

Assessing the distributional impact of “imputed rent” and “non-cash employee income” in micro-data: Case studies based on EU-SILC (2004) and SOEP (2002)

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(1) Introduction

- Considering non-cash incomes in order to achieve a more “comprehensive” income measure
 - Welfare economics
Full Income = Equivalent post-government income *plus* “Imputed Rent”
 - Labor economics
Full Labor Compensation = Gross cash employee income *plus* “Non-cash employee income”

- Challenge: Achieve comparability across time and space

(2a) “Imputed Rent” (IR)

Motivation for considering IR

- Housing costs saved due to home-ownership
(→ opportunity cost of housing)
- Return on private investment in real estate rather than in the financial market (→ opportunity cost of capital)

The impact of IR on income inequality

Convincing and consistent empirical evidence ...

- Smeeding et al. (1993): leveling effect on inequality in DE, SWE, CA, NL
- Meulemans / Cantillon (1993): income inequality declines in BE
- Eurostat (1998, 2005): poverty-reducing effect in selected EU-countries
- Yates (1994): income inequality declines slightly in Australia
- Frick / Grabka (2003): poverty reduction, declining inequality in DE,US,GB

Methods to measure IR

- “Rental equivalence approach” (“opportunity cost”)
 - Based on *true* rent data actually paid by non-subsidized tenants
 - Regression rental equivalence
 - Stratification rental equivalence
- “User cost approach” (“capital market”)
 - Based on fictitious return of investment in real estate
- “Self-assessment” approach
 - Based on *subjective* estimates of owners and renters

European Commission: Definition of IR

*“... imputed rent shall be imputed for all households that do not report paying full rent, either because they are **owner-occupiers** or they live in accommodation **rented at a lower price than the market price**, or because the accommodation is provided **rent-free**.*

*The imputed rent shall be estimated only for ... **main residence**.*

*The value to impute shall be the **equivalent market rent** that would be paid for a similar dwelling as that occupied, **less any rent actually paid, less any subsidies received ... , less any minor repairs ...***

The market rent is the rent due for the right to use an unfurnished dwelling on the private market, excluding charges ...”

Source: Commission Regulation No. 1980/2003

Data and Implementation

Data sources and countries:

- EU-SILC survey year 2004: Denmark (DK), Finland (FI), France (FR)
- SOEP survey year 2002: Germany (DE)

Baseline Income Measure:

- Annual equivalent post-government income (modified OECD scale)
- EU-SILC 1% top and bottom trimming.

Income Measure when considering IR (“change” Model):

- Baseline income PLUS “imputed rent” as given in EU-SILC variable HY030[G/N]

Analysis population:

- Entire population living in private households with positive post-government income

Current **EU-SILC** Implementation of IR :

- **Denmark:** mix of methods (mostly **Gross** IR) [currently being reconsidered]:
 - "User cost method" for owners: 4% of taxable value of property [information provided by municipalities]
 - no consideration of repayment status of mortgage
 - Self-assessment approach for tenants
- **Finland:** "Stratification rental equivalence" (**Gross** and **Net** IR)
 - 128 strata based on official rent statistics → applied to owners and tenants
 - all relevant costs deducted, *except for mortgage interest* → "Gross" IR in this paper
 - However, deducting those (as given in variable HY100G) yields a *net* IR measure
 - tenants in social housing are NOT considered for IR
- **France:** "Regression rental equivalence" (**Net** IR)
 - 8 separate regressions based on external rent data (2002 Housing Survey)
 - very comprehensive list of covariates
 - no selection correction and no consideration of depreciation

SOEP Implementation of net IR for Germany

➤ (1) “Regression rental equivalence” :

- Regression of gross rent per square meter paid by main tenants in private, non-subsidized housing (using Heckman-selection)
- Applied to otherwise comparable owners and tenants (subsidized & rent-free) adding an error term randomly chosen from the true distribution
- Deduction of operating and maintenance costs (flat sum per m²)
- Deduction of interest on mortgages for owners.

➤ (2) “Capital Market” approach (owners only): Net equity (market-value minus outstanding mortgages) multiplied with a real interest rate of 2%, 3% and 4%. Owner-specific costs are deducted.

➤ (3) “Self-assessment” approach (owners only): Original question: “And if you lived in this flat or house as tenant: what do you estimate would be the monthly rent without heating costs? About Euros.” Owner-specific costs are deducted.

IR: Housing tenure by country

% population living in ...

