

It takes four to construct a living standard indicator

$$\text{Living standard indicator} = \frac{\text{nominal household consumption expenditure}^1}{\text{household size}^2 \times \text{temporal CPI}^3 \times \text{spatial CPI}^4}$$

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**)?

3

1. Which expenditures, exactly?

4

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 us to exclude all infrequent, extra-ordinary expenses
 - 4) ...
- These examples imply that the choice of consumption expenditures to be aggregated is **selective**, not straightforward.

5

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**.

6



***Definition:** public good

- In economics, a **public good** is a good that is both **non-excludable** and **non-rivalrous**
 - **Non-excludable** = individuals cannot be excluded from use (they can benefit from it even if they are not paying for it)
 - **Non-rivalrous** = use by one individual does not reduce availability to others (the good can be used simultaneously by more than one person)
- Many public goods are provided by the **government**. For example, national defense – but also streets, street lighting, and much more.

7

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

2

8

2. Adjusting for household size and composition

9

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'?

10

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: an analogy can be drawn with the idea of **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).

11

Economies of scale: adjustment

- A popular strategy is to rescale household consumption expenditure as follows:
$$\tilde{x}_i = \frac{x_i}{(n_i)^\alpha} \quad \alpha \in [0,1]$$
- $\alpha = 1$ means we assume that **no** goods consumed are **public** within 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** within the household. This is a purely hypothetical situation in which each individual is assumed to consume the total consumption of the household.
- In practice, α assumes conventional values. E.g. $\alpha = 0.5$ implies that a household of **four** persons needs twice as much as a single-person household.

12

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

13

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.



14

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.
- **For example**, an equivalence scale may look like this:

$$ES = (n_{males\ 15+} \times 1) + (n_{females\ 15+} \times 0.8) + (n_{kids\ 0-14} \times 0.5)$$
 where **ES** denote the **equivalent household size**, that is, the number of equivalent adults.
- Different categories have different **'weights'**: adult males may count for 1, adult females for 0.8, ...
- Once the equivalent household size has been calculated, we use it to rescale household consumption expenditure as follows:

$$\bar{x}_i = \frac{x_h}{ES}$$

15

Equivalence scales: OECD and Eurostat

- The OECD equivalence scale (OECD-I) is defined as follows:

$$ES_{OECD-I} = 0.3 + 0.7 \times A + 0.5 \times K$$

- where ES_{OECD-I} is the number of 'adult equivalents', that is, the household equivalent size, as measured by the OECD type-I scale.
- The first adult (A) is given a weight of 1. Other adults are given a weight of 0.7, to reflect economies of scale. Children (K) are given a weight of 0.5 to reflect their lower needs.
- In the late 1990s Eurostat adopted the so-called OECD-modified scale (OECD-II):

$$ES_{OECD-II} = 0.5 + 0.5 \times A + 0.3 \times K$$

16

Equivalence scales: USA

- Originally suggested by Cutler and Katz (1992), and subsequently adopted by the US National Research Council (1995):

$$ES_{NRC} = (A + \alpha \times K)^\theta$$

where ES_{NRC} denotes the number of adult equivalents that is, the household equivalent size, as measured by the NRS scale;

- As before, A = number of adults, K = number of children;
- α in $[0,1]$ = cost of a child relative to that of an adult;
- θ in $[0,1]$, $(1 - \theta)$ measures the extent of economies of scale.

17

Equivalence scales in practice

Household composition	Equivalent household size				Per household
	Per capita	OECD-I scale	OECD-II scale	Square root scale ($\alpha = 1, \theta = 1/2$)	
1 adult	1	1	1	1	1
2 adults	2	1.7	1.5	1.4	1
2 adults, 1 child	3	2.2	1.8	1.7	1
2 adults, 2 children	4	2.7	2.1	2.0	1
2 adults, 3 children	5	3.7	2.4	2.2	1

18

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**.

19

The international practice

Where do countries around the world fall when adjusting for household size and composition?

20

East Asia & Pacific



Surveys	Consumption vs Income	Household Size
Australia 2015	Income	Per Adult Equivalent
Cambodia 2011	Consumption	Per Capita
Indonesia 2016	Consumption	Per Capita
Japan 2016	Income	Per Adult Equivalent
Malaysia 2016	Income	Per Capita
Mongolia 2016	Consumption	Per Capita
Myanmar 2017	Consumption	Per Adult Equivalent
Philippines 2015	Income	Per Capita
Vietnam 2016	Consumption	Per Capita

