

# Variable constructions in Longitudinal Research: Education

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*Longitudinal Data Analysis in the Social Sciences: Variable  
Constructions in Longitudinal Research*, 11<sup>th</sup> May 2007

<http://www.longitudinal.stir.ac.uk/variables/>



LDA, 11th May 2007



- \* Types of measures & variables
- \* Micro-level social change
- \* Organisation and structural changes
- \* Changes in distributions
- \* What can we learn from international comparisons?
- \* Remarks

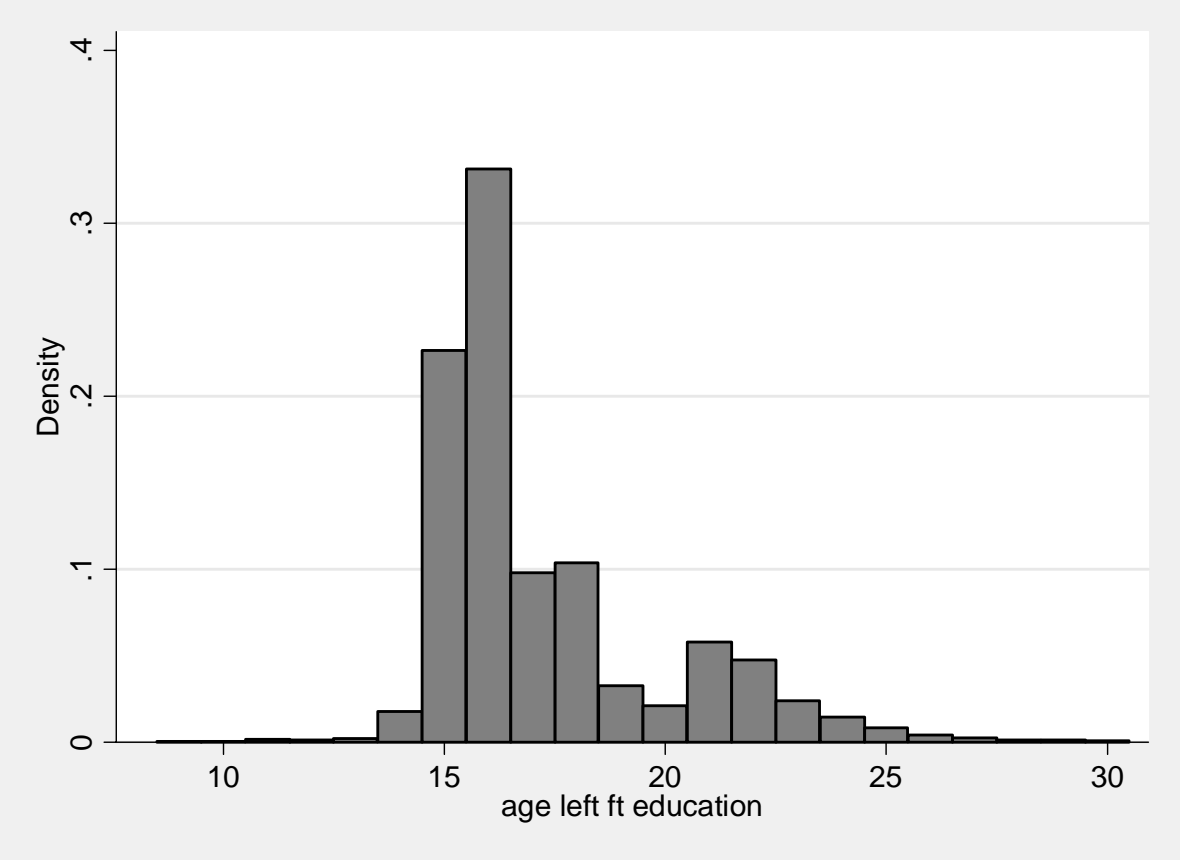
## \* Types of measures & variables

"the question of how to measure education and qualifications - or indeed what 'measure' means - raises interesting issues... Since there is no agreed standard way of categorising educational qualifications" (Prandy, Unt & Lambert 2004)

