Equality of Opportunity in Public Education Provision

Francesco Andreoli
Giorgia Casalone
Daniela Sonedda

Motivation

- Traditional redistributive tools are taxes and transfers.

- We study **transfers in-kind:** the policymaker redistributes resources through publicly supplying goods/services and selecting the recipients

  - **Examples**: educational, health care services and public transportation provision
  - **Issues**: eligibility to consumption; private market and differential in goods quality; modality of provision; progressivity

- This paper focus on provision of **educational in-kind transfers** at the level of the household.

Relevant facts

- **In-kind trasfers** are measures of the market-equivalent value of publicly provided educational services received by an household.
- In-kind educational transfers depend on **family income**.
  - through assignment rules : progressivity, negative relation with household income
  - Human capital formation: wealthier households have less children, who stay longer in education
- Relations between in-kind educational transfers and **unfair income advantage** enjoyed by an household represent forms of distributional **unjustice**.

Objectives

- Compute precise measure of **in-kind educational** transfers in **Italy** based on detailed provision costs

- Unveil **unfair income advantages** of Italian households in income acquisition, using informations on **grand-parental background**

- Assess how unjust income **advantage affects in-kind** transfers distribution

Units of analysis

- Households:
  - Children (go to school, define size of in-kind transfer)
  - **Parents** (earn income – pay taxes – receive benefits)
  - Grand-parents (do not exist in the family, but they contribute in setting the parents' background of origin)
- The unit of reference is "**parents"**.
  - Part of their income is **unfairly associated to grand-parents background**
  - Part of their income is not foregone thanks to **in-kind transfers** received by family

