Essays on the provision of long term care to older adults in Scotland: did administrative data help?

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EHE Academic Meeting 21st February 2020

Overview

- Brief background

- Whistle stop tour of my PhD

- Did the administrative data help?

Brief background

- Undergraduate degree in Economics in Stirling (2009-2013)
  - Dissertation on the cost of free prescriptions in Scotland
  - Internship at HERU Aberdeen

- Masters in Economics in Edinburgh (2013-2014)
  - Dissertation on the impact of disability legislation on employment outcomes for the disabled

- PhD in Economics back in Stirling (2014-2018)*
  - Costs at the end of life
  - Costs of living alone
  - Costs of polypharmacy

Brief background

- Had access to social care, housing and health linked data set (XRB14001)

- Applied to update this data in April 2016

The Motivation

- **Changing structure of Scottish population**
  - The number of people aged 75+ is projected to increase by 27% over the next ten years and increase by 79% over the next 25 years.

- **Pressure on long term care services**
  - Expansion of morbidity
  - Shrinking social care resource

- **The role of unpaid carers**
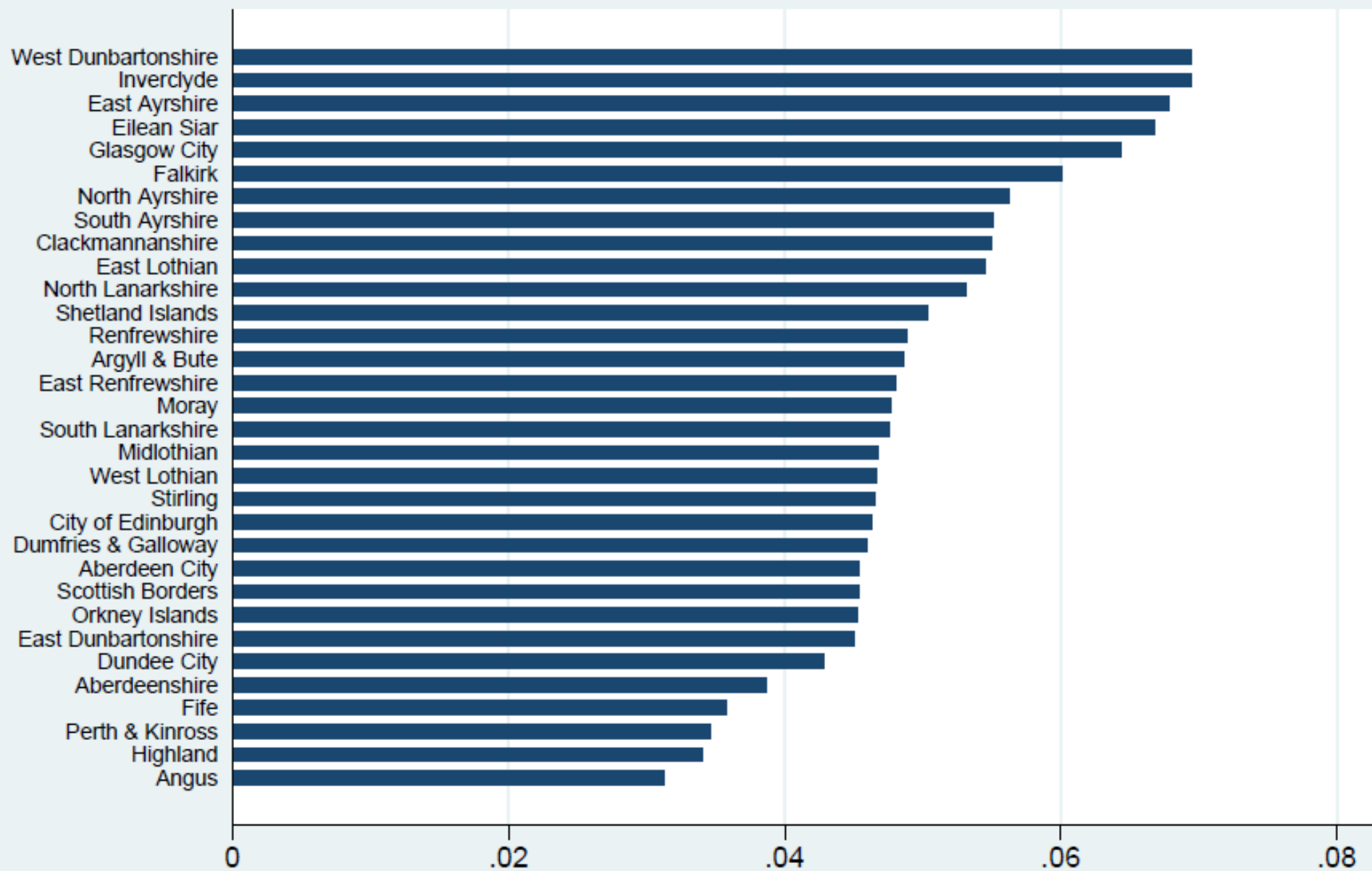 - About 17% of the population aged 50-64 are unpaid carers. 11% for 65+

My PhD

- **Paper 1:** Variations in domiciliary free personal care across Scottish local authorities

- **Paper 2:** Utilisation of personal care services in Scotland: the influence of unpaid carers

