Analyzing and comparing the Gender Gap in Poland and Italy

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joint work with Alina Jędrzejczak, University of Łodz (Poland)

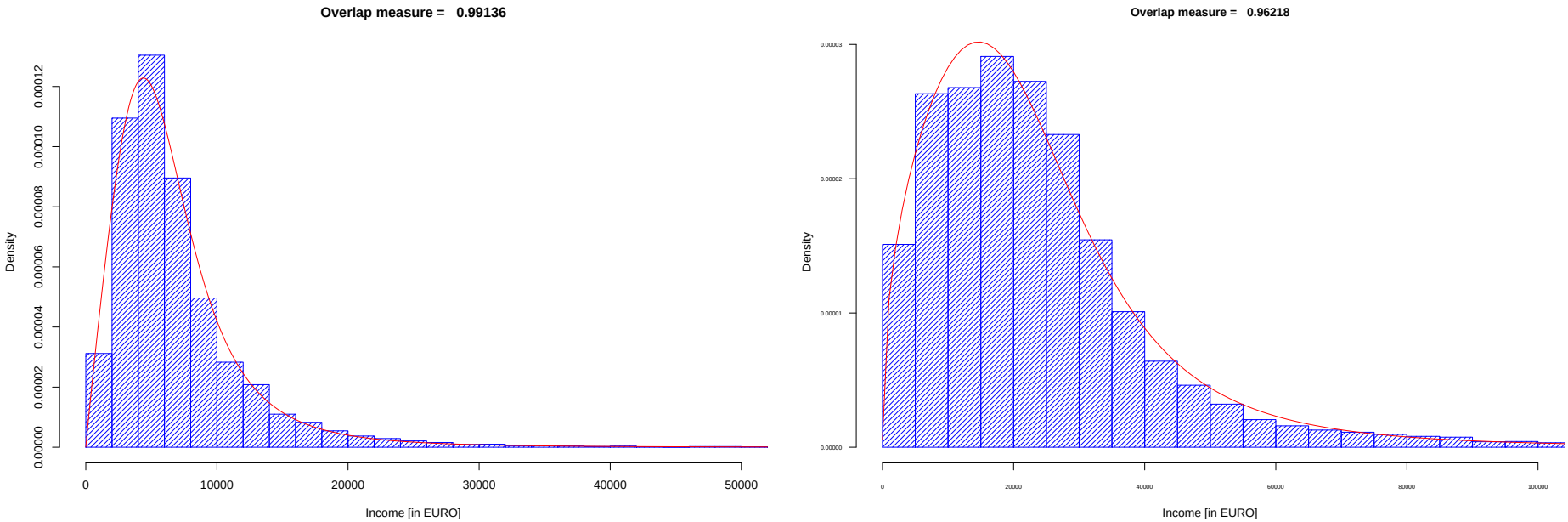
Outline

- A first look at data in EUSILC
- Empirical results, with summary measures and model estimation
- To study gender gap, is this enough?
- Relative distributions
- Conclusions and further research

The European Union Statistics on Income and Living Conditions (EU-SILC) is an instrument aiming at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions. This instrument is anchored in the European Statistical System (ESS).
The employee gross income consists of

- cash gross total Income PY010G,
- cash benefits from self employment PY050G,
- gross pension individual plans PY080G,
- gross unemployment benefits PY090G,
- old age benefits PY100G,
- survival benefits PY110G,
- disability benefits PY130G,
- educations related allowances PY140G.

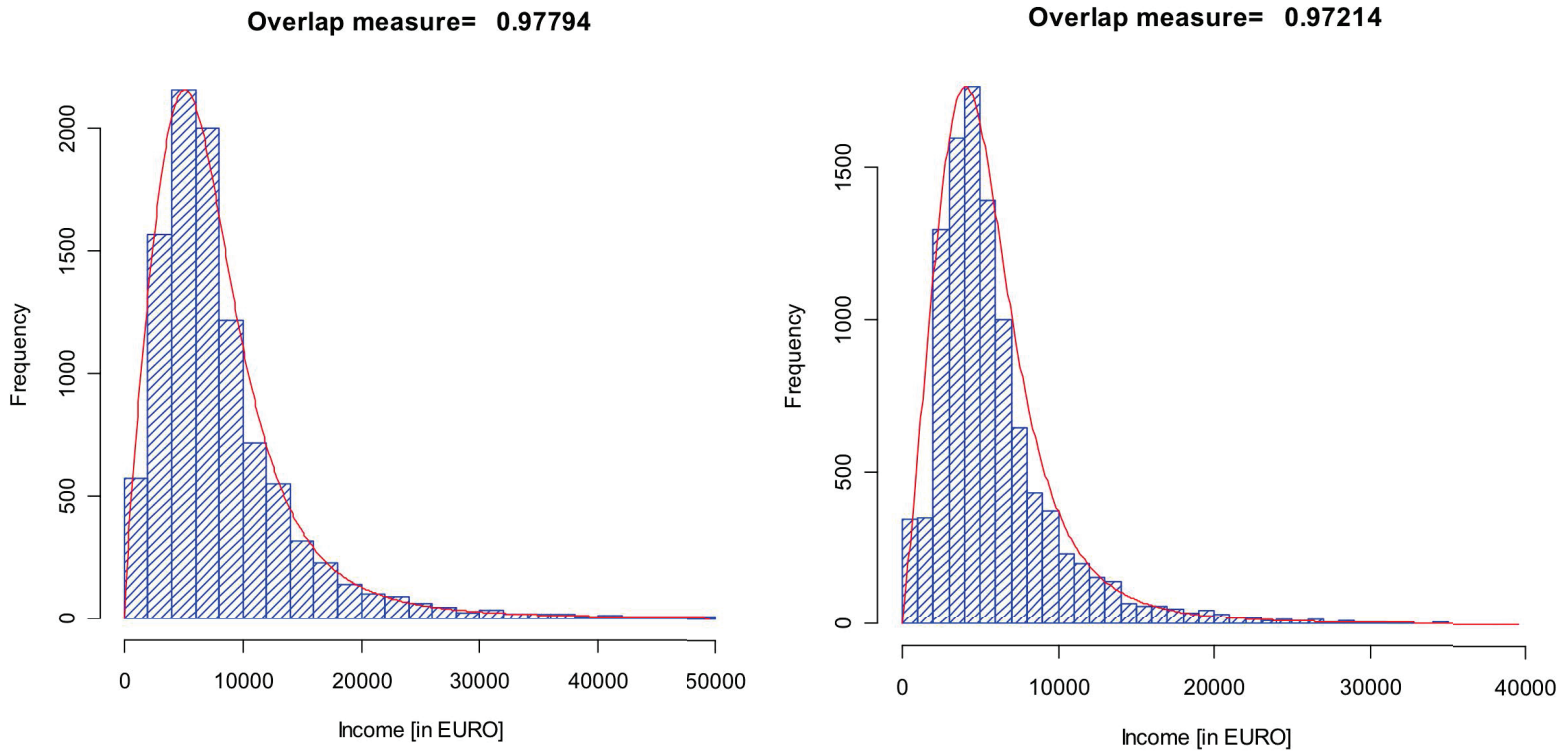
Income distribution in Poland and in Italy



Polish (left) and Italian (right) distribution of Gross Income 2015

S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
20 353	35.9	114 855.8	5625.1	23 205	29 831	52	1 227 624	20 483	88 968
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.008	0.648	7096.58	0.369	0.715	3.291	0.633	6162.19	0.344	0.689

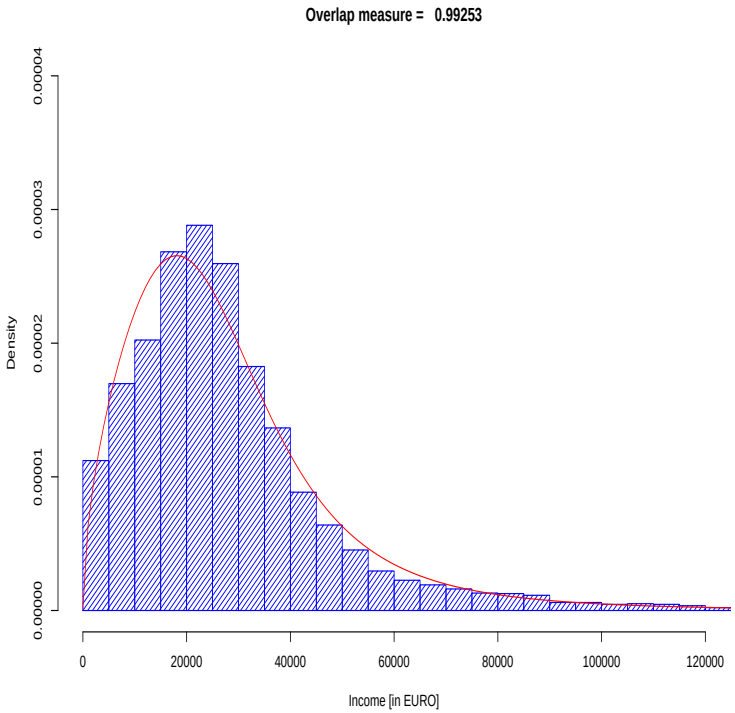
Gender gap in Poland

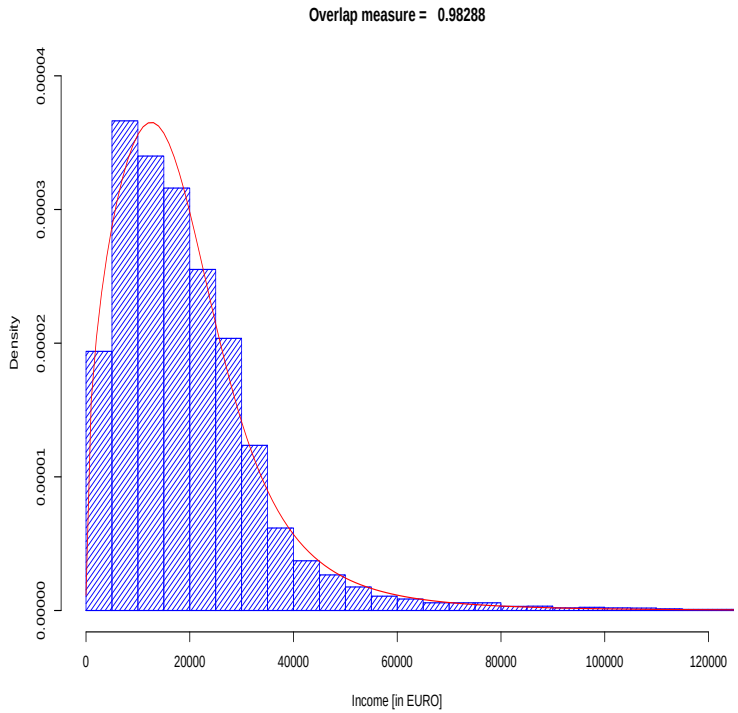


Men (left) and Women (right) distribution of Gross Income 2015

S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
9 933	35.9	114 855.8	6 613.5	26 855	10 420	38.2	64 088.6	4 954	19 079
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.067	0.592	8 633.7	0.374	0.723	3.291	0.633	6 162.2	0.344	0.689

Gender gap in Italy





Men (left) and Women (right) distribution of Gross Income 2015

S.size	Min	Max	Median	0.98%Q	S.size	Min	Max	Median	0.98%Q
15 636	74	1 227 624	24 250	106 527	14 195	52	266 249	16 513	64 208
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.173	0.491	34161.32	0.395	0.747	3.442	0.401	25673.25	0.388	0.744

The Overlap measure

It is a coefficient of distribution similarity (Vielrose, 1960)

$$S = \sum_{i=1}^{k} min(w_i; w_i^*)$$

where:

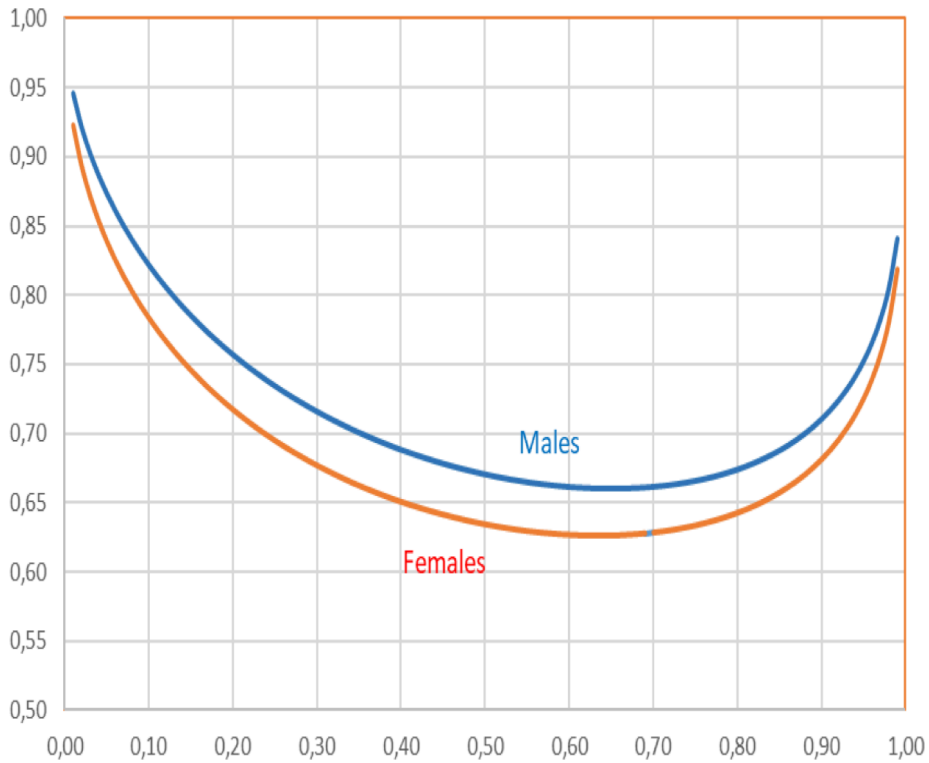
w_i is the empirical relative frequency

w_i^* is the theoretical relative frequency

k is the number of class intervals

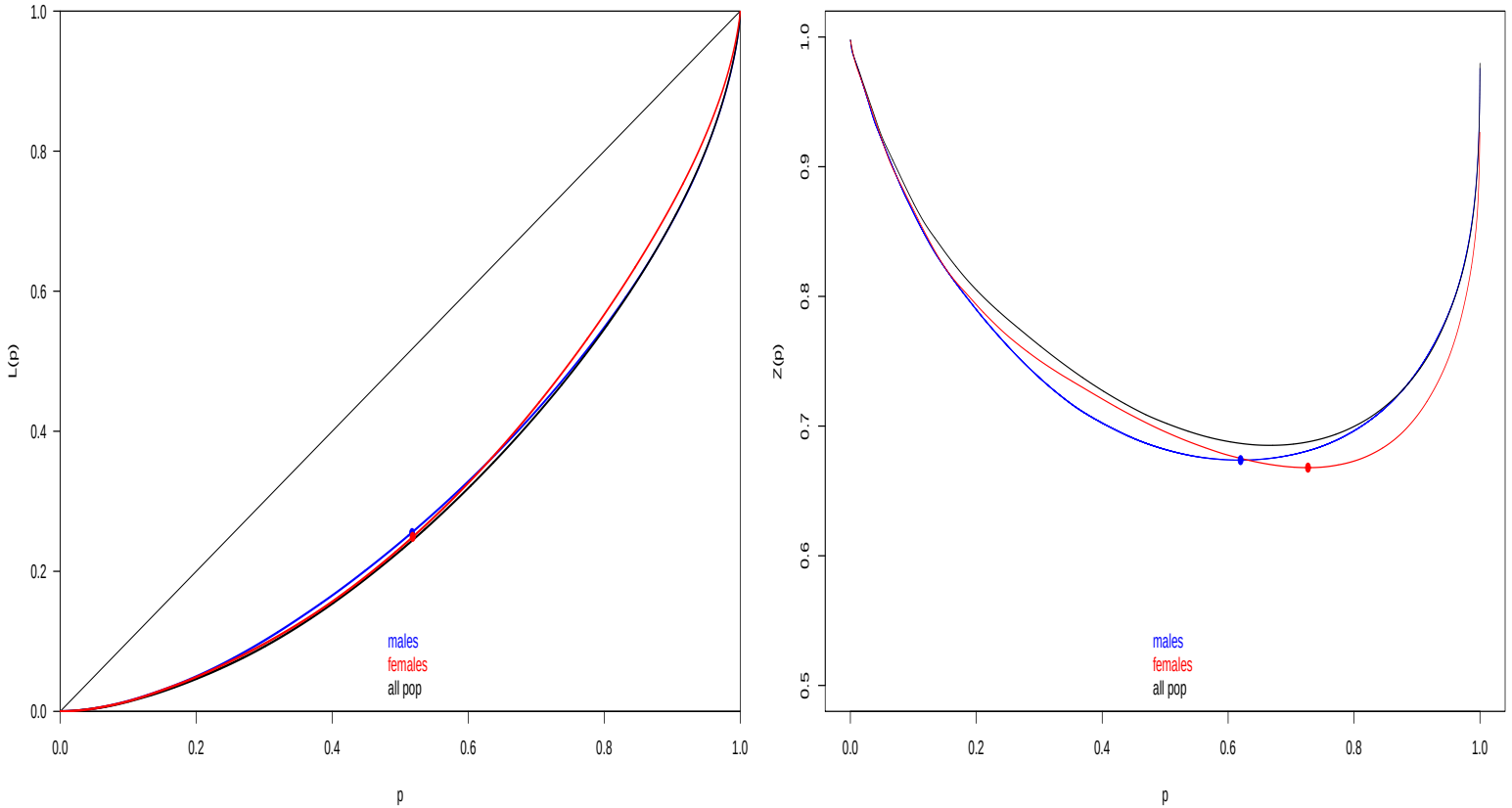
Comparing distributions of income in Poland

Let us employ the Zenga curve, and compare



Comparing distributions of income in Italy

Let us employ the Lorenz and the Zenga curve, and compare



Interpretation of the red point: the poorest 72% women have mean income equal to 33% of the mean income of the richest 28%.

The Relative distribution

Let Y_0 be a r.v. representing the reference distribution, with cdf $F_0(y)$.

Let Y be the comparison distribution, with cdf $F(y)$.

The objective is to study the difference between the comparison and the reference distribution.

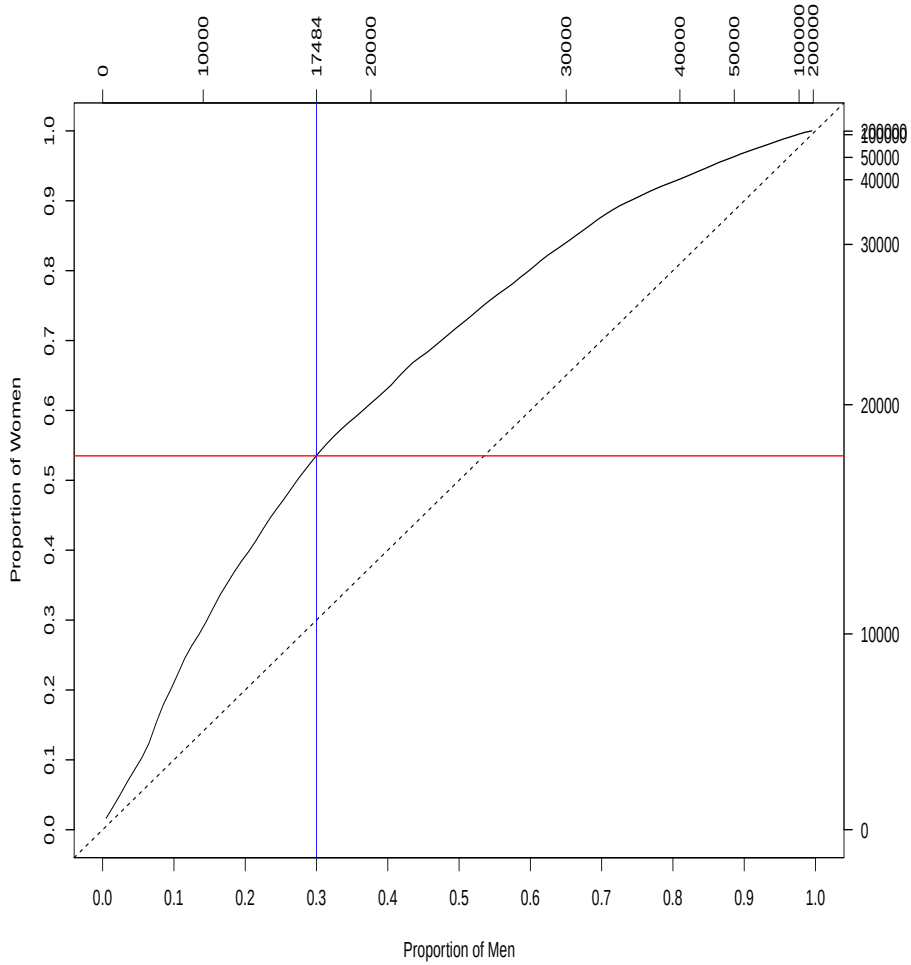
The relative distribution of Y to Y_0 is defined as the distribution of the r.v.

$$R = F_0(Y)$$

(Handcock and Morris, 1999)

- R is obtained from Y by transforming it by the cdf of Y_0, that is F_0
- R measures the relative rank of Y compared to Y_0
- R has cdf G such that $G(p) = F(F_0^{-1}(p))$ for $0 \leq p \leq 1$.

Comparing distributions of income in Italy



Women income quantiles versus Men income quantiles

At the third decile of the male earnings distribution, $p = 0.3$, $G(p) = 0.54$. This means that approximately 54% of women earn less than the 'third decile male'.

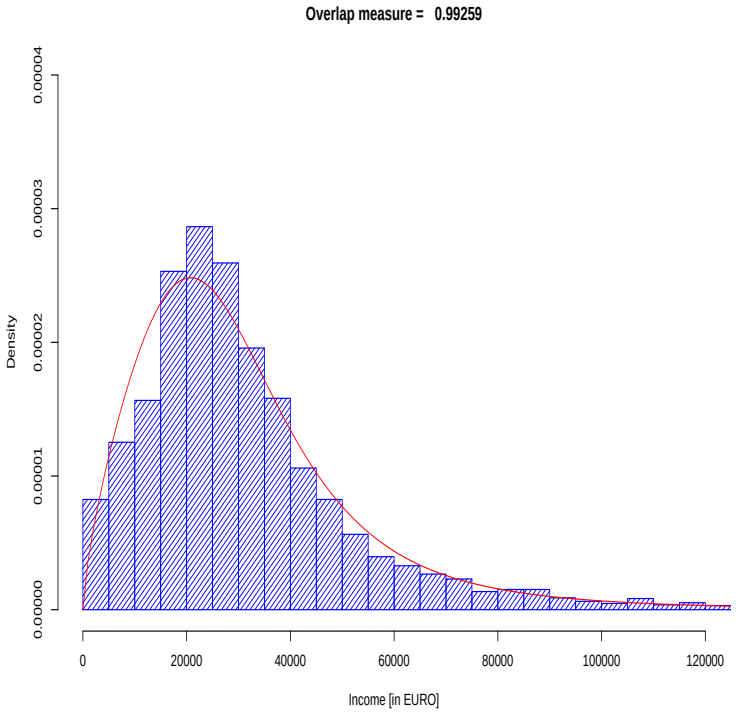
The Relative distribution

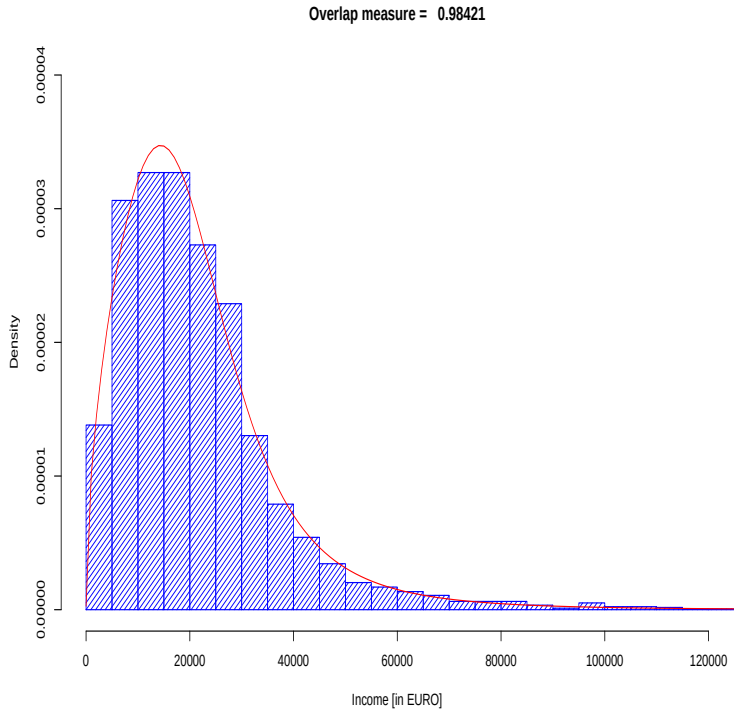
The distance between Euro values on the right hand scale is measured in units of persons rather than Euro.