	Germany 2002	Denmark 2004	Finland 2004	France 2004
Owner-occupied housing	47,4	67,2	71,4	60,4
Rented accomodation, total	52,6	32,8	28,6	39,6
<i>thereof:</i>				
# non-subsidized	42,5	-	11,7	21,1
# rent-free	2,7	-	0,9	4,0
# reduced rent	7,4	-	16,0	14,5
Total	100,0	100,0	100,0	100,0

Major Finding: Lowest ownership-rate in DE. High share of renters potentially profiting from IR.

IR: Housing tenure and IR

Share of beneficiaries from IR (%) by housing status

	Germany (Net IR)	Denmark (Gross IR)	Finland (Gross IR)	Finland (Net IR)	France (Net IR)
Owner-occupiers	74,5	94,6	100,0 ...▶	96,1	97,4
Tenants, total	19,1	3,8	6,3	6,3	36,9
<i>thereof:</i>					
# non-subsidized	0,0	-	0,0	0,0	0,0
# rent-free	100,0	-	74,2	74,2	81,5
# reduced rent	99,7	-	7,4	7,4	78,2
Total	45,4	64,8	73,2 ...▶	70,5	73,5

Major Finding: Gross vs. Net measure → Reduced share of beneficiaries.

Differential treatment of social housing in FI

IR: Incidence

Share of beneficiaries from IR (%) by Income Decile

	Germany (Net IR)	Denmark (Gross IR)	Finland (Gross IR)	Finland (Net IR)	France (Net IR)
1 (bottom)	42,5	39,7	52,9	52,0	55,5
...					
5	47,8	64,3	72,8	69,3	75,7
...					
10 (top)	52,9	89,7	89,1	84,6	84,3
Total	45,4	64,8	73,2	70,5	73,5

Major Finding: Incidence of IR (and Gross-Net variation) rises with income;

IR: Relevance (1)

Income Effects by decile (% Change in income due to IR)

	Germany (Net IR)		Denmark (Gross IR)		Finland (Gross IR)		FI (Net IR)	France (Net IR)	
	Baseline Euro	Change %	Baseline Euro	Change %	Baseline Euro	Change %	Change %	Baseline Euro	Change %
1 (bottom)	5.674	19,6	9.138	13,5	7.960	16,6	15,6	6.374	20,2
...									
5	14.982	8,4	20.325	8,8	15.773	11,7	9,6	14.324	14,8
...									
10 (top)	42.895	5,3	41.384	11,3	35.170	10,0	8,2	36.715	11,5
Total	18.191	7,1	24.262	10,4	19.355	12,0 → 10,1		17.171	14,4

Major Finding: IR as a share of “full” income more relevant among lower incomes.

IR: Relevance (2) Income Effects by age

	Germany (Net IR)		Denmark (Gross IR)		Finland (Gross IR)		FI (Net IR)	France (Net IR)	
	Baseline Euro	Change %	Baseline Euro	Change %	Baseline Euro	Change %	Change %	Baseline Euro	Change %
Below 25	16.050	5,7	20.758	9,2	16.491	10,4 →	7,6	15.264	13,4
25-64	19.835	6,0	24.284	9,6	19.647	10,7 →	8,7	18.072	13,6
Over 64	16.178	13,4	18.382	13,2	15.031	16,8 →	16,6	16.785	17,0
Total	18.191	7,1	24.262	10,4	19.355	12,0	10,1	17.171	14,4

Major Finding: Strongest effects among the elderly; Gross-Net variation decreasing with age.

IR: Inequality

Inequality and Poverty effects (assuming constant poverty lines)

	Germany (Net IR)		Denmark (Gross IR)		Finland (Gross IR)		FI (Net IR)	France (Net IR)	
	Baseline Index	Change %	Baseline Index	Change %	Baseline Index	Change %	Change %	Baseline Index	Change %
Gini	0,2949	-2,0	0,2195	3,9	0,2317	-0,6	-1,2	0,2675	-0,1
MLD	0,1594	-6,9	0,0915	2,1	0,0888	-1,4	-2,7	0,1202	-0,6
Half SCV	0,2690	-6,3	0,0853	6,4	0,0979	-2,4	-2,7	0,1368	-2,8
Poverty									
FGT0	15,14	-21,2	10,95	-24,1	10,95	-35,2	-33,3	13,63	-34,9
FGT1	4,38	-24,5	2,84	-21,1	2,04	-37,3	-35,4	3,14	-35,0
FGT2	2,08	-29,5	1,37	-25,5	0,68	-39,7	-37,4	1,18	-37,3

