Virtual Worlds

Modelling A Local Authority Using the FRS



Why?

- Localism agenda: Benefits increasingly devolved to local authorities;
- Social Care;
- Born of failure: we were asked to bid for a project to do this – we didn't get it!

How?

- The FRSs we have don't include LA identifiers
- In any case, samples would be small, and sample is stratified.
- Instead: find weights so the sample looks like the council

How?

- Technique is an extension of the method used to create the basic FRS weights included in the dataset
- Council populations differ in (e.g)
 - Proportions employed and unemployed
 - Racial composition
 - Age Structure
 - Numbers on Benefits
- And many others

How?

- Get Data on these things broken down by council from Nomis, HMRC, DWP...
- Make a dataset with the same variables from FRS
- Find a set of weights such that the FRS data sums to the council totals
- Infinitely many sets of weights are possible
- Pick the set that minimises the distance (in some sense) between the final weights and some initial (usually uniform) set of weights.
- Problem is then a constrained minimisation problem familiar in economics

How: Choosing Weights?

- A variety of distance measures are possible
- See Creedy (2006) and Deville and Sarndal (1992) (Atkinson (1989) for a discussion;
- Obvious one: sum of squared deviations ('Chi-square') doesn't work because weights can be negative
- Various 'entropy' measures proposed, but these can be unstable
- 'Constrained chi' works well, usually minimise sum of squared deviations between uniform and new weights but place constraints on how far new weights can deviate from initial weights e.g. must be positive.

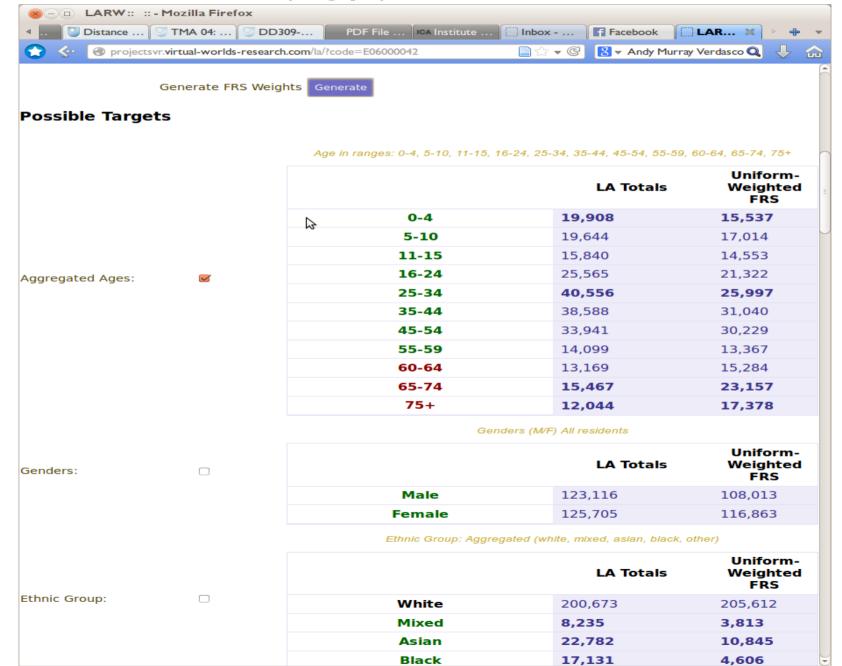
Limitations

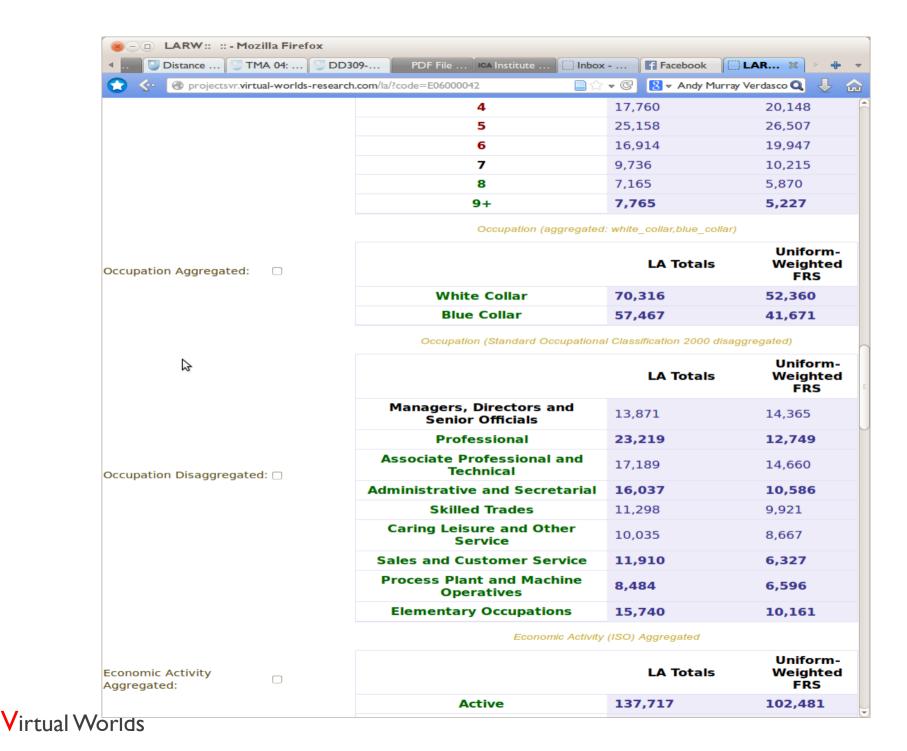
- Can only fix composition differences distributions of (e.g.) wages, housing costs will be corrected only to the extent that they are due to differences in composition (a council has disproportionate number of professionals, large houses, etc.);
- Composition variables not in the targets set may be made worse by the new weights;
- Program doesn't always converge