The distance between 0 and 10 000 is larger than 40 000 and 50 000, because there are more people in the former range than in the latter.

In general the relative distribution is invariant to the scale of the distributions (up to a monotone transformation) like, for example, the log.

Gender gap in North Western Italy

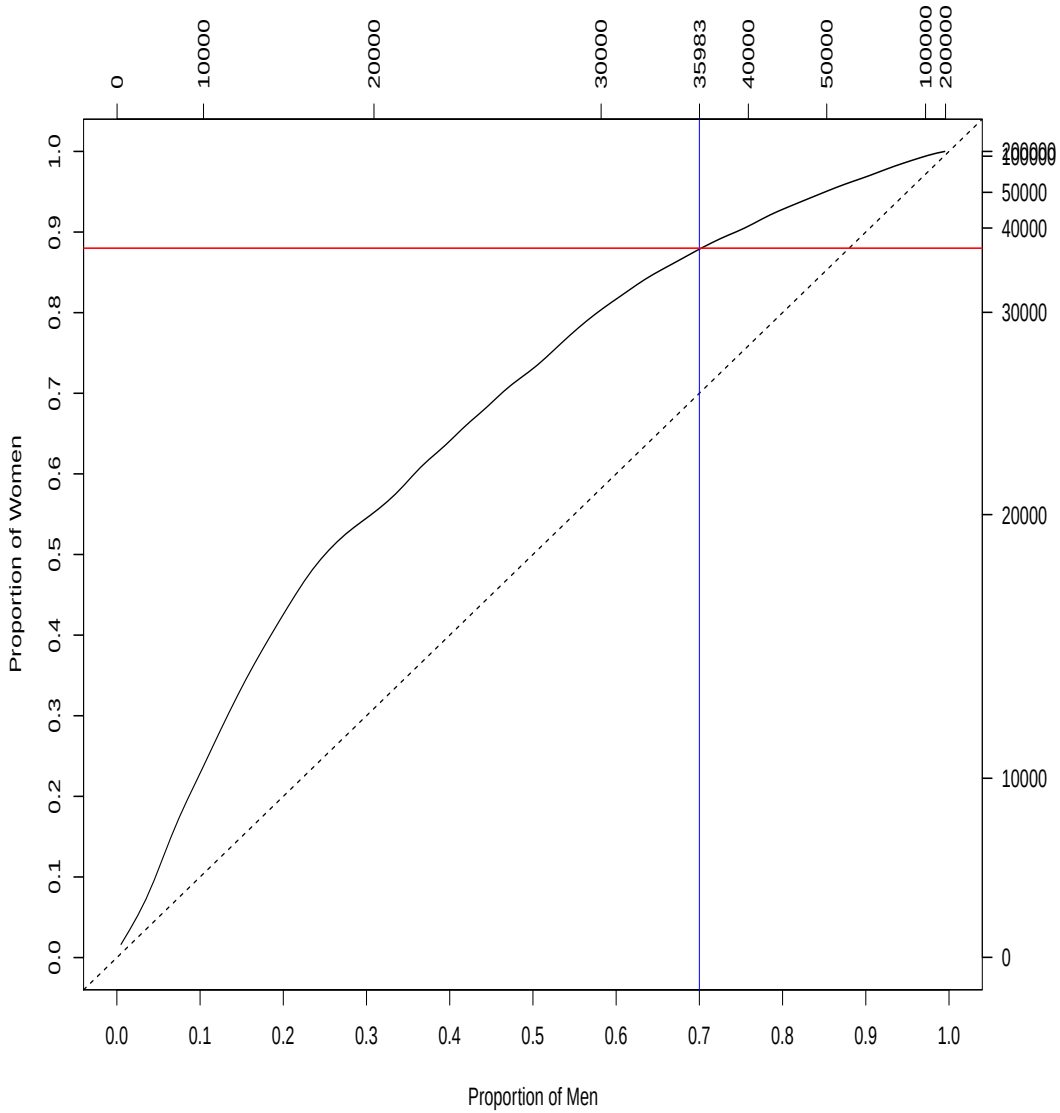




Men (left) and Women (right) distribution of Gross Income

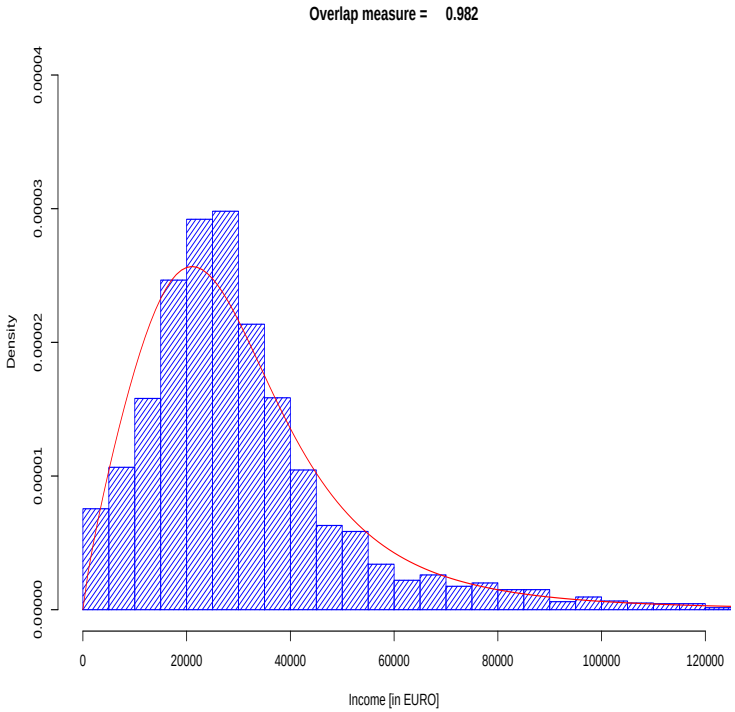
S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
3 832	120	795 532	26 558	115 004	3 547	60	266 249	18 336	70 201
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.155	0.543	36 268	0.381	0.732	3.398	0.448	26 847	0.375	0.729

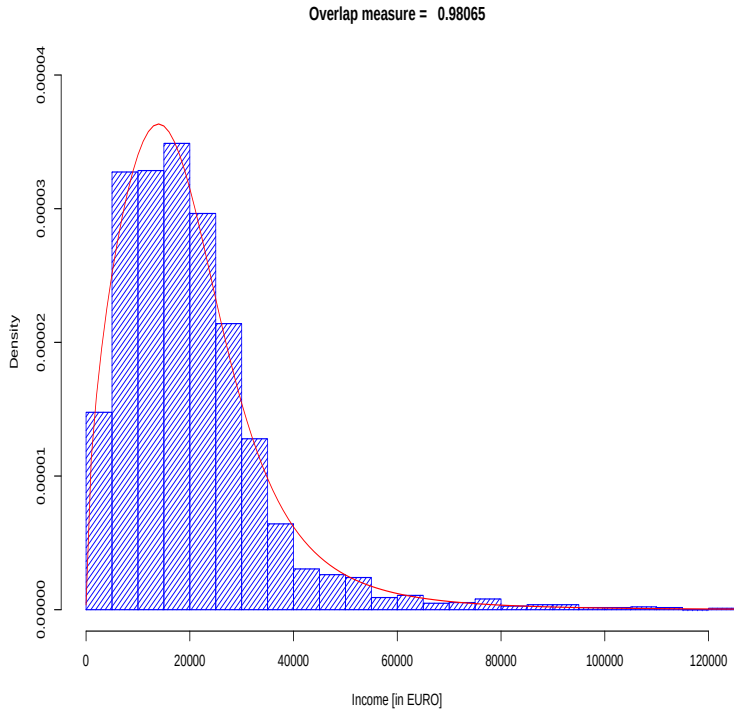
Gender gap in North Western Italy



Women income quantiles versus Men income quantiles

Gender gap in North Eastern Italy

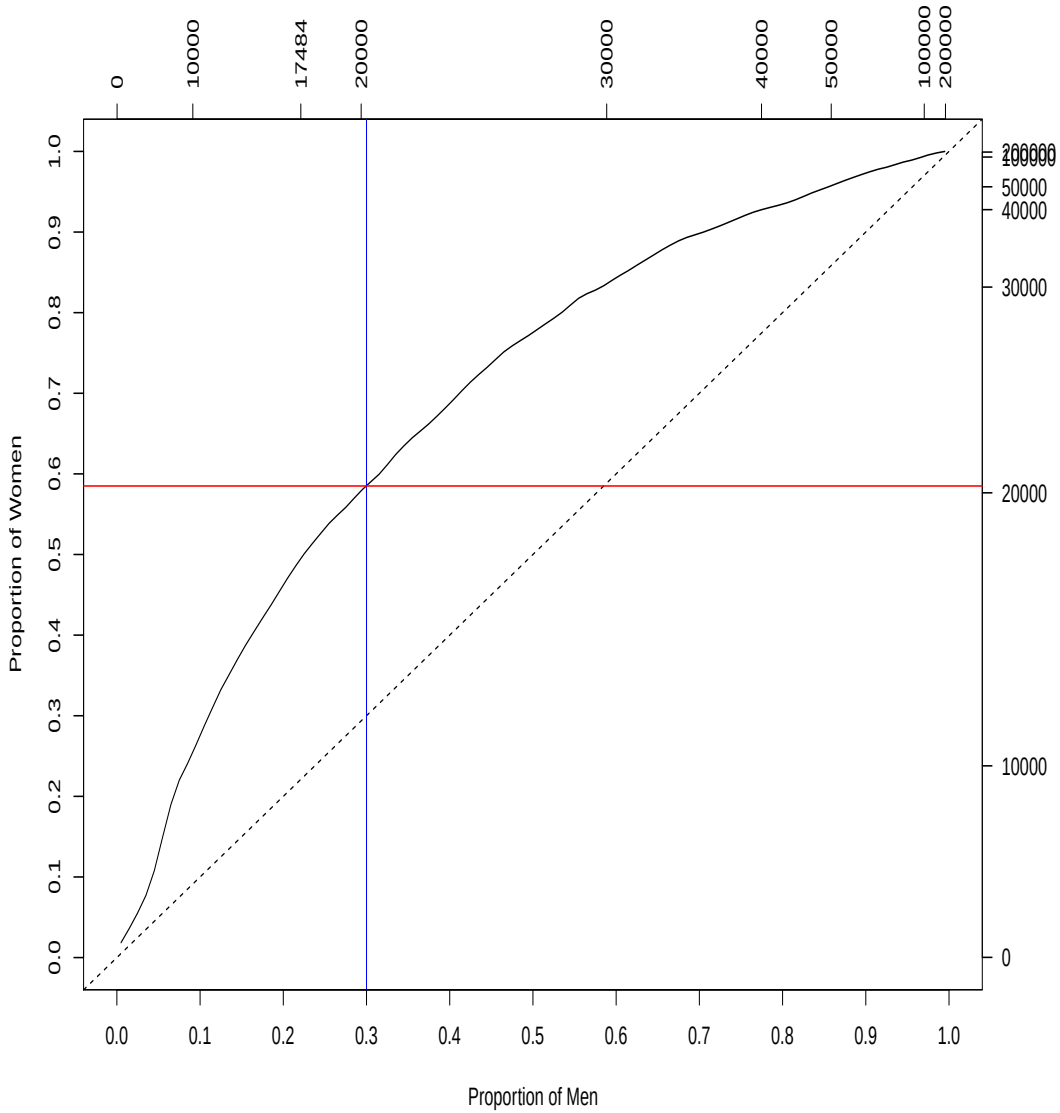




Men (left) and Women (right) distribution of Gross Income

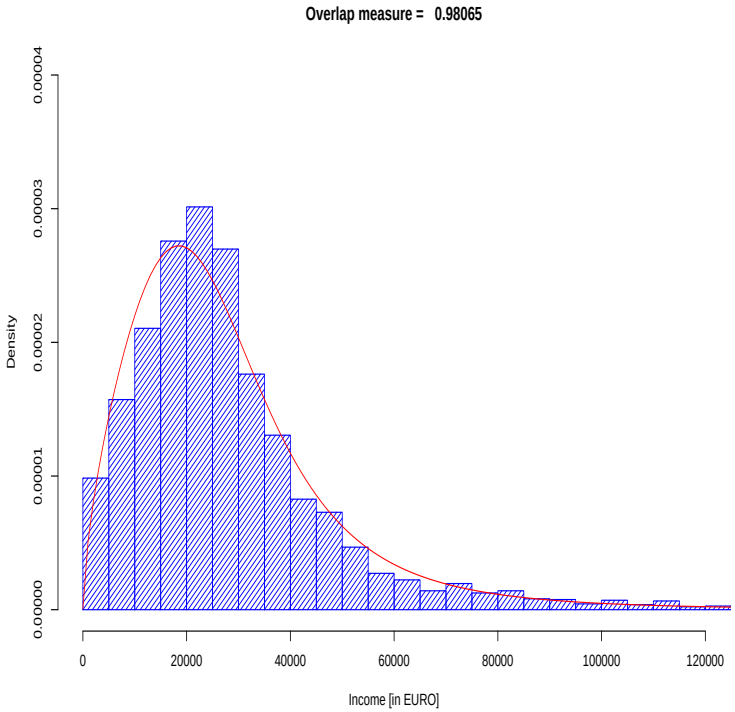
S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
3 999	156	624 591	26 924	119 106	3 738	65	264 400	17 954	69 697
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.176	0.574	35 119	0.378	0.726	3.546	0.423	26 063	0.375	0.731