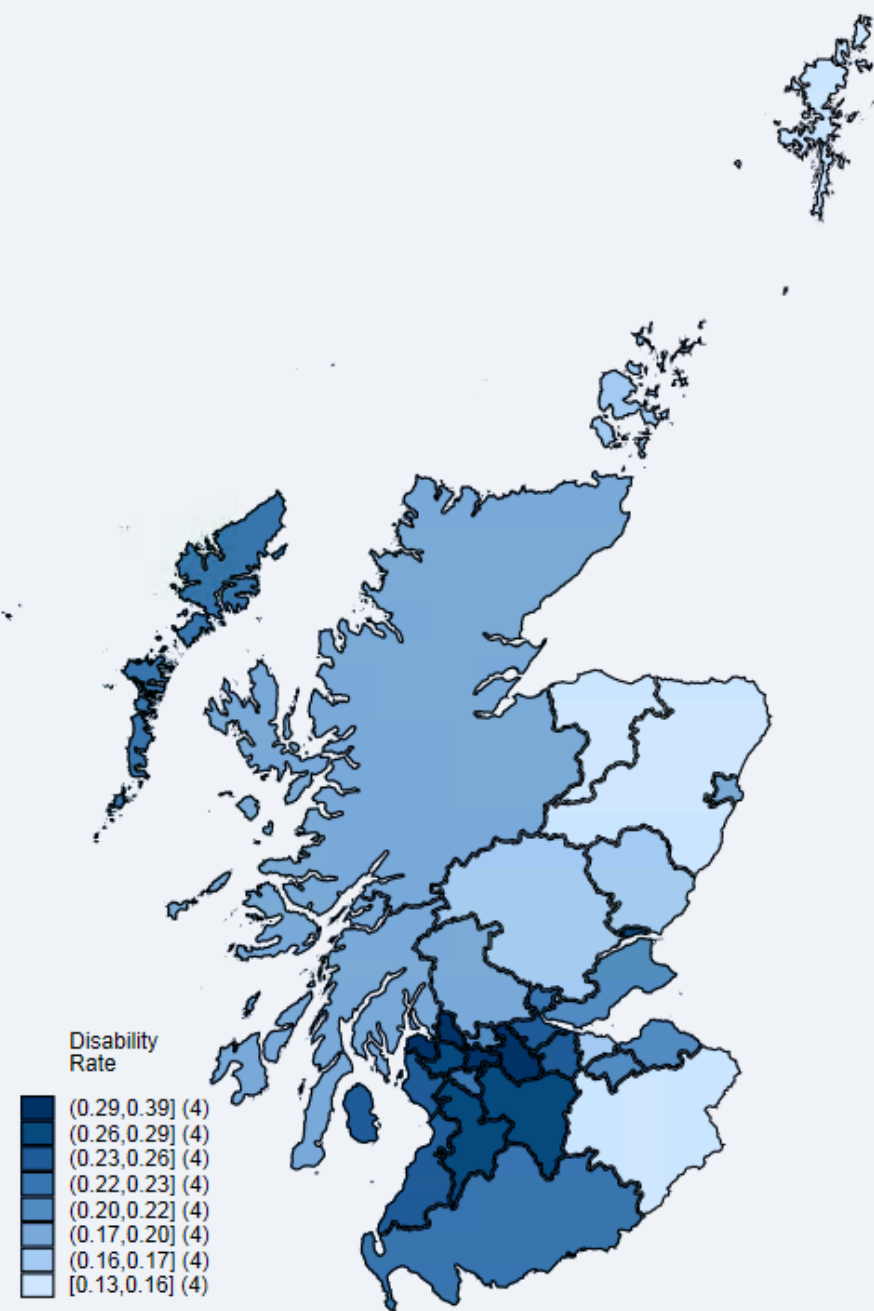- **Paper 3:** The cost of unpaid care: a standard of living approach

Paper 1:

Variations in domiciliary free personal care across Scottish local authorities

Free Personal Care Rate
Mean = 0.05

Free Personal
Care Rate

(0.06,0.07] (4)
(0.05,0.06] (4)
(0.05,0.05] (4)
(0.05,0.05] (4)
(0.04,0.05] (4)
(0.04,0.04] (4)
(0.03,0.04] (4)
[0.03,0.03] (4)