School Leaving Age (British Household Panel Survey 1991 - Wave A)

school leaving age	Freq.	Percent	Cum.
-9. missing or wild	21	0.20	0.20
-8. inapplicable	231	2.25	2.46
9	3	0.03	2.48
10	14	0.14	2.62
11	12	0.12	2.74
12	32	0.31	3.05
13	109	1.06	4.11
14	1,833	17.86	21.97
15	2,475	24.11	46.08
16	3,386	32.99	79.07
17	897	8.74	87.81
18	1,111	10.82	98.64
19	119	1.16	99.80
20	15	0.15	99.94
21	3	0.03	99.97
22	3	0.03	100.00
Total	10,264	100.00	

Age Left Full-Time Education (General Household Survey 2003)



Years of Education Year Terminated Education  
 (General Household Survey 2003)

terminal age of education (8 groups)	Freq.	Percent	Cum.
-9. still studying or dna	989	4.04	4.04
-8. not answered	16	0.07	4.10
-6. child/no int	9,694	39.59	43.69
1. less than 15 or never attended schoo	347	1.42	45.11
2. 15	3,135	12.80	57.91
3. 16	4,556	18.60	76.51
4. 17	1,335	5.45	81.96
5. 18	1,416	5.78	87.75
6. 19-21	1,518	6.20	93.94
7. 22-24	1,183	4.83	98.77
8. 25 or over	300	1.23	100.00
Total	24,489	100.00	

Year Terminated Education by Education Level  
 (General Household Survey 2003)

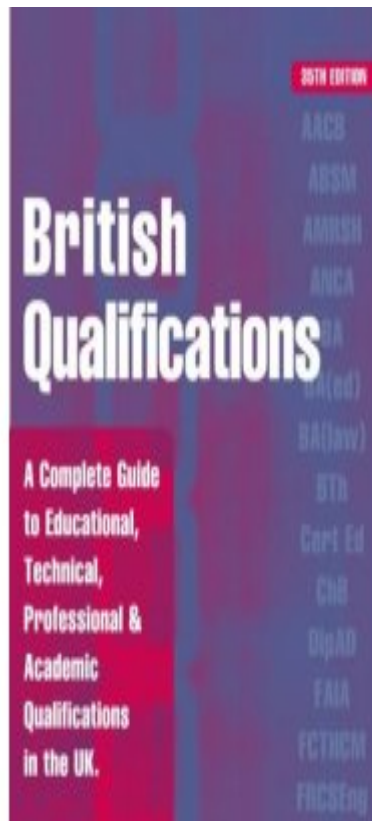
Terminated Education	education level				Total
	higher ed	A levels	O levels	none	
15	5.12	10.56	20.62	64.49	25.14
16	14.16	28.18	50.56	31.13	33.09
17-18	19.44	41.11	23.20	3.24	19.98
19+	61.27	20.15	5.62	1.13	21.79
Total	3,770 100.00	1,856 100.00	4,962 100.00	3,177 100.00	13,765 100.00

p<.001                  gamma = -0.7487

Highest Qualification (General Household Survey 2003)  
 Some Examples of the 41 Categories

highest qualification	Freq.
1. higher degree	669
2. nvq level 5	20
3. first degree	1,416
4. other degree	278
5. nvq level 4	71
6. diploma in higher education	282
7. hnc/hnd btec higher etc	551
9. teaching - secondary education	55
10. teaching - primary education	69
12. nursing etc	267
14. other higher education below degree	151
21. scotish 6th year certificate/csyp	24
28. city & guilds craft/part 2	306
29. btec/scotvec first or gen diploma e	42
30. o level, gcse grade a*-c or equival	2,460
31. nvq level 1 or equivalent	102
33. gse below grade 1, gcse below grade	693
41. dont know	79
Total	24,489





**This reference book gives you some idea of the possible range of qualifications**

Highest Academic Qualification  
 (British Household Panel Survey 1991 - Wave A)

highest academic qualification	Freq.	Percent	Cum.
-9. missing	19	0.19	0.19
-7. proxy respondent	352	3.43	3.61
1. higher degree	122	1.19	4.80
2. 1st degree	598	5.83	10.63
3. hnd,hnc,teaching	496	4.83	15.46
4. a level	1,362	13.27	28.73
5. o level	2,510	24.45	53.19
6. cse	529	5.15	58.34
7. none of these	4,276	41.66	100.00
Total	10,264	100.00	