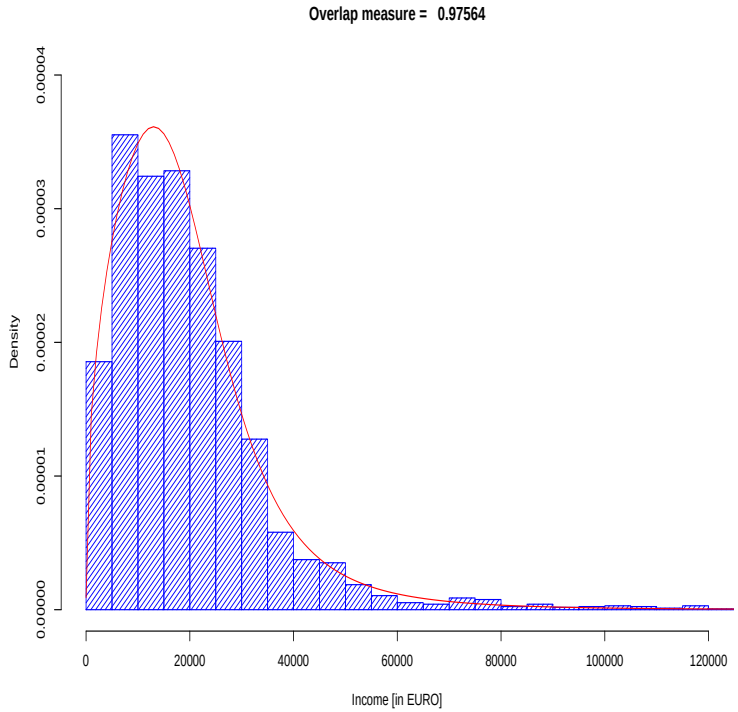
Gender gap in North Eastern Italy



Women income quantiles versus Men income quantiles

Gender gap in Central Italy

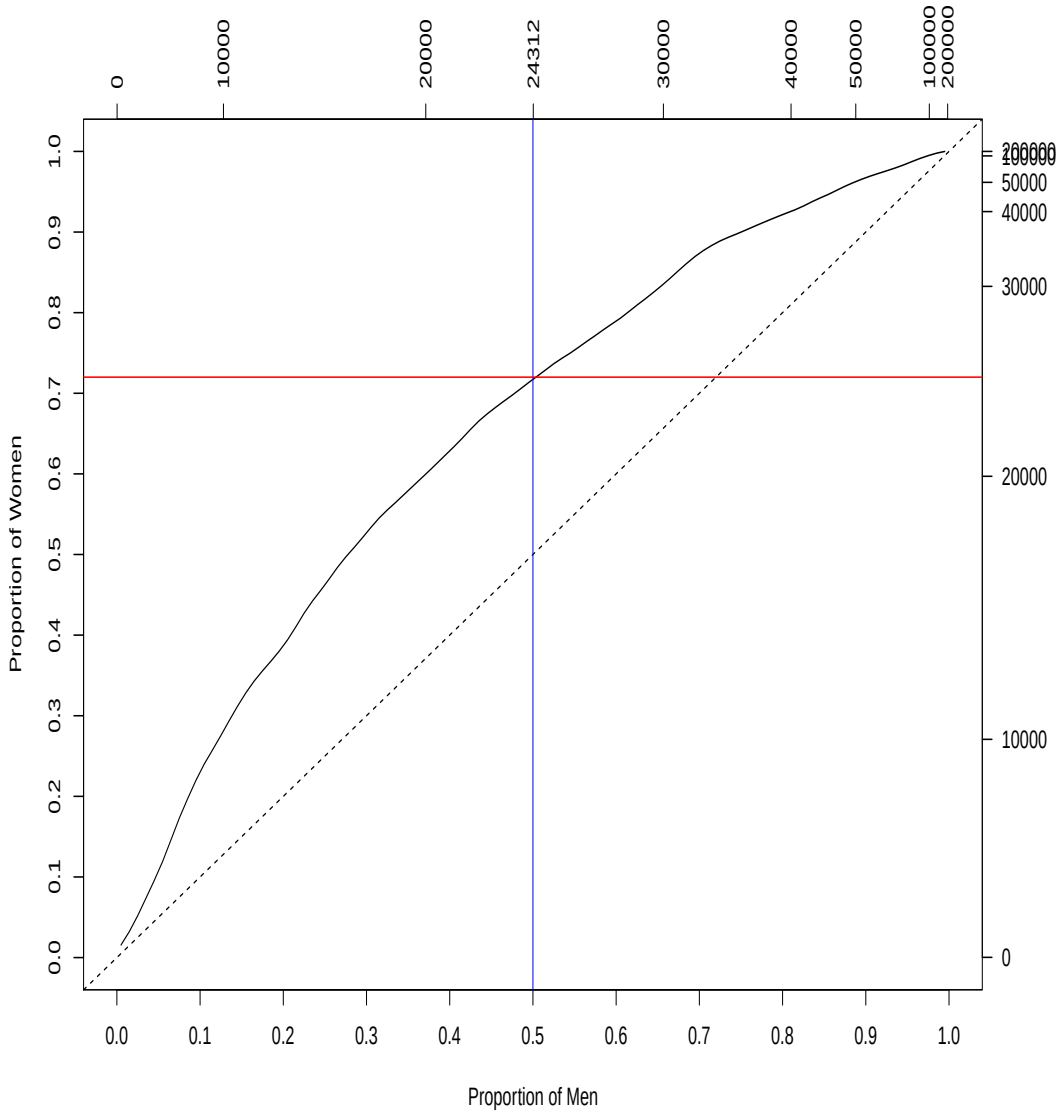




Men (left) and Women (right) distribution of Gross Income

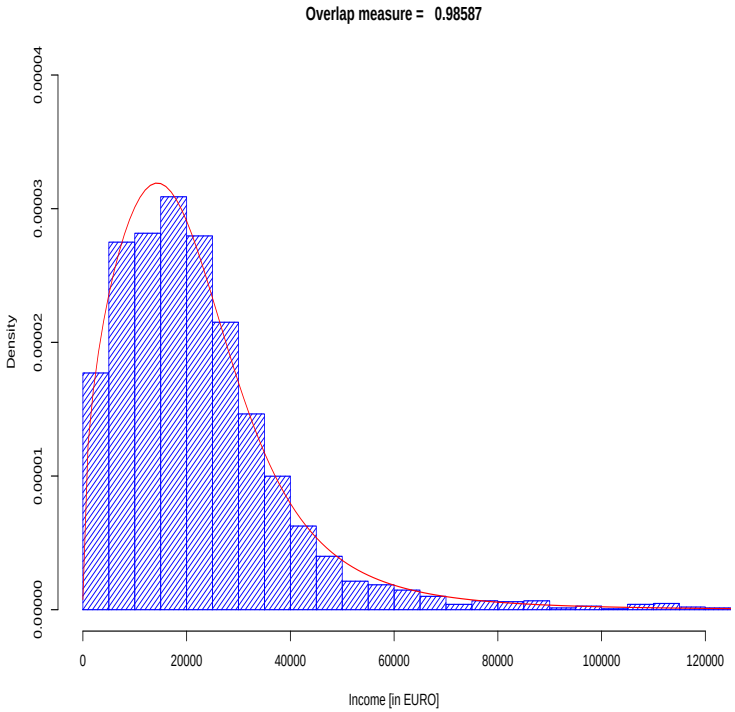
S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
3 677	98	296 178	24 312	105 968	3 417	150	222 944	17 008	67 820
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.182	0.518	32 272	0.382	0.734	3.483	0.402	26 041	0.383	0.739

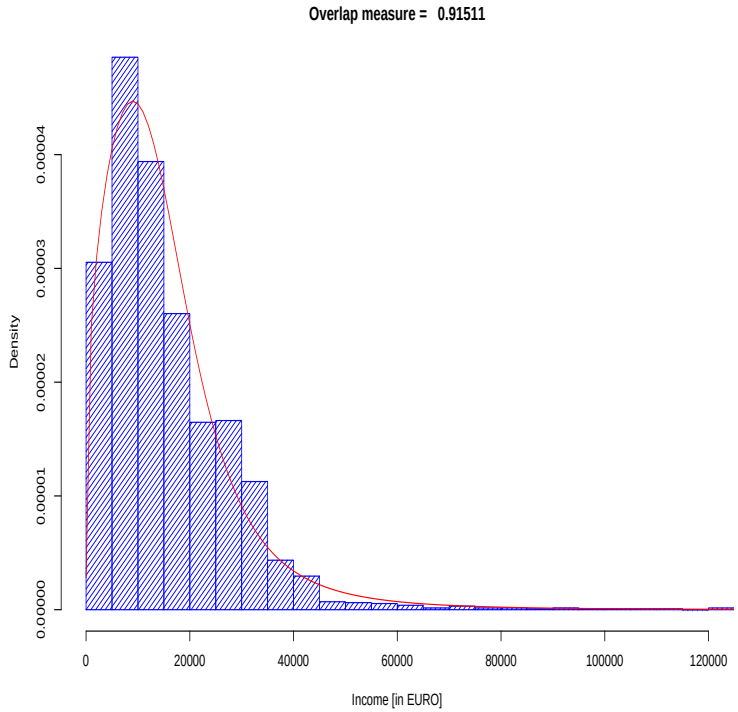
Gender gap in Central Italy



Women income quantiles versus Men income quantiles

Gender gap in Southern Italy



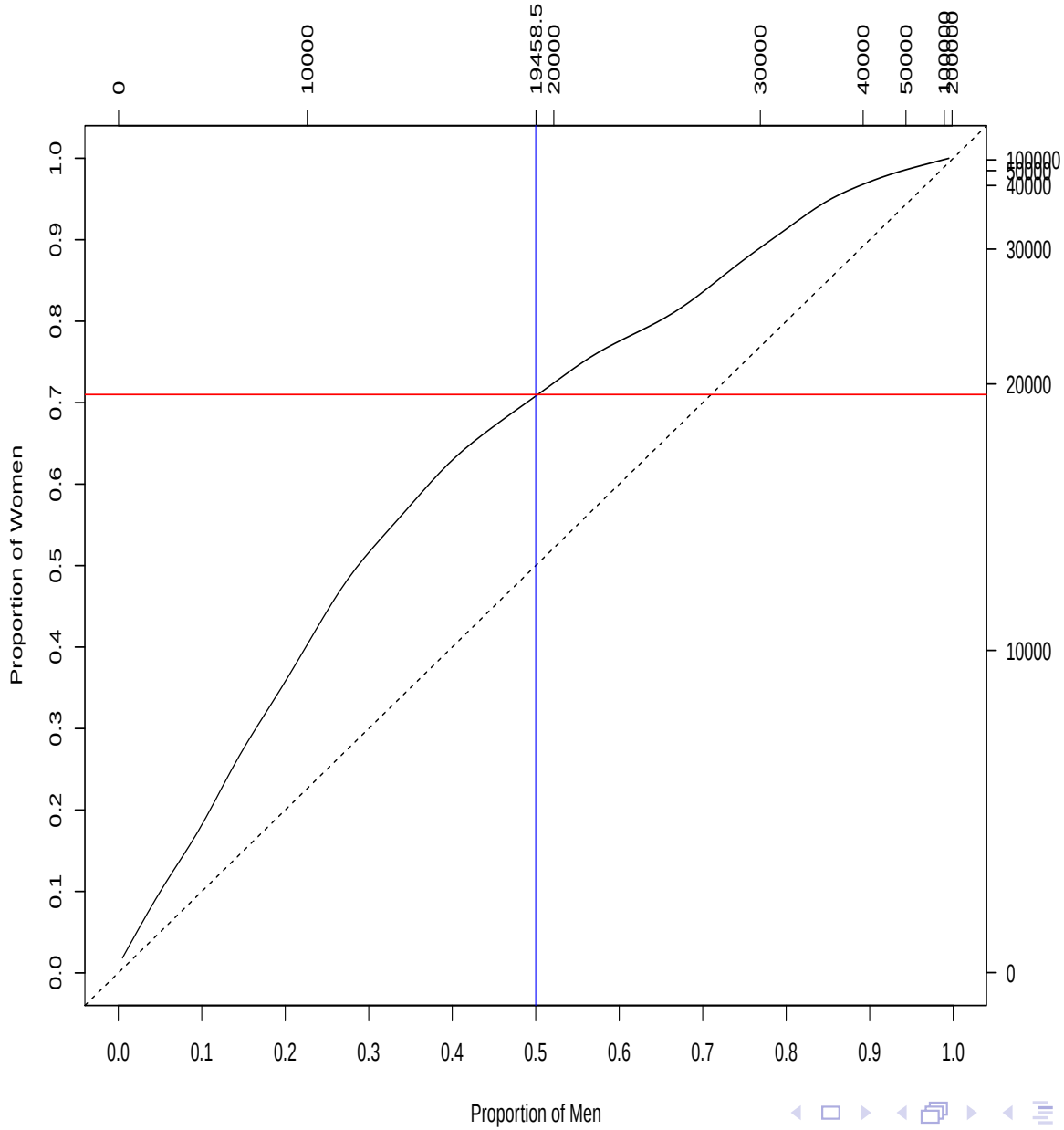


Men (left) and Women (right) distribution of Gross Income

S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
3 004	74	428 334	19 459	78 504	2 574	52	137 460	11 988	43 996

