First Exam (A1) of Social Economics and Public Policy – Answer Sheet

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Time: 3 hours. You may use a calculator. Please handle in the questions sheet signed with your answers. Answers written in pencil are not subject to revision.

Question 1 – Conceptual Exercises

Evaluate if each sentence is True or False (if any part is false the whole sentence is false – when this happen just the false part is underlined in the answers below). **YOU DO NOT NEED TO COMMENT WHY JUST Indicate** if each small letter is true or false (0.2 points each). Answer only 28 of the 32 items of parts I to IV below (0.2 points each)

I – Inequality and Welfare

a. National wide price indices in general do not affect inequality measures. T
b. Absolute inequality measures tend to decrease in the case of economic contraction.T
c. Lorenz dominance is valid for all inequality measures that obey Pigou-Dalton property. Simple Lorenz curves enable us to compare directly levels of welfare between societies. F
d. Lorenz curves can be seen as the general case of Concentration curves.F
e. Concentration ratios share the same range as the Gini index. F
f. The advantage of the J-Divergence over the Theil T index is to allow decompositions between and within groups across variables such as education or gender. F
g. Income inequality captured by household surveys such as PNAD underestimates actual income inequality by not capturing the income of the richest. However, the level of social welfare would not be necessarily overestimated by the PNAD. T
h. The proportion of the richest 10% in income is an inequality measure that does not follow the principle of transfers (Pigou-Dalton). T
i. Income inequality measures captured by the share of the bottom 40% in income is not consistent with Atkinson approach that derives inequality directly from a social welfare function. Inequality of opportunities is also not consistent with Atkinson approach. F
j. Inequality captured by the share of the bottom 40% in income is less sensitive to the lower tail of income distribution than the Gini index. F
k. The growth of the proportion of active age population (PIA) in overall population provides a measure of the demographic bonus while the growth of years of schooling provides a measure of the educational bonus.T
l. The Theil-T Index dual can replace with some advantages the Gini index in the Poverty Indicator proposed by Amartaya Sen (1976). Being the main improvement of making poverty sensitive with inequality among the poor. F

II - Poverty

a. Poverty targets based on P1 (Poverty Gap) have difficulty in inducing actions aimed at the poorest in society. T
b. Two complementary ways to minimize the cost of eradicating poverty are calculate the poverty gap associated with it giving to the poor exactly what is needed to reach the poverty line established. The second is to apply resources with the highest rate of social return. T
c. The Brazilian government just announced a 13th annual additional payment of Bolsa Familia to its beneficiaries this is less costly for the government than raising the poverty line by 8,33%. T
d. The existence of pure economies of scale within households makes (linear) per capita household income to underestimate individual inequality. F
e. The existence of pure economies of scale within households makes (linear) per capita household income to overestimate poverty. T
f. Datt-Ravallion decompositon allows to decompose poverty changes into mean, inequality and residual interactive terms. T
g. The counterfactual of poverty measures with a distribution of year t and mean income of year t+1 is generated dividing the micro income data of year t+1 by the growth factor between the two years. F
h. The poverty dominance analysis allows to reduce the arbitrariness derived from choosing a specific poverty line <u>but not about the choice of FGT poverty measures poverty aversion parameter.</u> F
i. If the Income Cumulative Distribution Function of society A is always above the one of society B, then we can ensure that all three FGT indicators (P0, P1 and P2) are always higher in A than in B for any poverty line. T
j. If we adopt a social goal system based on the poverty indicator known as the poverty head-count ratio (P0) we will implicitly assume that priority is given to the least poor of the poor. T

III – Global Social Indicators and Social Targets

a. The standard Human Development Index (HDI), after incorporating the log of income as a component, is sensitive to inequality. T
b. The Inequality adjusted Human Development Index (IHDI) is irresponsive to mean changes in HDI components, F
c. The total variance explained by outer components of perceptions are generally greater than for inner components. OBS: Inner refers to aspects of the individuals life while Outer is related to the environment. F
d. A system of targets based on international indicators such as MDGs and SDGs allows to lengthen the planning horizons of policy makers; Intermediate actions between different levels of government and creates automatically insurance against systemic (aggregate) shocks. T
e. If Politicians are less concerned with underrepresented groups in the electoral market, such as children. Social targets can eliminate <u>completely</u> the distance of the treatment given to different groups. F
f. Ceará State uses municipality education performance to distribute the proceeds of its State Taxes (ICMS). This can not only improve local

education performance but also increase the incentive to raise municipal own education budget. T

