Economic insecurity in the UK: first evidence from longitudinal EUROMOD data

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(data preparation and * slides by Nick Buck)

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This presentation

1. A first application of EUROMOD on longitudinal data from Understanding society (UKHLS) for the UK.

2. A first test of a new measure of economic insecurity (Richiardi and He, 2019) in the UK.

EUROMOD based on longitudinal data

- "Frontier research in microsimulation modelling": Application to longitudinal data?
- Using microsimulation as an enhancement to panel analysis
- Using panel data as an enhancement to microsimulation
- Validation of UKHLS data – e.g. improved basis for household net income measures
- Improved input data for cross-sectional simulation – measures that depend on history
- Link to other data collected in UKHLS

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Data

- Understanding Society (UKHLS): the largest longitudinal study of its kind - around 40,000 households (at Wave 1).

- Ethnic minority boost

- Biomarkers and genetic data

- Can be linked to administrative data

- We now have a live version of UKHLS-EUROMOD for 7 waves which can be used for microsimulation (work done by Nick Buck, based on earlier work by Ricky Kanabar, Paul Fisher and Nicole Martin)

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Advantages of UKHLS *

- Household panel structure and repeated measurements on same subjects over time
- Focus on many of the issues core to EUROMOD data requirements
- Rich data on other subjects not covered by typical EUROMOD source data
- Large sample size
- ISER has internal access to data with fewer restrictions (e.g. geo-data) and also data created as part of income imputations

Challenges of UKHLS *

- Some (limited) data gaps compared with requirement
- Missing data issues, especially incomplete households
- Two-year fieldwork period – how align with policy years?

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Data gaps (complete households) *

EUROMOD TARGET VARIABLES NOT COMPUTED IN CURRENT UKHLS IMPLEMENTATION	
boactcm	Secondary State Pension UKHLS asks if state pension includes serps. Assume the recorded state pension amount includes the serps amount?
yiynt	Exempt investment income (ISA, PEP, Member of Share Club and NSB Ordinary account)
yiytx	Taxable investment income
bdimb	Disability living allowance (mobility) – single DLA variable collected
bhlwk	Statutory sick pay
buntr	Training allowance
bedsl	Student loan
bmaer	Statutory Maternity Benefit (Work related, paid by employer) assume included with gross pay
boaht	Winter Fuel Payments
yls	Redundancy payment - converted to monthly
xhcot	EXPENDITURE : Housing cost : Other, including water and sewerage charges
xhcsc	EXPENDITURE : Housing cost : Service Charges
yot02	last earnings not from the last pay period
lhw02	LABOUR MARKET : Hours worked per week : 02 Total hours of work as employee-last earnings before last pay period

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Variables not available for proxy and non-response cases *

dcz	DEMOGRAPHIC : Citizenship
ddipd	DEMOGRAPHIC : Disability period
afc	ASSETS : Financial Capital
tpcpe	monthly Contribution made to private and occupational pensions (tpcpe)
liwwh	LABOUR MARKET : In work : Work history (length of time in months)
lim	LABOUR MARKET : Insurance Scheme Member – contracted in or out
xmp	EXPENDITURE : Maintenance Payment
xcc	EXPENDITURE : Child Care
xpp	EXPENDITURE : Private Pension (voluntary)

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Variables not available for within-household non-respondents *

ddi	DEMOGRAPHIC : Disability, disabled or not disabled
dec	DEMOGRAPHIC : Education - Current Status
deh	DEMOGRAPHIC : Education - Highest Status
deh02	DEMOGRAPHIC : Education - Highest Status
dew	DEMOGRAPHIC : Education - When achieved Highest Status
dey	DEMOGRAPHIC : Education - Number of Years
les	LABOUR MARKET : Economic Status
lcs	LABOUR MARKET : Civil Servant
lhw	LABOUR MARKET : Hours worked per week
lin	LABOUR MARKET : Industry (NACE)
loc	LABOUR MARKET : Occupation (ISCO 1-Digit)
lowas	LABOUR MARKET : Out of work : Actively Seeking
lcr01	LABOUR MARKET : Carer for dependent person
lcr02	LABOUR MARKET : Caring for dependent person
lle	LABOUR MARKET : On leave
lhw00	LABOUR MARKET : Hours worked per week : Main/Basic
lhw01	LABOUR MARKET : Hours worked per week : 01

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Data construction

1. Single-wave implementation
2. Multi-wave implementation

Validation: Single-wave *

Selected Simulated Taxes and Benefits (with take-up correction) Wave 4 / 2012

	N Recipients (thousands)			Expenditure (£ million)		
	EUROMOD FRS	EUROMOD UKHLS	Admin sources	EUROMOD FRS	EUROMOD UKHLS	Admin sources
Income tax	31375	29401	30600	126448	122085	150030
SIC Employees (Class 1)	19321	19768		39698	37483	41194
SIC Employers	19891	20500		52478	46450	60830
SIC Self employed (Class 2 + any Class4)	2476	2666		3802	4076	2458
Child Benefit (N families, expenditure)	7825	7821	7920	12042	12324	12167
Working Tax credit (all)	1493	1817	2295	3981	4454	7094
Child Tax Credit (all)	3521	3619	4110	16307	16358	21685
Either CTC or WTC	3851	4024	4622	20288	20812	28779
Without children (WTC only)	330	405	512	574	701	1191
Job Seekers allowance (contributory)	146	75	196	522	272	662
Income Support+JSAinc	3337	2576	2514	12812	8053	9816
Income based ESA	819	1404	887	4709	7720	4475
Income Support+JSAinc+inc ESA	4156	3980	3401	17521	15773	14291
Income Support lone parents only	620	316	534	2379	1136	2085
Pension Credit - any / total	2225	1932	2505	6335	4649	7511
all IS+PC+JSAinc+ESAinc				23856	20422	17327
Housing benefit: total	4433	4197	5053	18581	18132	23892
Council tax benefit	6755	5186	5805	5380	2819	4912
Winter fuel payment	13347	14572	12683	2147	2347	2144

Dealing with partial household response *

- Key issue is potential bias of using only households with complete response – around 70% of UKHLS sample members
- Aim is to incorporate all households rather than have full information for all individuals
- UKHLS income imputation involves imputing all components for all household members: most critical variables are available
- This implementation involves simple imputation of other key variables
- Overall two versions are rather close – differences follow from:
  - Differences between complete households and all not corrected by additional weighting (e.g. slightly higher poverty in all households)
  - Limitations in input variables for simulation
- All household version is probably to be preferred