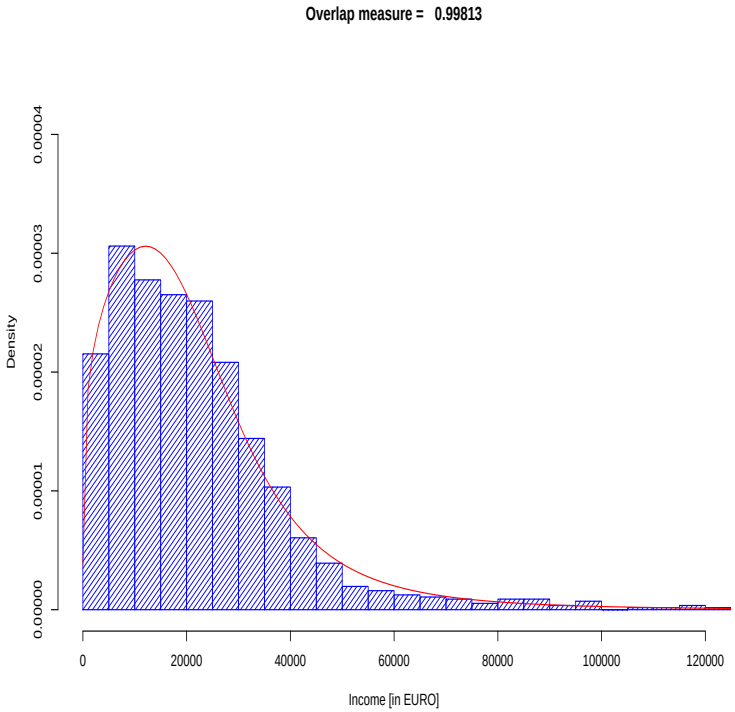
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.361	0.417	29 145	0.397	0.753	3.140	0.419	20 472	0.401	0.756

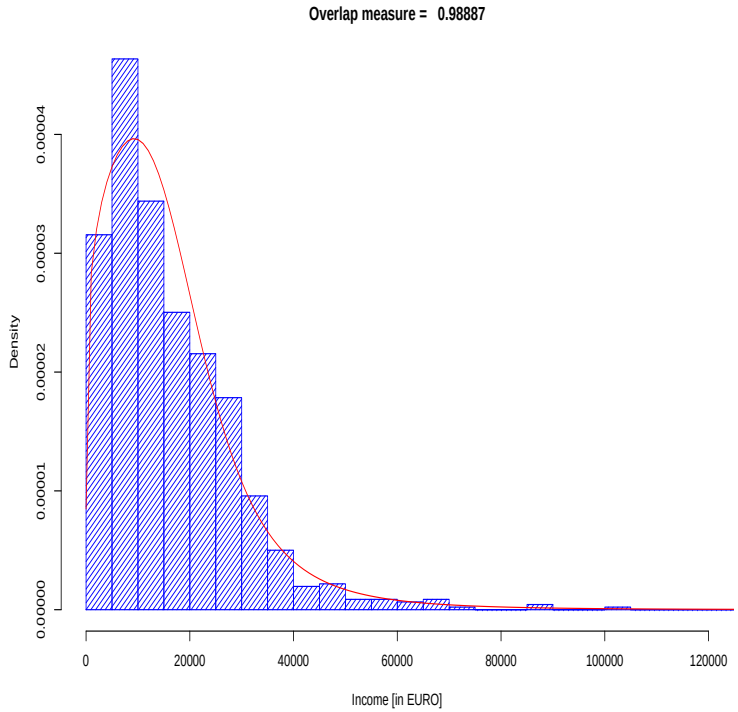
Gender gap in Southern Italy



Gender gap in Insular Italy

Regional statistics	
Composition	Sardinia Sicily
Area - Total	49,801 km² (19,228 sq mi)
Population - Total	6,746,464[1] (2015 est.)
GDP	€117.7 billion (2008)[2]

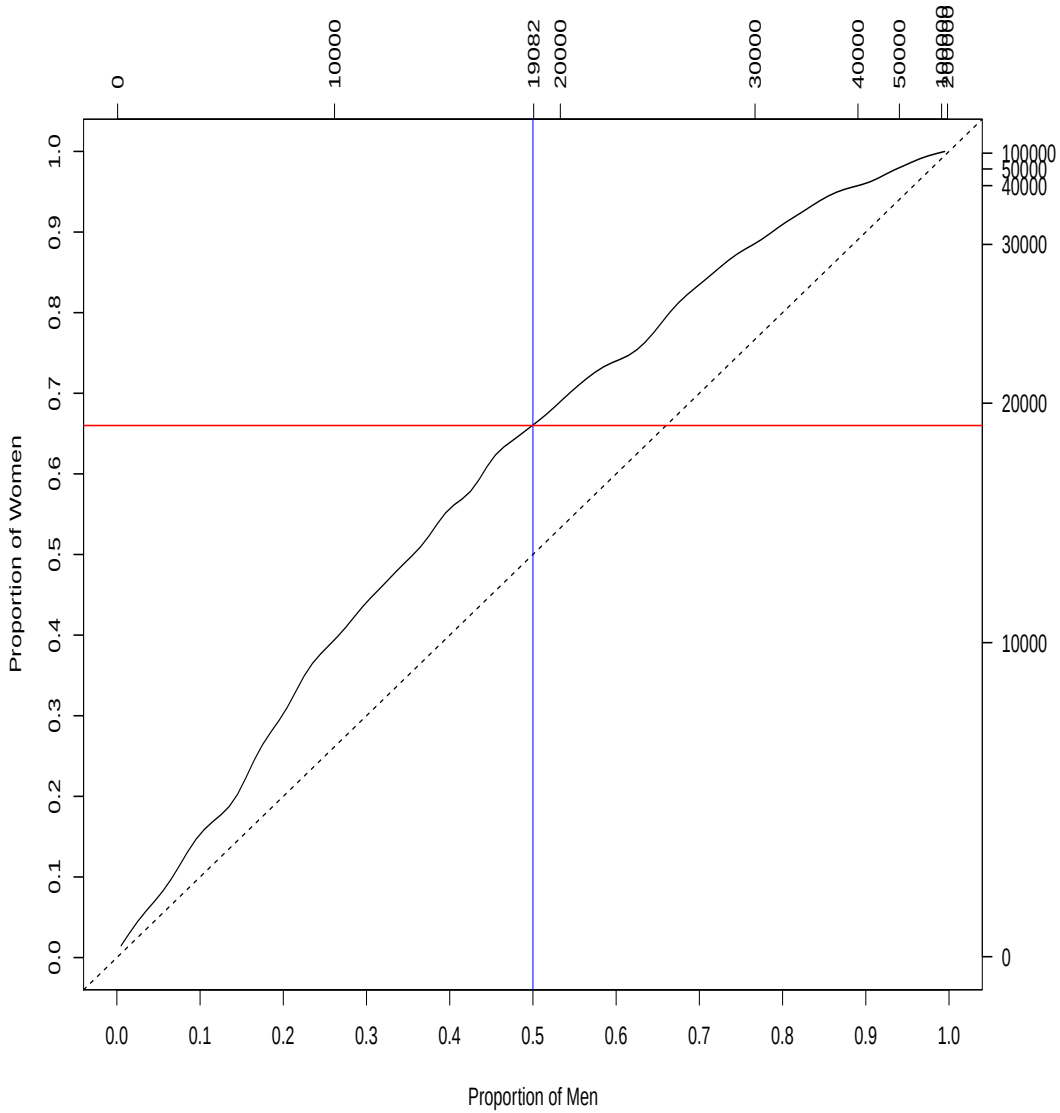




Men (left) and Women (right) distribution of Gross Income

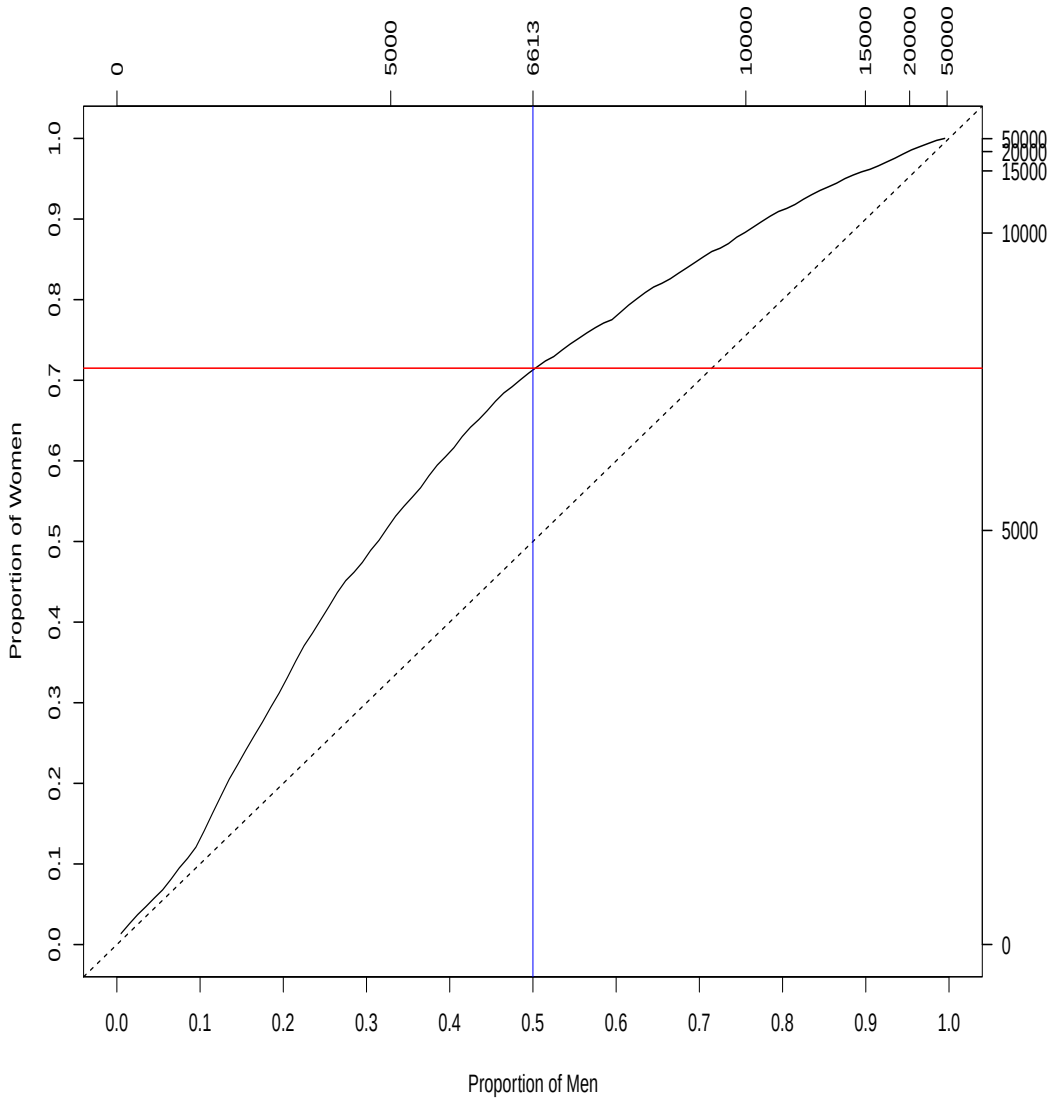
S.size	Min	Max	Median	98%Q	S.size	Min	Max	Median	98%Q
1 124	208	1 227 624	19 082	83 811	919	83	186 947	13 291	53752
Dagum parameters			Ineq. Measures		Dagum parameters			Ineq. Measures	
shape *a*	shape *p*	scale *b*	Gini	Zenga	shape *a*	shape *p*	scale *b*	Gini	Zenga
3.171	0.388	30 242	0.446	0.794	3.411	0.344	23 835	0.413	0.770