IV - Empirical Methods Analysis

a. In the context of a Mincerian (log-linear) earnings equation, the concept of the net contribution to inequality is measured by the R^2 of a regression with only one constant term and the variable that we want to evaluate the contribution (education, for example). F
b. The advantage of running bivariate regressions with a constant over using simple cross tabulations is to provide confidence intervals to test hypothesis.T
c. The coefficient of education in the mincerian regression gives us how much the absolute change in average schooling affects the income of individuals in relative terms (in percentual terms). T
d. In the context of a Stepwise Procedure, it is not possible to capture externality effects of infrastructure because the procedure is automatic and carried out without any theory. F
e. Differences in differences estimator (DD or diff-in-diff) is captured by an interactive term in a regression. This work for both continuous but not for discrete regression models. F

Question 2 – Conceptual and Discursive Question – Choose 1 (and only 1) of the 2 items below: **(1.4 points)**

I) i. What is your favorite income inequality index? ii. Justify your choice in pratical, ethical and theoretical grounds using its formula and respective social welfare function specification. Illustrate its main features. iii. Describe decomposition methods applied to it. iv. (Bonus 0,4 points: Give another Social Welfare Function and its respective inequality measure example).

II) i. What are the possible constraints imposed on the social welfare function below so that the Pigou-Dalton's Principle of Transfer is observed? Provide examples.

We could observe the Pigou-Dalton Principle of Transfers if we assume utility functions u(x) with decreasing marginal utilities or if we impose bigger weights w(x) to the poorest. One special case is if we take u(x) = log(x) and w(x) = 2[1 – F(x)], where F(x) is the cumulative distribution function.

ii. Write down the functional form of the Social Welfare function associated with the Gini Index from the equation below. Explain each component.

This corresponds to the case where u(x) = x and w(x) = [1 – F(x)].

iii. Sketch and explain the passage from the Social Welfare Function to the Gini inequality measure.

If u(x) = x and w(x) = 2 [1 – F(x)] then applying Atkinson certainty equivalente idea

$$u(x^*) = \int_0^\infty w(x)u(x)f(x)dx = 2\int_0^\infty x\,[1 - F(x)]f(x)dx = \mu(1 - G)$$

iv. (Bonus 0,4 points): How to incorporate the temporal choice dimension in the equation below. Explain

$$u(x^*) = \int_0^{\infty} w(x)u(x)\,f(x)dx$$

$$u(x^*) = \int_0^{T}\int_0^{\infty} w(x)u(x)f(x)dx\,dt$$

Besides aggregating individual welfare levels into social welfare in a moment of time, the first integral aggregates different instants of time (and also under uncertainty different states of nature) .

Question 3 – Quantitative Questions – Choose 2 (and only 2) of the 4 items below: **(1.5 point each)**

I) i. Write down the formulas and compare advantages and disadvantages of the Gini, Theil-T, Theil-L and J-Divergence inequality index

