Introduction to the analysis of data on social connections

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Introduction to the analysis of data on social connections

1)	Studying social connections
2)	Practical issues (i): Dealing with microdata on social connections
3)	Models for individual level outcomes
4)	Association models
5)	Network analysis
6)	Practical issues (ii): Software

1) Studying social connections

Social connections matter!

- Form of the social structure
  - Structural homophily in occupations, education, etc

  [Laumann & Guttman 1966; McPherson et al. 2001]
- Mechanisms of social inequality & social structure
  - Attainment
  - Intergenerational transmission

  [e.g. Bourdieu 1984; Devine 2004]

Some images of elite and popular contemporary British culture…!

Studying social connections?

- Many research methods have been 'individualist'
  - In statistical analysis & explanatory frameworks
- To study empirical data on social connections…
  - Individualist approach: Use data about the alter(s) to inform analysis of the individual
  - Structural approach: Use data about the connections to inform understanding of the structure
  - Today's examples feature both, but mainly we look at two examples of structural analysis, 'network analysis' and 'association modelling'
- In social history…
  - Data on social connections is one of few forms of readily available large scale microdata, and is increasingly accessible
  - Social connections are central to interesting social trends, e.g. in social mobility; homogamy; industrialisation; etc

Occupations, stratification, & personal networks

Analysis of personal connections between occupations helps us to understand both the structure of social stratification, and the mechanisms by which it is generated/sustained

(1) Broad stability in occupational orders ('Treiman constant') *[Treiman, 1977]*, but some interesting change across countries/time *[Lambert et al., 2008]*

- ..changes across contexts which effect social relations of occupations include..
  - Occupational segregation by gender (and ethnic group)
  - Educational expansion & industrial restructuring
  - Changing institutions (e.g. 'key linking occupations')

- ..can study social positions of occupations (revealed by personal connections), not their objective qualities *[e.g. Bottero et al., 2009, cf. Rose and Harrison, 2010]*

Occupations, stratification, & personal networks

Analysis of personal connections between occupations helps us to understand both the structure of social stratification, and the mechanisms by which it is generated/sustained

(2) Exploring interpersonal 'inheritance' in occupations and in stratification advantage/disadvantage

- Strong empirical trends of occupational homogamy/endogamy *[Brynin et al., 2008]* and inter- and intra-generational stability *[e.g. Breen, 2004]*
- The 'principle of kinship' *[Young, 1958]*
  - Share socio-economic resources: parents/children; spouses; wider family connections; friends
  - Lifelong values and aspirations *[e.g. Devine, 2004]*
  - Parents use their networks to help their children find work *[Jaeger and Holm, 2007]*

Data on occupations and personal networks is abundant…

Finally, in this section I have a few questions about your friends.

47. First of all can you think of the people with whom you are most friendly. I am interested in their occupations. Will you think of one of them and give me his occupation?

Is he a relative?

Is he a workmate?

Can you give me the occupation of another?

and so on until respondent has given four friends

38-41 1.

Male Actual	1	Male Terminal	2	Relative	1	Workmate	1	Close Friend See Q. 48,56
Female	3	Female	4	not	0	not	0	1st = 1, 2nd = 2, neither = 0

Occupation

42-6 → Job

Type of Employer

47-50 2.

Male Actual	1	Male Terminal	2	Relative	1	Workmate	1	Close Friend See Q. 48,56
Female	3	Female	4	not	0	not	0	

Occupation

51-5 → Job

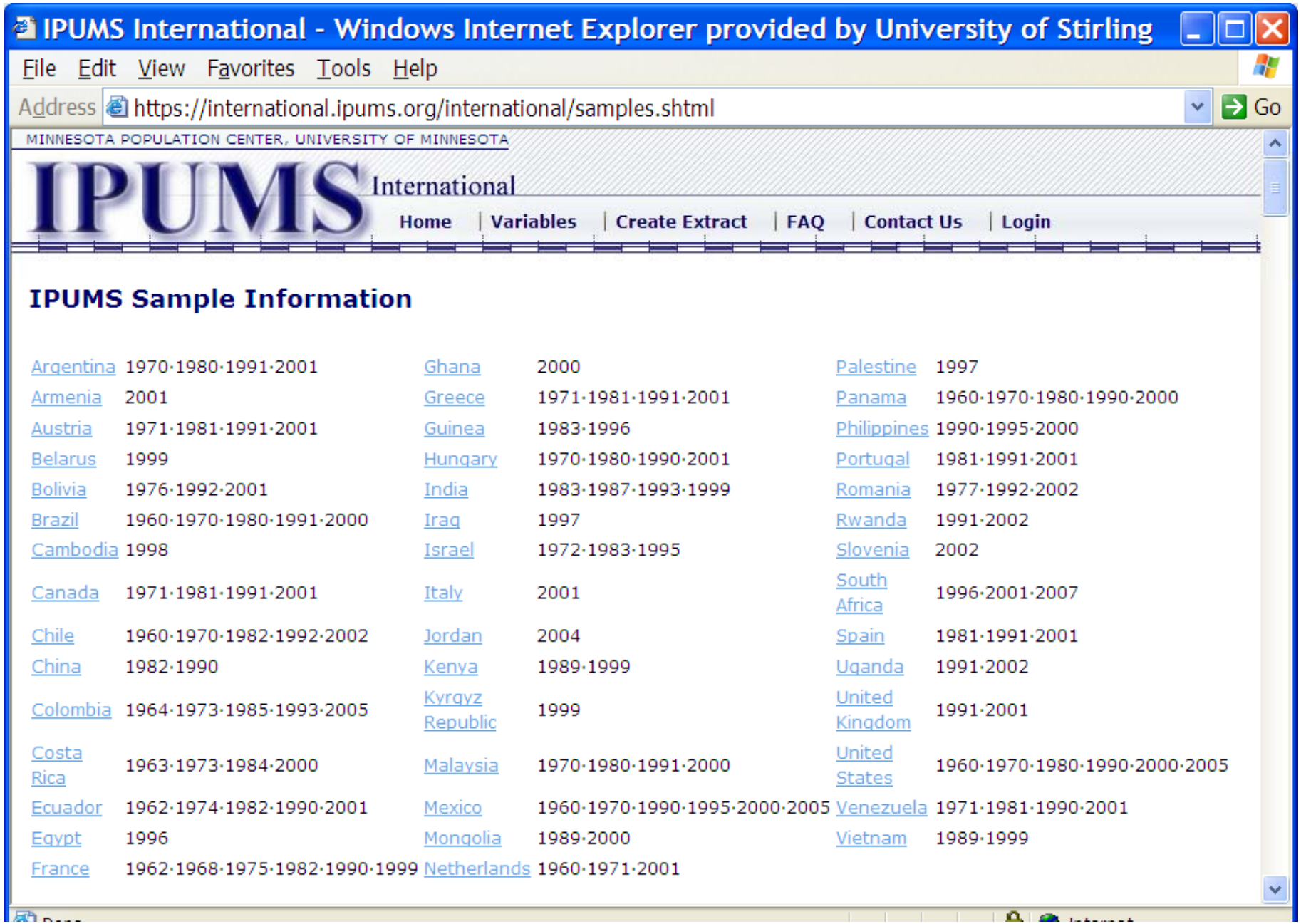
Social Status in Great Britain (1974)

..friendship data..

Freq.	Percent	Cum.	Pattern*
10309	24.98	24.98	1...............
5369	13.01	37.99	..........11.1111
5066	12.27	50.26	.1..............
4071	9.86	60.12	111
3127	7.58	67.70	11
1531	3.71	71.41	............11..
1431	3.47	74.88	1
1406	3.41	78.28	..........1.....
1218	2.95	81.23	..........11.....
7746	18.77	100.00	(other patterns)
41274	100.00		XX........XX.XXXX

- University of Oxford, & Oxford Social Mobility Group (1978). *Social Mobility Inquiry, 1972 [computer file]. Colchester, Essex: UK Data Archive [distributor], SN: 1097.*
- Blackburn, R. M., Stewart, A., & Prandy, K. (1980). *Social Status in Great Britain, 1974 [computer file]. Colchester, Essex: UK Data Archive [distributor], SN: 1369.*
- University of Essex, & Institute for Social and Economic Research. (2009). *British Household Panel Survey: Waves 1-17, 1991-2008 [computer file], 5th Edition. Colchester, Essex: UK Data Archive [distributor], March 2009, SN 5151.*

..family connections data..



..family connections data..

- Complex survey designs measure various connected occupations *(e.g. BHPS indvs/hhlds over time)*
  - *Connections between multiple interviewed adults (e.g. previously co-resident siblings now living apart)*
  - *All interviewed adults also give retrospective data on their parents' occupations and their best friends' occupations*

[Lambert and Gayle, 2008] ->

		BHPS Wave 15 (2005)	ID's/ PGP	PGP/HH
			Adult intrv.; ennumerated	
Household	HH	*Within a wave, all living in same building who share meals or living room*	1.80; 2.50	1.00; 1.00
All waves household	XH	*All living in any HH's to have shared ID's in any previous wave*	**2.17; 2.93**	**0.85; 0.83**
Longitudinal Household	LH	*For one selected individual, all indv's who currently share the HH (for w15)*	1.80; 2.50	1.00; 1.00
	LH	*(for w1-15 at w15)*	**16.4** (min 1, max 61)	0.07 (= 1/15)

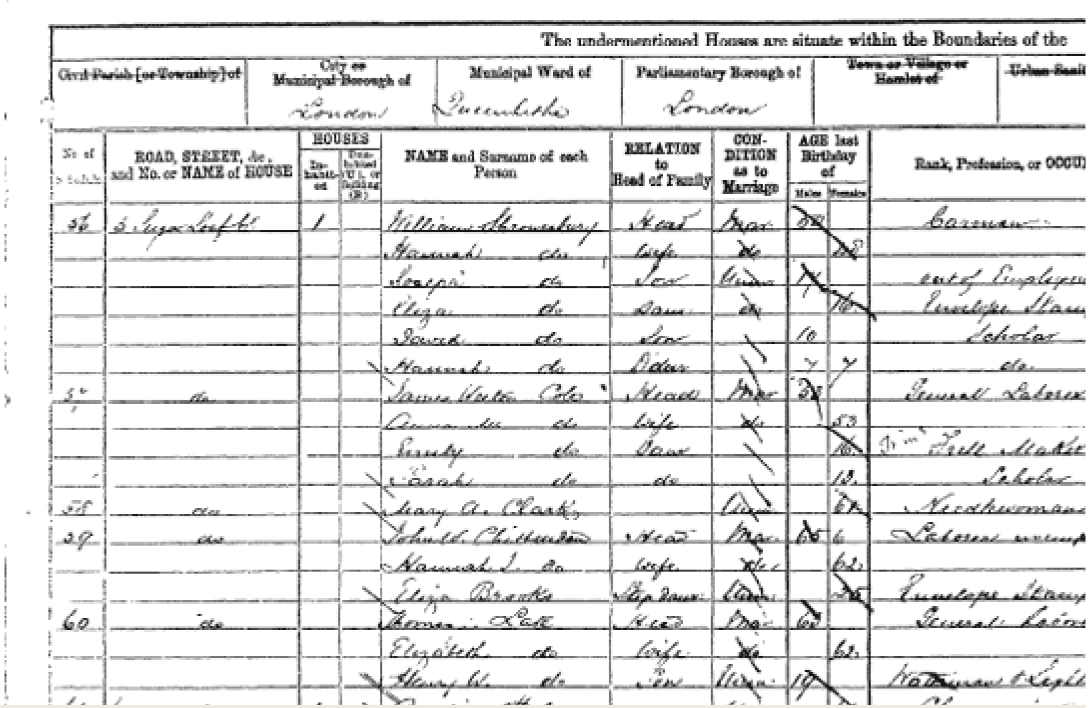
2) Practical issues (i): Dealing with microdata on social connections

- Many contemporary and historical sources feature microdata on socially connected individuals

- Data on one case plus proxy data on another
  - Friendship/social mobility surveys
  - Social capital surveys
- Data on more than one socially connected case
  - Household sampling method
  - Specialist source (e.g. genealogical data; register data)