Data

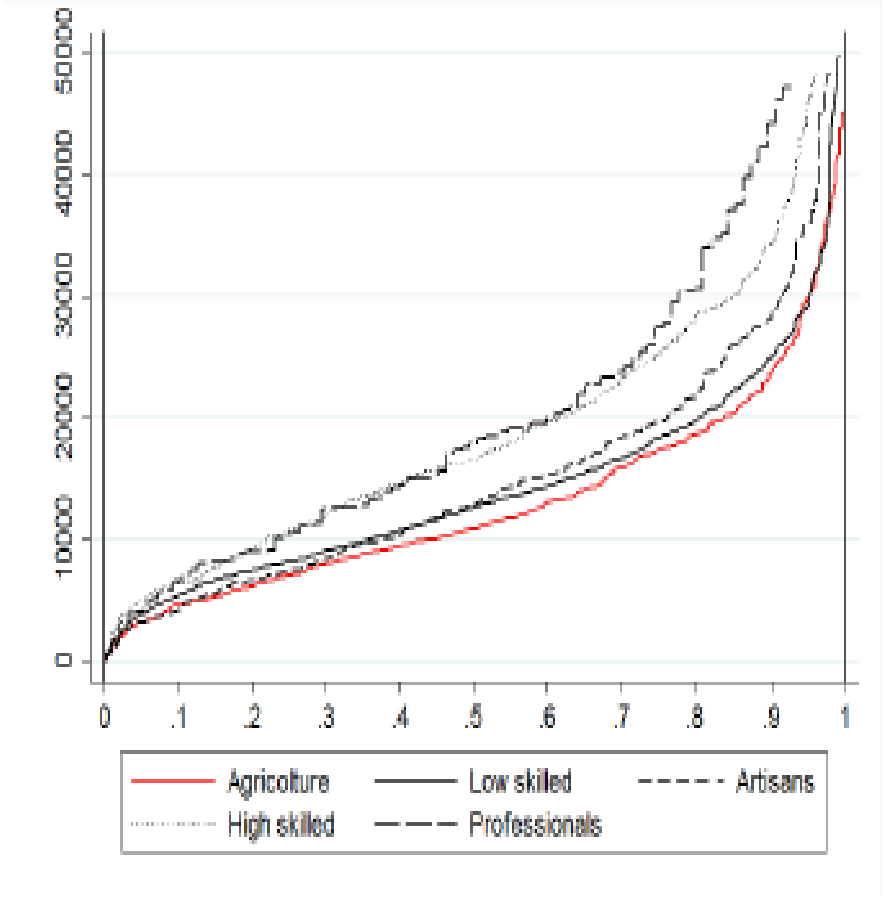
Table 1: Descriptive statistics

	Overall	Pure disadvataged	Mixed	Pure advantaged
Type's proportion	1.00	0.37	0.39	0.23
Equiv. net inc.	15,591.88	13,419.12	14,856.52	20,277.77
Hh components	3.88	4.00	3.86	3.73
Inkind recipients	1.77	1.77	1.77	1.77
Inkind (Euro)	1,599.85	1,528.40	1,608.05	1,700.11
Childre, tot	1.87	1.95	1.82	1.84
Children studying (comp)	0.57	0.60	0.57	0.53
Children studying (sec)	0.42	0.41	0.42	0.43
Children studying (univ)	0.20	0.19	0.18	0.24
Hh head, female	0.34	0.30	0.37	0.34
Max Hh education (years)	11.29	10.09	10.88	13.86
Hh employee	0.56	0.55	0.55	0.60
Hh Self employed	0.18	0.15	0.18	0.25
Unemployed	0.25	0.30	0.27	0.15
In agriculture	0.04	0.06	0.04	0.02
Sample size	2,222	832	868	522

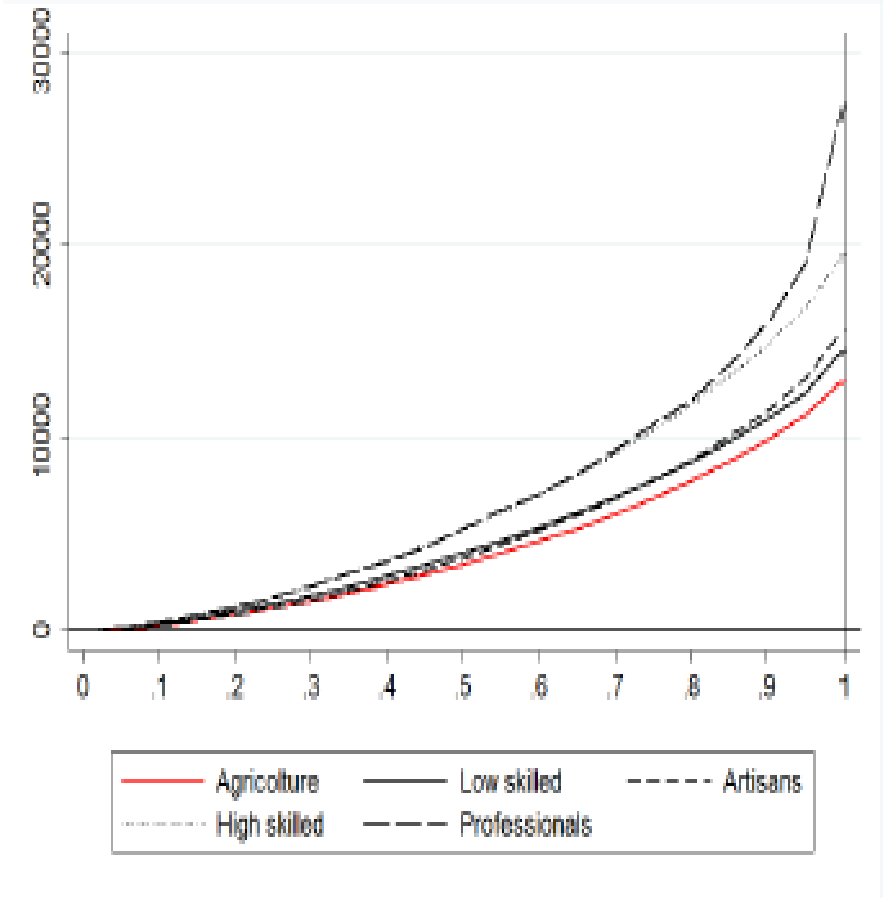
Source: SHIW survey, wave 2004 (Bank of Italy).

Notes: Grandparents background groups are defined according to the socioeconomic conditions of both family spouses' parents. Average observed characteristics reported in columns: (1) overall population; (2) pure disadvantage background; (3) mixed background; (4) pure advantaged background.