21

Europe and Central Asia



Surveys	Consumption vs Income	Household Size
Albania 2012	Consumption	Per Capita
Armenia 2015	Consumption	Per Adult Equivalent
Bulgaria 2016	Income	Per Adult Equivalent
France 2015	Income	Per Adult Equivalent
Germany 2018	Income	Per Adult Equivalent
Italy 2017	Consumption	Per Capita
Kosovo 2015	Consumption	Per Adult Equivalent
Kyrgyz Republic 2013	Consumption	Per Capita
Macedonia 2017	Income	Per Adult Equivalent
Moldova 2013	Consumption	Per Adult Equivalent
Russian Federation 2008	Consumption	Per Adult Equivalent
Tajikistan 2014	Consumption	Per Capita

22

Latin America & Caribbean



Surveys	Consumption vs Income	Household Size
Argentina 2016	Income	Per Adult Equivalent
Bolivia 2015	Income	Per Capita
Colombia 2017	Income	Per Capita
Ecuador 2013	Consumption	Per Capita
Ecuador 2018	Income	Per Capita
El Salvador 2015	Income	Per Capita
Guatemala 2014	Consumption	Per Capita
Haiti 2012	Consumption	Per Capita
Honduras 2018	Income	Per Capita
Mexico 2016	Income	Per Capita
Nicaragua 2014	Consumption	Per Capita
Panama 2008	Consumption	Per Capita
Paraguay 2017	Income	Per Capita
Peru 2017	Consumption	Per Capita

23

Middle East & North Africa



Surveys	Consumption vs Income	Household Size
Iraq 2012	Consumption	Per Capita
Jordan 2010	Consumption	Per Capita
Lebanon 2011	Consumption	Per Capita
Djibouti 2017	Consumption	Per Adult Equivalent
Morocco 2013	Consumption	Per Capita
West Bank and Gaza 2017	Consumption	Per Adult Equivalent
Yemen 2005	Consumption	Per Capita

24

South Asia



Surveys	Consumption vs Income	Household Size
Afghanistan 2016	Consumption	Per Capita
Bangladesh 2016	Consumption	Per Capita
Bhutan 2017	Consumption	Per Capita
Sri Lanka 2016	Consumption	Per Capita
India 2011	Consumption	Per Capita
Nepal 2010	Consumption	Per Capita
Pakistan 2013	Consumption	Per Adult Equivalent
Maldives 2016	Consumption	Per Capita

C4D2 TRAINING 25

25

Sub-Saharan Africa



Surveys	Consumption vs Income	Household Size
Côte d'Ivoire 2015	Consumption	Per Capita
Kenya 2015	Consumption	Per Adult Equivalent
Malawi 2016	Consumption	Per Capita
Mali 2018	Consumption	Per Capita
Mozambique 2014	Consumption	Per Capita
Nigeria 2010	Consumption	Per Adult Equivalent
South Africa 2014	Consumption	Per Capita
Tanzania 2018	Consumption	Per Adult Equivalent
Uganda 2016	Consumption	Per Adult Equivalent
Zambia 2015	Consumption	Per Adult Equivalent
Zimbabwe 2017	Consumption	Per Capita

C4D2 TRAINING 26

26

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

Green checkmarks are placed above 'nominal household consumption expenditure' and below 'household size'. Red boxes with numbers 3 and 4 are placed below 'temporal CPI' and 'spatial CPI' respectively.

C4D2 TRAINING 27

27

3. & 4. Adjusting for purchasing power

28

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.

29

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.

30

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.

31

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

32

Example: inflation matters

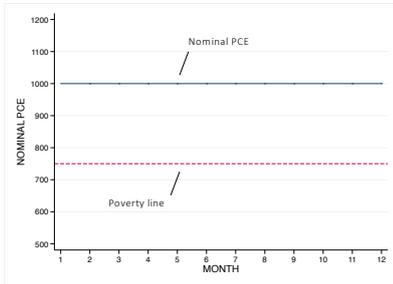
- Assume all households in the country are identical (same size, composition, etc.)
- Assume consumption expenditure $x = \$1,000$ for all households
- Assume **inflation = 5%** per month during the survey year
- Note: this is a high inflation rate... what would that be on a yearly basis?
- Assume that each month 1/12 of the households are interviewed
- Assume that the poverty line equals **\$ 750**

33

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%**.