Microdata on households

Image from: http://www.uk1881census.com/census_page.php



Census data: Example from France 1962 (20+yrs) accessed via IPUMS-I

serial	pernum	sex	age	fr62a_occ	educf
16000	1	Male	34	Administrative secretaries	CE
16000	2	Female	31	Former workers of the private sector	CE
17000	1	Male	41	Skilled workers	CE
17000	5	Female	40	Other nonactive people (includes persons age 14 or less)	CE
18000	1	Female	49	Smaller merchants	CE
19000	1	Female	33	Other nonactive people (includes persons age 14 or less)	None declare
19000	2	Male	32	Farmers	CE
19000	3	Male	24	Skilled workers	CAP, BE
20000	1	Male	59	Office employees	None declare
21000	1	Female	66	Other service personnel	None declare
22000	1	Male	28	Artists	BAC, BP, BT, BEA, BEC, BE
23000	1	Female	73	Skilled workers	None declare
24000	1	Female	38	Office employees	None declare
25000	1	Male	58	Smaller merchants	None declare
25000	2	Female	61	Specialized workers	None declare
26000	1	Female	37	Professors, literary and scientific professions	BAC
27000	2	Female	40	Other nonactive people (includes persons age 14 or less)	BAC, BP, BT, BEA, BEC, BE
27000	3	Male	46	Office employees	BAC

For analysis, we often convert data into a ‘pairs’ oriented dataset

```
use micro.dta, clear
keep if sex==2
keep serial occ age
rename occ wocc
rename age age_sp
sort serial
sav temp.dta, replace
use micro.dta, clear
keep if sex==1
keep serial occ age
rename occ hocc
sort serial
joinby serial using temp.dta
```

Stata ‘joinby’ command in this instance matches & keeps all male-female within household pairs

serial	hocc	wocc	age	age_sp
1000	Professors, professional scientists	Skilled industrial artisans	30	32
2000	administratve employees	administratve employees	45	45
8000	Civil employees, service agents of public function	Service personnel to indivduals	63	61
9000	Professional news, arts and shows	Professional news, arts and shows	40	40
25000	Businessmen and employees	Skilled driver	58	61
30000	Agricultural workers	administratve employees	68	58
45000	Service personnel to indivduals	Service personnel to indivduals	33	32
47000	Service personnel to indivduals	Service personnel to indivduals	33	29
52000	Skilled industrial artisans	Skilled driver	29	36
53000	Skilled driver	Skilled driver	23	20
57000	administratve employees	Business employees	40	42
59000	Skilled driver	Skilled driver	31	27
63000	Businessmen and employees	Skilled driver	30	26
64000	Skilled industrial artisans	administratve employees	28	30
65000	Skilled driver	Service personnel to indivduals	37	37
68000	Teachers and other employees	administratve employees	53	60
77000	Professional administrative and commercial institutions	Civil employees, service agents of public function	44	40
78000	Business employees	Civil employees, service agents of public function	39	36
85000	Engineers of technical businesses	Professors, professional scientists	61	54
95000	Service personnel to indivduals	Service personnel to indivduals	53	48

In turn, we would typically reduce the data into a ‘table format’ record

(Looses other features of microdata but dramatically improves storage/performance)

```
tab hocc
gen freq=1
collapse (sum) freq, by(hocc wocc)
summarize hocc wocc [fw=freq]
tab hocc [fw=freq]
```

	hocc	wocc	freq
1.	Agricultural farming, fishermen	Agricultural farming, fishermen	36853
2.	Businessmen and employees	Artisans	10335
3.	Skilled driver	Skilled driver	9979
4.	Skilled industrial artisans	Skilled driver	5851
5.	Skilled industrial artisans	administratve employees	4403
6.	Skilled driver	Service personnel to indivduals	3169
7.	Skilled industrial artisans	Skilled industrial artisans	3072
8.	Skilled driver	administratve employees	2792
9.	administratve employees	administratve employees	2540
10.	Skilled industrial artisans	Service personnel to indivduals	2400
11.	Businessmen and employees	Businessmen and employees	2265
12.	Skilled driver	Skilled industrial artisans	2262
13.	Skilled industrial artisans	Civil employees, service agents of public function	2172
14.	Skilled driver	Civil employees, service agents of public function	2001
15.	Teachers and other employees	Teachers and other employees	1866
16.	Artisans	Artisans	1678
17.	Technicians	administratve employees	1496
18.	Skilled driver	Businessmen and employees	1461
19.	Civil employees, service agents of public function	Civil employees, service agents of public function	1414
20.	Skilled industrial artisans	Business employees	1361

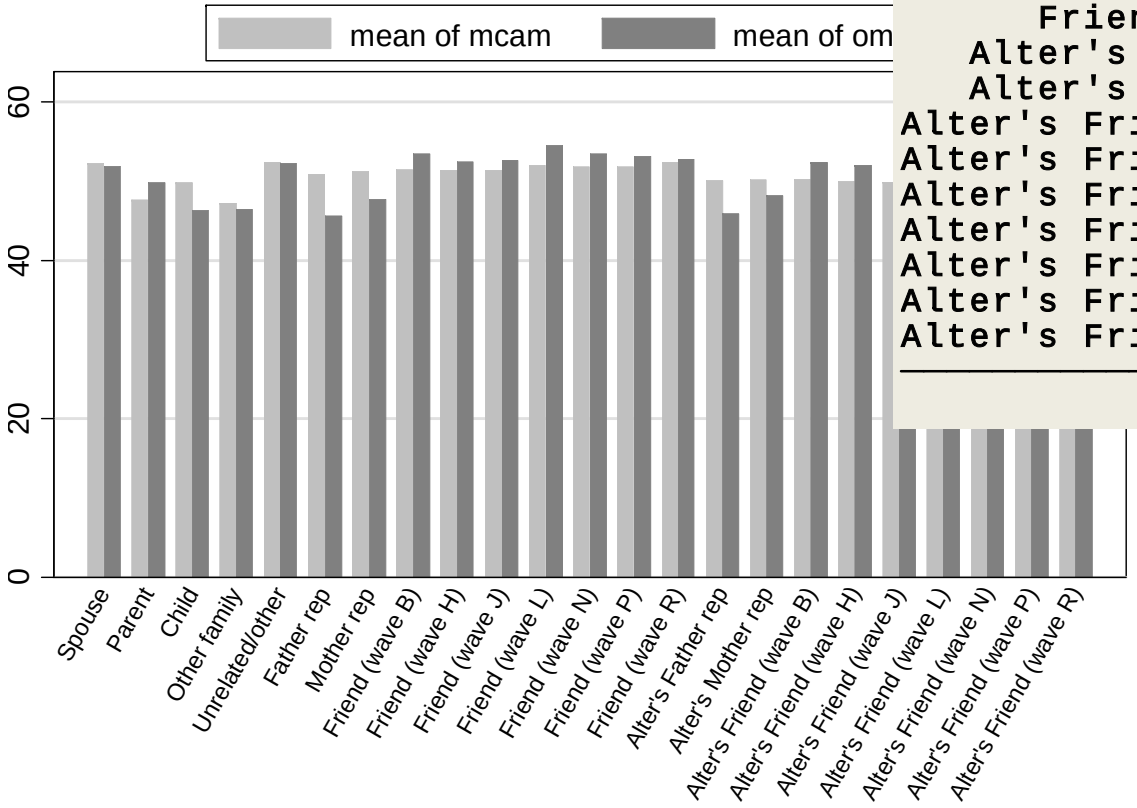
Microdata on households and/or other social connections

- Complex contemporary surveys with longitudinal and household designs often allow interlinking of extra data [e.g. Hill et al. 2000]
  - Current household sharers
  - Previous household sharers (& their new alters)
  - Questions on friends or other alters

	pid	year	hid	sppid	age	sex	educ4	mcamsis	hlghq1
43.	10029133	1991	1002449	10029168	29	2. female	2	52.5	8
44.	10029133	1992	2002019	0. spouse not in hh	30	2. female	2	52.1	11
45.	10029168	1991	1002449	10029133	38	1. male	.m	38.1	.m
46.	10040331	1991	1003372	0. spouse not in hh	38	2. female	1	.	.m
47.	10040331	1992	2002086	0. spouse not in hh	39	2. female	1	.	8
48.	10040366	1991	1003372	0. spouse not in hh	20	2. female	2	.	6
49.	10040366	1992	2002086	0. spouse not in hh	21	2. female	2	.	8
50.	10040404	1991	1003372	0. spouse not in hh	18	2. female	2	.	4
51.	10040404	1992	2002086	0. spouse not in hh	18	2. female	2	.	3
52.	10040439	1992	2002086	0. spouse not in hh	16	1. male	1	.	14
53.	10042571	1991	1003569	0. spouse not in hh	59	1. male	1	.	11
54.	10043691	1991	1003658	0. spouse not in hh	70	2. female	1	25.6	13
55.	10047069	1991	1003933	10047093	30	1. male	3	.	19
56.	10047069	1992	2002507	10047093	31	1. male	3	.	8
57.	10047093	1991	1003933	10047069	29	2. female	2	.	22
58.	10047093	1992	2002507	10047069	29	2. female	2	.	31
59.	10048189	1991	1004026	10048219	47	1. male	.m	38.9	.m
60.	10048189	1992	2002728	10048219	48	1. male	.m	36.3	.m
61.	10048219	1991	1004026	10048189	43	2. female	1	43.5	7
62.	10048219	1992	2002728	10048189	43	2. female	1	43.5	14
63.	10048243	1991	1004026	0. spouse not in hh	21	2. female	3	43.5	7
64.	10048243	1992	2002728	0. spouse not in hh	22	2. female	3	43.5	10
65.	10048278	1991	1004026	0. spouse not in hh	19	2. female	3	34.4	14
66.	10048278	1992	2002728	0. spouse not in hh	20	2. female	3	34.4	10

BHPS own, family & friends' jobs

Alter's relation to ego	sex 1. male	2. female
Spouse	58,561	58,374
Parent	21,029	15,972
Child	16,308	19,657
Other family	8,063	6,614
Unrelated/other	4,079	3,829
Father rep	22,674	22,732
Mother rep	12,841	14,066
Friend (wave B)	9,525	10,335
Friend (wave H)	8,458	9,031
Friend (wave J)	10,709	11,619
Friend (wave L)	9,947	10,541
Friend (wave N)	7,085	7,934
Friend (wave P)	6,150	7,219
Friend (wave R)	3,676	4,238
Alter's Father rep	45,590	41,846
Alter's Mother rep	28,551	25,826
Alter's Friend (wave	21,481	19,375
Alter's Friend (wave	24,785	22,599
Alter's Friend (wave	30,902	28,240
Alter's Friend (wave	35,537	32,498
Alter's Friend (wave	30,446	27,585
Alter's Friend (wave	35,912	32,814
Alter's Friend (wave	28,843	26,512
Total	481,152	459,456



A major challenge concerns 'data management'

- '*the tasks associated with linking related data resources, with coding and re-coding data in a consistent manner, and with accessing related data resources and combining them within the process of analysis*' *[…www.dames.org.uk..]*

  - Usually performed by social scientists themselves
  - Most overt in quantitative survey data analysis
    - 'variable constructions', 'data manipulations', 'linking datasets'
    - navigating abundance of data
  - Usually a substantial component of the work process