Q1 – Unfair income



(a) Pen's Parade of groups



(b) Generalized Lorenz curves of groups

Q1 – Unfair income

The measure of advantage of the household of a given type t at tranche p is denoted $\Delta_t(p)$ and calculated as follows:

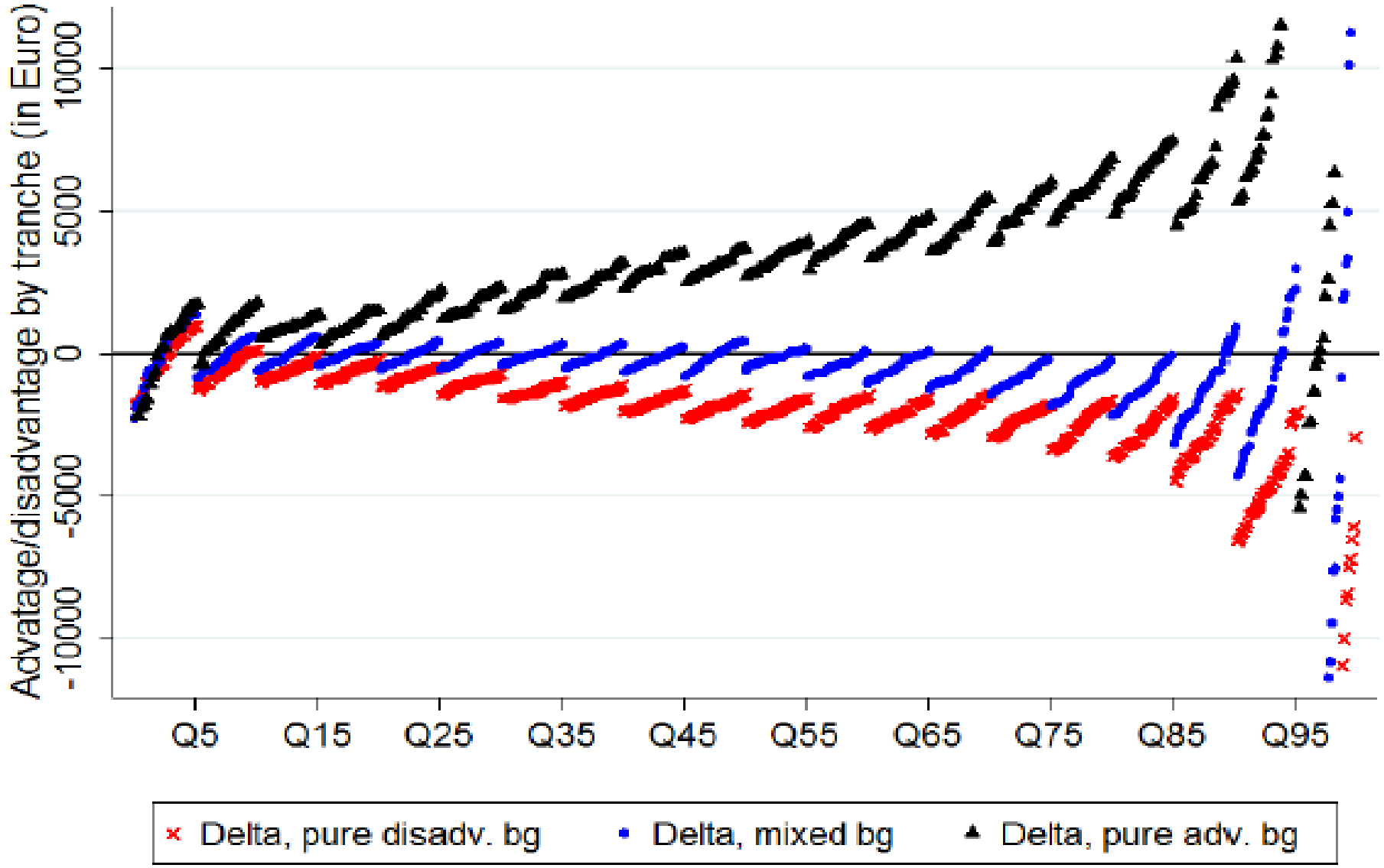
$$\Delta_t(p) = F_t^{-1}(p) - \mu(p). \tag{1}$$

The set $P(p_j, t)$ gathers all the households of type t whose income falls in the interval $\left[\hat{F}_t^{-1}(p_{j-1}),\ \hat{F}_t^{-1}(p_j)\right]$, where $\widehat{F}_t^{-1}(p)$ denotes the empirical quantiles function of each type's population.

