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Determining PhD holders' salaries in social sciences and humanities: 'impact' counts

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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

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"POCARIM" project

- **Mapping the population, careers, mobility and impacts of advanced research degree graduates in the social sciences and humanities**
- http://cordis.europa.eu/project/rcn/101868_en.html
- This proposal is focused on increasing our understanding of the career paths and employment patterns and contribution of doctoral graduates in the social sciences and humanities. The study focuses on three Objectives:

- Objective 1: Identification of the dimensions of the population and its core characteristics and assess trends in their employment
- Objective 2: Identify the diversity of post-doctoral career paths in the SSH field.
- Objective 3: Assessment of the contribution that this diverse group of research-trained graduates make to Europe's knowledge based economy and society (their 'impact').

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Countries involved (red ones are outside EU)

- FR
- SK
- IT
- DE
- UK
- HU
- ES
- PT
- LV
- PL
- NO
- TR
- CH

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Setting the problem

- The labour market of PhD holders is critical (Cyranoski et al. 2011; Auriol et al. 2013; Auriol et al. 2016)
- and employability (outside academia) is now considered (van der Weijden, Teelken, de Boer and Dros 2015; Neumann & Khim Tan 2011)
- Possible employments in academia are becoming diversified (Eigi 2014; Broadbent & Strachan 2016)
- Detecting specific strengths and goals for PhD programs in SS&H is becoming emergent (Halse & Mowbray 2011; Evans & Maresi 2014; Borrell-Damian et al. 2010; Malfroy 2011)
- Going beyond a generic position of advantage (Meissner et al. 2016) or just relying on "more agency/resilience" (McAlpine & Emmioğlu 2015), or specific institutional solutions (Lightowler & Knight 2013) is needed.

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What PhD in SS&H can do, especially outside academia? Who is better off and why? Dimensions of analysis

- Income
- Type of work (research vs. teaching vs. other*)
  - * Other can be “managerial”, “administrative” or “other” activities
- Type of employer (HE, other education, NGOs, Companies etc.)
- Type of contract
- Mobility
- Work trajectories (i.e. how many employers and for how long)
- List of “Objective Impact” (which activities have been done during PhD time)
- Some “Subjective Impact” (opinion upon PhD relevance)

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My research question

- I want to see which PhD holders are better off (assuming income at PPP as a "Y" variable) by:
  - Discipline
  - Prestige of awarding Institution (i.e. from Rankings)
  - Gender
    - Further analysed by having child/ren
  - Mobility
    - Sector
    - Geography
  - Sort of job
    - Academic vs. outside academia or research intensive institutions
    - Research vs. Third mission impacts
  - Objective / Subjective impacts
- I keep constant:
  - (ln) Years elapsed from PhD attainment
  - Age (in order to get if some attained PhD when already adult)
  - PPP already discounted

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Implications

- Is the emphasis over mobility and impact(s) justified?
- Is it possible to find some common patterns within SS&H?
- How can these people perform better, whether outside or inside academia?

- In one sentence:

  What can we recommend to both possible PhD candidates and PhD programmers in SS&H if the salary (and not "personal satisfaction") is considered the measure of success (or "happiness")?

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Weak points (some of them…)

- I am not comparing SS&H with people from STEM
- I don't have information about the social class of origin
- I am not comparing PhD with people with MA and/or other Certificates
- Sampling was a problem (oversampling of academics; oversampling of Italian PhD holders)

Some strong ones:

- A good array of disciplines and institutions from 13 Countries
- A quite reliable income variable
- Several dimensions under investigations

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Sampling problems

- We know quite well how many post docs each national systems have
  - It's easy to get the income
  - A little harder to get other patterns like:
    - Years to get a tenure
    - Ratio of teaching / research activities
- If you want to know what PhD holders do outside academia, you just don't know where they are and how to contact them
    - For Italy (my duty at that time at CNR as post-doc) I used some social networks