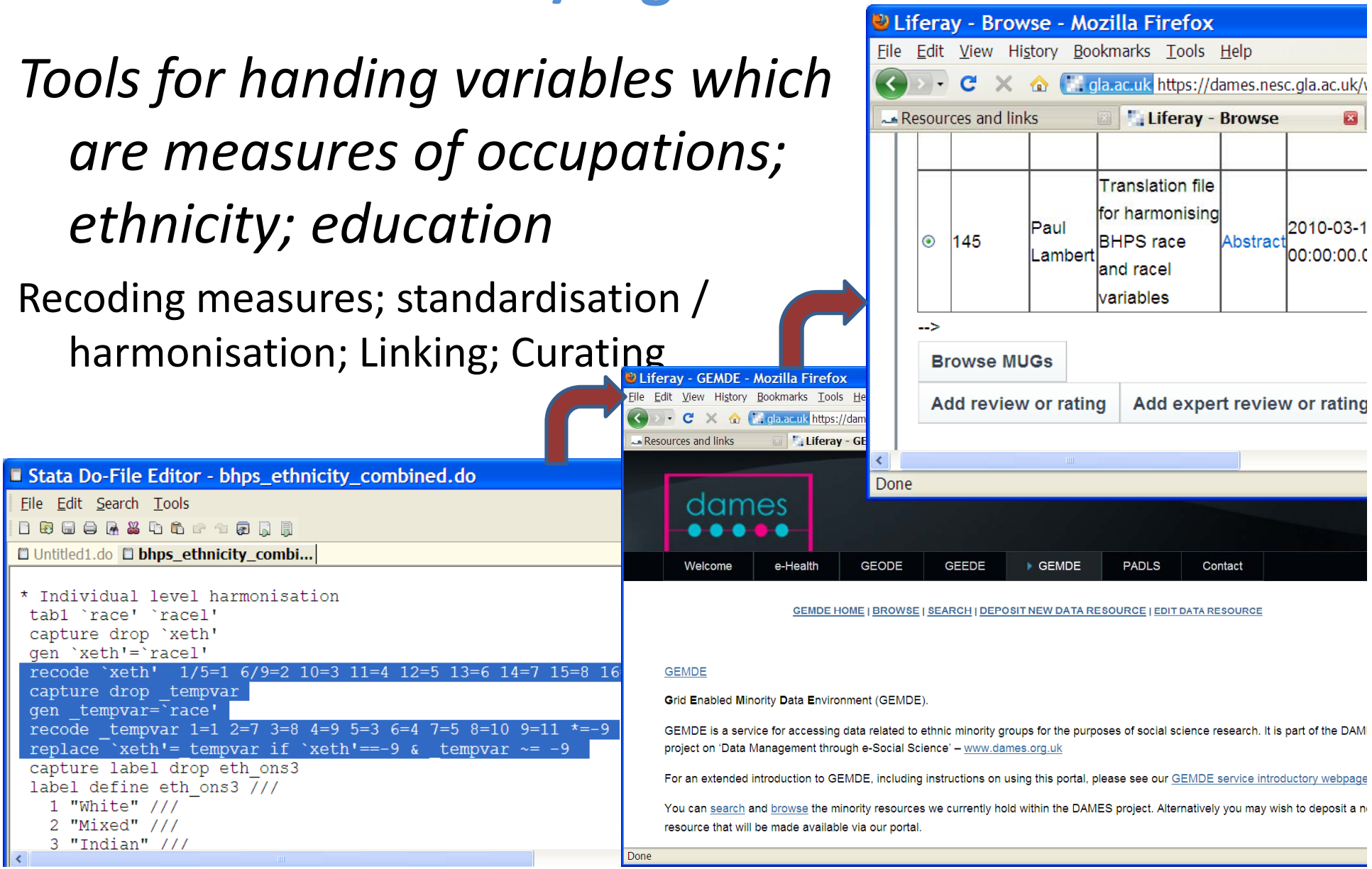
Inroads in two areas…

- Exploitation of software and construction of replicable documentation (see later)
- Taking advantage of existing metadata / disseminating new metadata

DAMES ‘GESDE’ tools: online services for data coordination/organisation

Tools for handing variables which are measures of occupations; ethnicity; education

Recoding measures; standardisation / harmonisation; Linking; Curating



‘Variable construction’ issues affect all data…

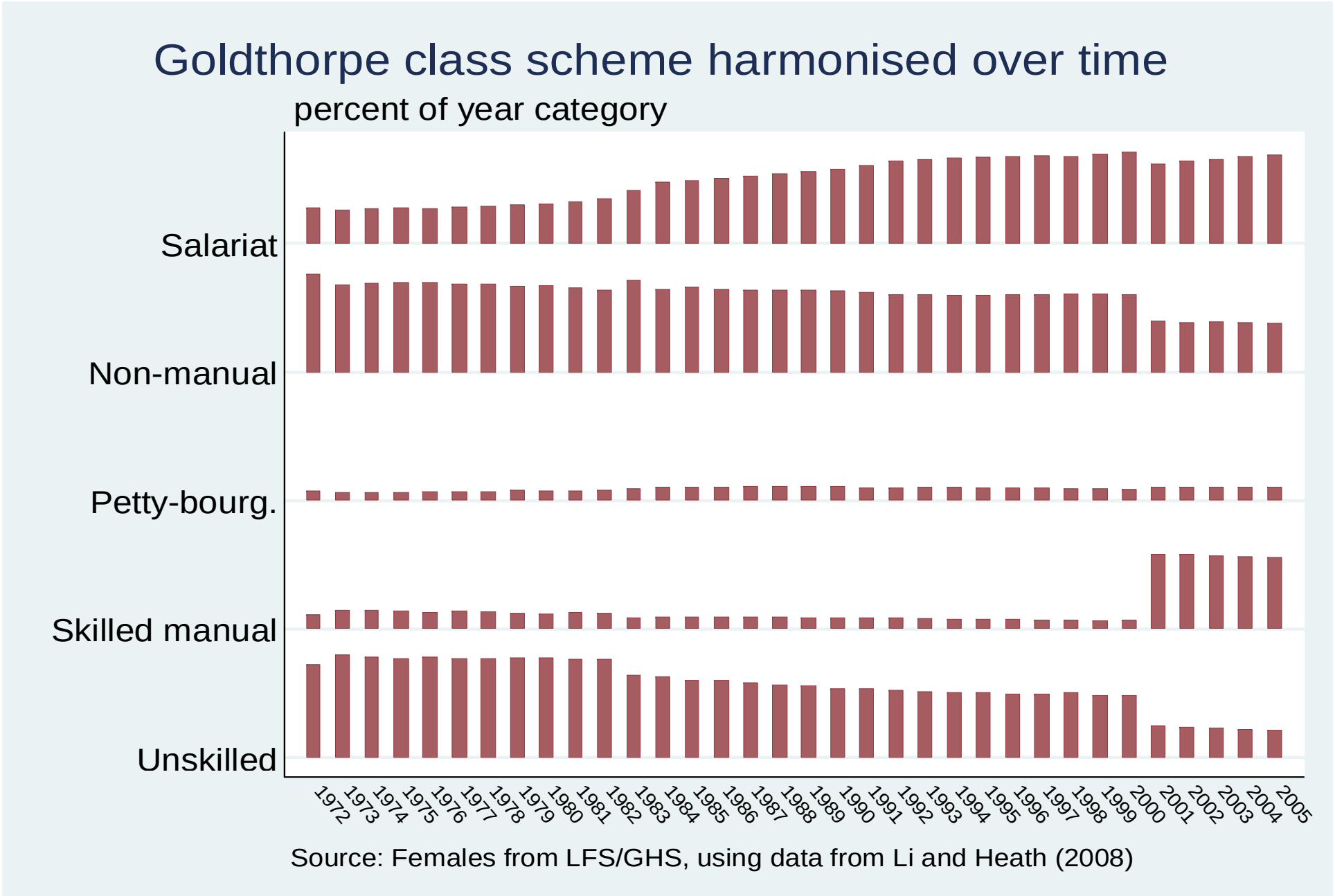
- Major part of the hands-on work of empirical data analysis
- Central to many critiques of research/outputs

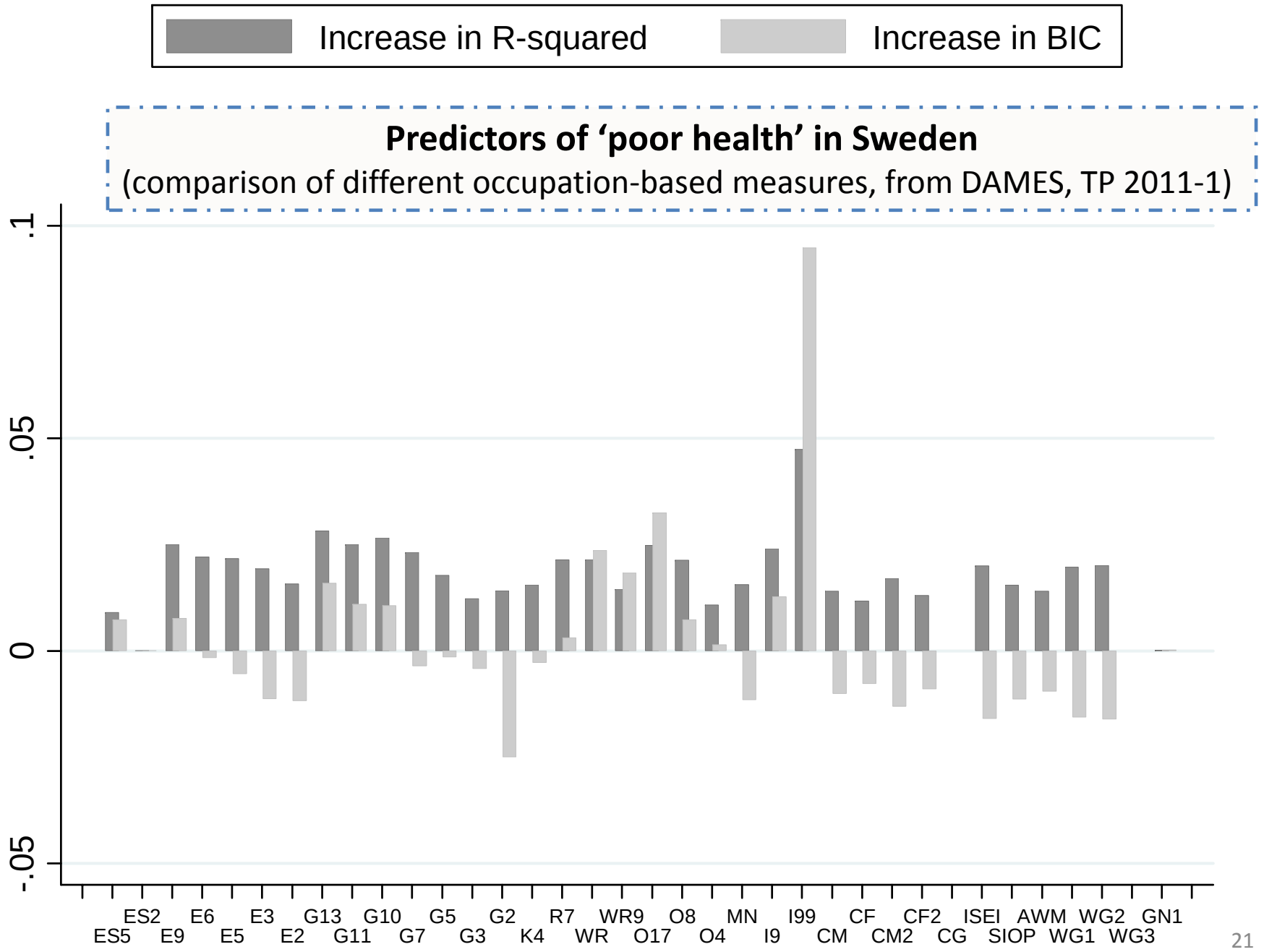
➢ Existing reflections and resources

- Methodological comments *[e.g. Stacey 1969; Burgess 1986]*
- Validity and reliability; harmonisation and standardisation efforts
- Cross-nationally comparative research into ‘equivalence’
  - [e.g. Hoffmeyer-Zlotnik and Wolf 2003; data provider’s such as www.ipums.org; www.europeansocialsurvey.org]

- *Attention to variables is marginalised in methodological reviews, which focus on data and/or techniques [cf. Raftery 2001]*
- *Reviews/resources on variables often don’t give good advice to those conducting complex statistical models of social processes*
  - *Univariate perspective*
  - *Inconvenient functional form (sparse and complex categorical measure)*