The set of households in the same tranche irrespectively of their type is denoted $P(p_j) = \bigcup_{t=1}^{T} P(p_j, t)$. Using this set, we can estimate relative advantage by looking

$$Y_h = \sum_{j=1}^{20} \beta_j \left[1\left(h \in P(p_j)\right)\right] + \varepsilon_h, \qquad \widehat{\Delta}_h = \widehat{\varepsilon}_h.$$

Q1 – Unfair Income



Q2 – Transfers in kind

Cost-based approach:

$$K_h = \frac{\sum_{i=1}^{n_h} w_i AC_i}{n_h}$$

- K_h : (equivalent) educational transfer in kind received by the HH
- AC_i : average cost per student which depends on the level of education and on the region of residence
- w_i : probability to attend a public school/university which depends on the level of education and on the region of residence
- n_h : number of children in the age 3-23 attending school/university in the household

Estimation

- Assess the impact of unjust income advantage, **Δ**, on the quantiles of the **in-kind distribution**
- Endogeneity of income wrt in-kind transfers solved within a **control variate (Ma Koenker 2010)** approach

$$Q_Y[\tau_{AP}|X,Z] = \alpha_1 X + \alpha_2 Z + G^{-1}_{AP}(\tau_{AP}) \quad (3)$$

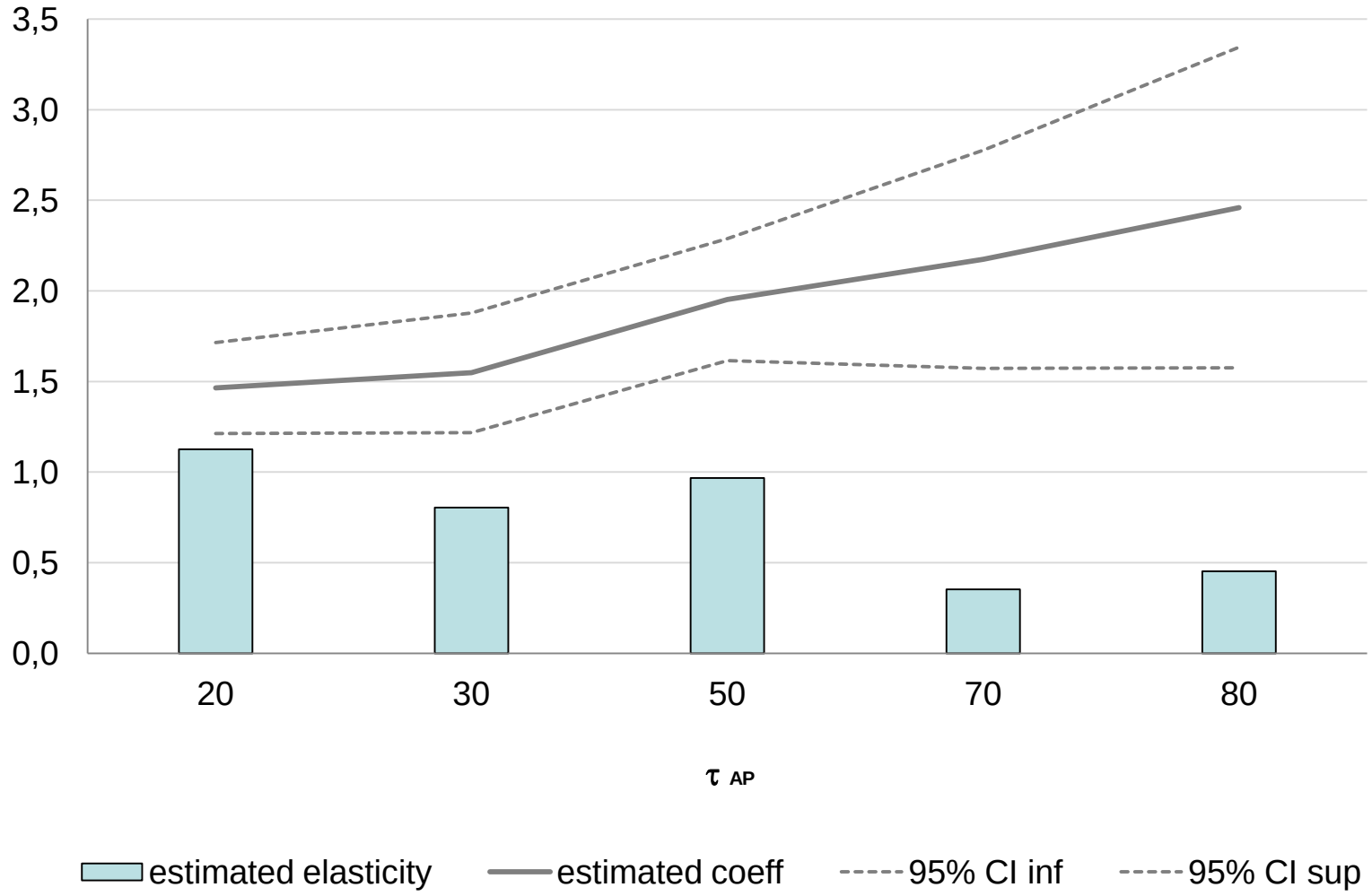
$$Q_K[\tau_{AB}|Q_Y(\tau_{AP}|X,Z),\hat{\Delta},X] = Q_Y(\tau_{AP}|X,Z)\pi_2(\tau_{AP},\tau_{AB}) + \beta_1\hat{\Delta} + \beta_2 X + \\ + \lambda\hat{G}^{-1}_{AP}(\tau_{AP}) + G^{-1}_{AB}(\tau_{AB}), \quad \forall \tau_{AP}. \quad (5)$$