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Complete vs. all households *

Simulated Taxes and Benefits (including take-up correction) – comparing complete and all households (wave 4)				
	N Recipients (thousands)		Expenditure (£ million	
	UKHLS: complete households	UKHLS: all households	UKHLS: complete households	UKHLS: all households
Income tax	29401	29555	122085	123254
SIC Employees (Class 1)	19768	19655	37483	37250
SIC Employers	20500	20397	46450	46427
SIC Self employed (Class 2 + any Class4)	2666	2821	4076	4441
Child Benefit (N families, expenditure)	7821	7573	12324	11938
Working Tax credit (all)	1817	1840	4454	4496
Child Tax Credit (all)	3619	3526	16358	16186
Either CTC or WTC	4024	3991	20812	20682
Without children (WTC only)	405	465	701	**857**
Job Seekers allowance (contributory)	75	64	272	230
Income Support+JSAinc	**2576**	**3101**	**8053**	**9541**
Income based ESA	1404	1414	7720	7840
Income Support+JSAinc+inc ESA	**3980**	**4515**	**15773**	**17381**
Income Support lone parents only	316	322	1136	1126
Pension Credit - any / total	1932	2026	4649	4919
all IS+PC+JSAinc+ESAinc			20422	**22301**
Housing benefit: total	4197	4286	18132	17946
Council tax benefit	5186	5273	2819	2920
Winter fuel payment	14572	14733	2347	2376

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Moving to multi-wave *

- Code now generalised for running on any UKHLS wave (not wave 1 because use previous wave data, and also to include BHPS sample throughout)

- Some use of adjacent wave data (child maintenance payments in odd numbered waves, payments into pension schemes even-numbered)

- There appear to be few substantial variations in macro-validation data for different waves, except those which can be explained by real changes – falling unemployment, changing pattern of disability benefits?

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Time trends: no. of recipients *

Simulated Taxes and Benefit (with take-up correction): All households, number of recipients/payers, '000s 2012 UK Policy system						
	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Income tax	29150	29484	29550	30023	**31084**	**31344**
SIC Employees (Class 1)	20170	19518	19655	19829	20205	20432
SIC Self employed (Class 2 + any Class4)	2792	2837	2821	2901	2975	2919
Child Benefit	7702	7636	7573	7389	7195	7103
Working Tax credit (all)	1753	1756	1840	1905	1692	1769
Child Tax Credit (all)	3553	3512	3526	3315	3132	3056
CTC and WTC	3984	3929	3991	3841	3563	3525
Without children (WTC only)	431	417	465	526	431	469
Jobseeker's Allowance (contributory)	61	62	64	65	**31**	**27**
Income Support+JSAinc	3621	3293	3101	2867	2559	2473
Income based ESA	1164	1271	1414	1491	1530	1612
Income Support+JSAinc+ESA	4784	4564	4515	4358	4089	4086
Income support lone parents only	**350**	**345**	**322**	**292**	**221**	**208**
Pension Credit total	1838	1819	2026	1953	1976	2030
Housing benefit: total	4185	4219	4286	4261	4161	4206
Council tax benefit	5185	5081	5273	5122	5017	5013
all IS+PC+JSAinc+ESAinc	6622	6383	6541	6311	6066	6116

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Time trends: expenditures/receipts *

Simulated Taxes and Benefit (with take-up correction): All households, number of recipients/payers, '000s 2012 UK Policy system	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Income tax	29150	29484	29550	30023	**31084**	**31344**
SIC Employees (Class 1)	20170	19518	19655	19829	20205	20432
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Opportunities for improvements:
Single wave complete household *

- Improve estimation of contributory JSA and ESA?
- Imputation of SERPS and second state pension
- Why low on council tax benefits?
- Estimation of gross income for amounts reported net, e.g. investment income, private pension (but does not seem to affect results?)
- Exploit areas where UKHLS data is better than available FRS data

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Opportunities for improvements:
Single wave all household *

- Better imputation of unemployment for non-respondents
- Verify relationship between complete household and all household input data sets (UKHLS general issue).
- Explore cross-wave imputation for within-household non-respondents

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Opportunities for improvements:
Multi wave implementation *

- Wealth data (could supplement with information on income from savings and investment)

- Childcare costs (update code for different questionnaire content)

- Local Reference Rent used for Housing Benefit (could also improve this given we have access to better geo-data than with FRS)

- Maybe some cross-wave imputation for missing data

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Opportunities for improvements: EUROMOD and others *

- Better exploitation of panel data as input ????

- Correction for partial take-up of benefits is random – so introduces noise between waves – ideally would want some cross-wave correlation in individual take-up probability

- Issues with uprating factors?

- Dealing with two year collection window: produce composite data sets based on single years? What issues arise here?

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Application 1: Movements out of poverty *

- Impacts of overall changes in taxes and welfare policy system 2010-2015 on movements out of poverty

Percentage of sample members in poverty at wave2 not in poverty at wave 7. Original data and EUROMOD Simulations using 2010 and 2015 policy systems (poverty defined as 60% of median)				
	2010 / Wave 2	2015 / Wave 7	All	Aged under 16	Aged 65 & over
Original data			63.0	58.6	56.9
With take-up correction	2010 system	2010 system	61.1	59.1	55.5
With take-up correction	2010 system	2015 system	59.9	58.9	53.7
No take-up correction	2010 system	2010 system	63.3	63.5	52.7
No take-up correction	2010 system	2015 system	60.6	60.8	52.1

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Application 2: Insecurity

Our measure of security S is defined as

$$S_{i,t=0} = \frac{1}{T} \sum_{t=0}^{T} y_{t,i}^{1/\alpha} \delta^t \tag{1}$$

where T is the number of future periods considered for individual i and $\delta \in (0,1]$ is a constant time discount factor. $y_{i,t} = Y_{i,t}/\bar{Y}_t$, with $Y_{i,t}$ being (equivalised disposable real household) income for individual i at time t, and $\bar{Y}_t$ being **a reference value (the median)**