$$G = \frac{1}{\mu N(N-1)}\sum_{i>j}^{N}\sum_{j}^{N}|x_i - x_j|$$

$$T = \sum_i y_i ln\frac{y_i}{1/n}$$

$$L = -\frac{1}{n}\sum_i ln\frac{y_i}{1/n}$$

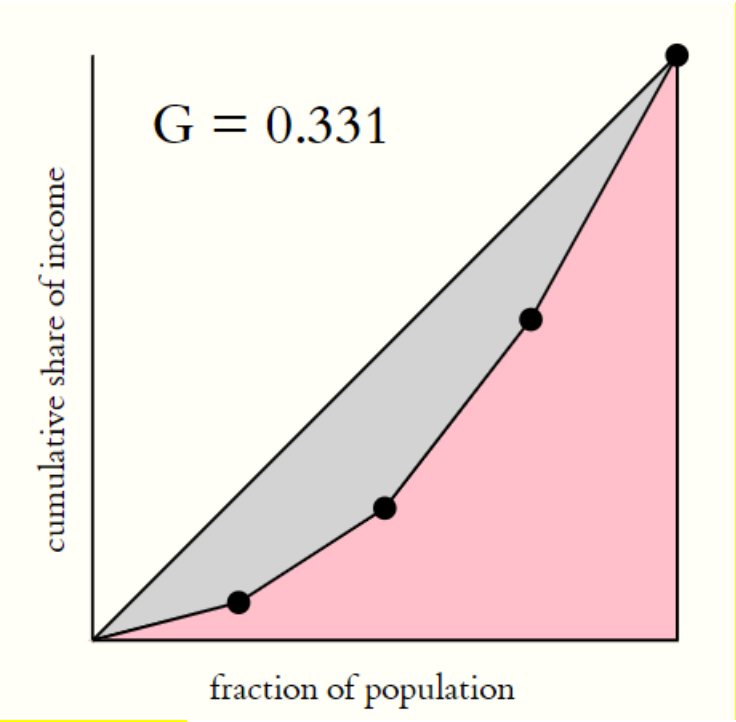
$$J = T + L$$

Gini advantages: Its graphical representation through the Lorenz curve and also its scale are intuitive;
Gini disadvantages: Not fully decomposable, very insensitive to lower tail of income distribution
Theil-T, Theil-L and J-Divergence advantages: Decomposable into intergroup and intragroup inequality
Theil-T, Theil-L and J-Divergence disadvantages: Also not very sensitive to poverty
Theil-L and J-Divergence extra disadvantages: Does not account 0 incomes Also not very sensitive to poverty.
Theil-J extra advantage: Its non negativity allows also to decompose by categories (for example, college degree) and not only education. Decomposable into share of x% richest inequality.

ii. Define and illustrate the concept of Lorenz dominance.
An F distribution Lorenz-dominates another distribution G when

$$L_F(p) \geq L_G(p) for\ all\ p\ in\ [0,1]$$

iii. Draw a sketch of the Lorenz Curve and calculate the Gini, Theil-L, J-Divergence and their duals, if they exist, using the following income distribution: x = [2; 5; 10; 14].



Theil-L: 0.237
J-Divergence:0.428
Duals:
G=0.331
Theil-L and J-Divergence have no duals

iv. If we add one individual with null income in the sample, how do these inequality measures change? Give the intuition. 0,3

G2=1/5+4/5*0,331=0.2+0.265=0.465

Theil-L and J-Divergence do not take 0 incomes into account

II) i. Compare advantages and disadvantages of the poverty indicators known as P0, P1 and the Mean Squared Poverty Gap (P2). Give the general and specific formulas and intuition. Sketch their relationship with poverty dominance concepts. 0,2

$$P^n = \frac{1}{N}\sum_{i=1}^{Q}\left(\frac{z - x_i}{z}\right)^n$$

ii) Calculate the Proportion of the Poor (P0), the Mean Squared Poverty Gap (P2), the Mean Poverty Gap (P1) and the mean cost of eradicating poverty per person for the 2 following periods and assuming a poverty line of 5 units: Period 1 = {2, 4, 6,8}; Period 2 = {3, 4, 7,10}.0,4
p0: 50% in t0 and 50% in t1.
p1:
¼ (5-2)/5 + ¼ (5-4)/5 = ¼ (3/5) + ¼ (1/5) = 3/20+1/20=4/20=20% in t0
¼ (5-3)/5 + ¼ (5-4)/5 = ¼ (2/5) + ¼ (1/5) = 2/20+1/20=3/20=15% in t1
p2:
¼ ((5-2)/5)² + ¼ ((5-4)/5)² = ¼ (3/5)² + ¼ (1/5)² = ¼ 9/25+ ¼ 1/25= 9/100+1/100 =10% in t0

¼ ((5-3)/5)² + ¼ ((5-4)/5)² = ¼ (2/5)² + ¼ (1/5)² = ¼ 4/25+ ¼ 1/25= 4/100+1/100 =5% in t1

Mean cost of eradicating poverty per person: (3+1)/4=1 in t0 and (2+1)/4 = 0.75 in t1.

iii. Do we have first order dominance of the distribution in period 2 in relation to period 1? Consider the relevant range of poverty lines going up to 7. 0,15

No, because p0 is the same for both periods for z=5. It doesn't change if z changes.

iv. As in the Datt-Ravallion decomposition, generate the contra factual distribution values of the mean in period 1 and distribution in period 2. 0,15

$$\mu_0 = 5;\ \mu_t = 6;\ \frac{\mu_t}{\mu_0} = \frac{6}{5};\ \frac{\mu_0}{\mu_t} = \frac{5}{6}$$

d0: {2;4;6;8} -> {12/5; 24/5; 36/5; 48/5}

d1: {3;4;7;10} -> {15/6; 20/6; 35/6; 50/6}

III) **Empirical Analysis of the Logistic regression:** i. Discuss the level and the evolution of poverty in Brazil and in Rio de Janeiro State from the binomial logistic regression below. 0,5

Poverty incidence in Brazil decreased significantly between 2004 and 2015 (-.7293 with a corresponding odds ratio below unity 0,482). People in Rio de Janeiro, had a 3,37% higher chances of being poor than in São Paulo considering the whole period. Rio de Janeiro citizens chances of being poor decreased 6,4% between 20104 and 2015.

ii. How to interpret the two terms for education in the regression below? 0,5

Education has a negative impact on poverty, the quadratic term show that this effect increases in module meaning that higher levels of education produce on the margin larger the effects on poverty.

iii. What if the regression also displayed a negative coefficient for the mean education in the State. How would you interpret that? 0,3

It means that a State with more average education has less poverty incidence besides the individual effect of education on poverty. That's probably due to positive externalities. For example, imply in better teachers or health professionals.

iv. What is the importance of restricting the sample to those with age 25 years of age or above? 0,2.

