Poverty measurement:
Housing
Why is housing relevant?

- Gaerner and Short (2009): “…[including housing in the welfare aggregate]…allows for more reasonable inter-household comparisons, as well as international comparisons, of economic well-being.”
Why is housing relevant?

**Dominant component of total income**
(Norris and Pendakur, 2013)

Share of housing consumption increases with welfare levels
(Blades, 2009)

Source: OECD National Accounts, 2012

Source: authors elaboration on UNStat System of National Accounts
What are the problems?

The basics…

- The utility → is the value of the flow of services from occupying the dwelling rather than the expenditure for purchase it over the period of analysis.
- Rental markets → they work perfectly and all households rent their dwellings. Hence, market rents are a good approximation of dwelling services.

However…

- Many households own their dwellings.
- In other cases, households receive housing free of charge or at subsidized rates by their employer, friends, relatives, government or other entities.
Few households rent their dwelling

Source: authors elaboration on EU-SILC; SEDLAC; http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?fpt=table (USA); http://kostat.go.kr/portal/english/news/1/17/1/index.board?bmode=read&bSeq=&aSeq=273080&pageNo=2&rowNum=10&navCount=10&currPg=&sTarget=title&sTxt= (Korea); authors elaboration on HBS (Albania, Bangladesh, Iraq, Peru)
Theoretical viewpoint

- When *expenditure* is used as a yardstick of welfare, it is important to achieve comparability across household.

- Including the rent expenditure for renters and not the flow of the service of the dwelling for non-renters would lead to wrong conclusions:
  - Tenants would be better off than Non-Tenants!
Empirical Application

Market Tenants

- We assume that tenants report the actual market rent
- However, it is important to check if this is an accurate value

Owners and Non-market Tenants

- Impute what they would be paying if they were renting instead of owning
The rent paid by tenants as reported in the survey is supposed to be the true value of the flow of services for tenant, and included as such in the welfare aggregate. Information from external sources may be used.
Econometric and statistical methods

- Find the best fitting model for rents paid by tenants on the basis of observable dwelling characteristics.
- Apply the same model on dwellings' characteristics of home owners and non-market tenants.
- Infer imputed rent for home owners and non-market tenants.
Econometric and statistical methods

1. Hedonic models

- Utility derives from attributes or characteristics of goods and not from goods per se (Lancaster, 1966)
- In equilibrium, economic agents observe the prices of differentiated products and specific amounts of characteristics associated with them. This reveals the implicit prices for the different characteristics (Rosen, 1974)
- Housing can be considered as a composite commodity:
  
  \[ R_h = R(L_h, S_h, N_h) = R(X_h) \]

- No consensus about the specific explicit form the hedonic price function might take
- **BUT**: the relation between rent and characteristics should be non-linear
Econometric and statistical methods
1. Hedonic models

- The most generic functional specification is:
  \[ g(R_h) = \alpha_0 + \sum_{m=1}^{M} f_m(X_{hm})\beta_{hm} + \sum_{m=1}^{M} \sum_{k=1}^{M} f_m(X_{hm})f_k(X_{kh})\gamma_{hmk} + \varepsilon \]

- In the literature, different specifications and estimation methods are found:
  - Linear, semi-log and higher order
  - Quantile regression, semi-parametric and non-parametric
  - Heckman selection model
  - Spatial Dependency
Econometric and statistical methods
1. Hedonic models: Semi-Log

\[ \ln R_h = \alpha_0 + \sum_{m=1}^{M} f_m(X_{hm})\beta_{hm} + \varepsilon \]

**PROs:**
- The coefficients show approximately the percentage change in the imputed rent for a given unit-change in the covariate
- It mitigates the heteroskedasticity problem
- It is computationally simple
- It allows the marginal rent-value to be a non-linear function of the size and quality of the dwelling

**BUT:**
- The unobserved quality of the dwelling chosen by renters can be different from that chosen by owners
Econometric and statistical methods
1. Hedonic models: Heckman Selection