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Security index: Summary statistics

	mean	s.d.	min	median	max
individual variables					
S index pre-tax and benefit	1.03	0.50	0.00	1.03	5.61
S index post-tax and benefit	1.02	0.30	0.00	0.99	4.15
Age	47.99	16.72	16.00	48.00	96.00
Male	0.48	0.50	0.00	0.00	1.00
high education	0.34	0.47	0.00	0.00	1.00
middle education	0.50	0.50	0.00	0.00	1.00
low education	0.16	0.37	0.00	0.00	1.00
couple	0.61	0.49	0.00	1.00	1.00
no. of kids	0.50	0.90	0.00	0.00	7.00
working	0.65	0.48	0.00	1.00	1.00
household variables					
single without children	0.27	0.45	0.00	0.00	1.00
lone parent	0.05	0.21	0.00	0.00	1.00
couple with children	0.23	0.42	0.00	0.00	1.00
couple without chilren	0.23	0.42	0.00	0.00	1.00
retired	0.21	0.41	0.00	0.00	1.00
Owner-outright	0.38	0.48	0.00	0.00	1.00
Owner-mortgage	0.46	0.50	0.00	0.00	1.00
no. of workers	1.07	0.78	0.00	1.00	3.00
N	23815				

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Security index: Overall
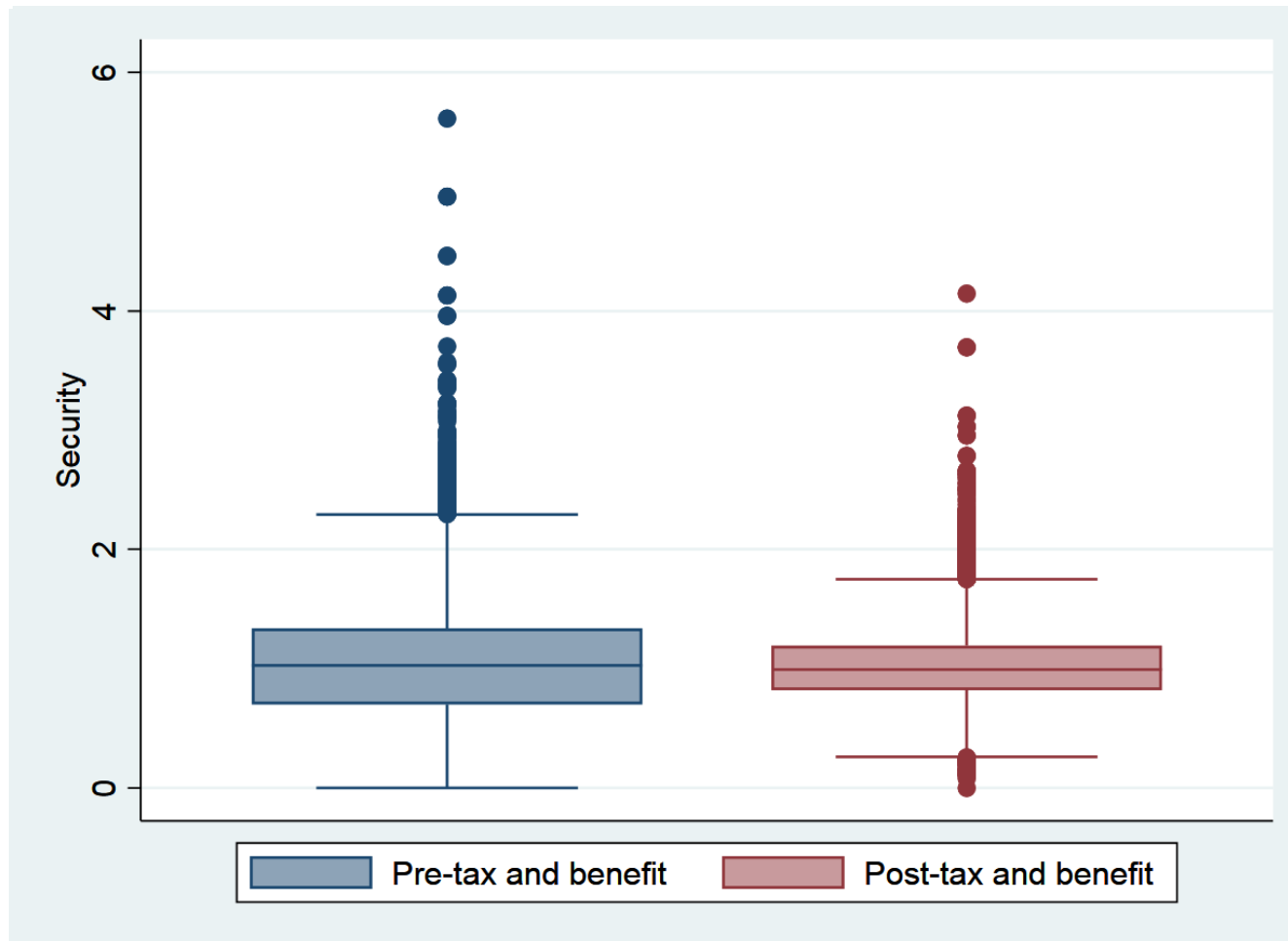
Security index: Sensitivity to α
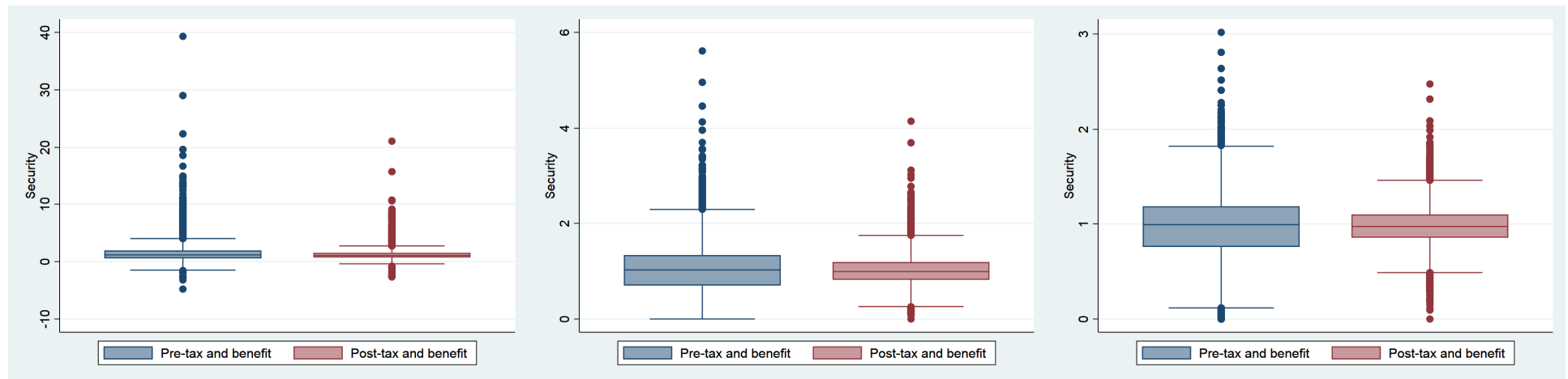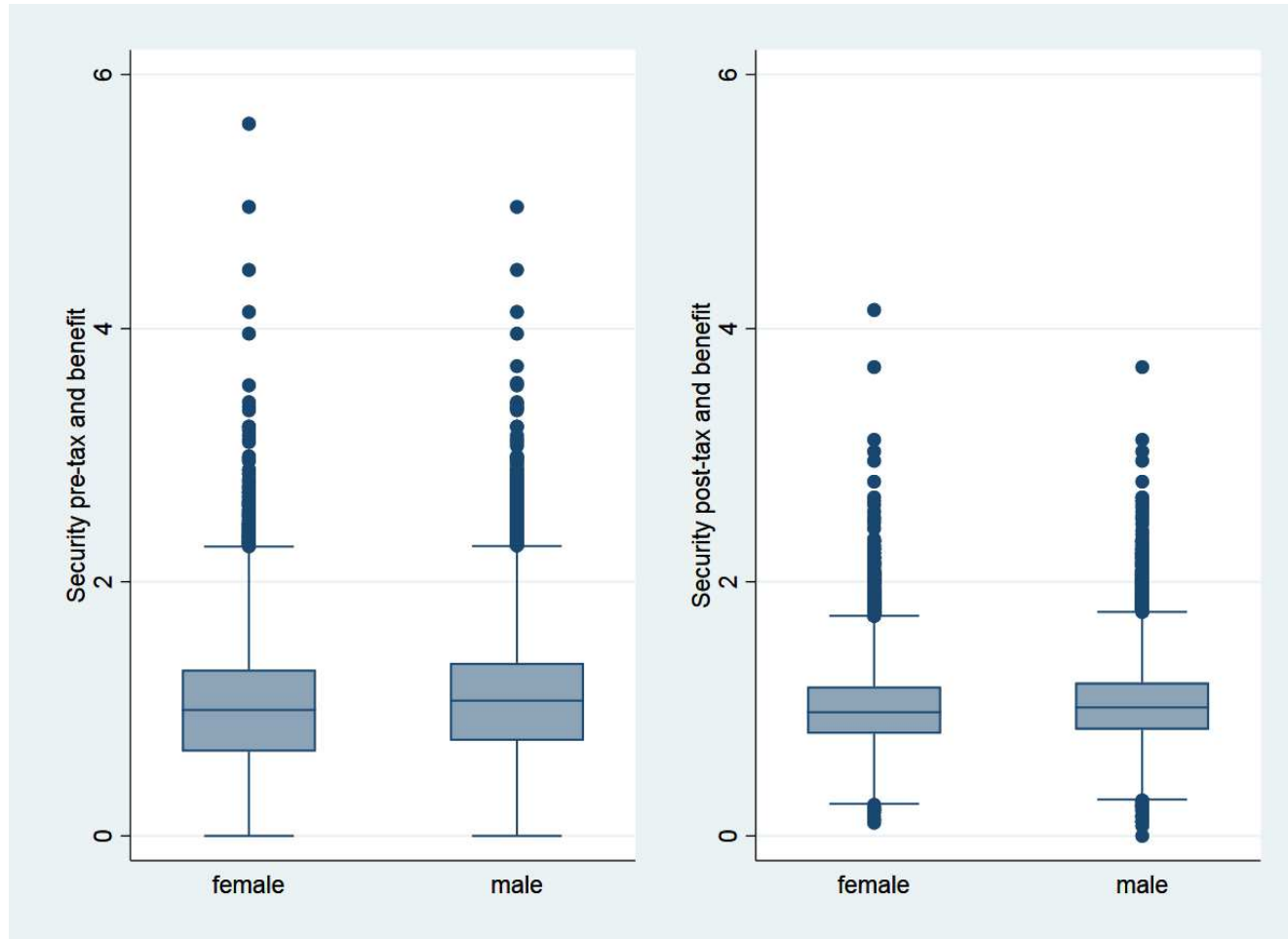