Disability
Rate

(0.29,0.39] (4)
(0.26,0.29] (4)
(0.23,0.26] (4)
(0.22,0.23] (4)
(0.20,0.22] (4)
(0.17,0.20] (4)
(0.16,0.17] (4)
[0.13,0.16] (4)
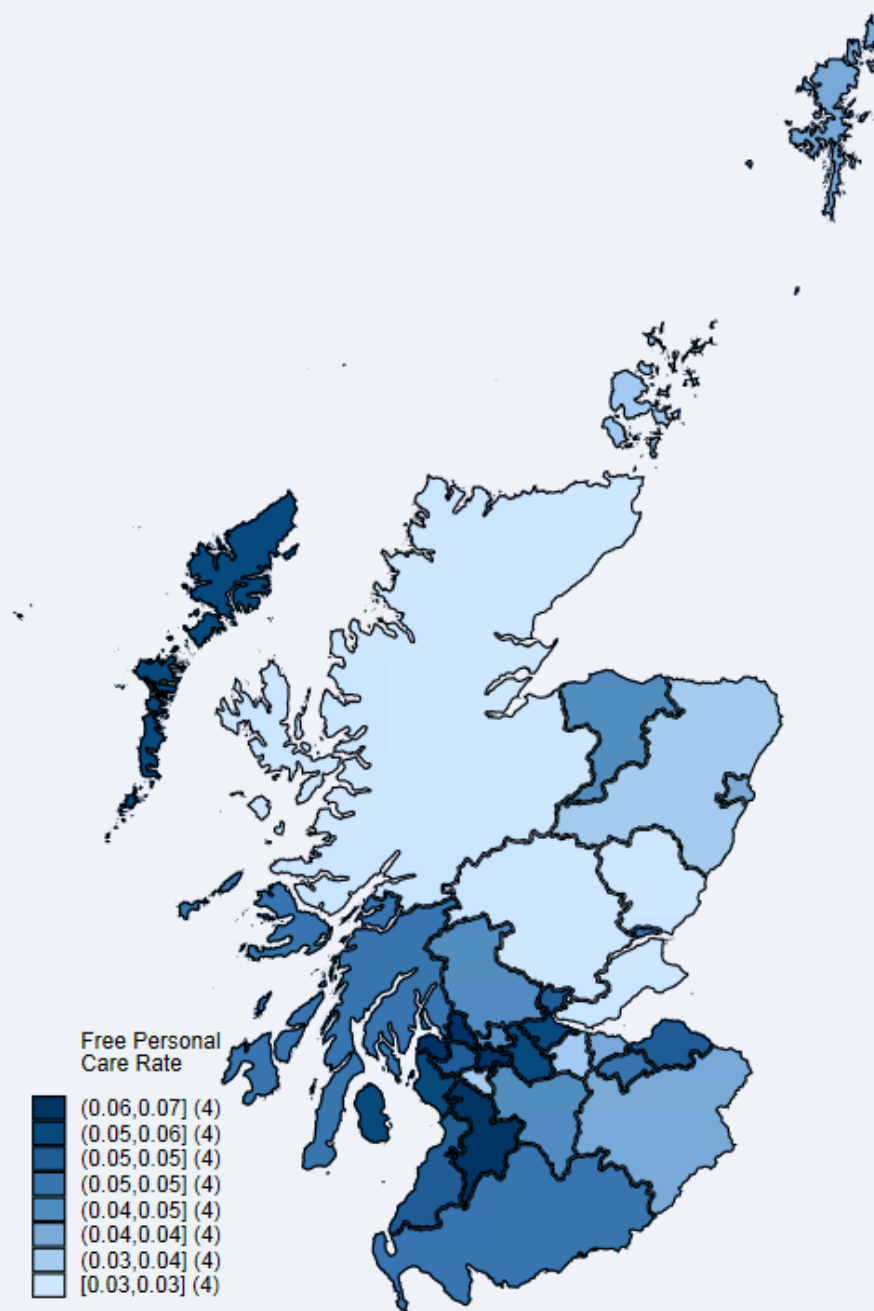
Aim and contribution

- To offer evidence on the existence of geographic inequity in FPC provision, alongside evidence of what factors could be driving this inequity.

  - Looking at LTC
  - Unique context in Scotland
  - Geographic inequity
  - Unique administrative dataset- Scottish Social Care Survey

Key variables and data

- Free Personal Care Rate (FPCR)

- Personal care need

    - Disability Rate (DR) - Disability benefits including Attendance Allowance (AA) and Personal Independence Payments (PIP). Administered at UK level.

    - 85+, gender, life expectancy, standard deviation of DR

The Model

$$y_{it} = f(n_{it}, m_{it}, a_{it}, g_{it}, p_{it})$$

Where:

i	geography (local authority, data zone)
t	time period in years
y_{it}	the free personal care rate
n_{it}	needs-related characteristics
m_{it}	availability of other forms of care
a_{it}	access to care indicators
g_{it}	expenditure on FPC
p_{it}	political preferences

Analysis

$$y_{it} = \alpha + X_{it}\beta + u_{it}$$

- Pooled OLS

- Fixed and random effects

- Spatial autocorrelation models to test for spillover effects

	Pooled	FE	RE	Spatial RE
Disability Rate	0.0564**	0.291	0.0791*	0.0957*
	(0.022)	(0.193)	(0.043)	(0.050)
Expenditure on FPC	-0.000622*	-0.00136***	-0.00118***	-0.00119***
	(0.000)	(0.000)	(0.000)	(0.000)
Gender	-0.082	0.306	0.026	0.001
	(0.102)	(0.327)	(0.161)	(0.176)
Age	0.251***	0.0488***	0.0510***	0.052
	(0.062)	(0.017)	(0.014)	(0.058)
Life Expectancy	-0.00317**	-	-0.002	-0.002
	(0.001)	-	(0.002)	(0.003)
Married	-0.0560*	-	-0.056	-0.048
	(0.030)	-	(0.057)	(0.057)
Income Deprivation	0.011	0.404	0.003	0.003
	(0.007)	(0.371)	(0.011)	(0.016)
Standard Deviation DR	-0.054	0.000	-0.151	-0.118
	(0.068)	-	(0.106)	(0.110)
Political Preferences	0.000	-	0.000	0.000
	(0.000)	-	(0.000)	(0.000)
2014	0.000	0.002	0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.001)
2015	-0.003	0.002	-0.001	-0.001
	(0.002)	(0.003)	(0.001)	(0.001)
2016	-0.004	0.003	-0.002	-0.002
	(0.002)	(0.004)	(0.002)	(0.001)
Constant	0.177***	-0.235	0.105	0.111
	(0.061)	(0.232)	(0.114)	(0.113)
ρ	-	-	-	-0.094
	-	-	-	(0.089)
λ	-	-	-	0.023
	-	-	-	(0.232)
Moran Test for Spatial Dependence (prob >chi2)	N/A	N/A	N/A	-
Wald Test of Spatial Terms (prob >chi2)	N/A	N/A	N/A	0.555
R-Squared	0.47	0.34	0.43	0.452
Observations	128	128	128	128

Robust standard errors are shown in parentheses; * p <0.10, ** p <0.05, *** p <0.01.