## A' Level Point Systems

	UCAS Tariff	Old UCAS Tariff	Even Older UCAS Tariff
A	120	10	5
B	100	8	4
C	80	6	3
D	60	4	2
E	40	2	1

Therefore 3 A' Levels at Grade A was 30 points now it is 360 points using the UCAS Tarriff

<http://www.ucas.com/higher/tariff/calc/calculator.html>

## UCAS Tariff - Comparison of English & Welsh with Scottish Qualifications (extract)

GCE/VCE Qualifications			Points	Scottish Qualifications			
GCE AS/ AS VCE	GCE AS AS Double Award	GCE A level/ AVCE		Advanced Higher	Higher	Int 2	Standard Grade
	AA	A	120	A			
	AB		110				
	BB	B	100	B			
	BC		90				
	CC	C	80	C			
			77				
			72	D	A		
			71				
	CD		70				
			64				
A	DD	D	60		B		
			58				
			52				
B	DE		50				
			48		C		
			45				
			42		D	A	
C	EE	E	40				
			39				
			38				Band 1
			35			B	
			33				
D			30				
			28			C	Band 2
			26				
E			20				

\* When an educational measure is an outcome variable ( $y$ ) we might want to measure with a better degree of resolution

\* When it is an explanatory variable ( $x$ ) we are often only interested in using it to provide increased control in an analysis (e.g. a statistical model)

\* Micro-level social change

Individual level change over time (e.g.  
panel data)

Youth Cohort Study (Cohort 1 1985) Sweep 1  
 What are you doing now?

what are you doing now	Freq.	Percent	Cum.
1. out of work	967	11.99	11.99
2. yts	1,160	14.38	26.38
3. full-time job	2,001	24.81	51.19
4. full-time education	3,776	46.83	98.02
5. something else	76	0.94	98.96
6. part-time job	82	1.02	99.98
9. not applicable	2	0.02	100.00
Total	8,064	100.00	

Youth Cohort Study Cohort 1 Sweep 2 (1986)  
 What are you doing now?

what are you doing now	Freq.	Percent	Cum.
1. unemployed-out of work	594	7.37	7.37
2. yts	242	3.00	10.37
3. full-time job	2,261	28.04	38.41
4. full-time education	2,774	34.40	72.81
5. full-time unpaid work looking after	33	0.41	73.21
6. doing something else	46	0.57	73.78
7. part-time job	94	1.17	74.95
8. government scheme	31	0.38	75.33
.	1,989	24.67	100.00
Total	8,064	100.00	

Note:

1. Changes in categories
2. Missing data through sample attrition



Youth Cohort Study Cohort 1 Sweep 3 (1987)  
 What are you doing now?

what are you doing now	Freq.	Percent	Cum.
1. unemployed	522	6.47	6.47
2. yts	10	0.12	6.60
3. another government scheme	121	1.50	8.10
4. full-time job	2,744	34.03	42.13
5. full-time education	1,430	17.73	59.86
6. looking after family or home	40	0.50	60.35
7. doing something else	81	1.00	61.36
8	113	1.40	62.76
.	3,003	37.24	100.00
Total	8,064	100.00	