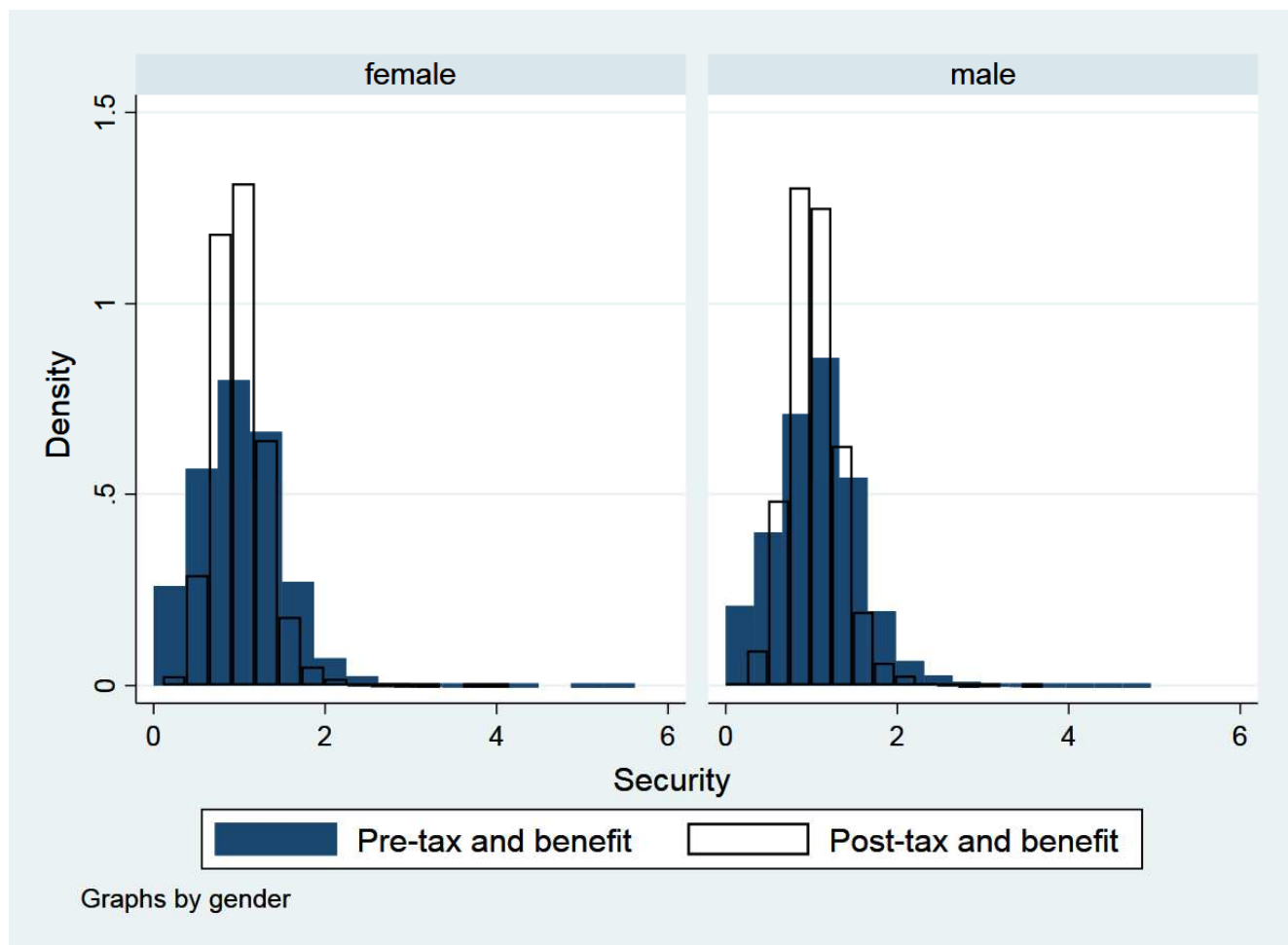$\alpha = 1$ $\alpha = 2$ $\alpha = 3$

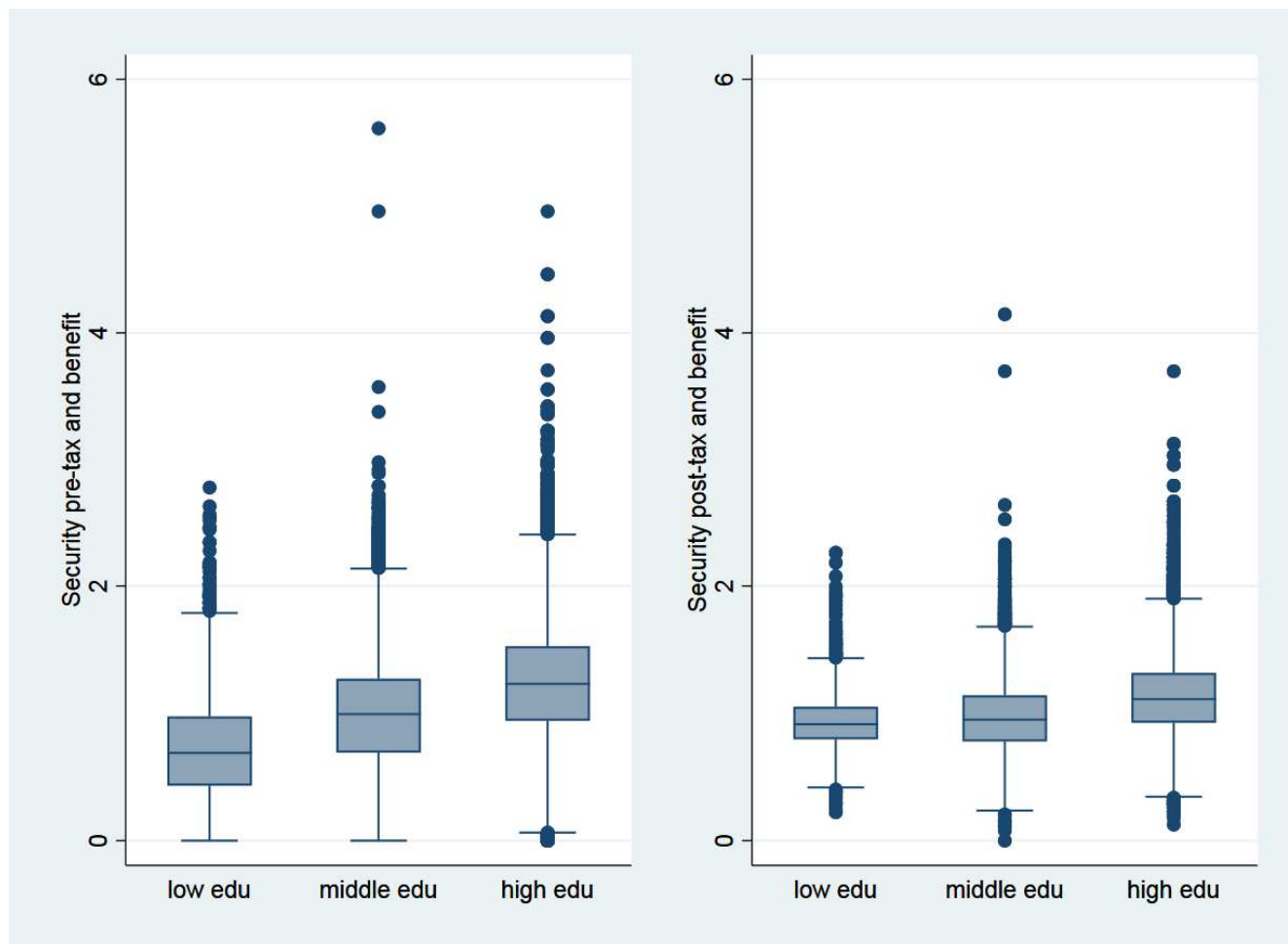