Edinburgh
FPCR

■ (0.07,0.27] (109)
■ (0.05,0.07] (110)
■ (0.03,0.05] (109)
■ (0.02,0.03] (110)
□ [0.00,0.02] (110)

Glasgow
FPCR

■ (0.09,0.32] (137)
■ (0.07,0.09] (138)
■ (0.05,0.07] (137)
■ (0.03,0.05] (136)
□ [0.00,0.03] (140)
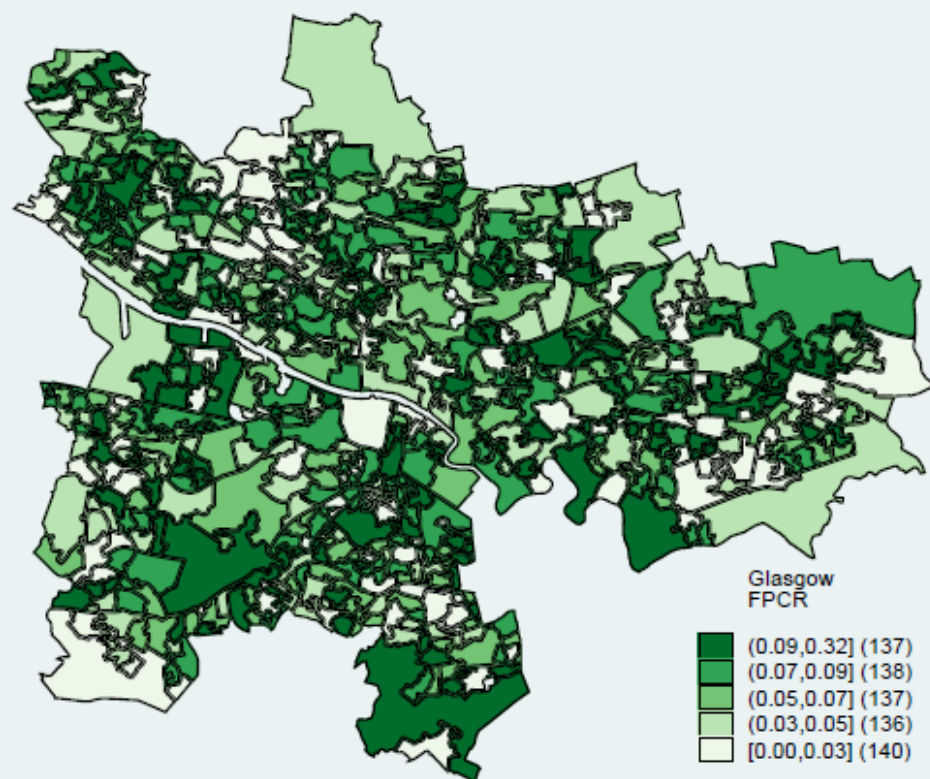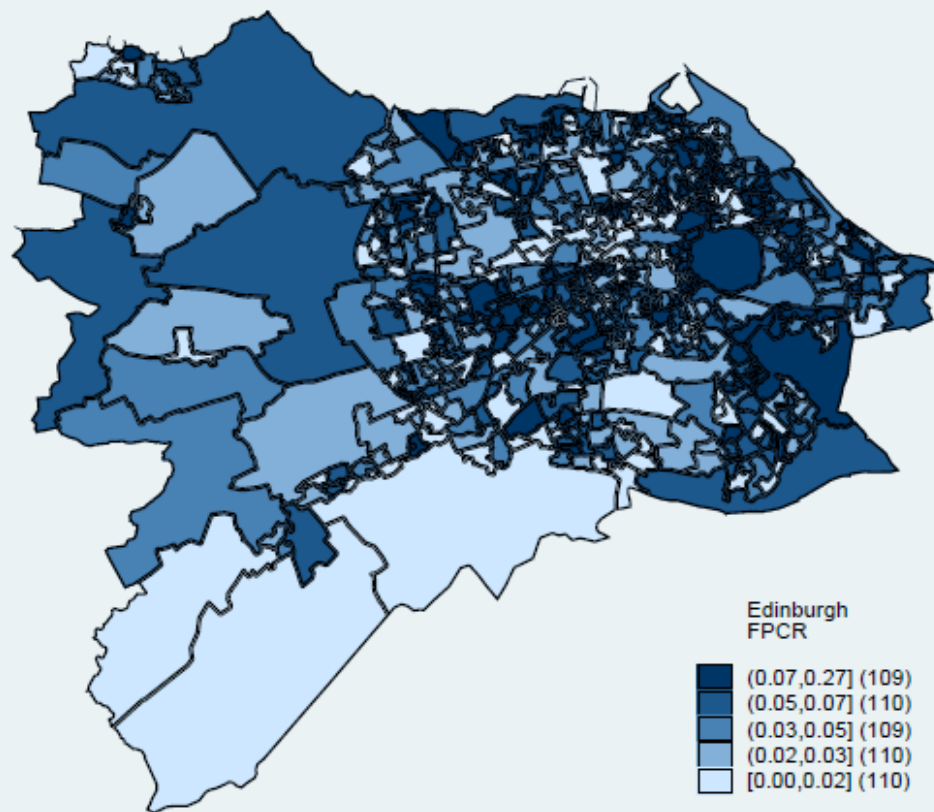
	Pooled	FE	RE	Spatial Edin 2013	Spatial Edin 2014	Spatial RE Edin
Disability Rate	0.151***	0.0502***	0.119***	0.111***	0.182***	0.114***
	(0.007)	(0.006)	(0.005)	(0.014)	(0.015)	(0.011)
Gender	0.0448***	-0.008	0.0404***	0.0499**	0.0639***	0.0353**
	(0.009)	(0.015)	(0.007)	(0.020)	(0.021)	(0.017)
Age	0.106***	0.0950***	0.106***	0.0627***	0.020	0.0593***
	(0.010)	(0.010)	(0.008)	(0.017)	(0.018)	(0.015)
Married	-0.0175***	-	-0.0227***	0.000	-0.004	-0.005
	(0.005)	-	(0.005)	(0.007)	(0.008)	(0.007)
Income Deprivation	-0.0212***	-0.009	0.001	0.018	-0.0535***	0.008
	(0.006)	(0.014)	(0.006)	(0.018)	(0.020)	(0.016)
Standard Deviation DR	0.202	0.223	0.215	-	-	-
	(0.160)	(0.158)	(0.158)	-	-	-
2014	0.001	0.000	0.000	-	-	0.002
	(0.001)	(0.001)	(0.001)	-	-	(0.001)
Constant	-0.0523**	0.008	-0.0418*	-0.018	-0.0224*	-0.007
	(0.025)	(0.021)	(0.025)	(0.012)	(0.012)	(0.010)
ρ	-	-	-	0.092	0.069	0.0976*
	-	-	-	(0.073)	(0.074)	(0.053)
λ	-	-	-	-0.030	0.135	0.129
	-	-	-	(0.112)	(0.105)	(0.095)
Moran Test for Spatial Dependence (prob >chi2)	N/A	N/A	N/A	0.46	0.01***	-
Wald Test of Spatial Terms (prob >chi2)	N/A	N/A	N/A	0.36	0.03**	0.00***
Local Authority Dummies	Yes	Yes	Yes	N/A	N/A	N/A
R-Squared	0.41	0.03	0.41	0.27	0.33	0.29
Observations	12,996	12,996	12,996	548	548	1,096
Robust standard errors are shown in parentheses; * p <0.10, ** p <0.05, *** p <0.01						