1. Changes in categories
2. Missing data through sample attrition
3. Poor coding

# Youth Cohort Study (Cohort 1 1985)

## What are you doing now? Sweep 1 to Sweep 2 transitions

what are you doing now sweep 2	what are you doing now sweep 1						Total
	1. out work	2. yts	3.ftjjob	4.ft ed	5. else	6. pt job	
1. unemployed-out of work	254 44.17	167 21.92	86 6.40	69 2.09	11 23.40	7 13.46	594 9.78
2. yts	57 9.91	34 4.46	12 0.89	134 4.07	5 10.64	0 0.00	242 3.98
3. full-time job	175 30.43	483 63.39	1,209 90.02	355 10.77	11 23.40	28 53.85	2,261 37.22
4. ft education	25 4.35	25 3.28	19 1.41	2,698 81.86	3 6.38	4 7.69	2,774 45.66
5. ft unpaid work	15 2.61	5 0.66	3 0.22	1 0.03	8 17.02	1 1.92	33 0.54
6. something else	11 1.91	11 1.44	3 0.22	16 0.49	5 10.64	0 0.00	46 0.76
7. part-time job	23 4.00	23 3.02	10 0.74	23 0.70	3 6.38	12 23.08	94 1.55
8. government scheme	15 2.61	14 1.84	1 0.07	0 0.00	1 2.13	0 0.00	31 0.51

Youth Cohort Study (Cohort 1 1985)  
 What are you doing now? (harmonised)

outcome y1	year			Total
	1985	1986	1987	
ft education	46.83	45.66	28.26	41.56
unemployed	11.99	9.78	10.31	10.85
training	14.38	4.49	2.59	8.15
employed (ft/pt)	25.83	38.77	54.22	37.41
other	0.97	1.30	4.62	2.04
Total	8,064 100.00	6,075 100.00	5,061 100.00	19,200 100.00

p<.001

Youth Cohort Study (Cohort 1 1985-1987)  
(Short Panel - Sweeps 1-3) Outcome in full-time education

```
Logistic regression                               Number of obs   =       16128
                                                    Wald chi2(2)    =       977.05
                                                    Prob > chi2     =       0.0000
Log pseudolikelihood = -10733.353                 Pseudo R2      =       0.0147
```

(Std. Err. adjusted for 8064 clusters in sernum)

y2	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
female	.2523042	.0427005	5.91	0.000	.1686128	.3359955
sweep	-.520347	.0168574	-30.87	0.000	-.5533868	-.4873071
_cons	.2625818	.0386827	6.79	0.000	.186765	.3383985

1. Robust standard errors used to control for clustering within individuals
2. A random effects logit could be fitted to these data-  
Note that Beta estimates of this model would be scaled differently however