# Security index: Overall
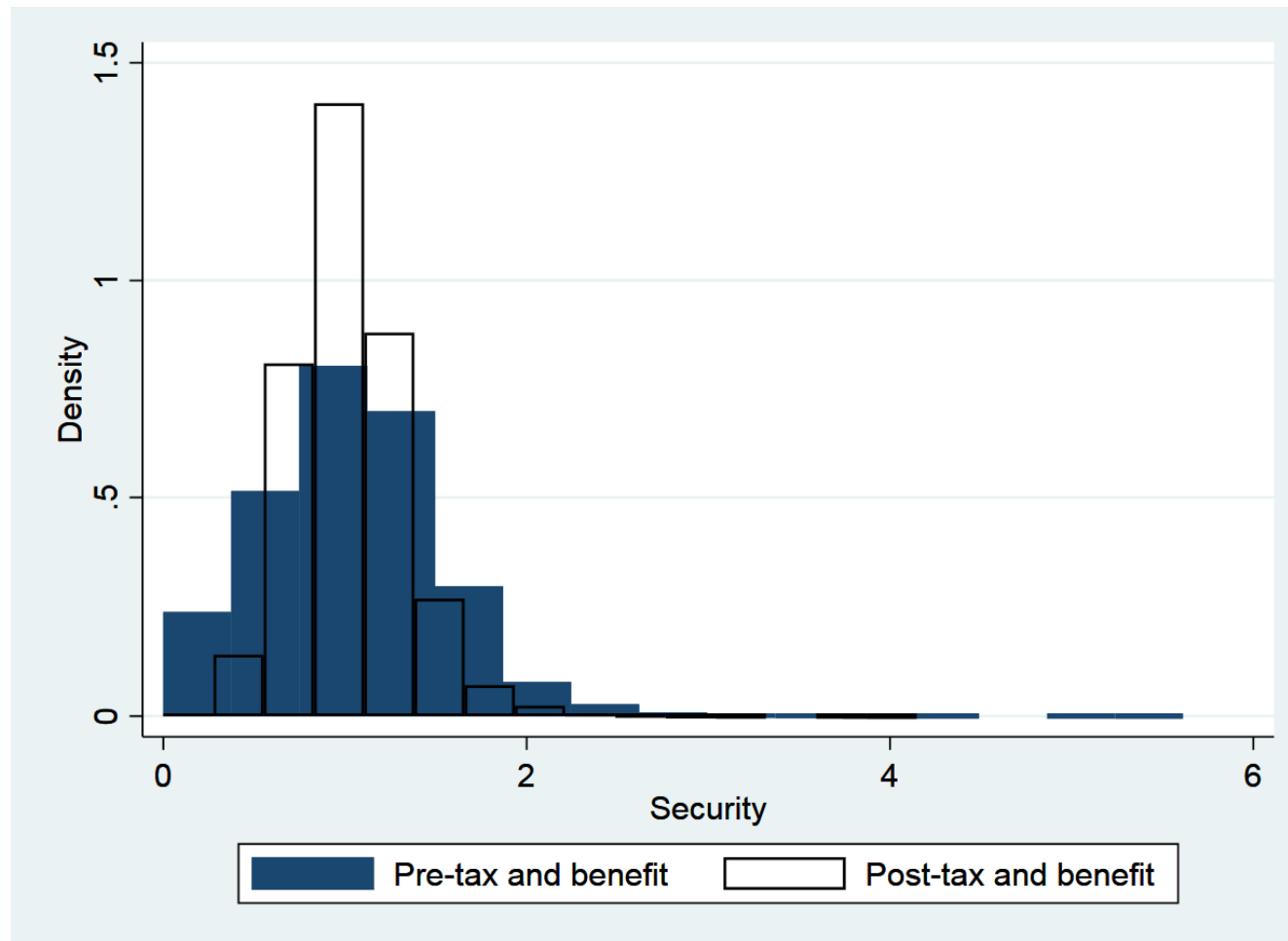
Security index: By gender