Major Findings:

- IR reduces inequality and poverty (except DK “user cost approach”; gross IR)
- Inequality Decomposition: IR reduces inequality mostly among the elderly and consequently, also between group inequality

Measurement issues to be considered for IR (1)

- Population: are all potential beneficiaries identifiable in micro-data ?
- Source of information for “true” market value/rent (esp. user cost method)
 - internal data; extrapolation of purchase price based on external information
- Data Quality and Selectivity
 - Potential bias in any type of self-assessed information
 - Item-non-response on any relevant component
- Rental equivalence method
 - problematic for countries with small private rental market (e.g. UK)
 - regression-approach needs comprehensive list of covariates
 - stratification-approach may understate true variation

Measurement issues (2)

- Deduction of (owner)-specific costs
 - all relevant components considered or at all attributable ?

- Consideration of national institutional framework incl. taxation and policies promoting home ownership
 - (non-)taxation of net IR
 - (non-)taxation of capital gains on the sale of property
 - tax deductibility of mortgage interest
 - deductibility of local property taxes
 - direct housing support/promotion for owner-occupiers

Conclusion: IR in cross-national perspective

- **Germany: Conflicting results across methods**
 - User cost approach: Increasing inequality when including IR
 - Rental equivalence and self-assessment approach: levelling effect
- **Need for harmonized treatment of all relevant costs**
 - Example: gross vs. net IR in Finland
- **Need for harmonized definition of beneficiaries**
 - Example: exclusion of tenants in social housing in Finland
- ➔ **Overall: empirical results reinforce Eurostat's recommendation pro "Rental equivalence approach"**
 - Net measure (deduction of all relevant costs incl. mortgage interest)
 - Non-complex implementation using a set of standard variables available in most population surveys
 - Allows consistent application to owners and subsidized tenants
 - Supports longitudinal research (e.g. income mobility)

(2b) Non-cash employee income

- Motivation: a) analyzing *full* compensation for labor
b) enhancing comparability across time and space
- Pierce (2001): study based on US micro-data

Wide definition of compensation

- voluntary fringe benefits (related to leave, pensions, and health insurance)
→ increase dispersion
- legally required compensation costs (e.g., compensation insurance and social security)
→ reduce dispersion
- Analyzing trends over the 1980s and 1990s: „Fringe benefits have become less equally distributed [...] and compensation inequality rose [...] by a greater amount than did wage inequality” (Pierce 2001: 1520).

“Non cash employee income” in EU-SILC

EU-SILC-variable PY020[G/N]:

Till 2006, this variable only includes private use of company cars (CC)

- Company cars and associated costs (e.g. free fuel, car insurance, taxes and duties as applicable)
- value shall be calculated according to the market value of these goods and services.

From 2007 onwards, the variable gross non-cash employee income should also include:

- Free or subsidized meals, luncheon vouchers;
- Reimbursement or payment of housing-related expenses
- Other goods and services provided free or at reduced price by the employer to their employees

Data and Implementation

Data source and countries:

- EU-SILC, survey year 2004: Belgium (BE), Denmark (DK), Estonia (EE), Finland (FI), Ireland (IE), Luxembourg (LU), Norway (NO), Sweden (SE)
- all other countries lack at least one of the relevant measures

Baseline Income Measure:

- Gross annual cash- and near-cash income from employment (employees only)
- 1% top and bottom trimming (EU-SILC-Variable PY010G)

Income Measure in "Change" Model:

- Baseline income PLUS "non-cash components" (EU-SILC-Variable PY020G)

Analysis population:

- Dependent employed individuals (≤ 65 years)
- with positive cash- and near cash employee income

CC: Incidence

Beneficiaries of CC by cash employee income quintile (% Population receiving CC)

Cash Employee Income Quintile	BE	DK	EE	FI	IE	LU	NO	SE
1 (bottom)	0,6	2,2	1,2	11,3	0,4	0,9	0,2	12,3
2	2,5	2,2	3,5	15,5	0,5	3,1	0,9	16,9
3	5,6	3,2	5,3	16,9	1,8	3,3	1,0	20,6
4	7,0	6,4	7,2	29,1	4,3	3,4	1,4	29,8
5 (top)	22,6	25,9	15,1	52,4	8,5	14,6	6,1	53,1
Total	7,7	8,0	6,5	25,0	3,1	5,0	1,9	26,5

Major Finding: CC is more common among high income earners in all countries.