Results

- The DR is consistently positively associated with the FPCR

- Significance of local authority dummies suggests geographic inequity

- Spatial models show spillovers

- Loss of information not available at data zone level

Results and conclusions

- Despite universal coverage, we find evidence of geographic inequity with respect to FPC provision

- Possible explanations include local authorities strategies at managing demand

- Needs distributions

- Further research necessary

- Implications of taking over of new powers

Paper 2:

Utilisation of personal care services in Scotland: the influence of unpaid carers

Motivation

- **2 competing hypotheses:**

    1. Substitution hypothesis

    2. Complementary hypothesis

- Mixed evidence in the literature

- Policy implications and consequences on the costs of formal care services will differ depending on which hypothesis holds

Aim and contribution

- To explore how unpaid carers influence Free Personal Care use by Scots aged 65 and over

  o First evidence for Scotland
  o Unique administrative dataset- Scottish Social Care Survey

The Model

$$PC_i = f(UC_i, X_i, \varepsilon_i)$$

- Where i indexes individual
- PC is weekly personal care hours
- UC is an indicator of unpaid care
- X is a vector of other socio-demographic and health characteristics including age, gender, local authority, need indicators, year.
- ε is the random error term.
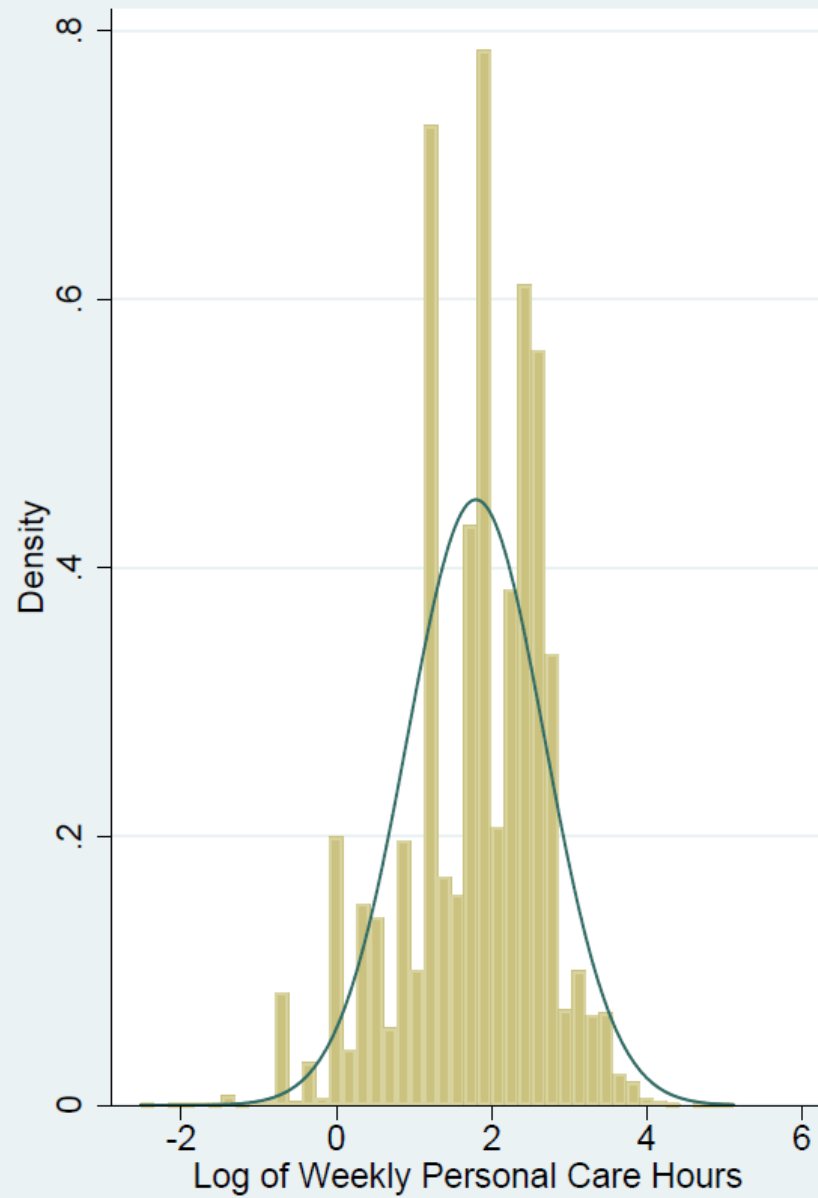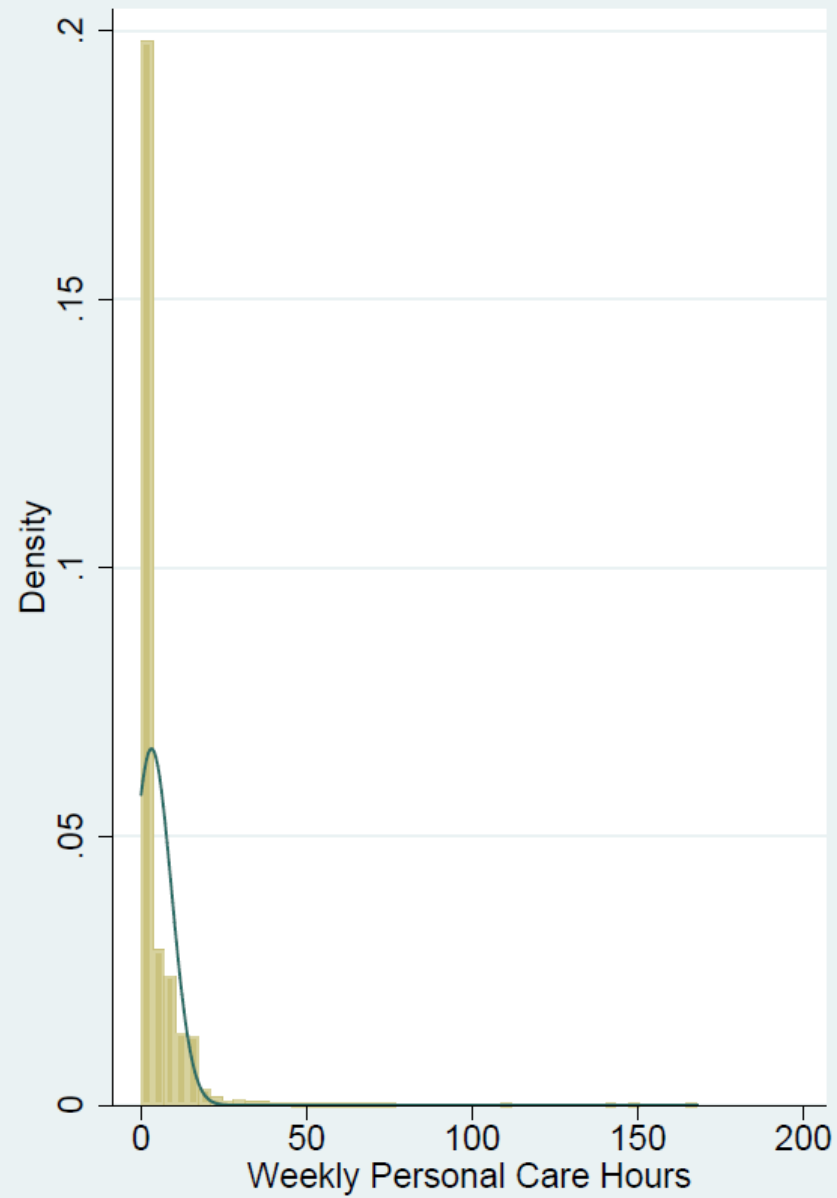