34

Nominal to real

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

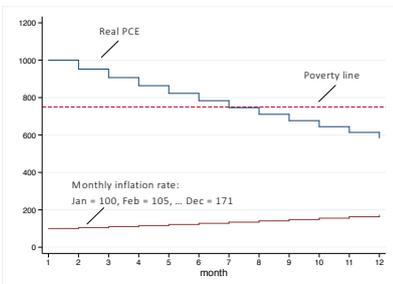
month	xnom	cpi	xreal
1	1000	100.0	1000
2	1000	105.0	952
3	1000	110.3	907
4	1000	115.8	864
5	1000	121.6	823
6	1000	127.6	784
7	1000	134.0	746
8	1000	140.7	711
9	1000	147.7	677
10	1000	155.1	645
11	1000	162.9	614
12	1000	171.0	585

35

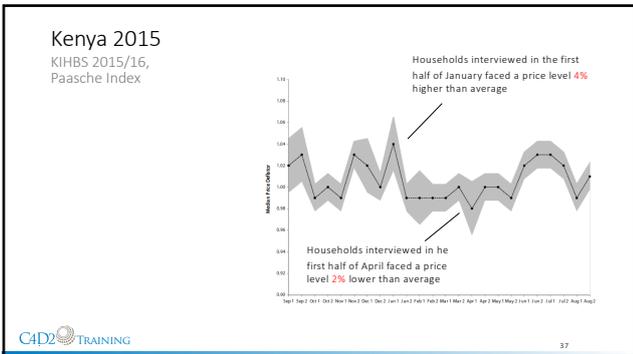
Adjustment for inflation

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).



36



37

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.

C4D2 TRAINING 39

39

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.

C4D2 TRAINING 40

40

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?”

$$L^t = \frac{p^t q^0}{p^0 q^0}$$

- q^0 reference vector of quantities;
- p^t vector of prices faced in period t ;
- p^0 reference set of prices

41

The Laspeyres index: interpretation

- When applied to bundles consumed by individual households, a Laspeyres index that equals 1 (or 100) implies that, if the household could afford to buy the reference consumption bundle in the base period, then she can also afford it in the current period.

42

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.

44

The Paasche index

- The Paasche index is the one that most **welfare analysts** opt for.
- **Deaton and Zaidi (2002)** explain why.



45

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?”

$$P^t = \frac{p^t \cdot q^t}{p^0 \cdot q^t}$$

- q^t vector of quantity purchased in period t;
- p^t vector of prices faced in period t;
- p^0 reference set of prices

46

The Paasche index: interpretation

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

47

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.

48

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.

49

Measuring prices



- A **beautiful** and **useful** paper
- It reviews the academic **literature** about **prices** for **poverty** measurement in **Africa**

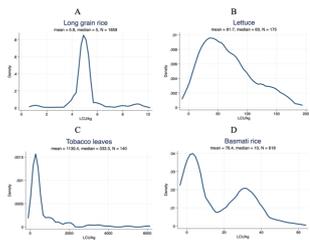
51

Market prices are not unit values (and vice-versa)

- Unit values are defined as the ratio of expenditure to quantity.
- **Unit value** for household h , good j : $uv_j^h = \frac{x_j^h}{q_j^h}$
- Unit values suffer from **quality bias**: richer households tend to buy higher quality foodstuffs, for instance.

52

Empirical distributions of unit values for selected food items Maldives (2016)



53

Unit values cannot be treated as if they were market prices

- Analysts are increasingly dissatisfied with unit values
- **Gibson and Kim (2019)** is the last of a string of papers advocating for better data on market prices
- We are still 'in transition'

54

Kenya 2015
 KIHBS 2015/16,
 Price deflator by Country

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

C4D2 TRAINING 55

55

 **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).

C4D2 TRAINING 56

56

References

Required readings:
 Deaton, A. and S. Zaidi (2002). Guidelines for constructing consumption Aggregates for welfare analysis, LSMS Working Paper no. 135, World Bank, Washington DC.(chap. 4, 5)

Suggested readings:
 Chen, S., & Ravallion, M. (1996). Data in transition: Assessing rural living standards in southern China. China economic review, 7(1), 23-56.
 Diewert (2004). Durable and user costs, in ILO (2005). Consumer Price Index Handbook.
 Gaddis, I. (2016). Prices for poverty analysis in Africa. The World Bank.
 Gibson, J. (2007). A guide to using prices in poverty analysis. World Bank, Washington, DC.
 Gibson, J., and Kim, B. (2019). Quality, quantity, and spatial variation of price: Back to the bog. Journal of Development Economics, 137, 66-77.
 Haughton, J. and Khandker, S. R. (2009). Handbook on poverty and inequality. Washington, DC: World Bank. (chap. 5)

C4D2 TRAINING 57

57

Thank you for your attention

C4D2 TRAINING 58

58

Homework

C4D2 TRAINING 59

59

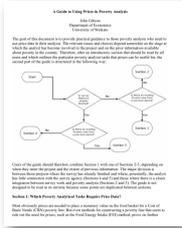
Exercise 1 – Engaging with the literature

- Chen, S., & Ravallion, M. (1996) underline the importance of adequately measuring prices for poverty and inequality estimates.
- Houghton, J. and Khandker, S. R. (2009, ch 5) discuss the sensitivity of poverty estimates to household size adjustments.
- Write a short essay (not to exceed 3000 characters) where you summarize their main findings.

C4D2 TRAINING 60

60

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.