Security index: By gender

Graphs by gender
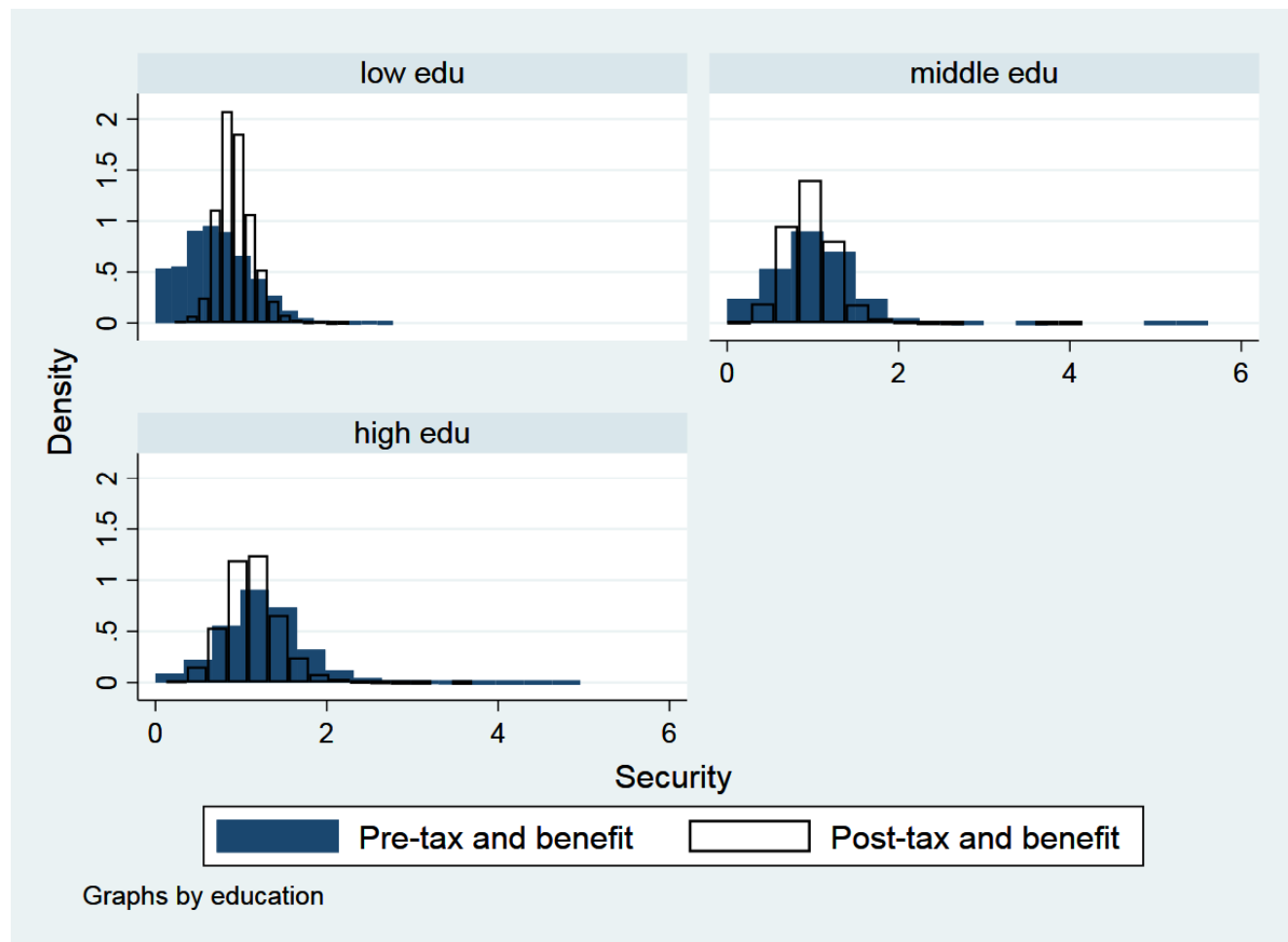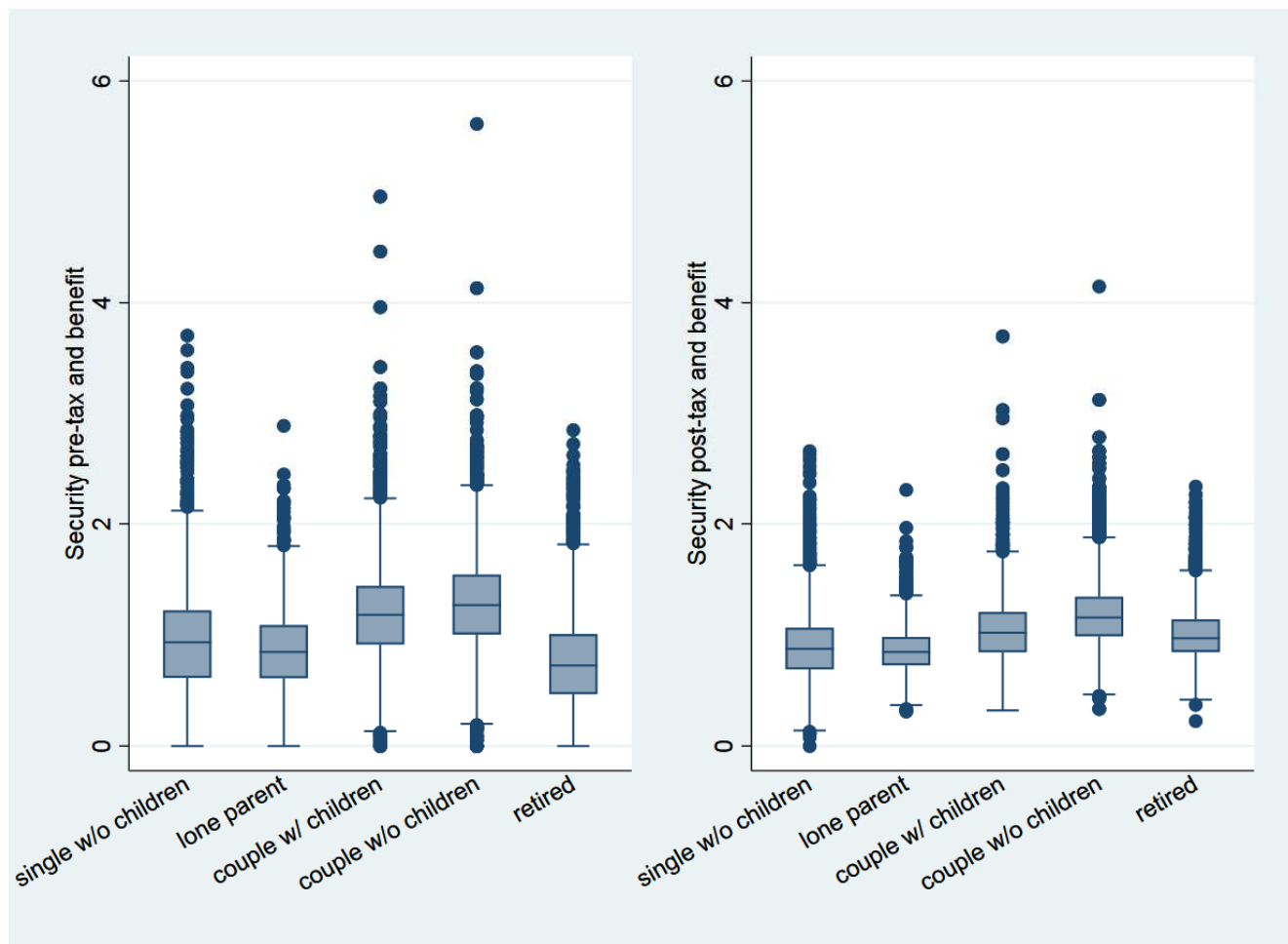