- If the choices of tenure type and characteristics of the dwelling are not independent, the OLS estimation in the market rental sector might be inconsistent (Arevalo and Ruiz-Castillo, 2004)

- **SOLUTION**: Heckman two-stages selection model

\[
g(R_h) = \alpha_0 + \sum_{m=1}^{M} f_m(X_{hm}) \beta_{hm} + \epsilon_h \text{ if } t_h = 1
\]

Where:

\[
t_h = \begin{cases} 
1 & \text{if } \sum_{m=1}^{M} f_m(X_{hm}) \gamma_{hm} + \sum_{j=1}^{J} f_j(X_{hj}) \delta_{hj} + \eta_h > 0 \\
0 & \text{otherwise}
\end{cases}
\]
Econometric and statistical methods
1. Hedonic models - COMMENT

- **PRO:**
  - Simple and fast to implement
  - We can apply the model fitted on tenants on the entire population and get an estimate of imputed rent for everybody

- **CONS:**
  - We risk to underestimate the prediction for those with higher flow of services from housing and to overestimate the prediction for those with lower
  - There is no way to test whether the prediction for owners and non market tenants is accurate
Alert:

In some countries, housing and rental markets are not well enough developed to permit any serious estimate of rental value, and attempts to repair the deficiency using data from a small number of households are unlikely to be effective, however sophisticated the econometric technique (Deaton and Zaidi, 2002, p.38-39)
Econometric and statistical methods
2. Stratification

- Define a set of relevant characteristics
- Each characteristic has a set of possible realizations:
  (e.g. Region1, Region2, Region3)
  (e.g. Detached House, Flat)
  (e.g. 1room, 2rooms, 3rooms, >3rooms)
- From which we can define strata of dwellings with homogeneous characteristics:
- Take the average rent for each stratum and assign it to each owner-occupied or non-market tenant dwelling in the same stratum
Econometric and statistical methods
2. Stratification

- **PRO:**
  - Dwellings in the same strata will be of a more homogeneous quality, leading to more precise estimates for owners and non-market tenants, since the model is defined on dwellings with similar characteristics.

- **BUT:**
  - Increasing the number of strata reduces the average number of observations per stratum.

- **What we learn:**
  - We may obtain better predictions for owners if we infer their rents using information from tenants with dwellings having similar characteristics, possibly there is no overlap.
Self-assessment

- This approach is based on data collected about owners’ estimates of a fictitious market rent → homeowners are asked to estimate how much they would pay if they were renting their home
- Assumption: owners can estimate rental equivalents
  - This should be less problematic in regions where rental market is active and well developed (Lanjouw, 2009)
  - BUT…owner-occupiers may over-estimate the true rental value of their dwelling given the affinity to their property or neighborhood (owner pride factor)
  - Should be treated with caution and should be tested
- Sergio’s presentation next Thursday!
III. Distributional Impacts
A theoretical framework

- Population $N$, made of $i = 1, 2, ..., n$ individuals, $n \in \mathbb{N}$
- $x = [x_1, x_2, ..., x_n]$ distribution of welfare aggregate (w/o rent)
- $x_i$ level of welfare aggregate for $i$ – th individual
- Assume $x_1 \leq x_2 \leq \cdots \leq x_n$
- $r = [r_1, r_2, ..., r_n]$ distribution of rents
- Consider three possible scenarios:
  A. $r_i^A = r$ \quad $\forall i \in N, \quad r > 0$
  B. $r_i^B = \rho x_i$ \quad $\forall i \in N, \quad \rho \in (0,1)$
  C. $r_i^C = \rho_i x_i$ \quad $\forall i \in N, \quad \rho_i \in (0,1)$
A theoretical framework

\[ y_i^A = x_i + r \]

\[ y_i^B = x_i + \rho x_i \]

\[ y_i^C = x_i + \rho_i x_i \]
Distributional Impact of Rent Imputation

We are interested in:

**Distribution**
- Shape
- Inequality
- Ranking
- Shared Prosperity

**Poverty**
- Fixed poverty line
- New poverty line
  - Levels
  - Profiles
Define a Rent-Incidence Curve:

\[ g_q = \frac{y^j_q - x_q}{x_q} = \frac{(x+r^j)_q - x_q}{x_q} \]
Distribution
Evidence from the Literature

- In general, the literature finds that including rents reduces inequality
- Mainly developed countries
- Mostly income as welfare aggregate
- Some examples:
  - Guenard and S. Mesple-Somps (2010) for Madagascar and Cote D’Ivoire: the poor are more likely to own their homes
  - Gasparini and Escudero (2004) for the Greater Buenos Aires area: large proportion of house-owners at the bottom of income distribution, and income elasticity in housing expenditure <1
  - Törmälehto and Sauli (2010, 2013) for 29 EU-SILC countries: combined effect of the equalizing gap-effect and dis-equalizing re-ranking effect
Distribution
Our Findings – Rent Incidence Curve

IRQ, 2007

- OLS
- Heckman
- Matching
- Self Assessed
- Original

IRQ, 2012

- OLS
- Heckman
- Matching
- Self Assessed
- Original
Distribution
Our Findings - Inequality

Iraq, 2012

Peru, 2013

Inequality increases when using OLS as the imputation method.
Even if inequality does not change much, there is still re-ranking.
Distribution
Shared prosperity

**IRQ, 2007 - 2012**
- No rent
- OLS
- Heckman
- Matching
- Self
- Original

**PER, 2010 - 2013**
- No rent
- OLS
- Heckman
- Matching
- Self
- Original
Theoretical Framework – Fixed Poverty Line

Poverty does not decrease and rank among the poor is preserved under scenarios A and B.

Poverty does not decrease but rank among the poor might NOT be preserved under scenario C.
Poverty Indices
Theoretical Framework – Adjusted Poverty Line

Even under the simplest scenario $A$ …

...Or remain the same …

...Or decrease

Poverty might increase…
Poverty Indices – FGT0
Our Findings – adjusting poverty line

Iraq, 2012
Absolute, Fixed Poverty Line

Iraq, 2012
Absolute, Adjusted Poverty Line

[Graph showing poverty indices for different tenure statuses and types of settlement, comparing fixed and adjusted poverty lines.]
Poverty Profiles
Theoretical Framework – Fixed Poverty Line

1/3 of poor individuals live in region 1, 1/3 in region 2 and 1/3 in region 3

2/3 of poor individuals live in region 1 and 1/3 in region 2

Profile is the same as the original distribution. Notice re-ranking!

- Other examples: urban/rural, minorities, education…
Poverty Profiles – FGT0
Our Findings

Iraq, 2013
Absolute, Fixed Poverty Line

Iraq, 2013
Absolute, Adjusted Poverty Line

Share of poor individuals

Demographic
- Male
- Married
- Employed
- Tenant

Education
- edu_1
- edu_2
- edu_3
- edu_4

Geographical Region
- Coastal
- Central
- Mountain

Share of poor individuals

Demographic
- Male
- Married
- Employed
- Tenant

Education
- edu_1
- edu_2
- edu_3
- edu_4

Geographical Region
- Coastal
- Central
- Mountain

No Rent
OLS
Heckman
Matching
Self Assessed
Original
Poverty

Summary of Results

- As expected, poverty decreases by keeping fixed the poverty line and adding imputed rents to the consumption aggregate.
- Poverty changes very little when the poverty line is adjusted by adding imputed rent in the non-food component.
- With an adjusted poverty line poverty tends to slightly decrease for tenants and to increase in rural areas (particularly in Iraq and Peru).
- The profile of the poor does not seem to change, both keeping fixed and varying the poverty line, according to the imputation method used.
Further Readings

The Review of Income and Wealth
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RENT-IMPUTATION FOR WELFARE MEASUREMENT: A REVIEW OF METHODOLOGIES AND EMPIRICAL FINDINGS

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The World Bank