CC: Relevance

% Change in income due to adding CC

Cash Employee Income Quintile	BE	DK	EE	FI	IE	LU	NO	SE
1 (bottom)	+0,04	+0,12	+1,20	+0,53	+0,12	+0,24	+0,11	+0,83
2	+0,15	+0,12	+1,60	+0,41	+0,06	+0,41	+0,11	+0,44
3	+0,29	+0,10	+1,81	+0,46	+0,14	+0,42	+0,16	+0,34
4	+0,29	+0,28	+2,18	+0,81	+0,53	+0,27	+0,29	+0,54
5 (top)	+0,66	+1,44	+2,47	+2,39	+0,68	+0,93	+1,01	+2,34
Total	+0,39	+0,60	+2,13	+1,22	+0,45	+0,59	+0,50	+1,17

Major Finding: Highest relevance of CC among high income earners in all countries.

CC: Inequality

% Change in inequality due to adding CC

Index	BE	DK	EE	FI	IE	LU	NO	SE
Gini	+0,39	+1,29	+1,25	+1,76	+0,45	+0,41	+0,73	+1,31
Mean Log Dev	+0,58	+1,79	+2,45	+2,64	+0,70	+0,75	+0,87	+1,03
Half SCV	+1,05	+4,07	+3,42	+5,83	+1,69	+1,58	+2,47	+4,23
Atkinson 0.5	+0,65	+2,18	+2,41	+3,15	+0,80	+0,81	+1,10	+1,65
Atkinson 1	+0,52	+1,66	+2,12	+2,44	+0,60	+0,65	+0,77	+0,88
Atkinson 1.5	+0,39	+1,20	+1,80	+1,81	+0,42	+0,52	+0,49	+0,23

Major Finding: CC increases inequality (esp. pronounced when using top sensitive measures)

(3) Conclusion & Prospects

- Empirical demonstration of relevance to consider non-cash components
 - CC: results may be subject to change once using wider definition
 - IR: reinforces Eurostat's recommendation pro rental equivalence method
- In principle, deviation from any proposed approach has to be justified
- But: in light of cross-national variation *wrt* data availability and the institutional framework (e.g. tax regimes), we need “functional equivalents” for capturing non-cash income components and not necessarily “national applications of pre-defined algorithms”
- Last but not least: EU-SILC provides panel data → as such, any definition should anticipate future use in longitudinal research (e.g. income and wage mobility)

Appendix 1

”Results on inequality using IR”

- a) SOEP: sensitivity results using different approaches
- b) EU-SILC: inequality decomposition by age

Additional sensitivity results for Germany

Inequality effects: “Capital market” vs. “Opp. Cost” approach

% change in inequality and poverty											
Inequality indices	Baseline	opportunity cost applied to ...				Capital-market 2%	Capital-market 3%	Capital-market 4%	self-assessment	* tenants with reduced-rent thereof	
		Total	owner-occupiers	tenants rent-free	tenants with reduced-rent*	owner-occupiers			owner-occupiers	Social housing	by employer, relatives
Gini	0,2949	-2,0	0,2	-0,5	-1,5	0,5	1,2	2,1	0,4	-1,0	-0,4
Atkinson 0.5	0,0762	-5,0	-0,5	-1,0	-2,9	0,6	1,3	2,6	-0,5	-2,0	-0,9
Atkinson 1.5	0,2279	-10,0	-3,6	-1,5	-4,0	-0,2	-0,3	-0,3	-3,3	-2,2	-1,8
MLD	0,1594	-6,9	-1,4	-1,3	-3,6	0,3	0,9	2,1	-1,2	-2,3	-1,2
Half SCV	0,7335	-6,3	-2,4	-1,0	-2,8	-0,2	-0,7	-0,8	-3,3	-1,6	-1,2
DR: 90/10	3,66	-3,4	1,6	-1,4	-2,5	0,4	2,3	5,1	2,3	-2,5	-1,2
DR: 90/50	1,88	-1,8	-0,3	-0,2	-1,2	0,2	0,5	1,4	-0,1	-0,6	-0,4
DR: 50/10	1,95	-1,5	2,0	-1,2	-1,3	0,2	1,8	3,6	2,4	-1,9	-0,8
FGT0	15,14	-21,2	-10,5	-2,6	-8,1	-4,7	-8,0	-10,2	-12,5	-5,6	-2,4
FGT1	4,38	-24,5	-11,3	-4,2	-9,0	-4,4	-8,3	-11,6	-13,3	-6,0	-3,0
FGT2	2,08	-29,5	-14,7	-5,1	-9,7	-5,6	-10,6	-14,5	-16,4	-6,3	-3,4

Source: SOEP 2002; n=28.925; population living in private households; shaded cells indicate n<30.