Analysis

- 3 estimations:
  - **1**: OLS with logged personal care hours

$$E[lnPC_i|UC_i, X_i] = (\beta_{uc}UC_i + X_i'\beta + \epsilon_i)$$

  - **2**: Generalized Linear Model (GLM)

$$E[PC_i|UC_i, X_i] = g^{-1}(\beta_{uc}UC_i + X_i'\beta + \epsilon_i)$$

  - **3**: Two- Part Model (2PM)

$$Pr[PC_i > 0|UC_i, X_i] = \Phi(\alpha_{uc}UC_i + X_i'\alpha + \xi_i)$$

$$E[PC_i|PC_i > 0, UC_i] = g^{-1}(\beta_{uc}UC_i + X_i'\beta + \epsilon_i)$$

| Variable	OLS	GLM	2PM (P1)
Aged 75-84	-0.00818	-0.0273*	0.0511***
	(0.016)	(0.016)	(0.016)
Aged 85-94	0.0506***	0.0252	0.0155
	(0.016)	(0.017)	(0.016)
Aged 95+	0.150***	0.125***	0.0326
	(0.026)	(0.023)	(0.027)
Female	0.0250**	0.0262**	0.0313***
	(0.011)	(-0.0102)	(-0.0112)
Has unpaid carer	0.114***	0.106***	0.269***
	(0.013)	(0.013)	(0.015)
No. Oth Services	0.125***	0.100***	-0.185***
	(0.008)	(0.007)	(0.008)
Dementia	0.0222	0.0161	0.00458
	(0.017)	(0.015)	(0.018)
Multistaff	0.994***	0.939***	-
	(0.017)	(0.015)	-
SCS previously	0.0633***	0.0437***	0.169***
	(0.013)	(0.012)	(0.014)
2015	-0.156***	-0.120***	-0.663***
	(0.020)	(0.018)	(0.021)
2016	-0.113***	-0.0742***	-0.353***
	(-0.0207)	(-0.0189)	(-0.0214)
Constant	1.521***	1.886***	0.511***
	(0.120)	(0.123)	(0.128)
Observations	25,423	25,423	67,682
Marginal Effect	0.80***	0.90***	1.23***

*Robust standard errors are shown in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*
Local authority dummies are included but are not presented in output.