Here, measurement equivalence is compromised by administrative errors, & meaning equivalence is doubtful due to industrial restructuring (orig. occ. codes not available)



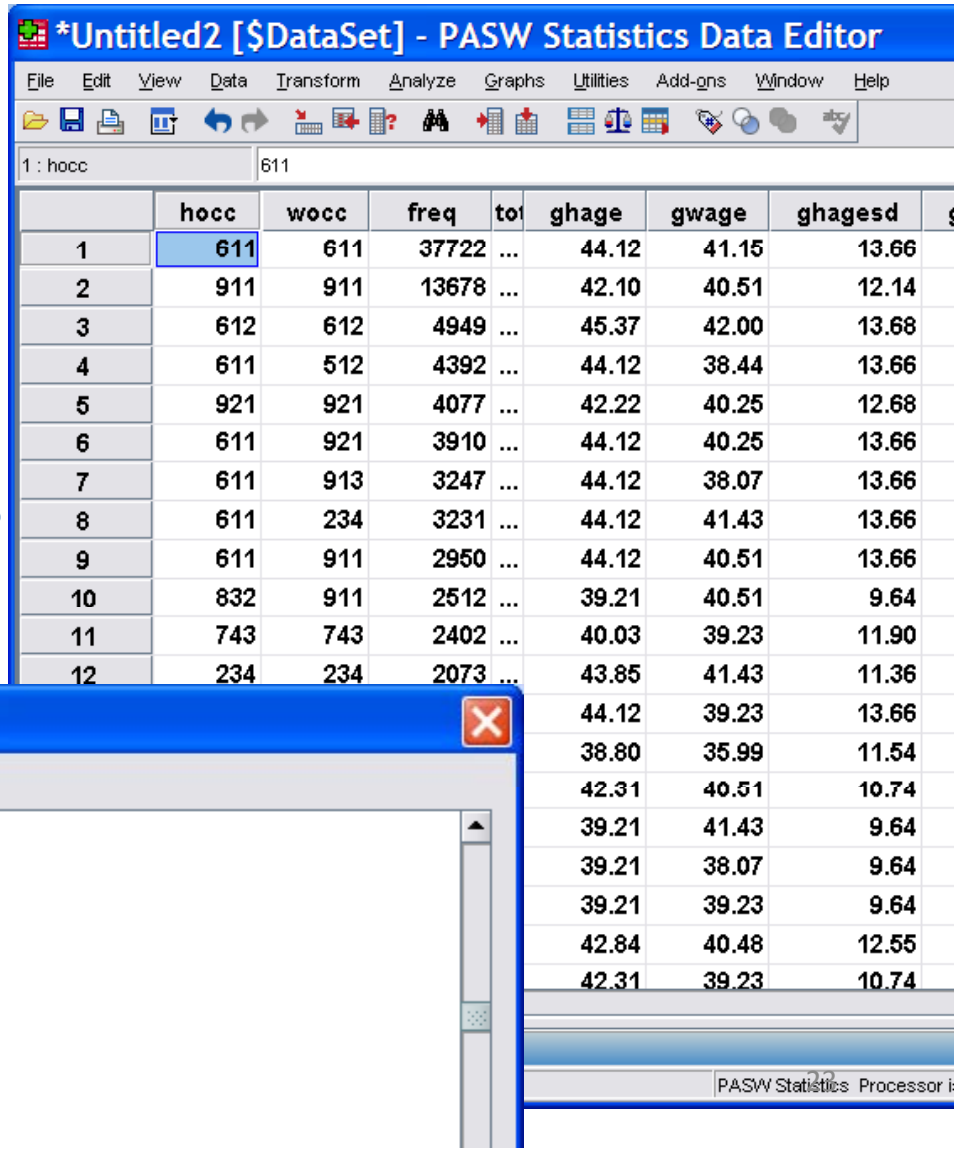

Increase in R-squared
Increase in BIC
Predictors of 'poor health' in Sweden
(comparison of different occupation-based measures, from DAMES, TP 2011-1)
.1
.05
0
-.05
ES5
ES2
E9
E6
E5
E3
E2
G13
G11
G10
G7
G5
G3
G2
K4
R7
WR
WR9
O17
O8
O4
MN
I9
I99
CM
CF
CM2
CF2
CG
ISEI
SIOP
AWM
WG1
WG2
WG3
GN1

Some themes on data issues for social connections data in social history

- Very large scale of some datasets
- Relatively few existing/shared coding schemes (compared to contemporary surveys)
- Historical social connections data tends to be:
  - Asymmetric (e.g. far more farmers-farmers than any other connection)
  - Prone to mislead (e.g. in census datasets there are many connections to ‘teachers’ which we suspect are parents or governesses; and many ‘connections’ between professional jobs and housekeepers/servants)

We'll now turn to three ways of analysing social connections between units…

3) **Modelling (e.g. random effects; fixed effects)**
4) **Social Interaction Distance analysis**
5) **Social Network Analysis**



3) Models for individual level outcomes

- *Here, the question is how best to account for data on alter(s) in an individual level model*
- Regard the social connection as a 'cluster'
  - Random effects ('multilevel') model
  - Fixed effects model (focus on within-cluster change)
- Regard the alters' information as a variable
  - Usually focus on one or more specific alters (e.g. wife; father)
  - Consider endogeneity of alter's measure & possible use of selection model/sub-population model
  - 'Resources' framework (e.g. Social capital/position generators)

Example: Fixed and random effects models on occupational outcomes (BHPS, lab 1)

Variable	cam1	cam2	cam3	cam4	cam6
_					
fem		1.52***	.904**		1.25***
age		.464***	.423***		.398***
age2		-.00425***	-.00387**		-.00368*
cohab		.179	-13.1		-1.19
educ4_1		-8.01***	-7.04***		-3.98***
educ4_3		4.53***	3.98***		3.19***
educ4_4		16.6***	14.4***		11.9***
spmcamsis			.186***		
_cons	50.7***	38.5***	43.7***		41***
mcamsis					
fem				1.47***	
age				.452***	
age2				-.00416***	
cohab				.0931	
educ4_1				-7.73***	
educ4_3				4.46***	
educ4_4				16.4***	
_cons				38.9***	
lns1_1_1					
_cons				1.43***	
lnsig_e					
_cons				2.41***	
Statistics					
N	11812	11286	6148	11286	11286
bic	95640	87971	47709	87919	75279
ll	-47815	-43948	-23815	-43913	-37602
r2	0	.263	.285		.0898

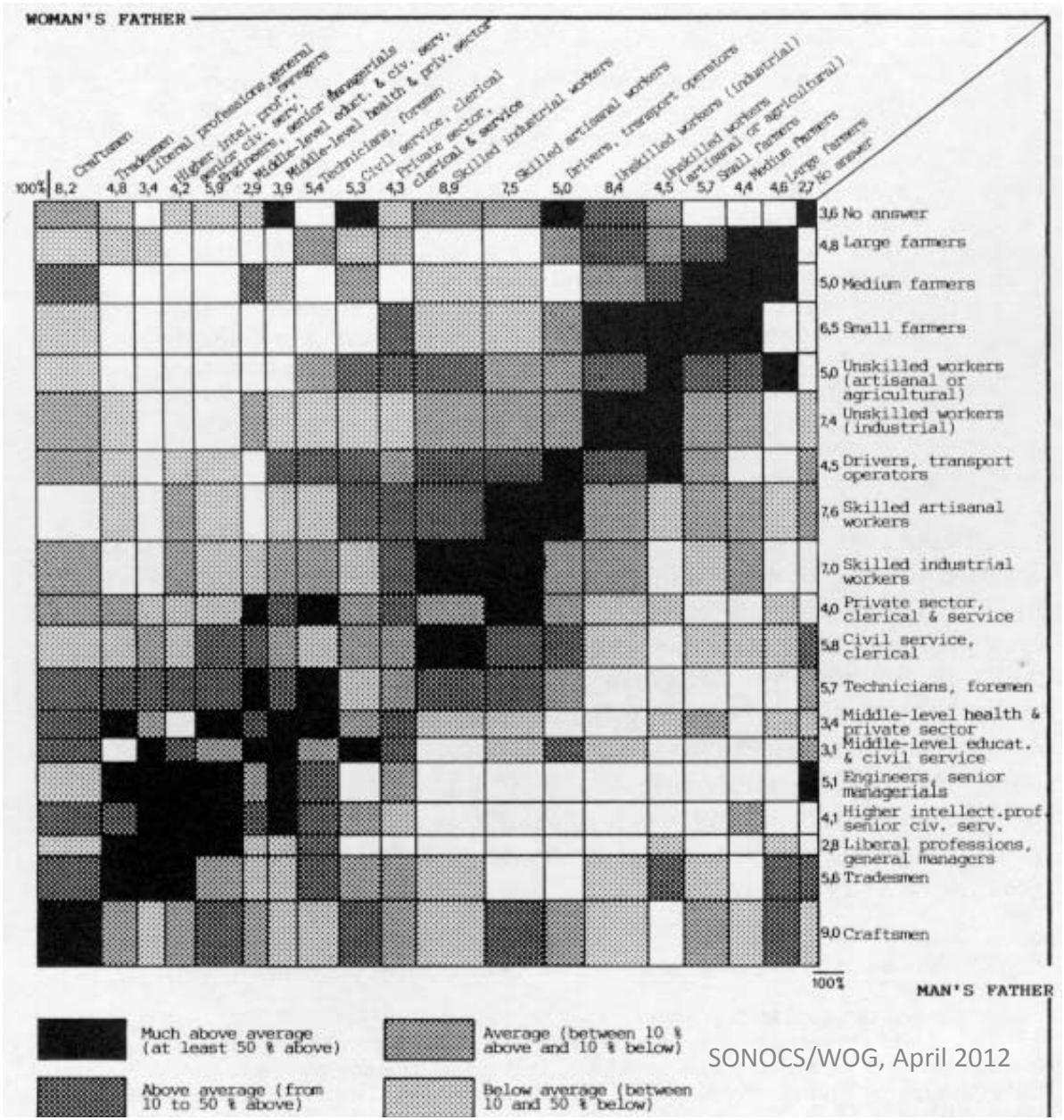
legend: * p<0.05; ** p<0.01; *** p<0.001

Example – Other random effects models (on related adults in the BHPS)

	Used health services in last year (Y=43%)				GHQ score			
	indv	***cp***	***hh***	***xhid***	***indv***	***cp***	***hh***	***xhid***
Female	0.63	0.77	0.69	0.65	1.36	1.36	1.36	1.53
Age	0.02	0.03	0.02	0.02	0.13	0.13	0.14	0.14
Age-squared(*100)					-0.12	-0.13	-0.13	-0.13
Cohabiting					-0.58	-0.58	-0.54	-0.59
Ln(household inc.)	-0.09	-0.14	-0.12	-0.11	-0.63	-0.62	-0.63	-0.62
Constant	-0.65	-0.67	-0.59	-0.55	12.9	12.8	12.6	12.6
ICC L2% (VC)	**0**	**6.3**	**8.8**	**7.9**	**0**	**22.9**	**15.8**	**7.8**
Mean cluster size	**1**	**1.4**	**1.8**	**4.6**	**1**	**1.4**	**1.8**	**4.5**
L2:sd(cons)		0.61	0.51	0.53		2.54	1.91	1.15
L2:sd(fem)		2.00	0.82	0.00		2.81	2.32	1.64
L1:sd(cons)	1.81	1.81	1.81	1.81	5.40	4.30	4.76	5.28
-Log-like (-40k)	**9648**	**9625**	**9624**	**9632**	**3529**	**3383**	**3410**	**3512**

4) Social Interaction Distance Analysis

(www.camsis.stir.ac.uk : correspondence analysis; RC-II association models)



From: Bozon and Heran (1989), 'Finding a spouse: A survey of how French couples meet', *Population,* 44(1):91-121.