Security index: By education
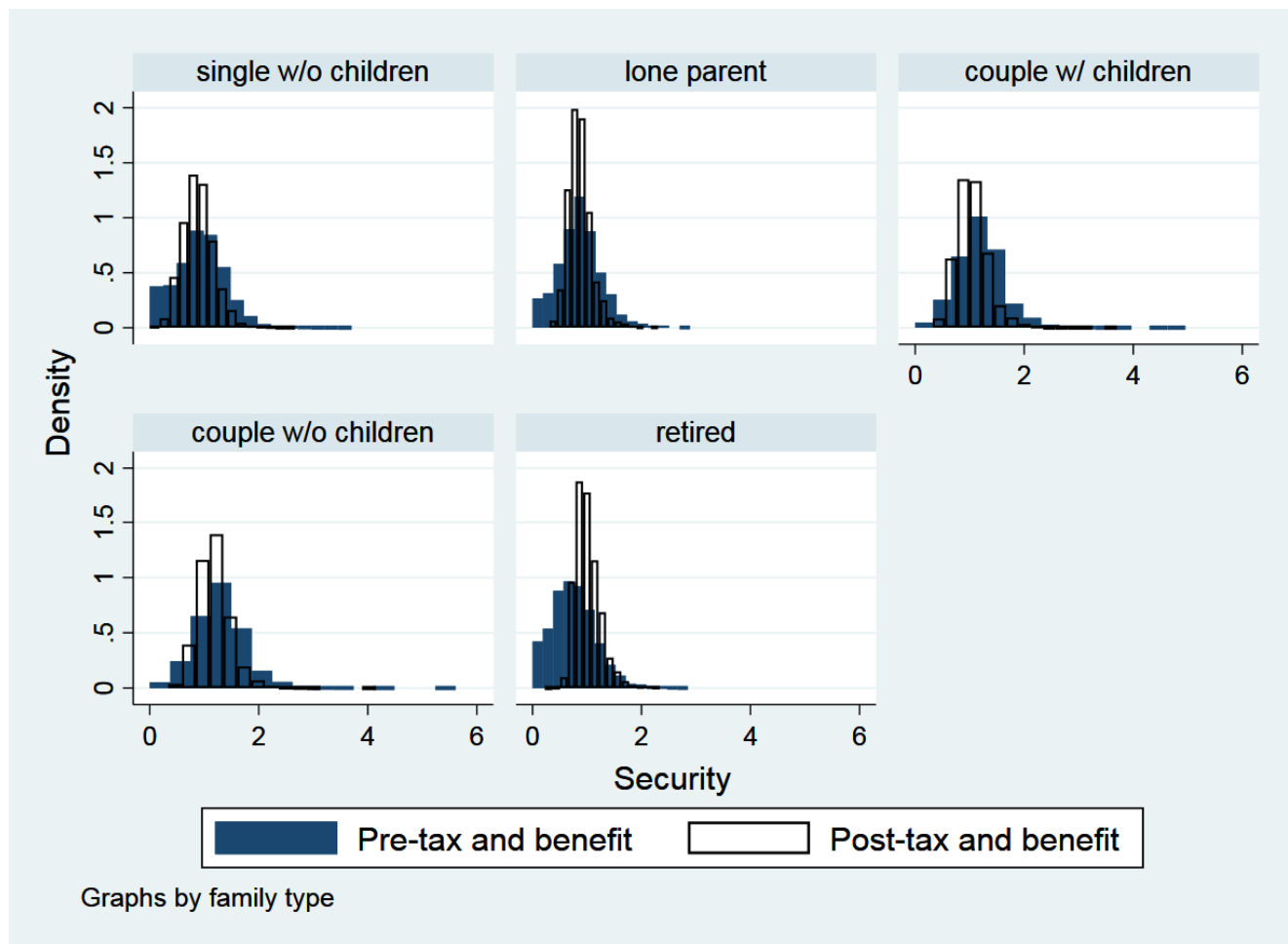
Security index: By education