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Respondents by Country

	Freq.	Percent	Cum.
CH	105	3.96	3.96
DE	194	7.32	11.27
ES	145	5.47	16.74
FR	123	4.64	21.38
HU	242	9.13	30.51
IT	816	30.77	61.27
LV	191	7.20	68.48
NO	137	5.17	73.64
PL	119	4.49	78.13
PT	175	6.60	84.73
SK	123	4.64	89.37
TR	127	4.79	94.16
UK	155	5.84	100.00
Total	2,652	100.00	

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Full details of disciplines

	Freq.	Percent	Cum.
Anth	67	2.53	2.53
Archa	74	2.79	5.32
Dem	11	0.41	5.73
EcBs	545	20.55	26.28
EdSc	191	7.20	33.48
Hist	202	7.62	41.10
LangLit	251	9.46	50.57
Law	172	6.49	57.05
MDisc	88	3.32	60.37
MeCm	87	3.28	63.65
OthHum	81	3.05	66.70
OthSocSci	85	3.21	69.91
PER	133	5.02	74.92
PolSci	163	6.15	81.07
Psy	159	6.00	87.07
SoEcGeo	70	2.64	89.71
Soc	273	10.29	100.00
Total	2,652	100.00	

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Types of employers

organization of current main job

	Freq.	Percent	Cum.
Unemployed	120	4.52	4.52
"not stated"	139	5.24	9.77
BusCom	150	5.66	15.42
EDU	52	1.96	17.38
GVT	146	5.51	22.89
HE	1,921	72.44	95.32
NGO	40	1.51	96.83
Oth	84	3.17	100.00
Total	2,652	100.00	

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Normalization of income by country of residence and PPP (World Bank)

Variable	Obs	Mean	Std. Dev.	Min	Max
salary	2541	29.31523	23.19812	0	100
PPP	2536	129.6215	45.8993	33.6	225.3
real_salary	2435	22.34773	.1767097	0	2.976191

	salary	real_s~y
salary	1.0000	
real_salary	0.7561	1.0000
	(0.0000)	

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The details of indep. variable

real_salary

Percentiles		Smallest		
1%	0	0		
5%	06.65779	0		
10%	10.85384	0	Obs	2435
25%	11.50748	0	Sum of Wgt.	2435
50%	20.22927		Mean	22.34773
		Largest	Std. Dev.	.1767097
75%	25.97403	132.9787		
90%	40.21448	163.9344	Variance	.0312263
95%	47.71643	224.7191	Skewness	4.175705
99%	93.08511	297.6191	Kurtosis	41.71359

Skewness remains almost the same excluding unemployed people

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Selection of Institutional Ranking

- Rankings have been tested to choose the one (or more) more suitable according to this specific dataset. Institutions were around 200.
- List of selected and tested Rankings:
  - THE World
  - THE Europe
  - THE Social Sciences & Humanities
  - ARWU
  - Webometrics
  - Leiden
  - QS by Disciplines
  - LeidenSS

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Descriptive Stats about Rankings

Variable	Obs	Mean	Std. Dev.	Min	Max
THEeurope	2560	38.07617	58.44494	0	200
WEBOMETRICS	2574	970.2191	2044.319	13	17975
THE_world	1848	385.2256	212.0806	2	700
Leiden	1561	9.145484	2.334871	3.3	16.7
ARWU	1385	19.35467	4.974189	12.6	69.8
LeidenSS	1115	9.150762	3.208145	1.8	17.2
QS_discipl~s	696	115.0589	61.10091	1	275
THE_SSH	327	56.15902	22.53584	4	99

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A quick look to the matrix correlation or Rankings