Gender gap in Insular Italy



Women income quantiles versus Men income quantiles

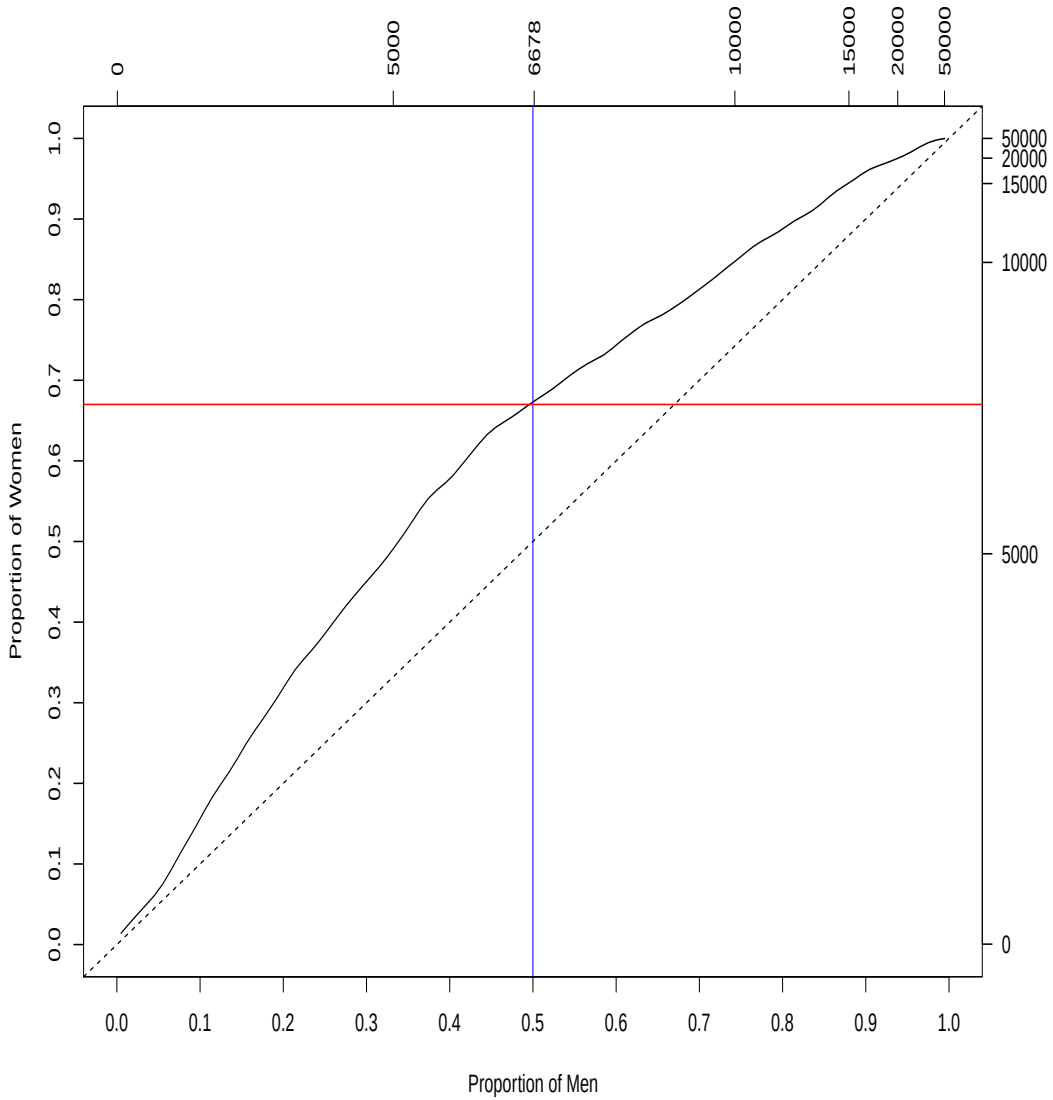
Analyzing gender gap in Poland



Women income quantiles versus Men income quantiles

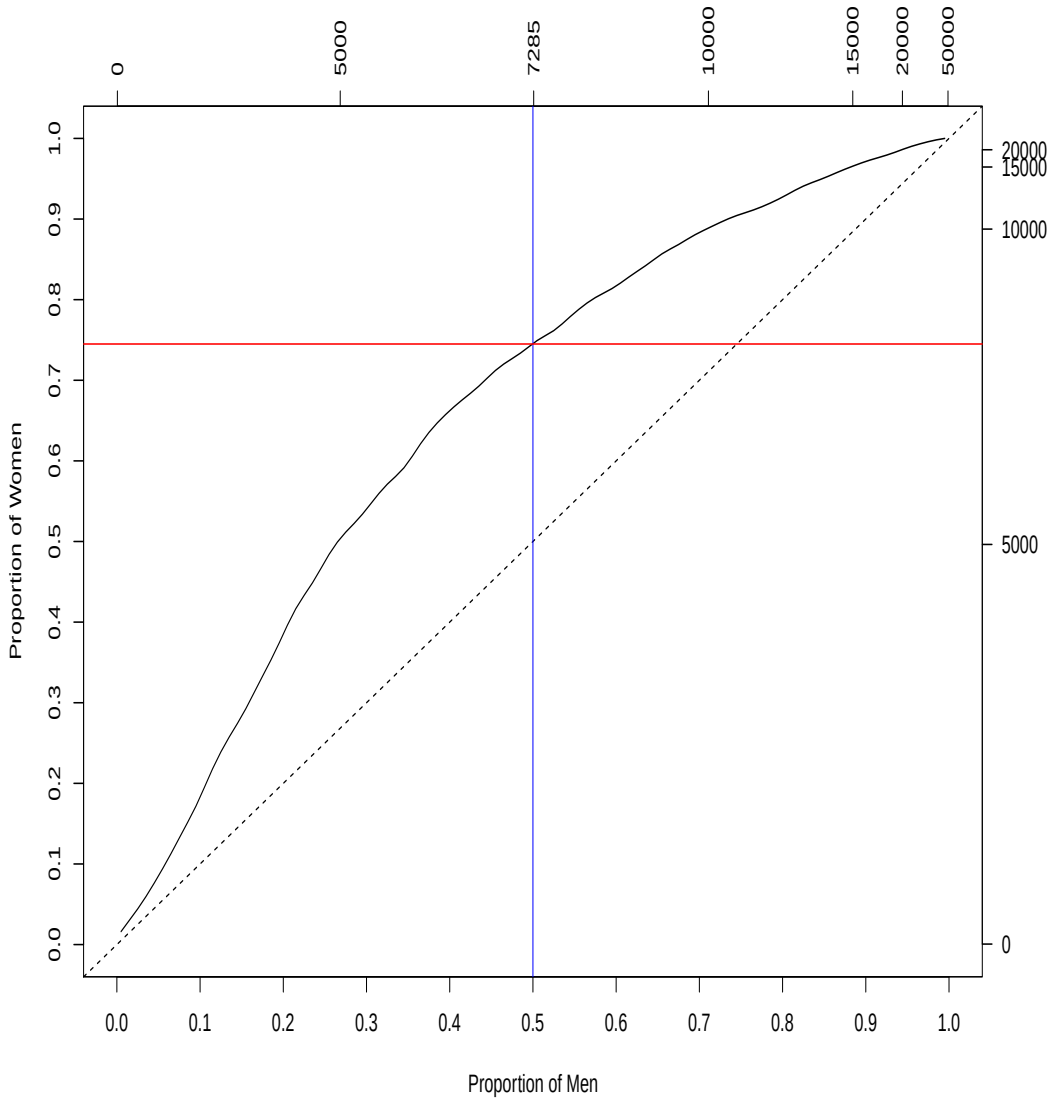
NUTS 1 statistical regions of Poland

PL1 Central Poland



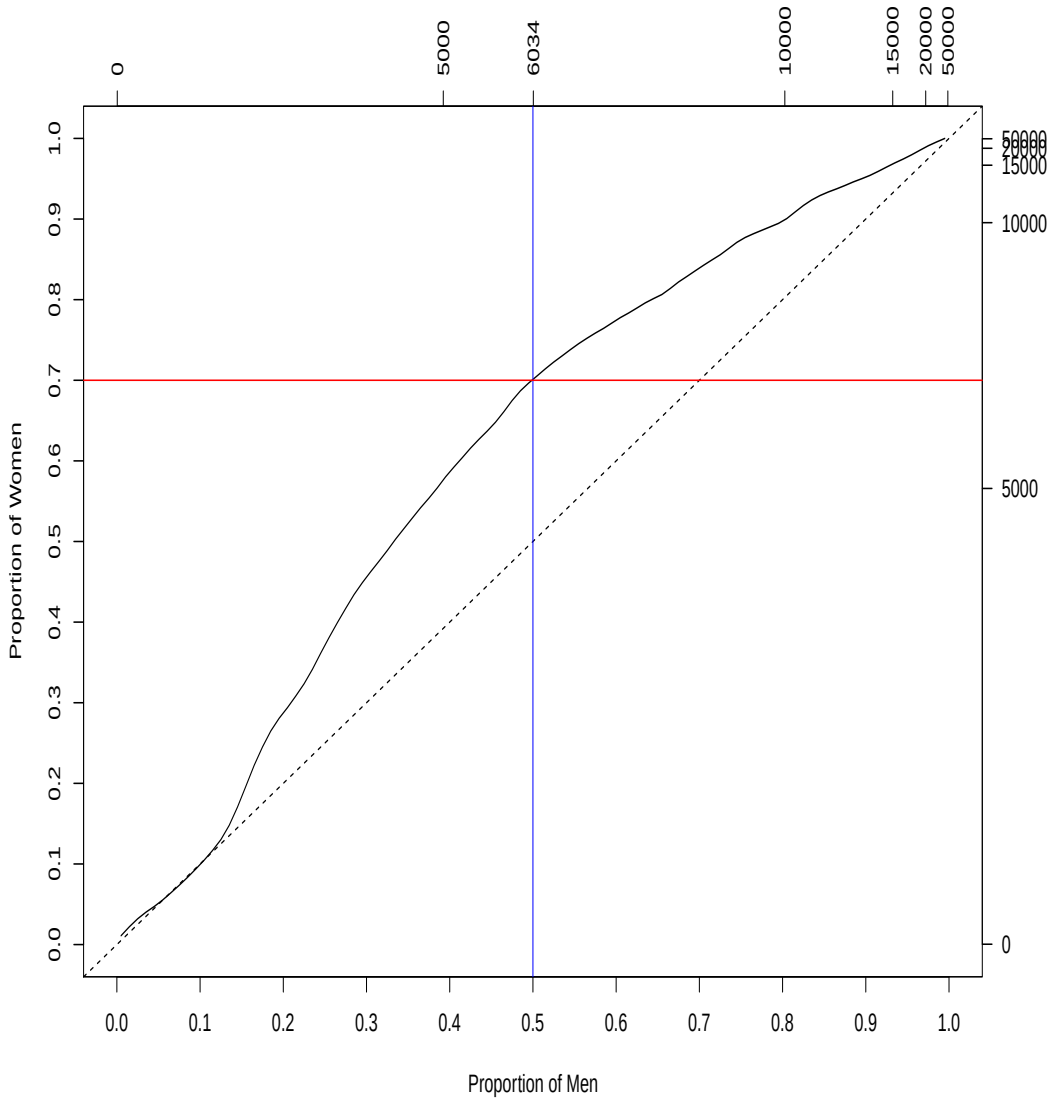
Women income quantiles versus Men income quantiles