Youth Cohort Study (Cohort 9 1998)  
 Bivariate Educational Outcomes

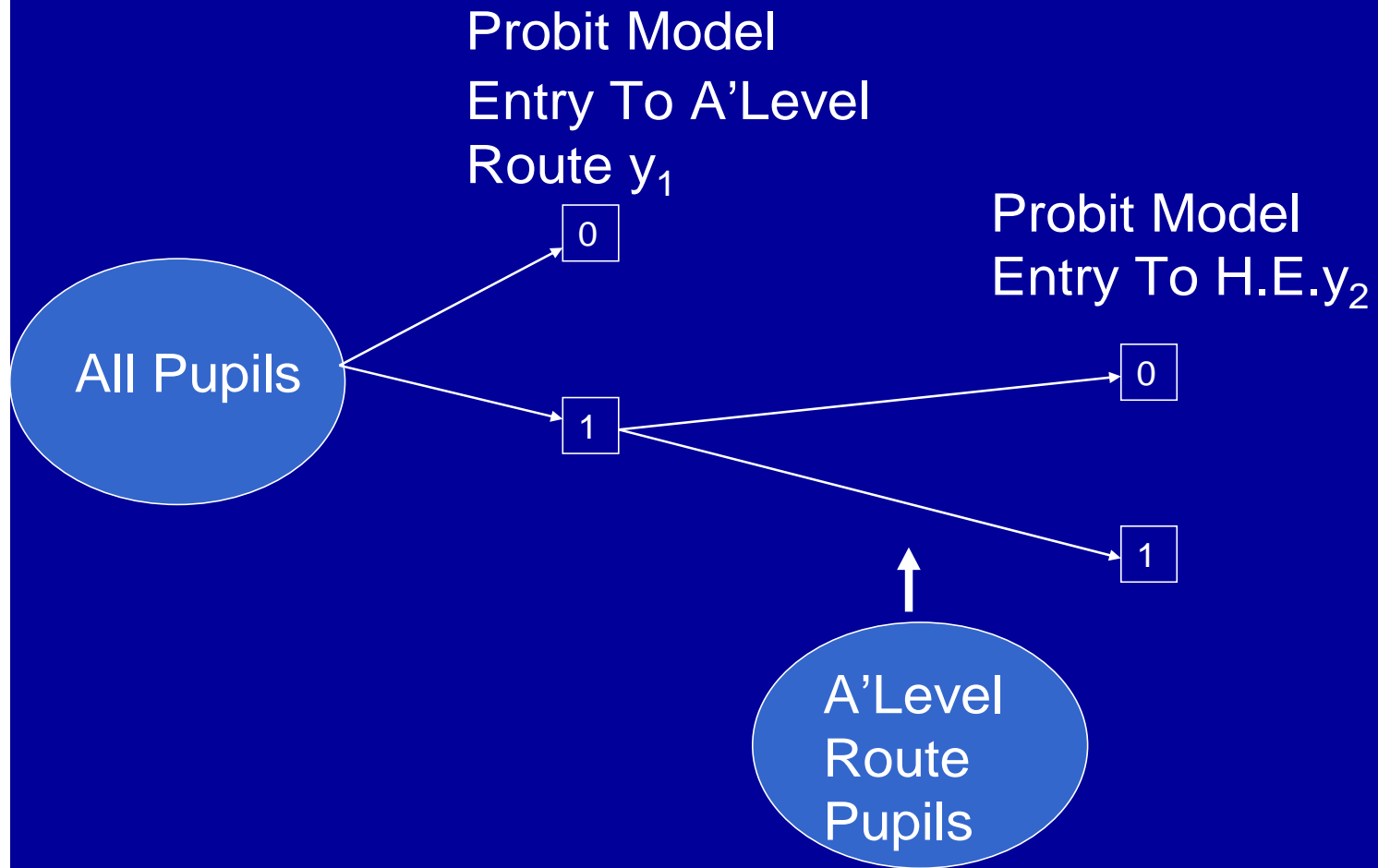
ALL SAMPLE PUPILS

Age 17 Studying A' Levels	Freq.	Percent	Cum.
no	2,443	38.75	38.75
yes	3,861	61.25	100.00
Total	6,304	100.00	

A' LEVEL PUPILS ONLY

Age 19 Studying for Degree	Freq.	Percent	Cum.
no	1,810	46.88	46.88
yes	2,051	53.12	100.00
Total	3,861	100.00	

# BIVARIATE PROBIT WITH SAMPLE SELECTION



**\* Organisation and structural changes**

**Changes to schools and qualifications etc**

Type of School Attended by Birth Cohorts  
 British Household Panel Survey 1991 - Wave A  
 (Extract column percentages)

type of school attended	cohorts			Total
	Prewar	1944 Act	Crossland	
comprehensive sch	-	10.47	53.25	25.92
grammar not fee pa	9.58	19.14	8.06	12.10
grammar fee-paying	4.55	1.93	0.97	2.25
public & private	5.52	5.63	4.68	5.22
elementary	35.20	2.45	-	10.35
secondary modern	-	52.11	24.01	33.64
technical	-	3.49	0.80	2.15