		1	2	3	4	5	6	7	8
THEeurope	(1)	1.0000							
WEBOMETRICS	(2)	-0.2706	1.0000						
		0.0000							
THE_world	(3)	-0.8516	0.6304	1.0000					
		0.0000	0.0000						
Leiden	(4)	0.7349	-0.4628	-0.7914	1.0000				
		0.0000	0.0000	0.0000					
ARWU	(5)	0.6885	-0.6923	-0.6880	0.5383	1.0000			
		0.0000	0.0000	0.0000	0.0000				
LeidenSS	(6)	0.5524	-0.0006	-0.5506	0.7180	0.1672	1.0000		
		0.0000	0.9848	0.0000	0.0000	0.0000			
QS_disciplins	(7)	-0.5966	0.0562	0.6814	-0.3283	-0.4363	0.0326	1.0000	
		0.0000	0.1404	0.0000	0.0000	0.0000	0.4331		
THE_SSH	(8)	-0.6271	0.0365	0.6288	-0.5453	-0.2847	-0.5221	0.2696	1.0000
		0.0000	0.5112	0.0000	0.0000	0.0000	0.0000	0.0000	

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Some descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	SalaryPPP	p	ln_salaryPPP	p
salaryPPP	2,435	22.34773	17.67097	0	297.63	1.0000	0.0000	1.0000	0.0000
ln_y (years after attainment	2,426	1.316291	0.7239166	0	2.485	0.2037	0.0000	0.2452	0.0000
Sex	2,608	0.4616564	0.4986232	0	1	0.1403	0.0000	0.1942	0.0000
Any Child(ren) (Y/N)	2,633	0.5028485	0.5000869	0	1	0.1486	0.0000	0.1766	0.0000
"THE_Europe" (Ranking as a score)	2,560	38.07617	58.44494	0	200	0.1401	0.0000	0.1835	0.0000
Contract (permanent "2" / other "1")	2,532	1.422986	0.4941308	1	2	0.1946	0.0000	0.2795	0.0000
Disc.H. (Humanities)	2,567	0.3139852	0.4642009	0	1	-0.1201	0.0000	-0.1603	0.0000
Disc.SS (Social Sciences)	2,567	0.6712115	0.4698645	0	1	0.1006	0.0000	0.1395	0.0000
Disc.Bus.Sch. (Business School)	2,567	0.0148033	0.1207883	0	1	0.0697	0.0007	0.0706	0.0008
Sector	2,532	0.2207741	0.4148504	0	1	0.2336	0.0000	0.1870	0.0000
Change.sector	2,545	0.1371316	0.3440539	0	1	-0.0081	0.6947	0.0174	0.4083
Change.country (Country of residence ≠ from PhD)	2,542	0.147915	0.3550856	0	1	0.1717	0.0000	0.1340	0.0000
Time spent weekly in research (%)	2,516	38.64626	27.84022	0	100	-0.1605	0.0000	-0.1629	0.0000
Time spent weekly in managerial tasks (%)	2,516	10.92488	17.24921	0	100	0.2405	0.0000	0.2400	0.0000

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Descr.Stats (2)

impct_med (interviews to media)	2,532	1.498815	0.5000974	1	2	0.1773	0.0000	0.1898	0.0000
impct_ngo (collaboration with NGOs)	2,487	1.242863	0.4288991	1	2	0.0886	0.0000	0.0880	0.0000
impct_innv (development of innovative products)	2,478	1.225182	0.4177862	1	2	0.1273	0.0000	0.1148	0.0000
impct_cmpny (board member in company)	2,454	1.101874	0.3025448	1	2	0.1642	0.0000	0.1400	0.0000
impct_teach (teaching)	2,624	1.892912	0.3092846	1	2	0.0635	0.0018	0.0435	0.0372
impct_cmmt (social and political committees)	2,509	1.342367	0.4745964	1	2	0.0860	0.0000	0.0919	0.0000
impct_pol (policy advisory)	2,490	1.368273	0.4824329	1	2	0.1860	0.0000	0.2245	0.0000
impct_pub (scientific publications)	2,630	1.917871	0.2746138	1	2	0.0217	0.2870	0.0098	0.6372
impct_spvs (serving as supervisor)	2,564	1.693838	0.4609879	1	2	0.0607	0.0032	0.0504	0.0168
impct_mgmt (managing projects)	2,538	1.627266	0.4836276	1	2	0.2004	0.0000	0.2237	0.0000
impct_kt (knowledge transfer)	2,535	1.645365	0.4784970	1	2	0.0846	0.0000	0.0727	0.0006
impct_cnfr (participation in policy-relevant events)	2,537	1.635396	0.4814138	1	2	0.1182	0.0000	0.1446	0.0000
imp_career	2,640	4.292424	0.8106548	2	5	0.1749	0.0000	0.1835	0.0000
imp_satisfaction	2,644	4.558245	0.6721390	2	5	0.0549	0.0069	0.0783	0.0002