PL2 Southern Poland



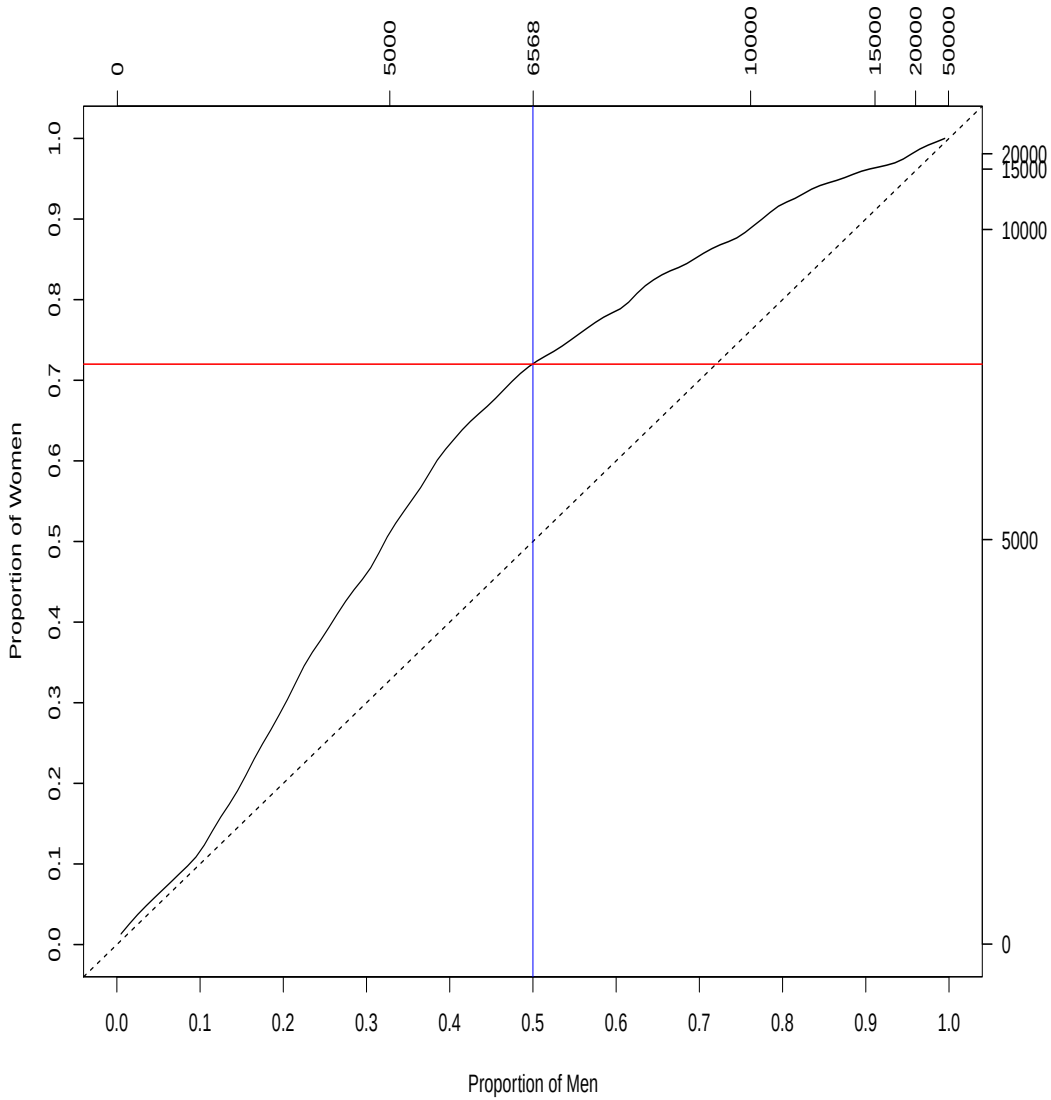
Women income quantiles versus Men income quantiles

PL3 Eastern Poland



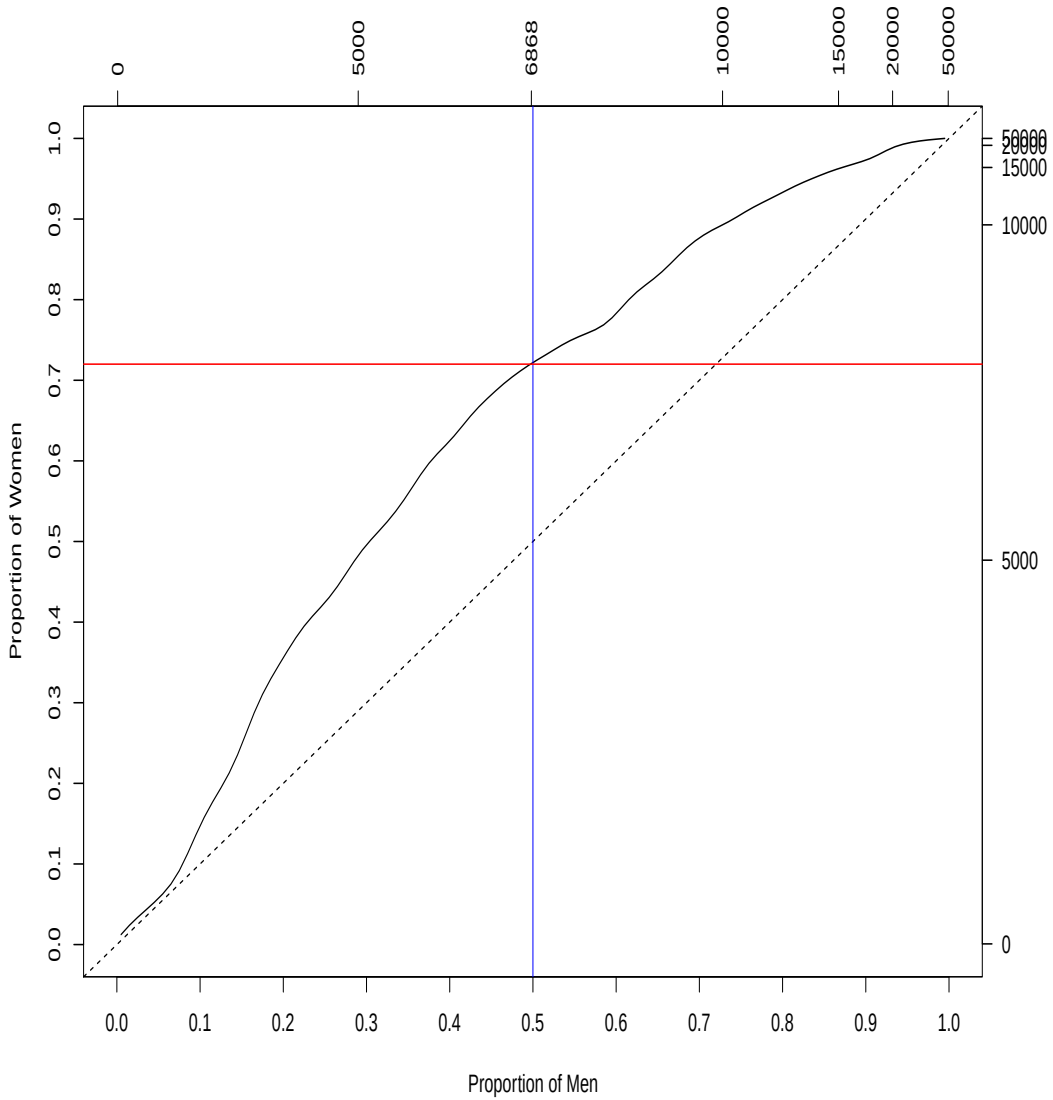
Women income quantiles versus Men income quantiles

PL4 North Western Poland



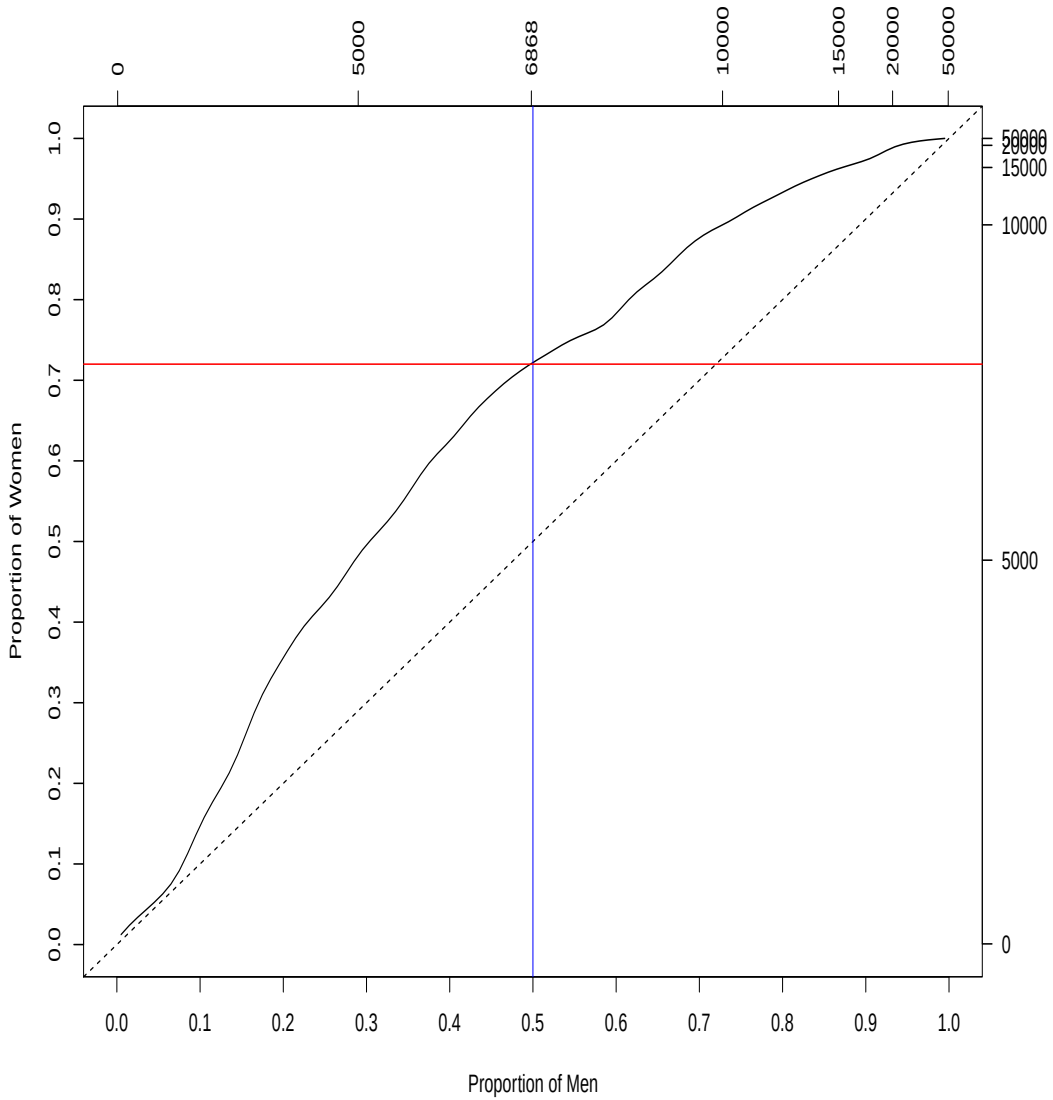
Women income quantiles versus Men income quantiles

PL5 South Western Poland



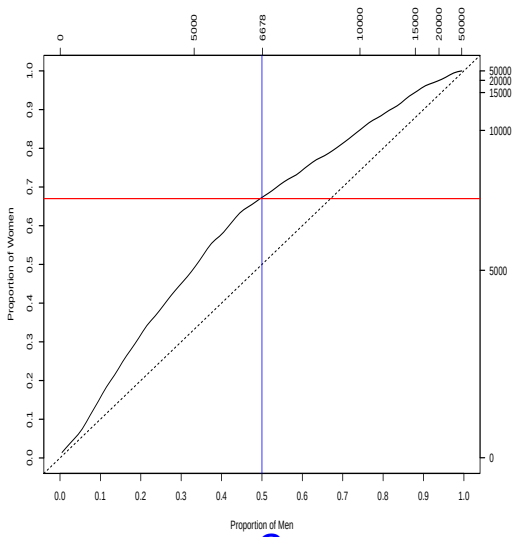
Women income quantiles versus Men income quantiles

PL6 Northern Poland



Women income quantiles versus Men income quantiles

Comparing gender gap in Polish regions



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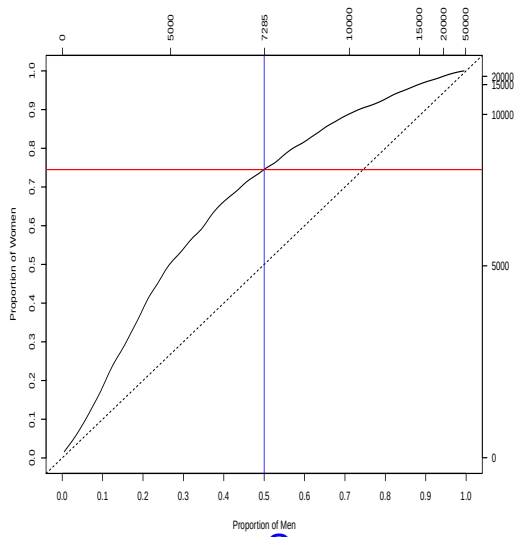