CAMSIS, www.camsis.stir.ac.uk

Lays out a methodology for analysing social interaction for the purpose of social stratification research

- Analyse pairs of occupations linked by a social interaction (marriage; friendship; inter- and intra-generational connections)
- Use correspondence analysis (SPSS; Stata) or RC-II association models (Stata; lEM) on pairs of occupations
- *Tradition of 'specificity': makes an empirical calculation within a 'context' (country; time period)*
- Many other writers are using association models/correspondence analysis for similar structural analytical purposes (e.g. Chan 2010; Bakker 1993; Laumann and Guttman 1966)

Husband's Job Units

	Occ Units ↓ →		1	2	..	407
		Derived scores ↓ →	*75.0*	*70.0*	..	*10.0*
Wife's	**1**	*72.0*	**30**	**15**	**..**	**0**
Job	**2**	*72.5*	**13**	**170**	**..**	**1**
Units	**..**	..	**..**	**..**	**..**	**..**
	407	*11.0*	**0**	**2**	**..**	**80**

- *Derived scores predict frequency of interactions (#cases per cell)*
- The scales describe one or more dimensions of a **structure of social interaction**…
  - ➢ …this turns out to also represent **a structure of social stratification…**
    - ➢ …resulting in scale scores which measure an occupation's relative position within the structure of stratification.

Stata/IC 10.0 - c:\temp\\hist1.dta

File Edit Data Graphics Statistics User Window Help

Results

c2gp2	sum(freq)	mean(rowsc2)	mean
1. 1 Physical Scientists and Related Tec	393	1.561271	
2. 2 Architects, Engineers and Related T	3885	1.194944	
3. 3 Architects, Engineers and Related T	2116	1.057375	
4. 4 Aircraft and Ships' Officers	6855	.0062811	
5. 5 Life Scientists and Related Technic	281	1.440953	
6. 6 Medical, Dental, Veterinary and Rel	5673	2.239389	
7. 7 Medical, Dental, Veterinary and Rel	303	.7487819	
8. 8.00	16	2.971333	
9. 9.00	74	-.0782805	
10. 11 Accountants	3768	1.415531	
11. 12 Jurists	4154	2.781205	
12. 13 Teachers	8456	.9445301	
13. 14 Workers in Religion	949	2.301595	
14. 15 Authors, Journalists and Related	471	2.247882	
15. 16 Sculptors, Painters, Photographer	1854	.7852771	
16. 17 Composer and Performing Artists	1791	.9471796	
17. 18 Athletes, Sportsmen and related w	24	.313147	
18. 19 Professsional, Technical and RWNE	123		
19. 20 Legislative Officials and Gov. Ad	682		
20. 21 Managers	6874		
21. 22 Supervisors, Foremen and Inspecto	4569		
22. 30 Clerical and RW, Spec Unknown	3476		
23. 31 Government Executive Officials	2577		
24. 32 Stenographers, Typists and Card-	818		
25. 33 Bookkeepers, Cashiers and RW	9807		
26. 34 Computing machine operators	11		
27. 36 Transport Conductors	1149		
28. 37 Mail and Telegraph Distribution C	4235		
29. 38 Telephone and Telegraph Operators	1516		
30. 39 Clerical and RWNEC	14207		
31. 41 Working Proprietors (Wholesale an	26886		

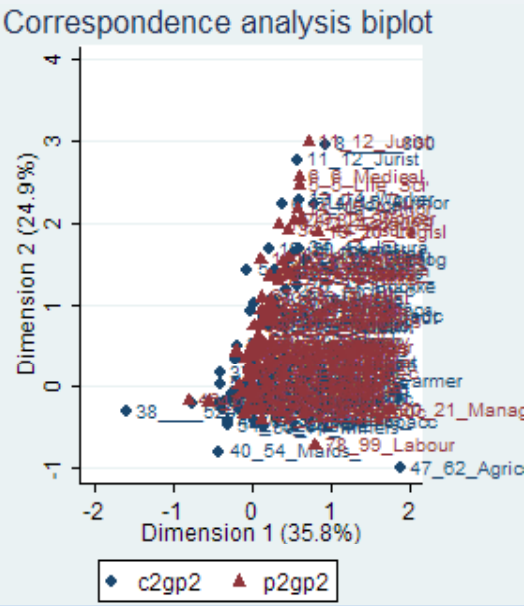
Command

C:\soft\stata10

Stata Graph - Graph

File Edit Object Graph Tools Help

Graph



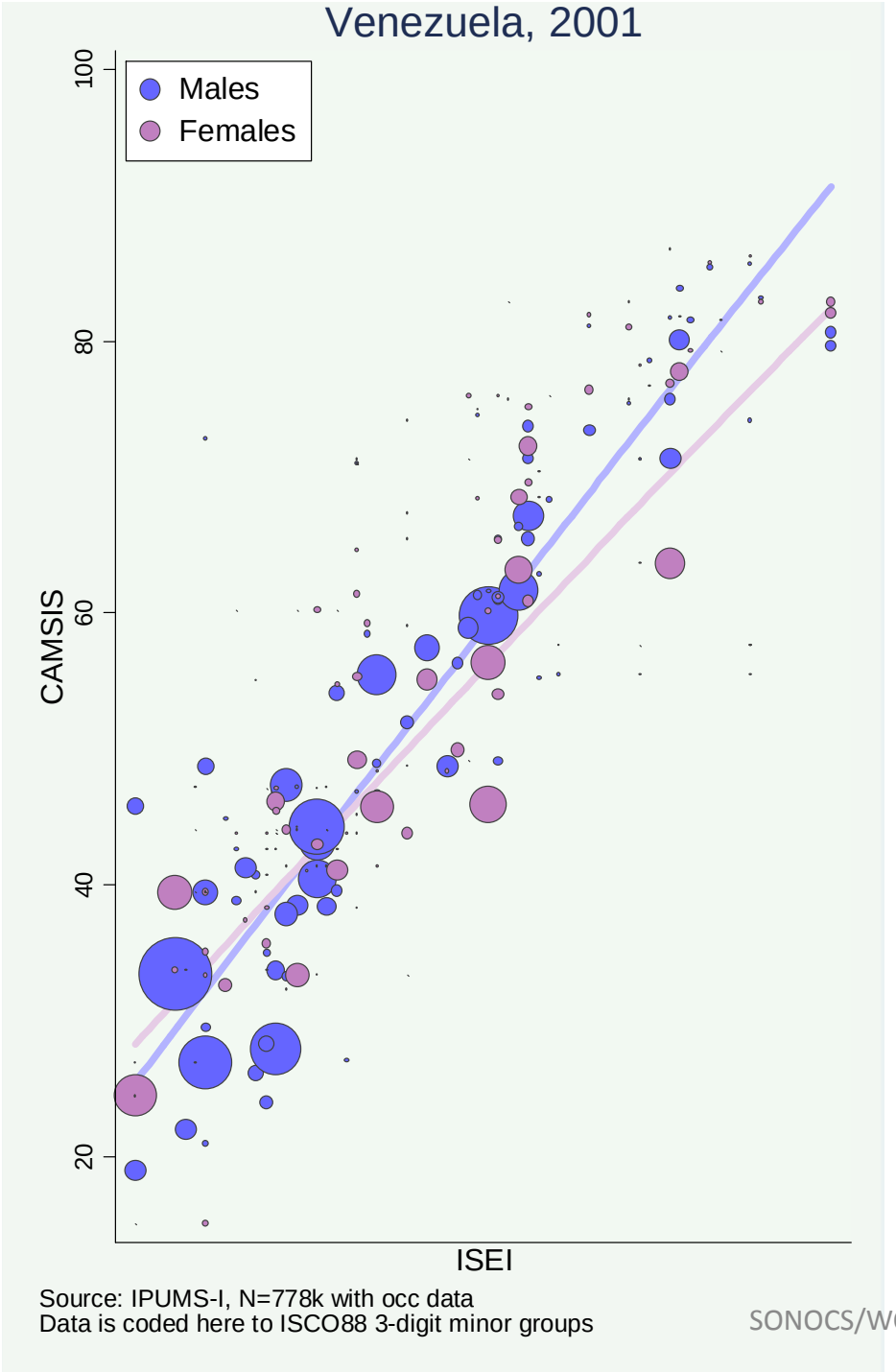
Stata Do-File Editor - ca_examples4.do

File Edit Search Tools

Untitled1.do | hiscam_20.do | ca_examples4.do

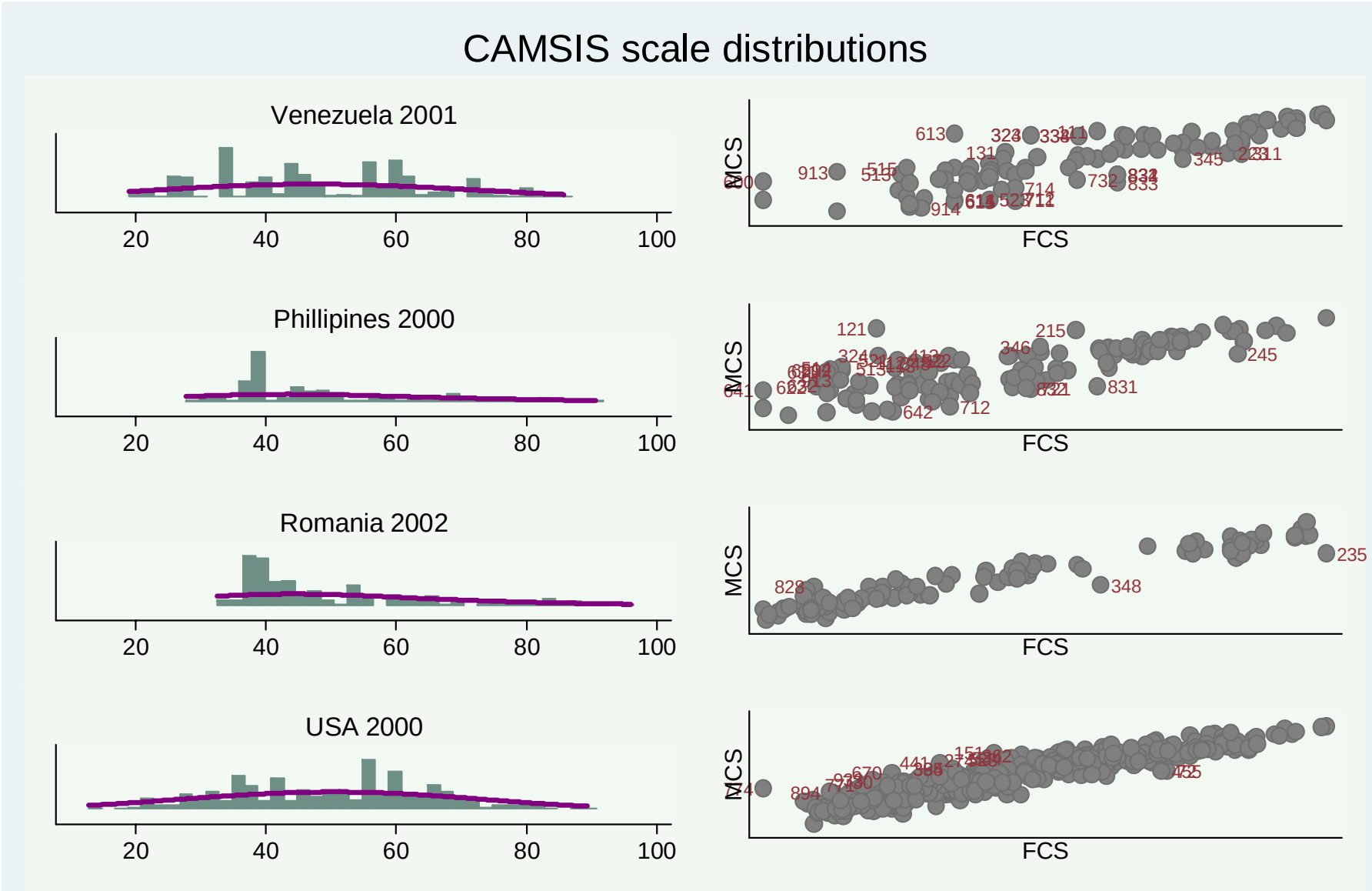
```
use $path9\hist1.dta, clear
list, nolabel
summarize c2gp2 p2gp2
tab c2gp2 [fweight=freq]
ca c2gp2 p2gp2 [fweight=freq], dim(2)
cabiplot
predict rowsc1, rowscore(1)
predict rowsc2, rowscore(2)
table c2gp2, c(sum freq mean rowsc2 mean rowsc1)
```