Results and conclusions

- Incremental effect of unpaid care on personal care hours:
  - **OLS**: 50 minutes per week
  - **GLM**: 54 minutes per week
  - **2PM**: 1 hour 14 minutes per week

- Unpaid care tends to complement personal care services.

- Robust to a variety of sensitivity and endogeneity checks.

- Number of limitations mainly concerning the data.

Paper 3:

The cost of unpaid care: a standard of living approach
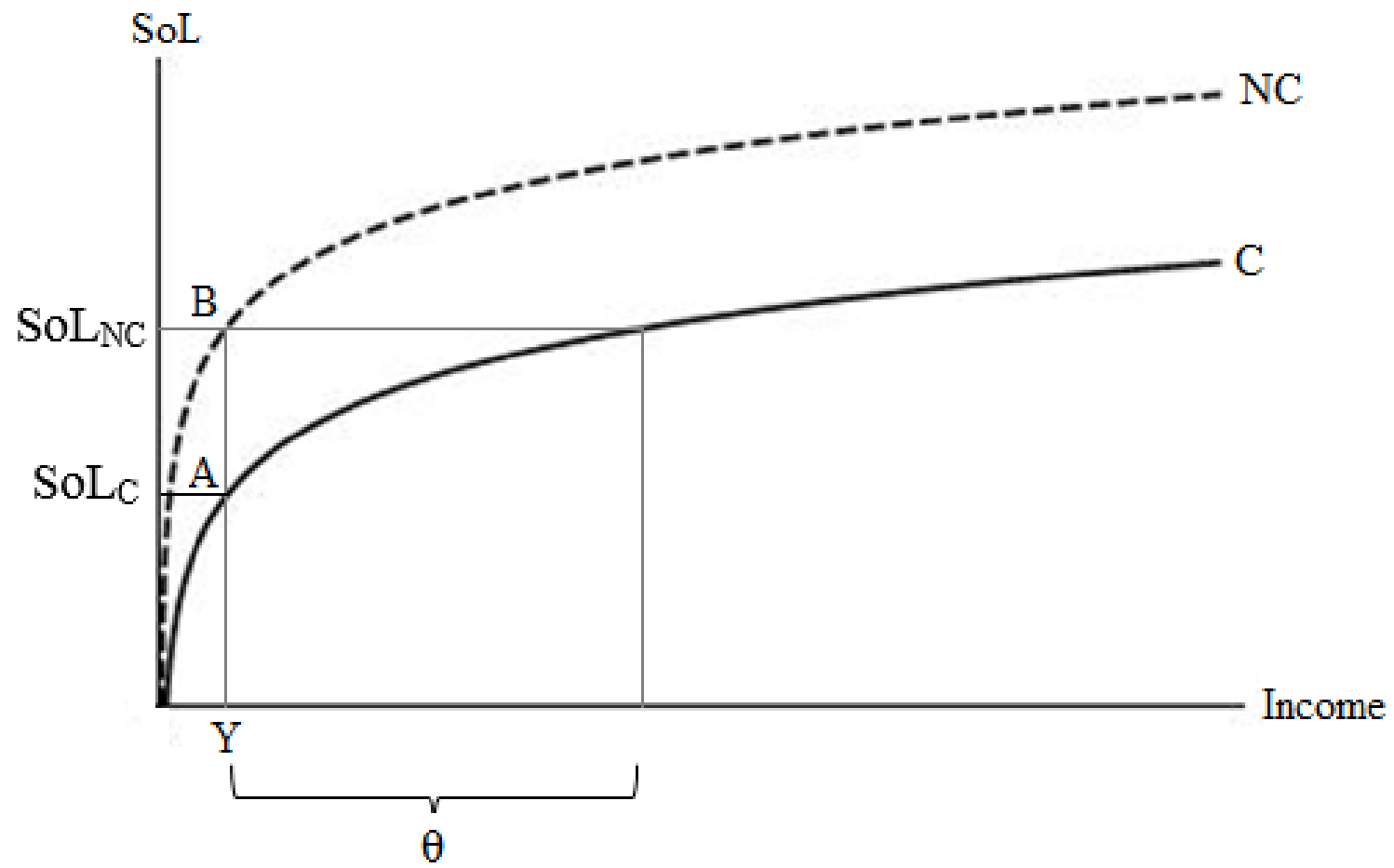
Motivation

- Current costing methods:-
    - o Opportunity cost
    - o Proxy goods
    - o Discrete choice experiments
    - o Well being approach

- Reliance on accurate measure of time spent caring.

- Underestimation highly likely

Aim and contribution

- Seeks to estimate the monetary cost associated with the provision of unpaid care provision.

    o Focus on material impact of caregiving rather than time
    o First evidence on ability of carers allowance to appropriately compensate unpaid carers

The Model

- Data from Family Resources Survey

$$SoL_j = \beta_1 f(Y) - \beta_2 C_j$$

Where:

SoL_j represents the SoL of individual j

$f(Y)$ represents some function of income Y

C_j represents an indicator of the care status of individual j, i.e. carer or non-carer.