IR: Inequality decomposition by age (based on MLD)

	Germany (Net IR)		Denmark (Gross IR)		Finland (Gross IR)		FI (Net IR)	France (Net IR)	
	Baseline	Change %	Baseline	Change %	Baseline	Change %	Change %	Baseline	Change %
Below 25	0,162	-6,3	0,090	3,6	0,079	6,8	4,4	0,106	4,7
25-64	0,157	-5,4	0,087	3,0	0,088	-1,0	-1,9	0,120	-1,2
Over 64	0,132	-10,9	0,076	2,3	0,075	-8,9	-9,2	0,131	-6,7
Within Group	0,154	-6,5	0,086	3,1	0,083	0,0	-1,3	0,117	-0,6
Betw. Group	0,005	-17,3	0,006	-13,5	0,006	-20,6	-23,2	0,003	2,2

Major Finding: IR reduces inequality mostly among the elderly (exception DK using gross IR) and between group inequality (exception FR due to increasing inequality among youth)

Appendix 2

”Measuring IR in SOEP”

Calculating IR in SOEP 2002 (1)

1) Self-assessment approach (owner-occupiers only)

- Self-assessment of monthly gross rent
- **minus** maintenance, operating, repair costs (lump sum per m²)
- **minus** interest payments on mortgages

2) User-cost / Capital market approach (owner-occupiers only)

- Self-assessment of current gross market value of flat / house
- Net equity = market value – outstanding mortgage debt
- Net equity multiplied by real interest rate of x%
Sensitivity analyses: x=2%, 3%, 4%
- **minus** maintenance, operating, repair costs (lump sum per m²)

Calculating IR in SOEP 2002 (2)

3) Rental equivalence/Opportunity-cost-approach: [a] Regression

- Semi-Log maximum-likelihood based Heckman selection model controlling for clustering effects at the regional level (*county*)
- Dependent variable: log of gross rent per square meter without heating costs of main tenants in private housing market
- Covariates:
 - Condition of building
 - Size of housing unit in square meters
 - Year of construction
 - Occupancy
 - Community Size
 - Regional information about levels of market rent / city center / East-West-Germany
 - Type of house
 - Equipment, Endowment (central heating, garden, etc.)
 - Disposable Income
 - Nationality
 - SOEP-sample-identifier

Calculating IR in SOEP 2002 (3)

3) Rental equivalence/Opportunity-cost-approach: [b] Implementation

- apply regression estimates to otherwise comparable owners / tenants
- add a randomly chosen error term from the true distribution
- multiply inverse of estimated fictitious rent by the size of flat or house (in square meters) and by 12 to get annual gross imputed rent
 - gross IR = $\exp(\ln mtqm02) * wohnfl02 * 12$

Calculating IR in SOEP 2002 (4)

3) Rental equivalence/Opportunity-cost-approach: [c] Deduction of relevant costs

Owner occupiers :

- deduct maintenance, operating, repair costs (lump sum per m²)
- deduct interest payments on mortgages

Rent-free households :

- no deduction of operating costs
- assumption: operating costs as part of income advantage !

Tenants with below market rent:

IR = difference between currently paid rent and estimated fictitious rent
(assuming constant operating costs)

- Social housing
- Tenants with below market rent
 - IR = 0: current rent > estimated market rent
 - Tax on fringe benefits in Germany; lump-sum tax on company housing: 10%

SOEP: *Net* IR requires deduction of owner-specific costs

- Operating, maintenance, repair costs: lump sum of 1,585 Euro per month/m² instead of real, but discretionary investments
- Property taxes: not sufficient information; minor relevance in Germany
- Interest & dividends: (amortization = saving) ↔ (interest = consumption)

SOEP surveys information about monthly loan or mortgage payment including interest. To differentiate amortization from interest we assume a (German) standard repayment scheme with ...

- annuity loan with 30 years payback period
- long lasting constant nominal interest rate (7%+1% amortization)
- year of move-in = start of repayment period
- Bias towards overestimation of interest payments
- If owner-specific costs > fictitious market rent → IR = 0 (no negative IR)