line number: 143

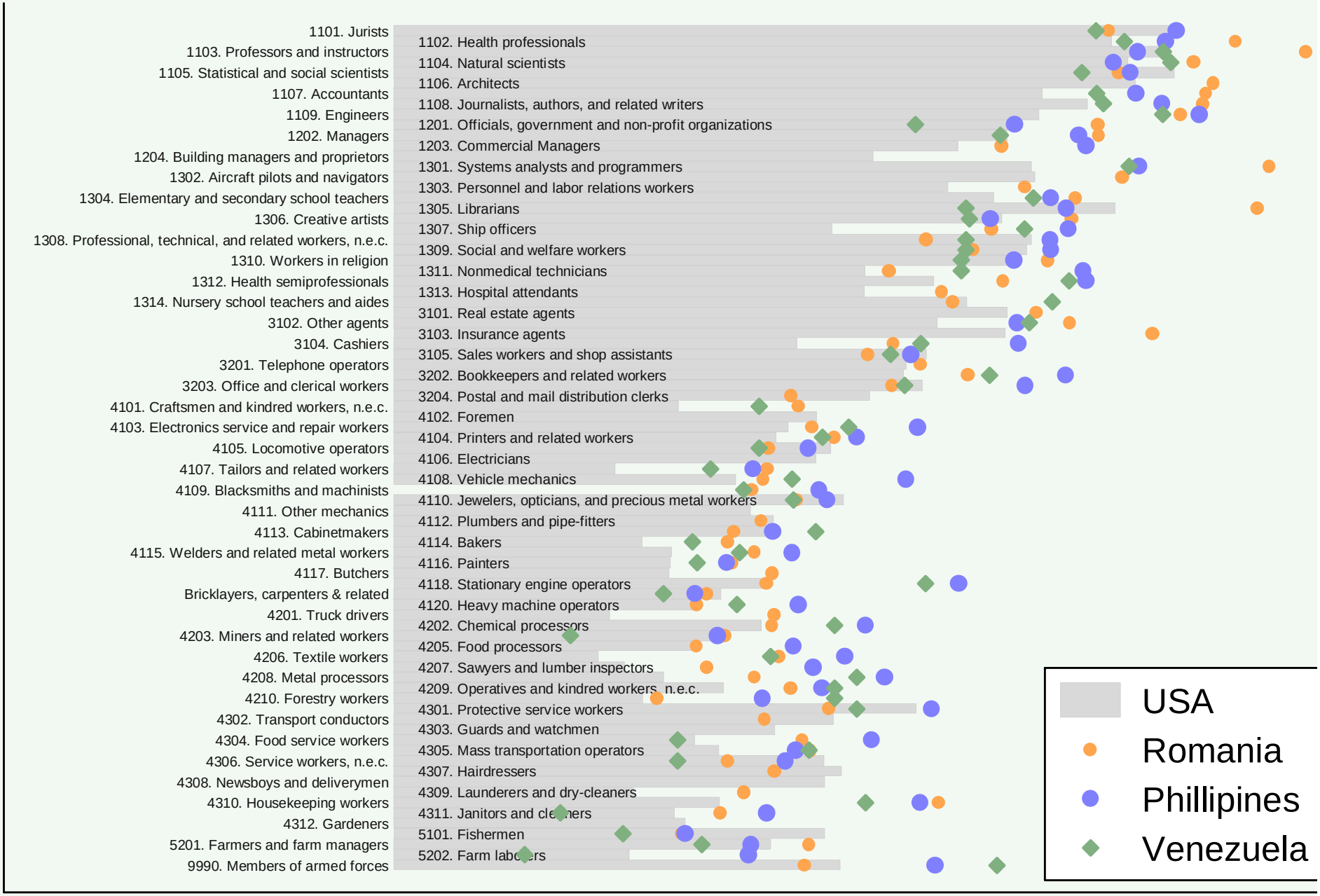


- *Using CAMSIS approaches, www.camsis.stir.ac.uk*
- First dimension of SID scales is usually 'social stratification'
  - We'd interpret it as the contour of social reproduction
  - Gradational, but 'lumpy' for operational reasons (occ.s)
  - 'Specificity' (many scales!)
- *Dimensions:*
  - *1 main one*
  - *numerous subsidiary patterns*
- *Boundaries:*
  - *None(?)*

Dimensions=1; Boundaries= none; or maybe 1 in Ro?



All microdata from IPUMS-I. CAMSIS scales at www.camsis.stir.ac.uk.
Histograms show distribution of male scale for all adults in work.
Scatterplots show unweighted male-female scores unweighted, ISCO88 3-digit or census SOC for USA



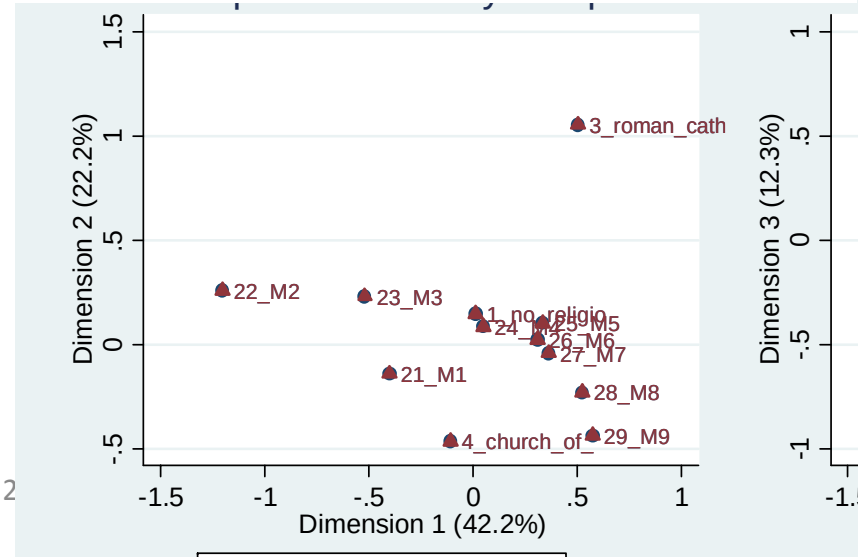
Male CAMSIS scale scores across four countries using 'microclass' units.

Analysing social interaction distances

Occupational units have been prominent in SID analyses, but association models can be used constructively in many other ways

- ✓ [Wong 2010]
- ✓ Educational and occupational mobility [e.g. Luijkx 1994]
- ✓ Cultural consumption, lifestyle and social position [e.g. Bourdieu 1984; Bennett et al. 2009]

This exploratory analysis looks at social distance involving mainstream religions and occupational groups in marriage patterns in Britain



5) Social network analysis

"..detecting and interpreting the social ties among actors.."
[de Nooy et al. 2011: 5]

- Actors ('vertices', 'Nodes') (subjects of analysis)
- Ties ('relations'; 'connections')
  - Directed ('arc')/undirected ('edge') ties
- Network (representation of actors and their ties)
  - Sometimes just study the patterns of connections actors have to others
  - When the Node is a social unit (e.g. occupation) it is possible to dichotomise whether or not disproportionately frequent connections to other things occur

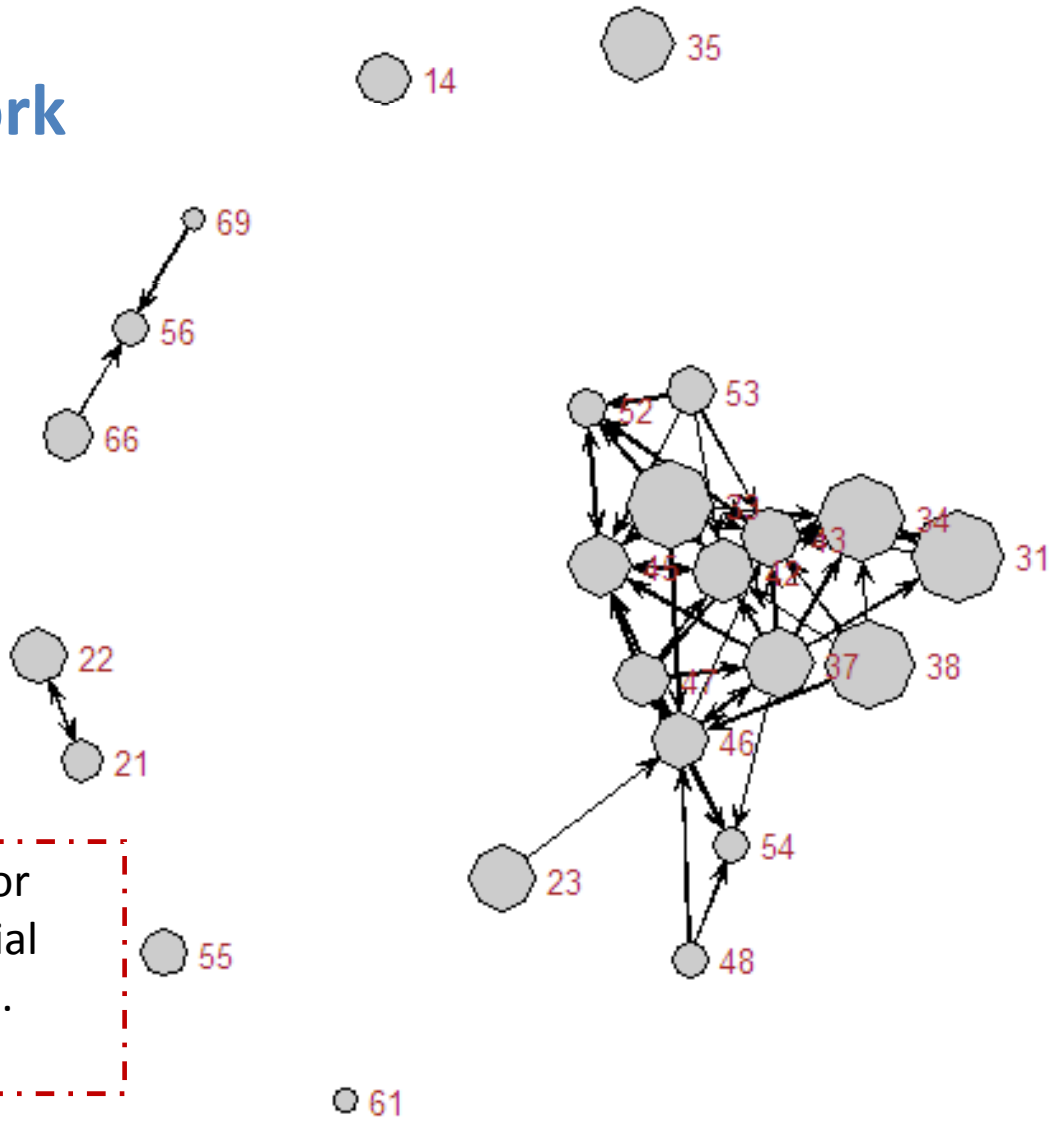
Graphs or statistics?