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Model 1

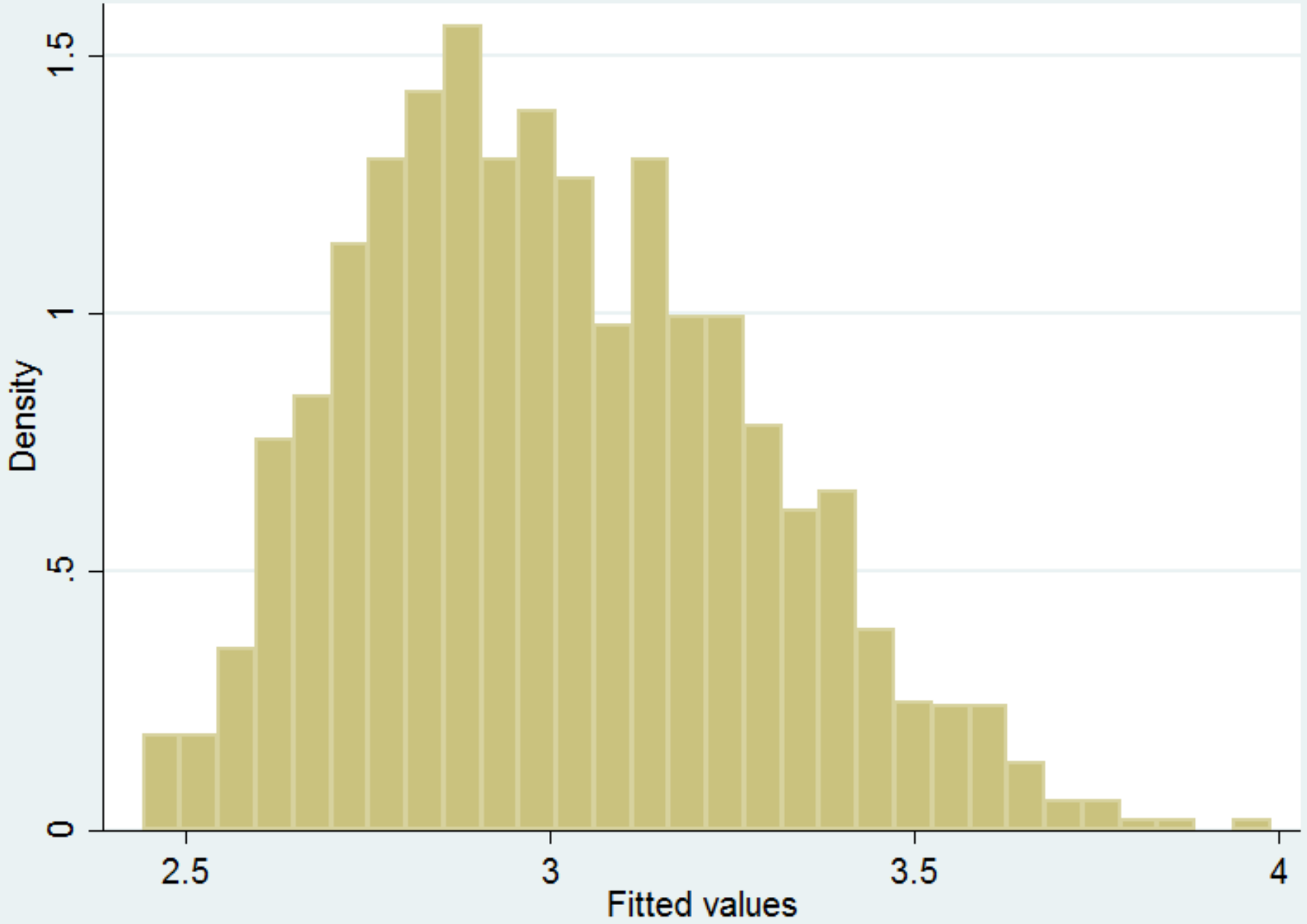
A BASIC MODEL

This model is used to test general patterns and to use as a general check. It tells:

- *To have children is a negative predictor only for women*
- *PhD in business schools outscore SS, that in turn are better than Humanities*
- *Ranking play a stable but very small role*
- *Albeit to work outside education sector is better, inter-sectoral mobility is not good idea*
- *To be permanent employee is better*

ln_real_W	M1
ln_y (ln years after viva)	** 0.119
ln_age	** 0.246
2.Male & child	** 0.207
3.Female & no child	-0.041
4.Female & child	* -0.076
2. Social Science	** 0.185
3. Business School	** 0.515
dSector	** 0.226
THEeurope	** 0.001
contr	** 0.186
R2	*0.24*
N	*1,892*

This is the predicted wage distribution out of Model1



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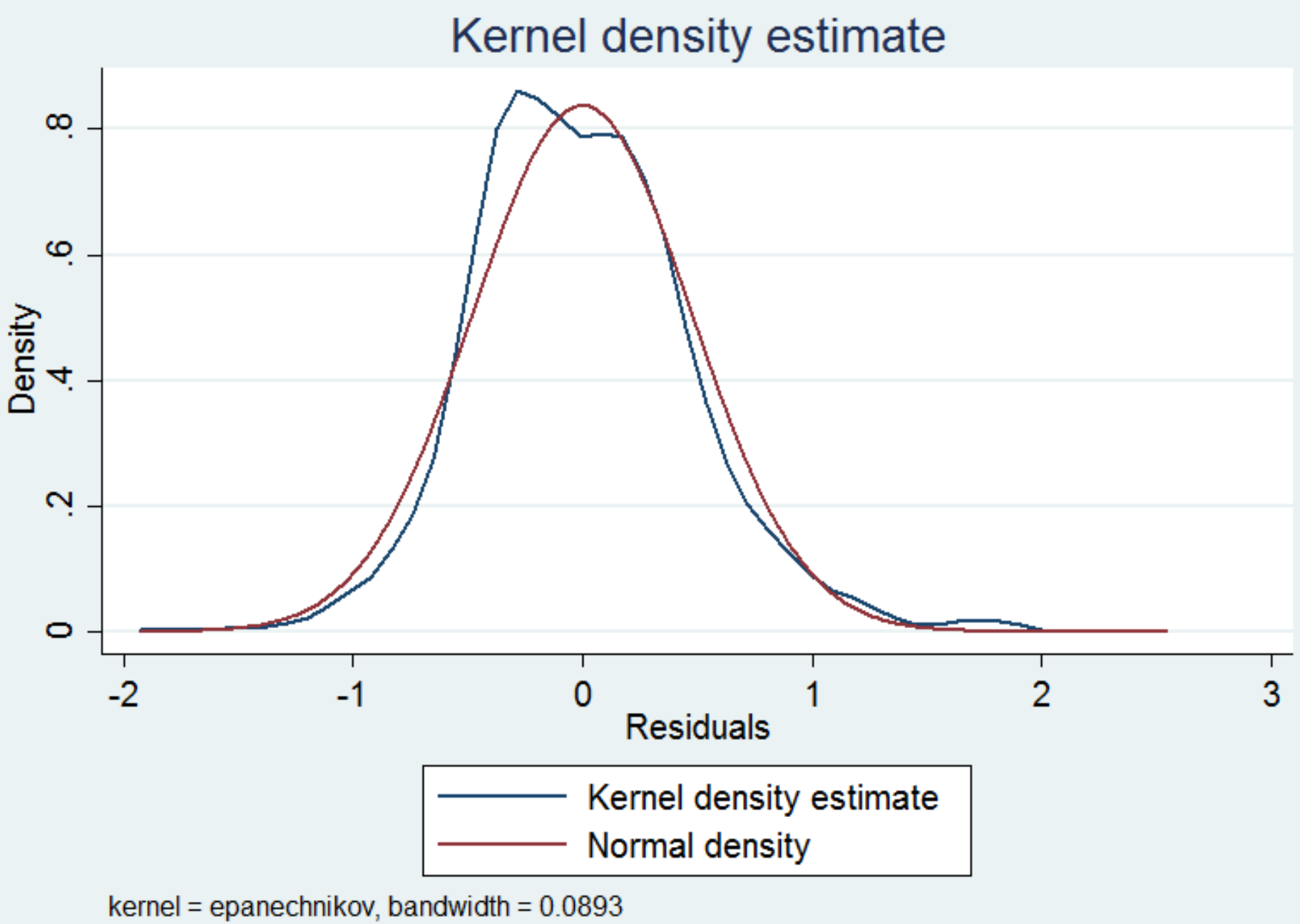
I am quite happy about this post-estimation of residuals, they are basically normally distributed