The Model

The necessary compensation for providing care, θ, is calculated such that it gives a carer the same SoL as a non-carer. Hence:

$$SoL_{NC} = SoL_C$$

$$\beta_1 f(Y) = \beta_1 f(Y + \theta) - \beta_2$$

Three functional forms of income are specified: linear, log and log-quadratic. This results in three compensation parameters:-

$$\theta_1 = \frac{\beta_2}{\beta_1}; \; \theta_2 = Y\left[e^{\frac{\beta_2}{\beta_1}} - 1\right]; \; \theta_3 = exp\left[\frac{-\beta_1 + \sqrt{\beta_1^2 + 4\alpha c}}{2\alpha}\right] - Y$$

Where: $c = \beta_1 lnY + \alpha(lnY)^2 + \beta_2$

Analysis

$$SoL_i^* = \beta_1 f(Y_i) - \beta_2 g(C) + Z'\beta_3 + \epsilon_i$$

- Where i indexes individuals.
- Where $SoL*$ is a latent variable made up of 12 SoL indicators.
- $f(Y)$ represents the three functional forms of income and β_1 their corresponding effects on SoL.
- $g(C)$ represents the care status of the individual and β_2 the associated coefficients.
- Z' captures all other observable, individual characteristics.
- ϵ captures other unobserved influences on SoL.

Variable	Specification (1)	(2)	(3)
Income (β_1)	0.00228***	-	-
	(0.000)	-	-
Carer (β_2)	-0.361***	-0.435***	-0.366***
	(0.102)	(0.103)	(0.100)
Disabled	-1.487***	-1.456***	-1.323***
	(0.072)	(0.072)	(0.069)
Retired	1.652***	1.498***	1.695***
	(0.103)	(0.102)	(0.103)
Age	0.0541***	0.0587***	0.0579***
	(0.003)	(0.003)	(0.003)
University	0.738***	0.887***	0.618***
	(0.073)	(0.074)	(0.071)
Married	0.414***	0.312***	0.0911
	(0.056)	(0.056)	(0.056)
Year	0.233***	0.234***	0.213***
	(0.023)	(0.023)	(0.023)
ln income(β_1)	-	1.421***	-2.429***
	-	(0.055)	(0.205)
(ln income)^2 (α)	-	-	0.348***
	-	-	(0.020)
Constant	4.665***	4.761***	4.348***
	(0.295)	(0.299)	(0.273)
AIC	68665.3	68320.7	67850
BIC	68908.4	68563.7	68100.6
θ	$\theta_1 = £158$	$\theta_2 = £200$	$\theta_3 = £101$
N	14,706	14,679	14,679

*Robust standard errors are shown in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*

Variable	Specification		
	(1)	(2)	(3)
Income (β_1)	0.00226***	-	-
	(0.000)	-	-
Live with carer (β_2)	-0.882***	-1.033***	-0.857***
	(0.154)	(0.156)	(0.151)
Parent carer (β_3)	0.0142	-0.0124	-0.013
	(0.133)	(0.133)	(0.130)
Disabled	-1.473***	-1.439***	-1.310***
	(0.072)	(0.072)	(0.068)
Retired	1.680***	1.532***	1.721***
	(0.104)	(0.103)	(0.103)
Age	0.0538***	0.0583***	0.0575***
	(0.003)	(0.003)	(0.003)
Univesity	0.733***	0.878***	0.613***
	(0.073)	(0.074)	(0.071)
Married	0.441***	0.342***	0.117*
	(0.057)	(0.057)	(0.056)
Year	0.236***	0.238***	0.216***
	(0.023)	(0.023)	(0.023)
ln income (β_1)	-	1.413***	-2.404***
	-	(0.055)	(0.204)
(ln income)^2 (α)	-	-	0.346***
	-	-	(0.020)
Constant	4.652***	4.741***	4.335***
	(0.294)	(0.298)	(0.272)
AIC	68647.5	68297.3	67833.6
BIC	68898.1	68547.9	68091.8
θ	$\theta_4 = £390$	$\theta_6 = £506$	$\theta_8 = £229$
	$\theta_5 = £0$	$\theta_7 = £0$	$\theta_9 = £0$
N	14,706	14,679	14,679

*Robust standard errors are shown in parentheses: * $p <0.05$, ** $p <0.01$, *** $p <0.001$*

Results and conclusions

- Unpaid carers experience a significant reduction in their SoL due to caring.

- This reduction is far greater for those who are living with the person being cared for.

- According to the best fitting model, they would need to be compensated by £229 per week.

- The current carers allowance is £64.60 per week.

- Limitations- positive effects, care networks, monetary payment as compensation, selection problem.

PhD Reflections

- The problems associated with the provision of LTC to older adults is only going to continue to grow.

- Unmet need is a particular difficulty.

- The administrative data struggle is real!

Administrative Data Reflections

- Did the administrative data help?

  - Yes! But…

    - Original PhD questions: Costs at the end of life; Costs of living alone; Costs of polypharmacy
    - Lack of controls
    - Missing data, differences between local authorities
    - Data needed on carer and cared for
    - Approvals and data linkage process

Administrative Data Reflections

- How can things change going forward?

  - There needs to be more information available to researchers
  - [Early Career Researchers Using Scottish Administrative Data (eCRUSADers)](#)
  - Answering policy relevant questions needs the right data
  - Data repositories

Thank you!

SG team: Julie, Ellen, Guy and Kirsty