- Various statistical summaries of the structure of connections can be developed:

[cf. Knoke and Yang 2008; de Nooy et al. 2011]

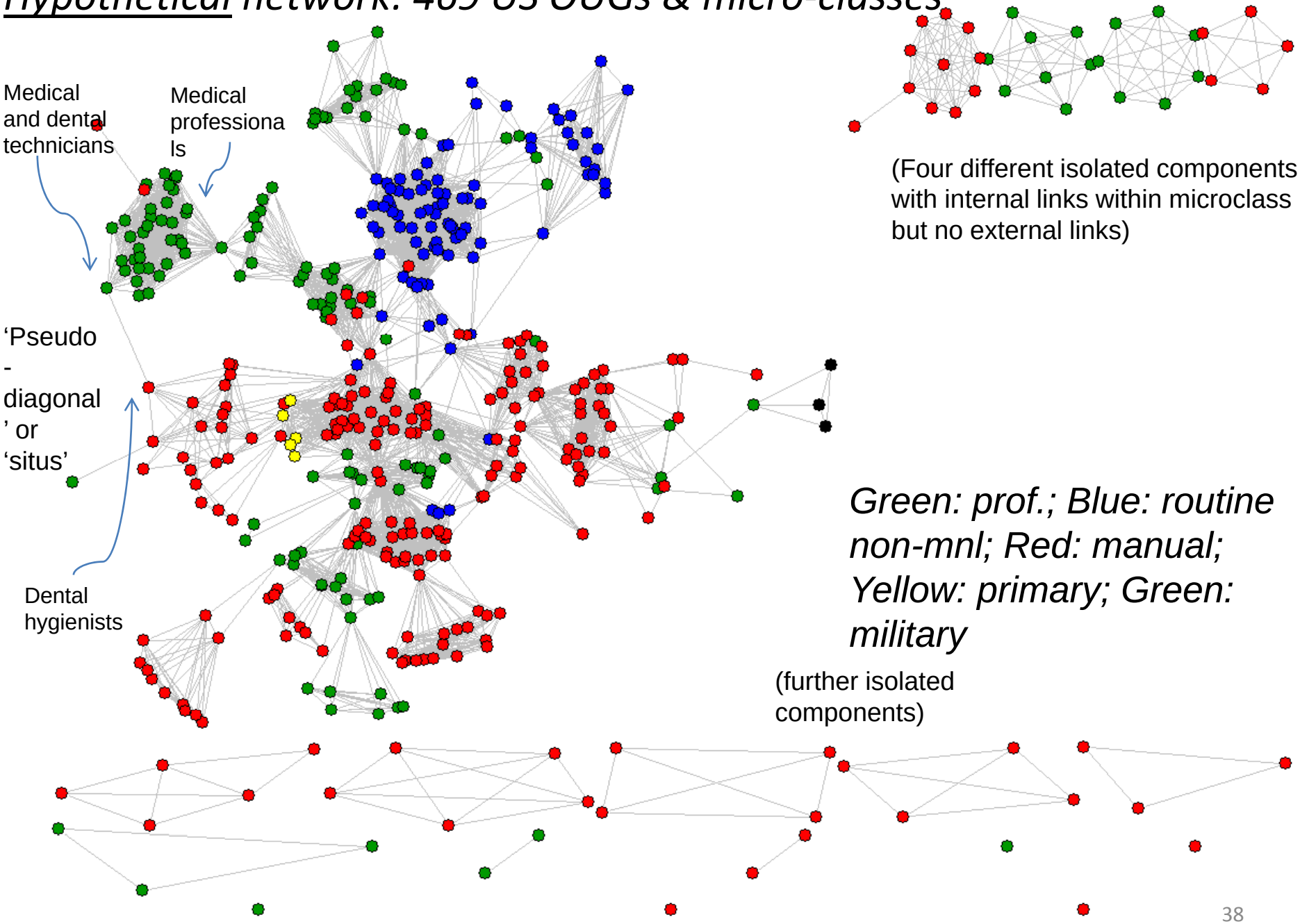
		E.g. : Occs, NAPP-USA, 1881
Cases	*Records behind analysis*	22,349
Nodes	*Units being linked*	45 ('microclasses')
Links (Ties)	*Number of links occurring (>2 times predicted cases)*	208
Strongest bond (* times expectation)	*Most disproportionate tie*	55
Network: Degree centrality	*Percentage of possible links which are actually formed*	.18
Network: Closeness centrality	*Measure of number of steps required for each node to access all others*	.26
Network: Components	*Isolated clusters within network*	1
Network: Distance	*Longest possible path between nodes*	5
Network: average distance	*Average of the length of the longest path for each node*	2.6

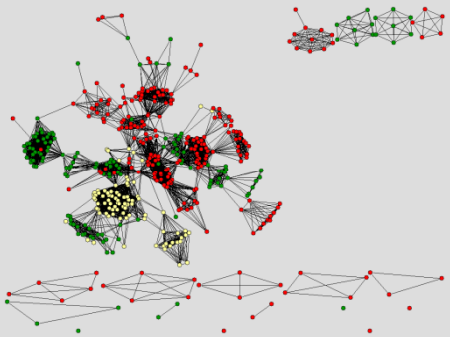
Social Network Analysis of occupations



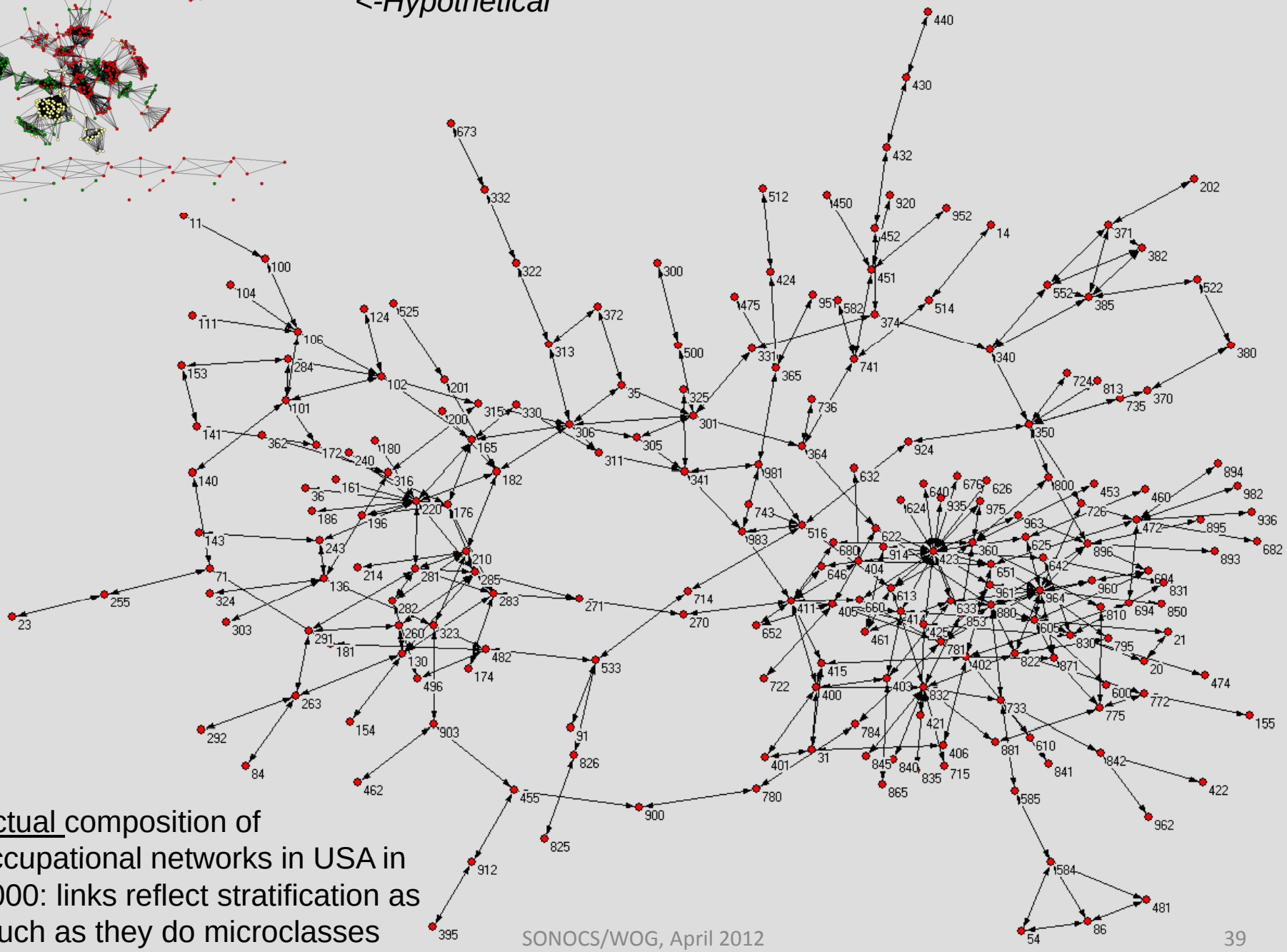
Network analysis to look for influential channels of social connections between occs. (camsis.stir.ac.uk/sonocs)

Hypothetical network: 469 US OUGs & micro-classes





<-Hypothetical

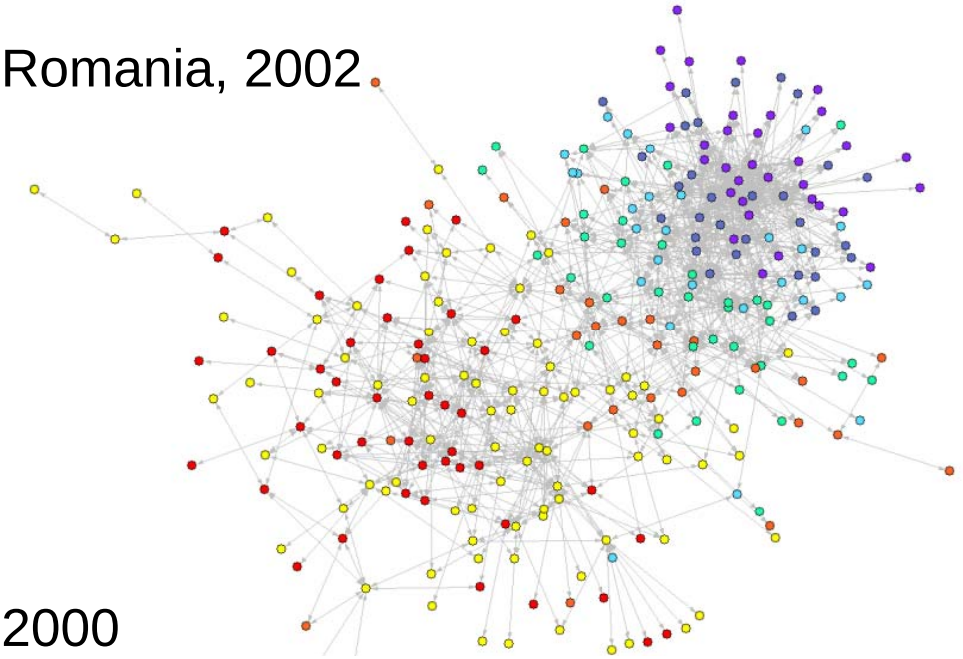


Actual composition of occupational networks in USA in 2000: links reflect stratification as much as they do microclasses and psds

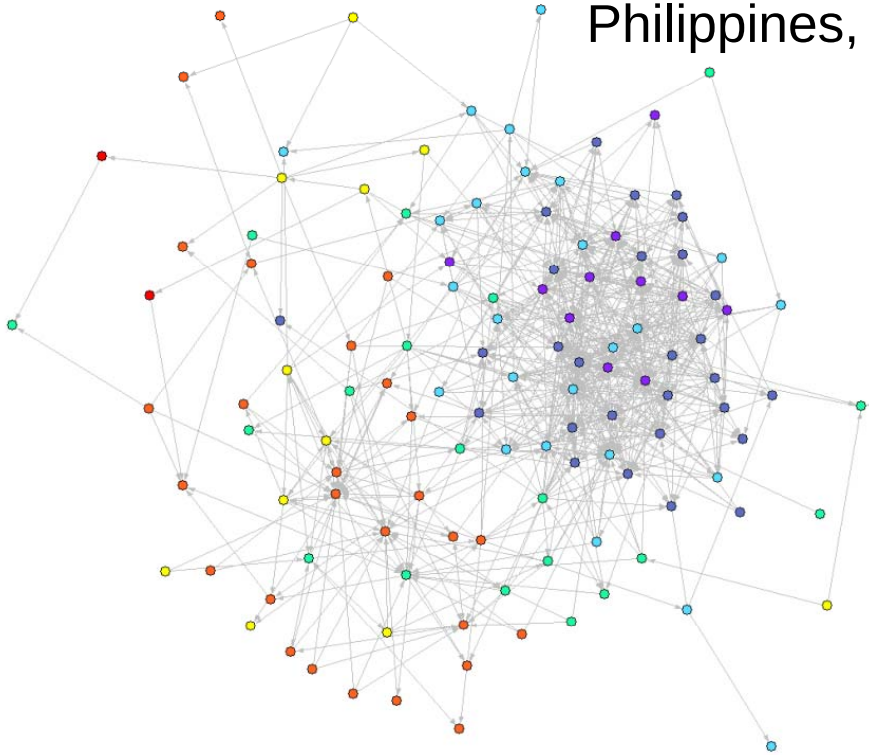
Red to violet for low to high CAMSIS (grouped into 7).