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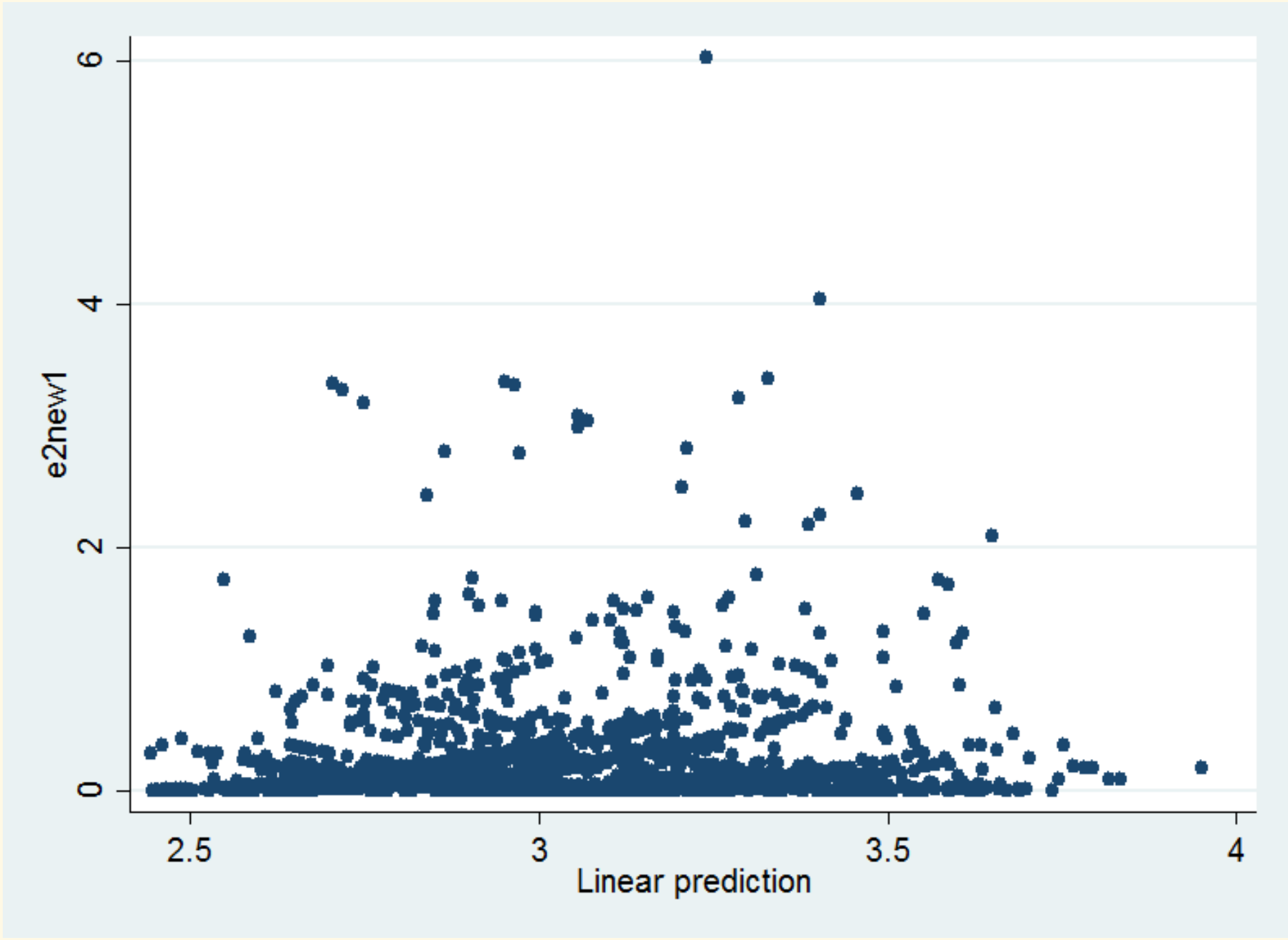
"White test" informs that there is no heteroscedasticity problem for Model1