1. Suspect errors - potentially misleading measure



# Changes to qualifications (messy measures...)

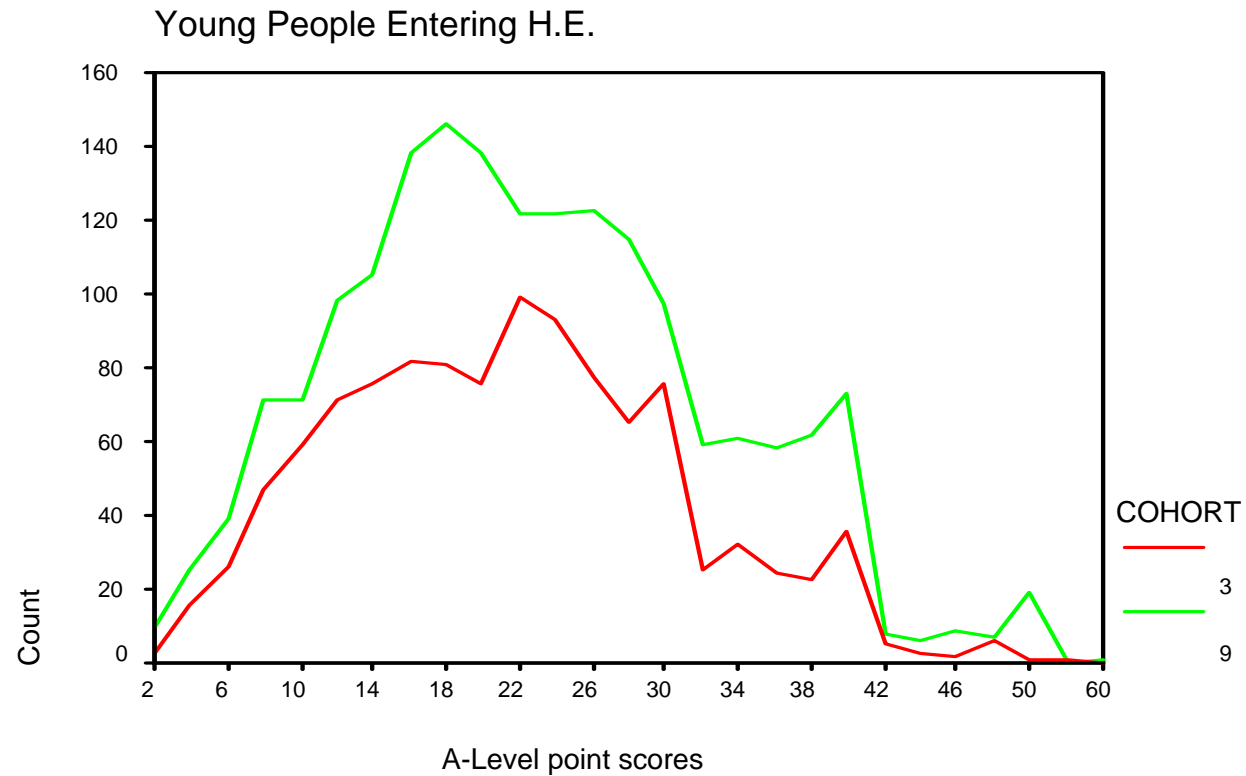
## GHS 1983 O'Levels

## GHS 2003 GCSE

educational level	Freq.	Percent	Cum.	education level -	Freq.	Percent	Cum.
-9. does not apply	3,529	17.59	17.59	-9. never attended school	21	0.09	0.09
1. higher degree	99	0.49	18.09	-8. na	4	0.02	0.10
2. first degree	790	3.94	22.03	-6. child/out age/no int	9,694	39.59	39.69
3. teaching qual	279	1.39	23.42	1. higher degree	689	2.81	42.50
4. other higher qual	651	3.25	26.66	2. first degree	1,765	7.21	49.71
5. nursing qual	283	1.41	28.07	3. teaching qualification	213	0.87	50.58
6. gce a level 2+	385	1.92	29.99	4. other higher qualification	979	4.00	54.58
7. gce a level 1	688	3.43	33.42	5. nursing qualification	259	1.06	55.63
8. gce o level 5+	1,439	7.17	40.60	6. gce a level in two or more subjects	1,752	7.15	62.79
9. gce o lev1-4 & cq	418	2.08	42.68	7. gce a level in one subject	486	1.98	64.77
10. gce o lev1-4 no cq	1,053	5.25	47.93	8. gcse/olevel, standard grades, 5+	1,915	7.82	72.59
11. com qual no o levels	704	3.51	51.44	9. gcse/olevel 1-4	1,257	5.13	77.72
12. cse grades 2-5	595	2.97	54.41	10. cse below grade 1, gcse below grade	1,373	5.61	83.33
13. apprenticeship	907	4.52	58.93	11. apprenticeship	144	0.59	83.92
14. foreign quals	154	0.77	59.70	12. other qualification	654	2.67	86.59
15. other quals	251	1.25	60.95	13. no qualification	3,284	13.41	100.00
16. no quals	7,734	38.56	99.51				
17. no answer	29	0.14	99.66				
18	8	0.04	99.70				
20. never went to school	61	0.30	100.00				
Total	20,057	100.00		Total	24,489	100.00	