Structures similar to CAMSIS scales. Using Kamada-Kawai algorithm and no manual adjustment (expect removing some occs with no ties/relations)

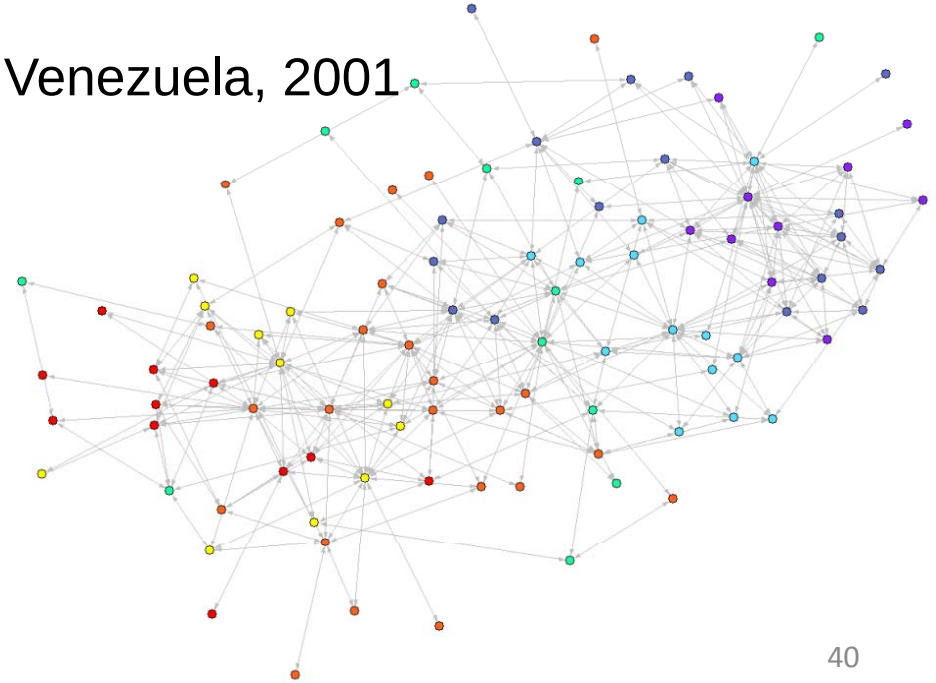
Romania, 2002



Philippines, 2000



Venezuela, 2001



6) Practical issues (ii): Software

Organising data on social connections:

- General purpose packages: Stata; R; [SPSS; etc]
- SNA packages for specific SNA formats

Analysis of data

- Statistical models:
  - Stata; R; [E-Stat: Browne et al. 2012] [etc]
- Association models
  - Stata [CA unlimited; RC2 restricted]
  - R [RC2 with standard errors, but slow]
- Network analysis
  - R (libraries include, see Tranmer 2011)
  - Pajek [freeware, wide range of coverage, no syntax]

‘Documentation’ (and its dissemination) is the key…

- By documentation we mean the ‘paper trail’
- For scientists, this is the log book / journal / laboratory notebook which provides ‘documentation for replication’
  - In the social sciences, there are few agreed standards [cf. Freese 2007]
  - But for quantitative researchers we can store data & syntax files during secondary survey research [Dale 2006]

Long 2009: Guidelines for effective social science documentation in Stata

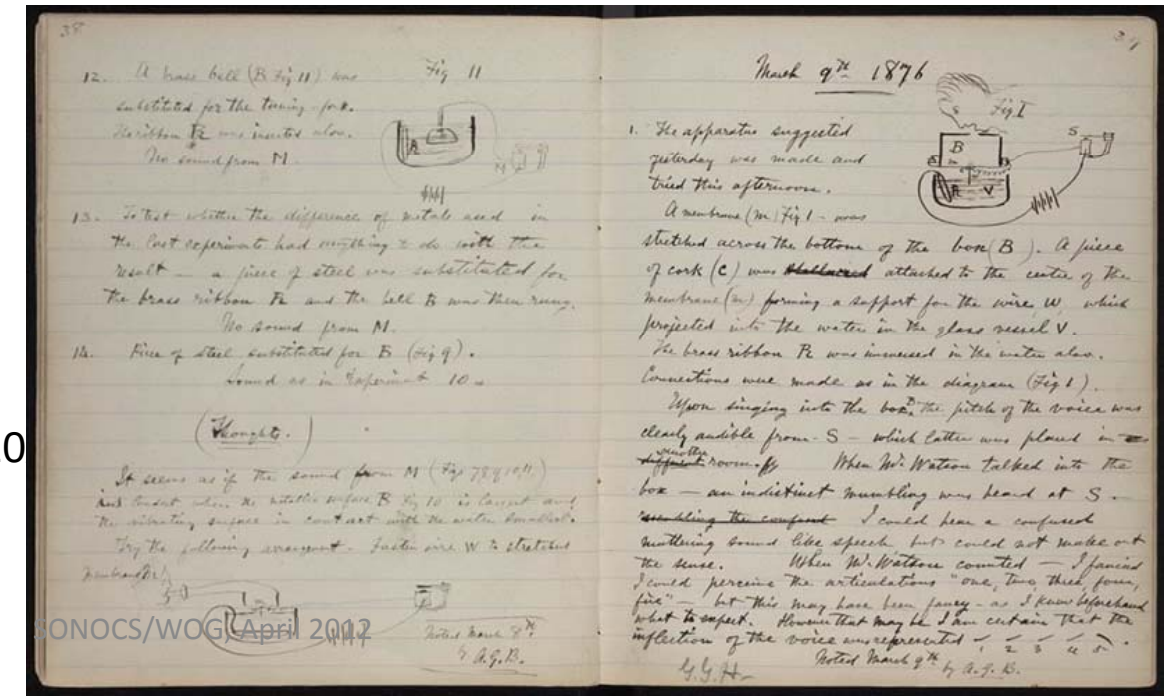

March 9th 1876

Fig 1

1. The apparatus suggested yesterday was made and tried this afternoon.

A membrane (m) Fig 1 - was stretched across the bottom of the box (B). A piece of cork (C) was attached to the center of the membrane (m) forming a support for the wire W which projected into the water in the glass vessel V.

The brass ribbon R was immersed in the water also. Connections were made as in the diagram (Fig 1).

Upon singing into the box the pitch of the voice was clearly audible from S — which latter was placed in another room. When Mr Watson talked into the box — an indistinct mumbling was heard at S.

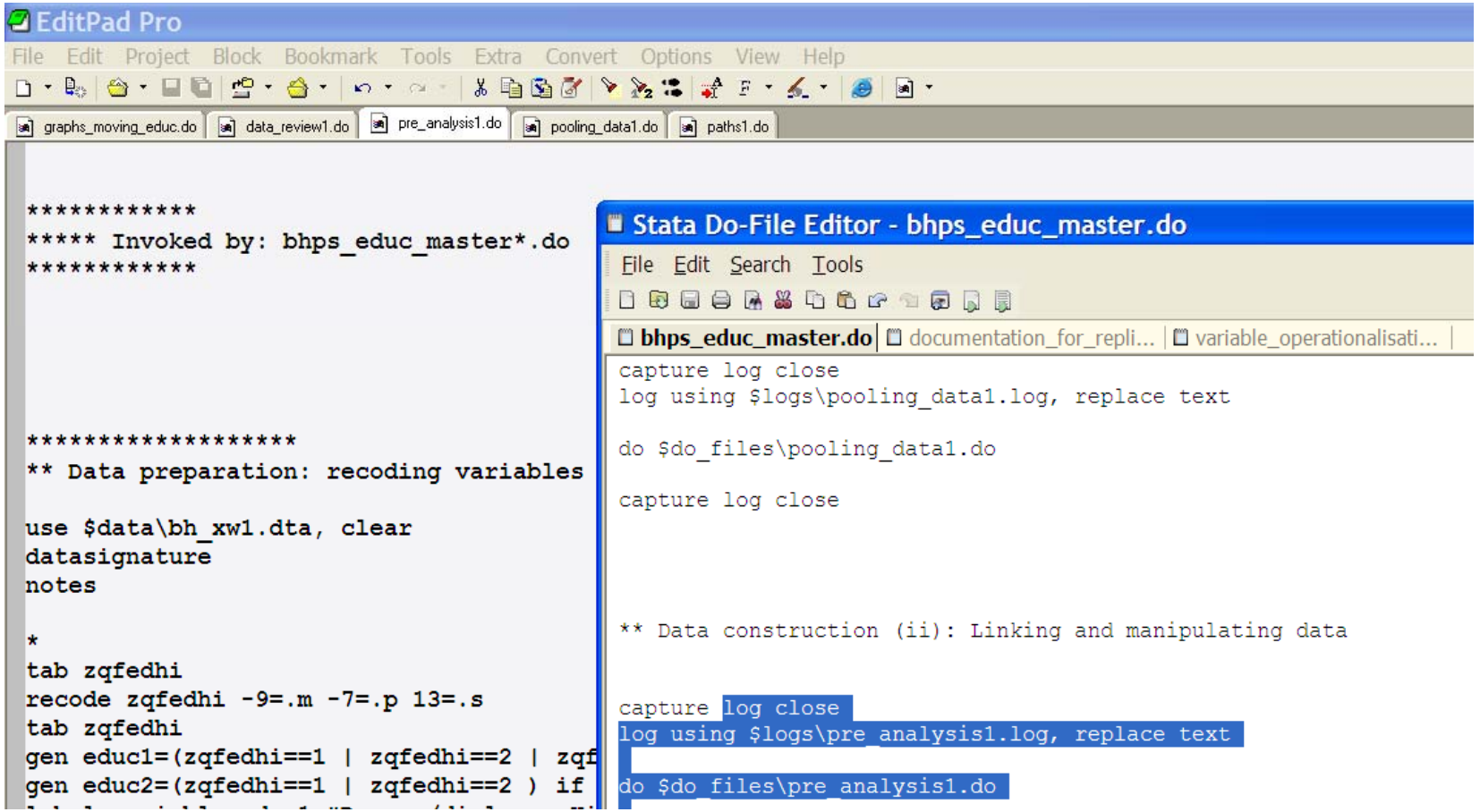
I could hear a confused mumbling sound like speech but could not make out the sense. When Mr Watson counted — I fancied I could perceive the articulations "one, two, three, four, five" — but this may have been fancy — as I knew beforehand what to expect. However that may be I am certain that the inflection of the voice was represented

Noted March 9th by A.G.B.

Image of Alexander Graham Bell’s 1876 notebook, taken from: http://sandacom.wordpress.com/2010/03/11/the-face-rings-a-bell/

In the 'DAMES' project, we wrote a guide for researchers...

- 'Software Session 1: Documentation & workflows with popular software packages' (www.dames.org.uk/workshops/stir10/docs_workflows_2010.html)
- Dozens of sample command files in SPSS, Stata and R from DAMES Node workshops at www.dames.org.uk



Lab sessions

- Handout features some short notes on packages
  - Syntax files (Stata do-files and R scripts) cover selected examples of data organitation and analysis in those packages, drawing upon example data
  - More extended handout instructions on using Pajek for nominated example dataset
    - Access to Stata: own arrangements
    - Access to R: http://www.r-project.org/
    - Access to Pajek: http://pajek.imfm.si/doku.php [de Nooy et al. 2011]
    - *Warning: Large datasets sometimes lead to slow performance in opening and/or processing data*

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