The variable Z corresponds to the household expected value of the maximum tax deductions.

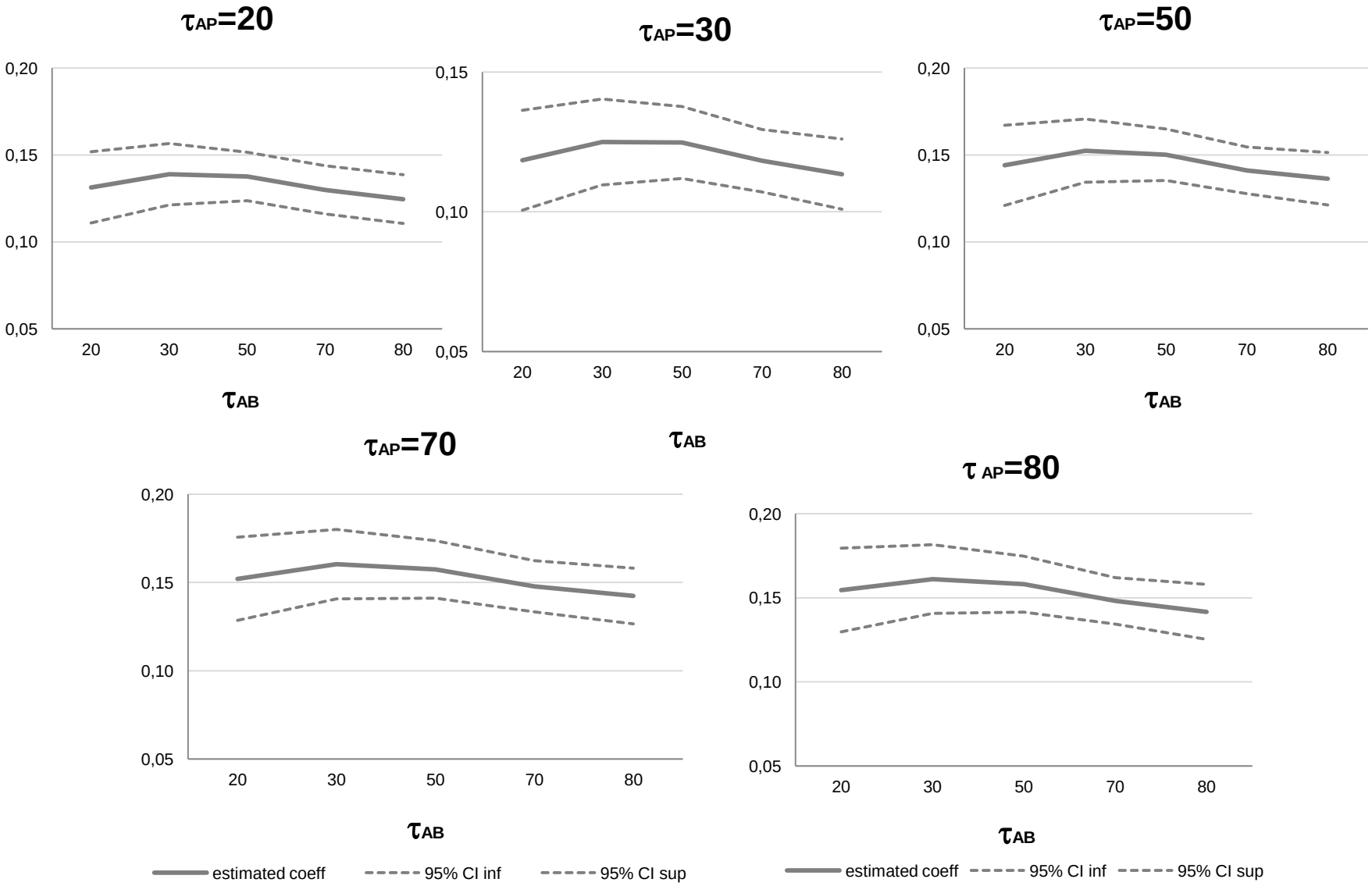
Estimation

The variable Z corresponds to the household expected value of the maximum tax deductions. We exploit differences in tax liabilities related to the source of the gross income (i.e. whether it is related to employment or self-employment or retirement status) of three main potential income recipients within the family, i.e. the household head, the spouse (if present) and, in case, a third income earner. We calculate the expected value of the maximum tax deductions accruing, according to the law, to each household member and weight this expected value by the individual probability to claim these deductions. We use data drawn from ISTAT (2003) to compute this probability as equal to the one-year lagged value of the share of employees, retired persons and self-employed, over the whole population. We allow this probability to vary across age and region of residence.

Results – first stage



Results – second stage (in kind on Δ)



Results – elasticity effects

Table 5: In-kind transfer value elasticities at different quantiles with respect to household income and household advantage/disadvantge, for the three grandparents backgrounds types.

Background:	In kind transfers quantiles				
	$\tau_{20\%}$ (1)	$\tau_{30\%}$ (2)	$\tau_{50\%}$ (3)	$\tau_{70\%}$ (4)	$\tau_{80\%}$ (5)
Household income					
Disadvantaged	-1.630*	-1.461*	-1.198*	-0.985*	-0.898*
Mixed	-2.190*	-1.934*	-1.542*	-1.241*	-1.123*
Advantaged	-3.677*	-3.129*	-2.336*	-1.796*	-1.602*
Unfair advantage/disadvantage					
Disadvantaged	0.147*	0.131*	0.111*	0.094*	0.085*
Mixed	0.013*	0.011*	0.009*	0.008*	0.007*
Advantaged	0.383*	0.324*	0.250*	0.198*	0.176*

* $p < 0.05$

Source: SHIW survey, wave 2004 (Bank of Italy).