Since the education cycle approximately ends before 25 years of age, this restriction avoids incorporating children and teenagers that would distort the analysis.

v**. (Bonus 0.3)** What is the advantage of multivariate poverty analysis?

It controls for other observable factors, allowing to isolate the contribution of a particular factor, providing a more precise estimate of.. For example, in the example we take into account educational, socio demographic and infrastructure differences when estimating the regional effects which may indicate possible policies paths.

Binomial Logistic Regression Poverty Line FGV CPS – For those with age 25 years of age or above.

INTERACTION STATE*YEAR OBS: Other State Categories are not displayed below Also controls for gender age, city size and variables related to acess to infrastructure are also not displayed.

Parameter	Category	Estimate	Standard Error	Chi-Squared	sig	Conditional Odds Ratio
YEARS OF EDUCATION		-0.0232	0.0001	25542.3	**	0.97703
(YEARS OF EDUCATION)^2		-0.0102	0.0000	728969	**	0.98983
STATE	RJ	0.0332	0.0010	1036.69	**	1.03371
STATE	zSP	0.0000	0.0000	.		1.00000
YEAR	a2015	-0.7293	0.0009	603648	**	0.48223
YEAR	z2004	0.0000	0.0000	.		1.00000
STATE*YEAR	RJ	-0.0661	0.0018	1411.80	**	0.93605
STATE*YEAR	RJ	0.0000	0.0000	.		1.00000
STATE*YEAR	zSP	0.0000	0.0000	.		1.00000

IV) Imagine a set of four countries to be compared. In Table below you will see some of their respective social indicators, for each there is a minimum and maximum values to be considered for calculating the Human Development Index (HDI). In Table II, you will see their loss due to inequality.

Table 1 - Indicator	Minimum	Maximum	Country's arithmetic mean
Life expectancy (years)	20	85	Brazil: 75.7
			Cuba: 79.9
			USA: 79.5
			China: 76.4
Expected years of schooling (years)	0	18	Brazil: 15.4
			Cuba: 14.0
			USA: 16.5
			China: 13.8
Mean years of schooling (years)	0	15	Brazil: 7.8
			Cuba: 11.8
			USA: 13.4
			China: 7.8
Gross national income per capita (2011 PPP $)	100	75000	Brazil: 13,755
			Cuba: 7,524
			USA: 54,941
			China: 15,270

Table 2 - Loss of HDI due to inequality

Brazil	23.9
China	14.5
Cuba	0
United States	13.8

Below we already calculate the HDI and the Inequality Adjusted HDI for each country and rank them.

Table 3

	HDI	Rank	InAdj HDI	Rank
Brazil	0.751924	3	0.572214	4
Cuba	0.777754	2	0.777754	2
USA	0.924204	1	0.796664	1
China	0.746589	4	0.638333	3

i. Summarize your take from the findings about Brazil posed on Table 3 above.0,35

Brazil loses position and is behind China when adjusting HDI by inequality, since inequality in Brazil is higher than in China.

ii. ii.. Explain the methodology to construct the Inequality Adjusted Human Development Index (IHDI).0,4

Ax = Geometric Mean(indicator)/Arithmetic Mean(indicator);
InAdj Index (education, health and income): (1-Ax)*Index
InAdj HDI = geometric mean of the three Inequality Adjusted Indexes.

iii. iii. How each component is weighted? What criticism (and possible solutions) can be made of this weighting methodology? 0,35

The weight is the same for the three general indexes by assumption.

iv. iv, .What are possible improvements and the new directions for multidimensional social measures seen in the course? 0,4

Multidimensional measures may include many life quality indicators, allowing to include State policies effectiveness indicators, such as public education and health provision. Also, there may be advances based on subjective indicators. For example, asking priorities directly to calculate weights or using a participatory forum to generate an overall weight structure. Besides one could happiness metrics to infer indirectly the weights given to dimensions.

Good Luck!