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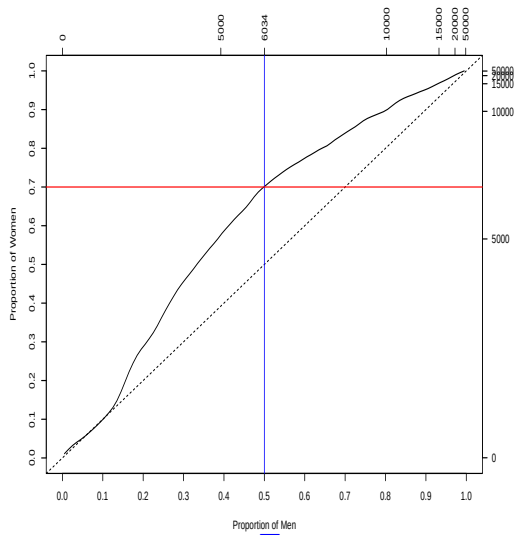

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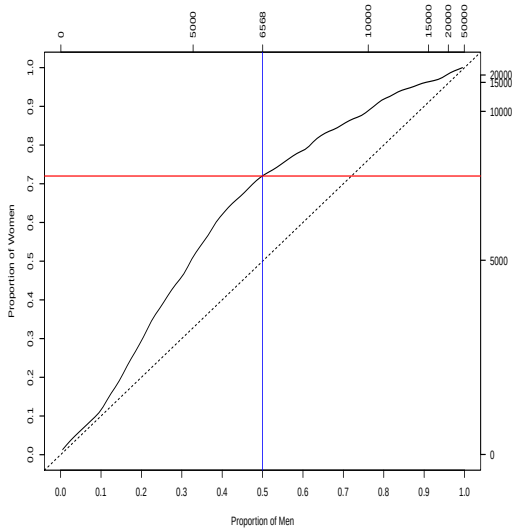

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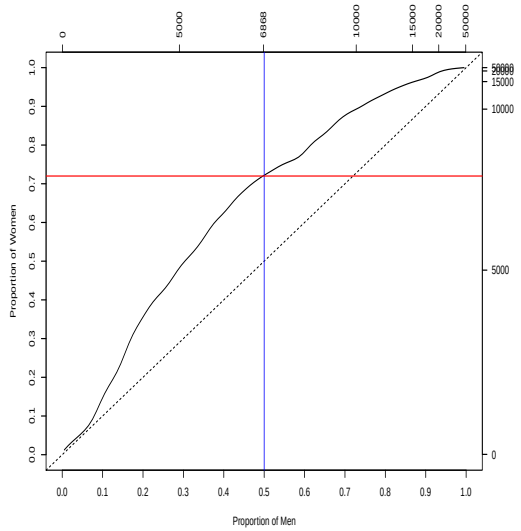

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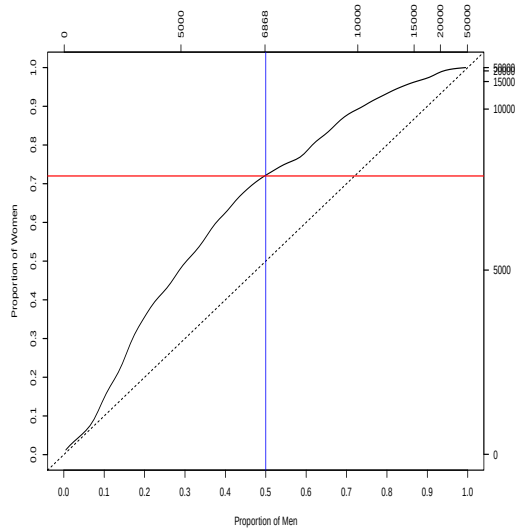

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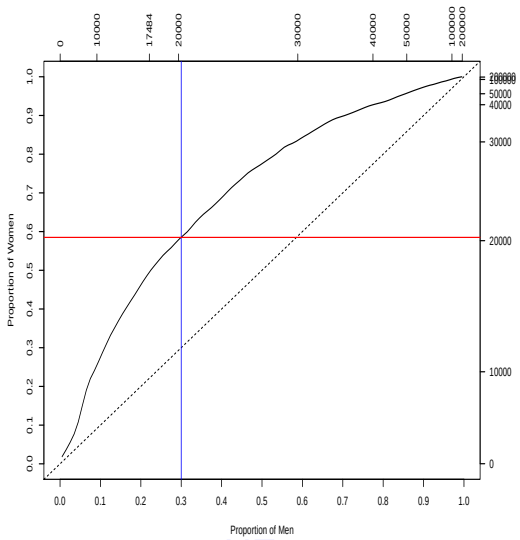
Comparing gender gap in Italian regions



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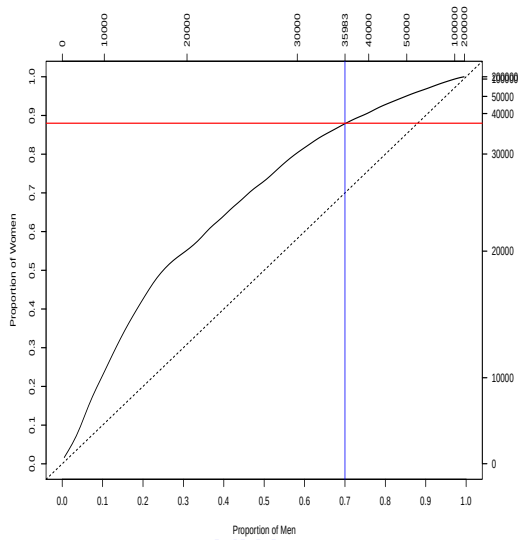

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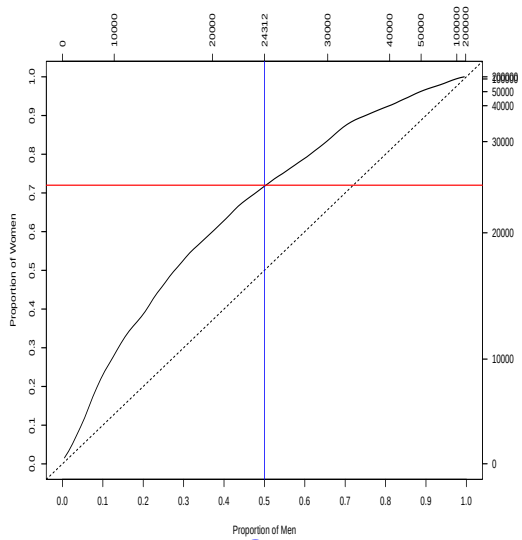

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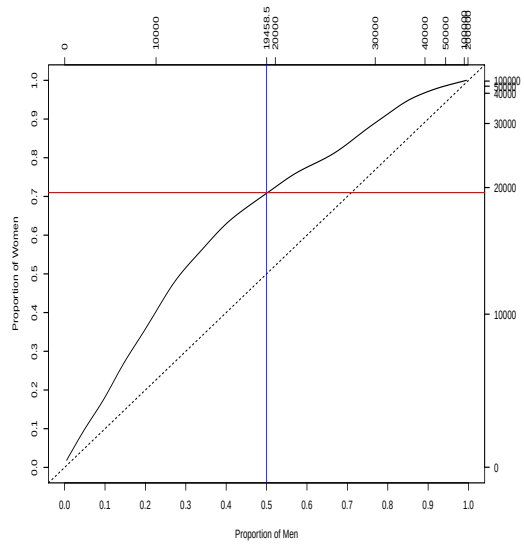

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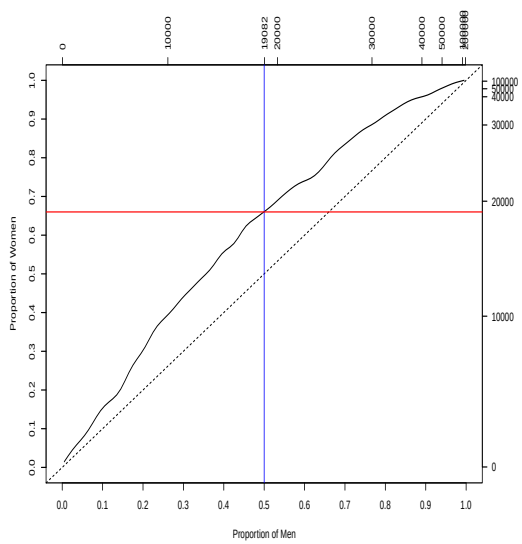

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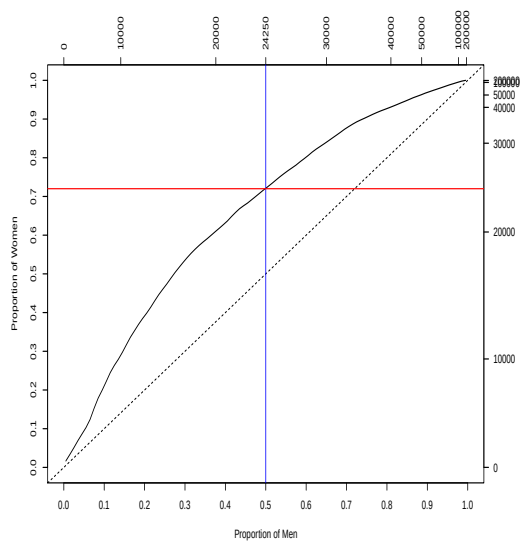

Italy

Conclusions and further work

- Income inequality in Italy and Poland vary across gender and Regions
- In Italy the highest inequality is observed in the poorest region, that is the Islands
- on the contrary, in Poland the highest inequality is observed in the richest region, the Central one
- In Italy the poorest regions are those with the lower gender gap, and viceversa
- on the contrary, in Poland gender gap is maximum in the Southern region, and minimum in the Central (richest) region
- In Poland gender gap is more stable across Regions
- The relative distribution is a powerful tool for studying gender gap
- Gender gap can also be measured by standard inequality decomposition, and Dagum Relative economic affluence

Conclusions and further work

- The present paper offers a descriptive approach.
- Policy recommendations can only be made based on an analysis of the causes of the gender gap.
- This might include analysis of the gender gap controlling for years of education, job tenure, marital status, age and number of children.
- Gender Gap studies require an interdisciplinary approach: we need you!

References

- Dagum, C. (1977). A new model of personal income distribution: specification and estimation. Economie applique e, 30(3), 413-437.
- Gini, C. (1914), Sulla misura della concentrazione e della variabilitá dei caratteri, *Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti*, 73, 1203-1248, reprinted in Gini (2005).
- Gini, C. (2005),On the measurement of concentration and variability of characters, *Metron*, 63, 3-38.
- Greselin F. (2014), More equal and poorer, or richer but more unequal?, *Economic Quality Control*, 29, 2, 99-117.
- Greselin, F. and A. Jędrzejczak (2020), Analyzing the Gender Gap in Poland and Italy, and by Regions, *International Advances in Economic Research*, 26, 433-447.
- Greselin, F. and L. Pasquazzi (2009), Asymptotic confidence intervals for a new inequality measure, *Communications in Statistics - Simulation and Computation*, 38, 1742-1756.
- Greselin, F., L. Pasquazzi, and R. Zitikis (2014), Heavy tailed capital incomes: Zenga index, statistical inference, and ECHP data analysis, *Extremes*, 17, 127-155.
- Greselin, F., L. Pasquazzi, and R. Zitikis (2010), Zenga's new index of economic inequality, its estimation, and an analysis of incomes in Italy, *Journal of Probability and Statistics*.
- Greselin F., L. Pasquazzi, and R. Zitikis (2012) Contrasting the Gini and Zenga indices of economic inequality, *Journal of Applied Statistics*, 40, 2, 282-297.
- Greselin, F., M. L. Puri, and R. Zitikis (2009), L-functions, processes, and statistics in measuring economic inequality and actuarial risks, *Statistics and Its Interface*, 2, 227-245.
- Handcock, M.S., and M. Morris (2006). *Relative distribution methods in the social sciences*, Berlin: Springer Science & Business Media.
- Lorenz, M. O. (1905), Methods of measuring the concentration of wealth, *Publications of the American Statistical Association*, 9, 209-219.
- Vielrose, E. (1960), Rozkład dochodów według wielkości", *Polskie Wydawnictwo Gospodarcze*, Warszawa
- Zenga, M. (2007), Inequality curve and inequality index based on the ratios between lower and upper arithmetic means, *Statistica & Applicazioni*, 5, 3-27.