Notes: Elasticities of in-kind transfers quantiles (by column) are reported for the median effort level and for the median income ability according to the observed grandparents background (by row). Elasticities are calculated at the median type income and the corresponding level of economic (dis)advantage associated to that type (while setting covariates at the average).

Results – Elasticity effects

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Conclusions

- After controlling for all determinants of in-kind transfers, unfair income advantage still plays a role.
- This effect is robust along the distribution of in-kind transfers.
- Unfair inequality begets unfair inequality
- Bequests (pure circumstances) vs unfair advantage passing through the human capital accumulation process.

Interpretation of first stage coefficients

Starting from the definition of net income Y_N:

$$Y_N = Y_G - T = Y_G - t(Y_G - d)$$

where Y_G is the gross income, T is the tax liability, d are deductions and $t()$ is a function defining the tax liability which depends on imposable income $(Y_G - d)$
The estimated coefficient of the first stage is:

$$\frac{\partial Y_N}{\partial d} = \frac{\partial Y_G}{\partial d} - \frac{\partial T}{\partial (Y_G - d)} \frac{\partial (Y_G - d)}{\partial d} = \frac{\partial Y_G}{\partial d} - t' \left(\frac{\partial Y_G}{\partial d} - \frac{\partial d}{\partial d} \right) = \frac{\partial Y_G}{\partial d} (1 - t') + t'$$

where t' represent the marginal tax rate
Why the estimated coefficients are always greater than one?
Because a one euro increase of deductions has two effects on net income:
1)a "direct" effect: for a given gross income, it cuts the tax liability by an amount equal to the marginal tax rate t' (second part of the right member)
2)a "indirect" effect through the variation of the gross income net of the marginal tax rate (first part of the right member).
Why the estimated coefficients increase along the gross income quantile?
Because the marginal tax rate of the personal income tax in Italy increases with income.