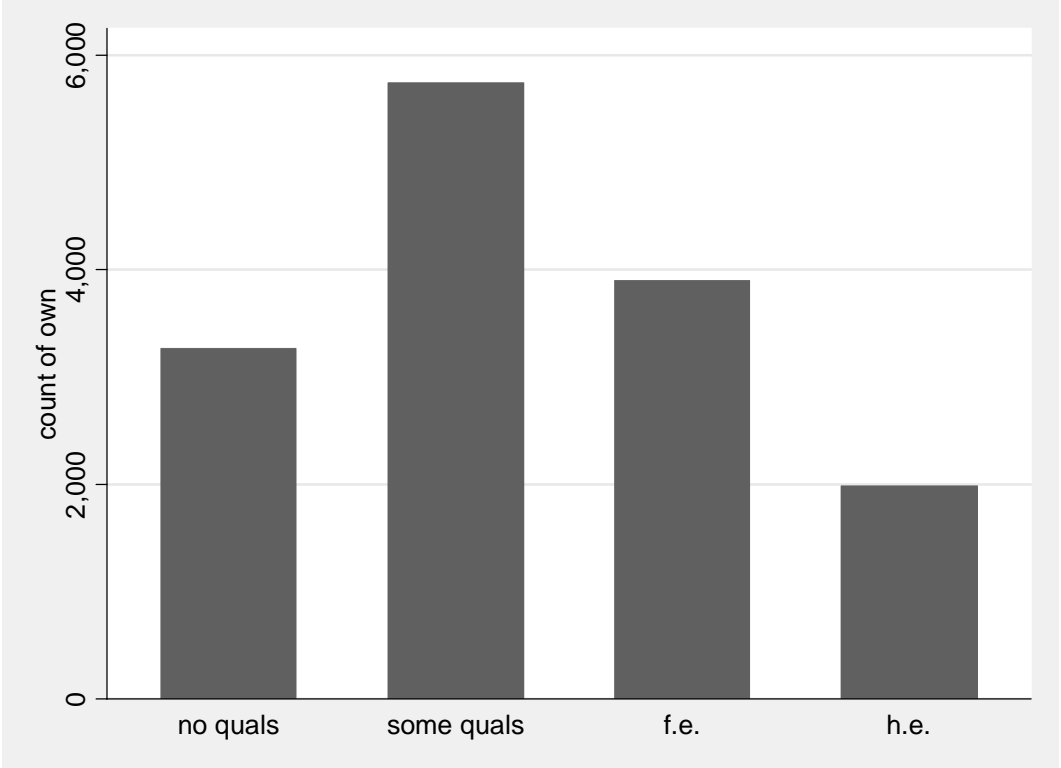
**\* Changes in distributions**

## The A'Level Point Scores of two YCS Cohorts (1987 & 1998) - Young People Entering Higher Education

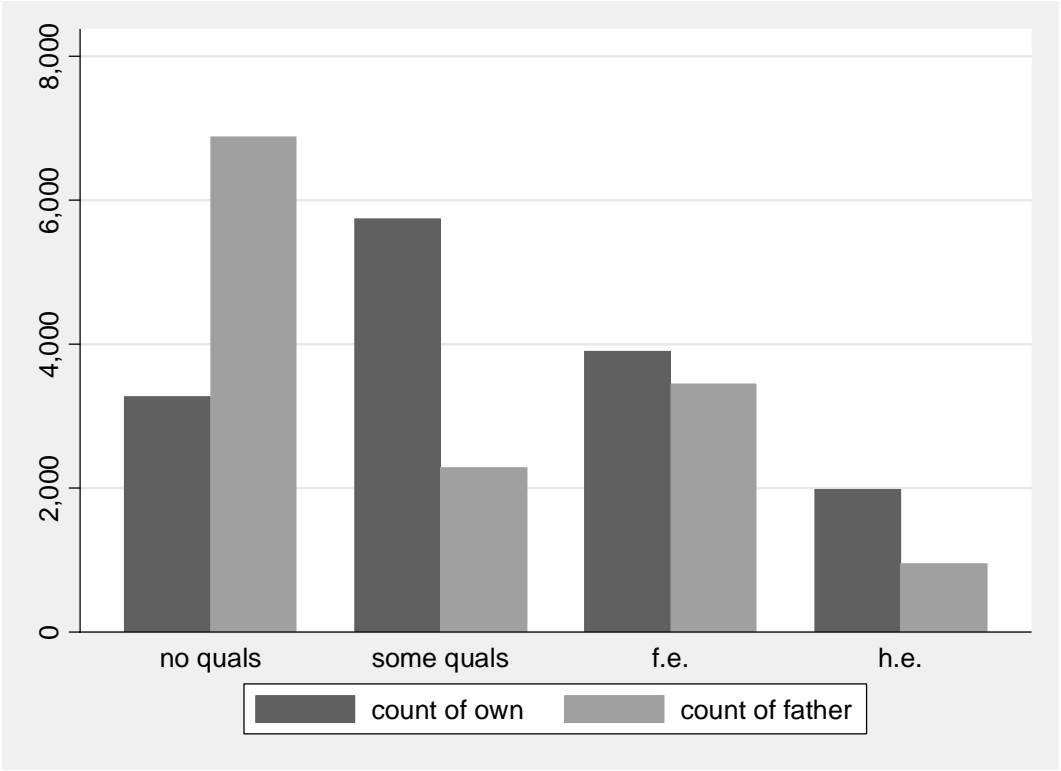


Could relative i.e. "specific" scales help here?

# British Household Panel Survey (Wave M) Respondent's Education Level



# British Household Panel Survey (Wave M) Respondent's Education Level and Father's Education Level



\* What can we learn from international comparisons?

Many of the problems that we experience in cross-national research also pervade longitudinal research

## CASMIN (Quick & Simple explanation)

A. Hierarchical -  
reflects length, ability required and curriculum

B. General or Vocational

C. Levels

- (1) Elementary
- (2) Secondary
- (3) Higher (tertiary)

## CASMIN Brynin Example of BHPS & GSOEP

Table 2: The CASMIN Scheme Applied to the BHPS and GSOEP with Mean Years of Education (YoE)

CASMIN Codes	BHPS scheme	BHPS (YoE)	GSOEP scheme	GSOEP (YoE)*
1a: incomplete	Up to 6 years schooling	10.05	No qualification	≤ 9
1b: elementary	No qualifications + 7-11 YoE	11.15	Hauptschule certificate	9
1c: basic vocational	NVQ 1, no GCSEs	11.47	Above + basic apprentice training	12
2a: intermediate vocational (+ intermediate general)	NVQ 2 with or without GCSEs	11.96	Realschule certificate + basic apprentice training	13
2b: intermediate general	At least GCSE grade A-C	11.69	Realschule certificate	19
2c: general: general maturity certificate	NVQ 3 with or without A-level	13.16	Abitur	13
2c: vocational: voc. maturity (+ general maturity)	At least 1 A-level	13.05	Abitur + full apprenticeship	16
3a: lower tertiary	NVQ 4/teaching	14.71	Technical college degree	17
3b: higher tertiary	Degree	17.65	University degree	19

Abbreviations: GCSE = General Certificate of Secondary Education;  
NVQ = National Vocational Qualifications

\* Not actual years of education but imputed from qualification level



ISCED 1997 (Quick & Simple explanation)

International Standard Classification of Education

[Level 0 Pre-Primary Education]

Level 1 / Level 2 Compulsory Education

Level 3 More Advanced Level

Level 4 Vocation (higher level)

Level 5 Graduate

Level 6 Post Graduate (research)

- \* Many measures (not just qualifications)
- \* Think about organisation and structural changes
- \* Changes in distributions over time
- \* We can learn from int comparisons
- \* We should consider universal and/or specific measures