Graphs by education

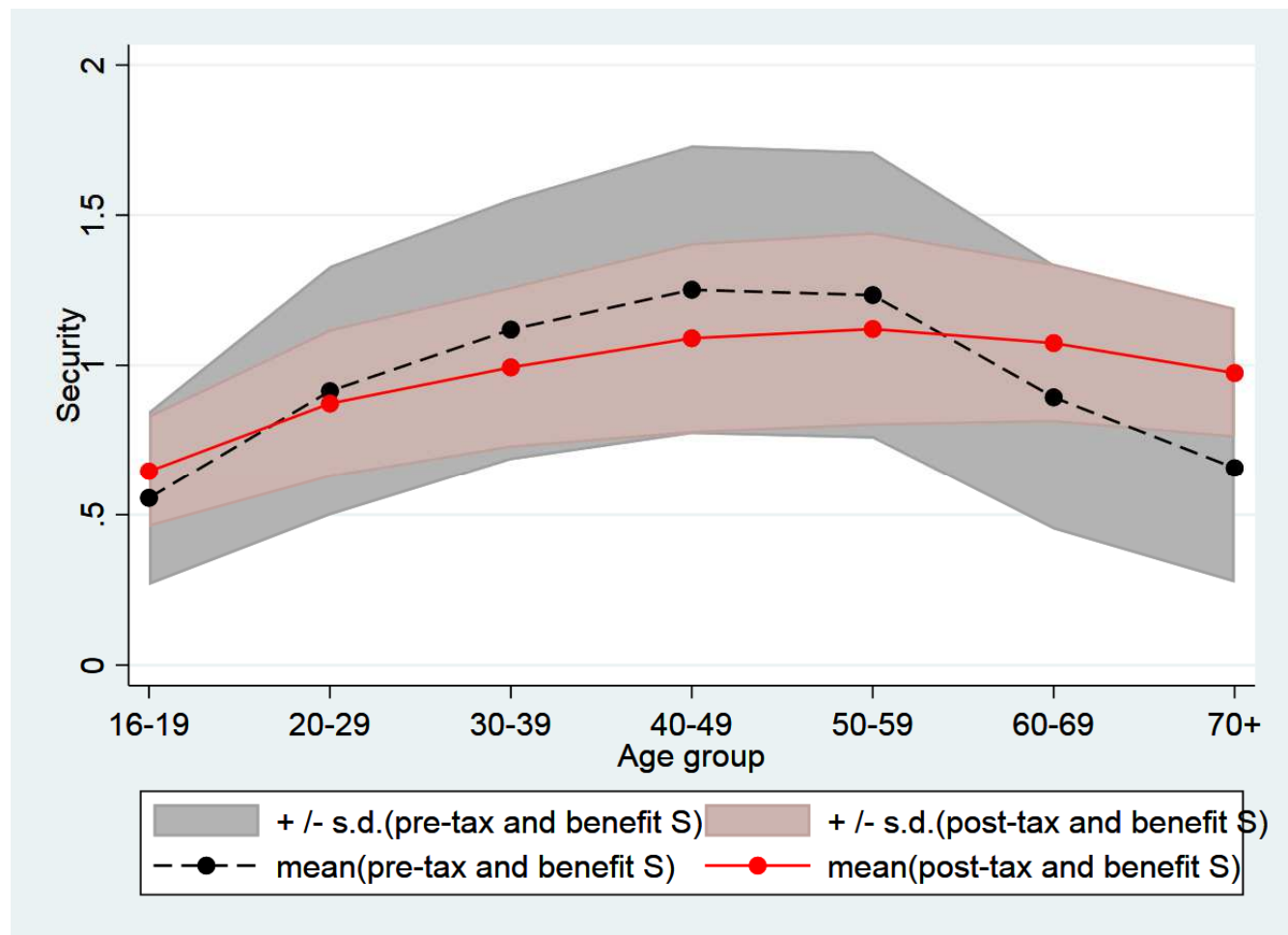# Security index: By family type

Security index: By family type

Graphs by family type

Security index: By age

Determinants of Security

	S index pre-tax and benefit	S index post-tax and benefit
Age	0.033***	0.018***
Age^2	-0.00032***	-0.00013***
Male	0.094***	0.055***
middle education	0.17***	0.089***
high education	0.39***	0.22***
Couple	0.21***	0.13***
no. of kids	-0.056***	-0.038***
Working	0.35***	0.17***
Owner-outright	0.18***	0.16***
Owner-mortgage	0.27***	0.18***
Constant	-0.43***	0.097***
Observations	23815	23815
R-squared	0.42	0.34

Note: $*p < 0.05, **p < 0.01, ***p < 0.001$. The base group of education qualification is low education. The base group of housing tenure is renters.

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