	M1		M2		M3		M4		M5	
ln_y	0.117	**	0.118	**	0.113	**	0.088	**	0.102	**
ln_age	0.249	**	0.256	**	0.226	**	0.258	**	0.298	**
2bn.sex_child2	0.212	**	0.204	**	0.199	**	0.176	**	0.195	**
3.sex_child2	-0.029		-0.041		-0.030		-0.022		-0.021	
4.sex_child2	-0.072	*	-0.076	*	-0.070	*	-0.073	*	-0.079	*
2bn.disc	0.179	**	0.185	**	0.172	**	0.164	**	0.173	**
3.disc	0.514	**	0.532	**	0.497	**	0.479	**	0.471	**
THEeurope	0.001	**	0.001	**	0.001	**	0.001	**	0.001	**
dSector	0.216	**	0.218	**	0.157	**	0.224	**	0.265	**
contr	0.182	**	0.188	**	0.158	**	0.172	**	0.173	**
changecountry			0.091	**						
change_sector			-0.023							
time_research					0.000					
time_manag					0.005	**				
impct_cnfr							-0.012			
impct_med							0.058	*		
impct_ngo							-0.023			
impct_innv							0.040			
impct_cmpny							0.073			
impct_teach							0.061			
impct_cmmt							-0.014			
impct_pol							0.074	**		
impct_spvs							0.016			
impct_mgmt							0.095	**		
impct_kt							-0.013			
imp_career									0.121	**
imp_satisf									-0.011	
_cons	1.445	**	1.407	**	1.546	**	0.948	**	0.824	**
R^2	*0.24*		*0.25*		*0.26*		*0.27*		*0.26*	

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The other Models

- *Model 2 - MOBILITY*

  Keeping variables in Model1 constant, to change country of residence predict higher salary (both when Country of destination has a higher or lower PPP index, not showed here).

- *Model 3 – content of Job*

  To do a job with more managerial tasks predicts higher salary. To be researcher does not play any role (teaching and administrative tasks are negatively associated, not showed here).

- *Model 4 – Objective Impact*

  3 over 11 "impacts" are good predictors:

  - *Having given interview to media;*
  - *Having advised policy makers;*
  - *Having managed (coordinated) projects.*

- *Model 5 – Subjective Impact*

  The retrospective opinion about the satisfaction oh having attained a PhD does not explain higher salary; the retrospective opinion about the impact over one's career is a positive predictor.

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Conclusions / Findings

- Prestige. Rankings informs quite well and are positively related to salaries, but not in a decisive way (global employers for PhD holders in SS&H display a more complex web of opportunities than those in research).
- Impact [skills]. Despite heterogeneity within SS&H, some "impacts" are useful for everybody ("the importance of being in touch with the real world"). To exploit one's cutting edge scientific knowledge is possible due to transferable skills.
- Mobility (Country). To get a PhD in a place and to use it elsewhere can be useful (inflation of PhDs in some countries can be, at least partially, avoided)
- Mobility (sector). To move to and back other sectors is not a good mobility strategy