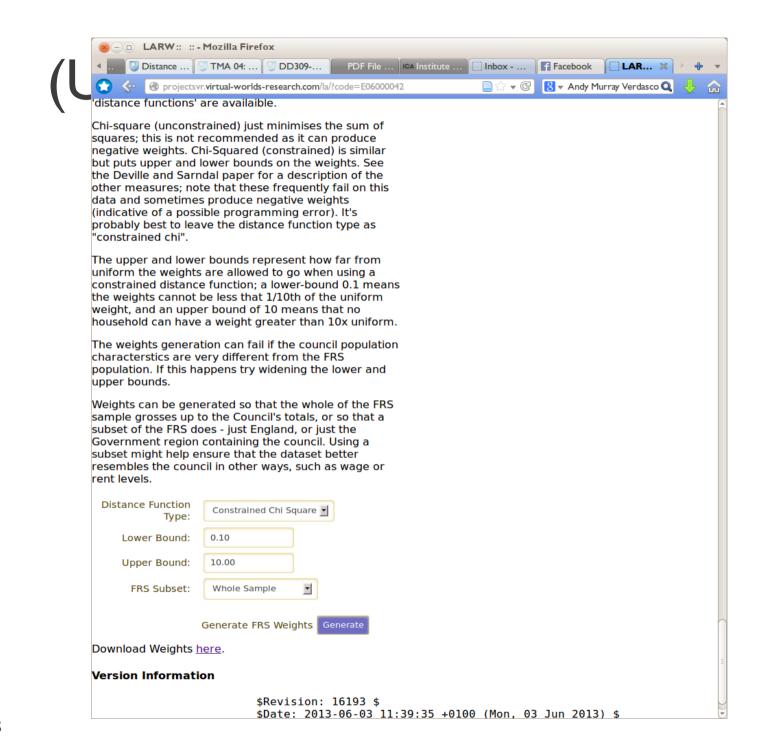
Implementation

- Written in Ada
- Data in relational database
- Council target data assembled from
 - Nomis Census Data
 - HMRC Tax Credit Data
 - Benefit Receipts from DWP and Nomis
- FRS data from 2009/10 and 2010/11 (other datasets possible)
- Getting NOMIS and FRS consistent is fiddly
- Minimisation code based on Creedy
- Generates Household-Level weights
- Has (very ugly) web interface http://projectsvr.virtual-worlds-research.com/la/
- All downloadable from http://virtual-worlds-research.com/downloads/

(Ugly!) User Interface









Example Output

YEAR	SERNUM	WEIGHT
910	1	1.999
910	2	2.087
910	3	2.882
910	4	1.092
910	5	1.113
910	6	1.542
910	7	1.324
910	8	3.538
910	9	1.521
910	10	1.542
910	11	1.627
910	12	2.087
910	13	3.019
910	14	1.777
910	15	2.369
910	16	1.753



Do do

- Add code to correct wages, housing costs, other incomes, given composition:
 - Quite good disaggregated data on wages from LFS
 - Housing costs data seems less good (regional only?)
 - Haven't investigated other incomes
 - Probably never be able to capture some councils properly (Westminster)
- Support other datasets;
- Wider range of targets;
- Different aggregations (regions, police authorities, metropolitan areas..);
- Build directly into tax-benefit model;
- Nicer interface.

- Run the program: http://projectsvr.virtual-worlds-research.com/la/
- Download the code: http://virtual-worlds-research.com/downloads/
- Further Reading:

Creedy (2003) "Survey Reweighting for Tax Microsimulation Modelling"

Deville, J.-F. and Sarndal, C.-E. (1992) Calibration estimators in survey sampling. Journal of the American Statistical Association 87