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# ESCoE Research Seminar

## A Democratic Measure of National Income Growth

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29 January 2019



ECONOMIC  
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# A Democratic Measure of National Income Growth

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January 2019



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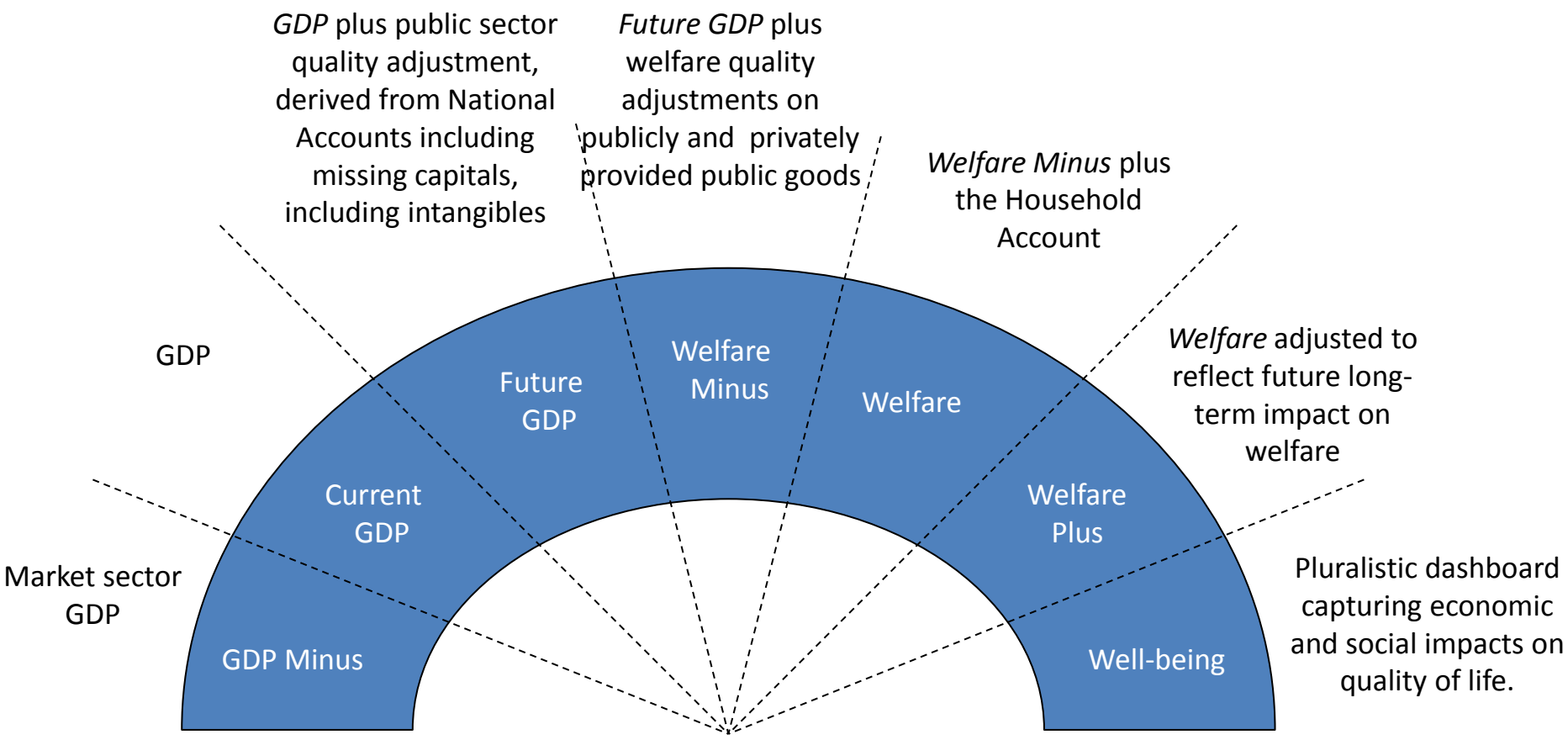
The results presented here are preliminary. Please do not quote them.

# GDP, National Income and Welfare

- GDP is widely used to provide a measure of economic welfare.
- But as Heys (2018) has noted, there is a spectrum of different measures which relate to different concepts of welfare.

# The GDP/Welfare Spectrum

Source: (Heys 2018)



# Two strands of work on welfare

## Strand 1- Consumer Surplus

- Look to expand definition of national income to show consumer surplus arising from consumption.
- Attention is specifically focused on digital consumption free at point use
- But there is no reason to believe consumer surplus on the digital economy is the most important component of surplus, and it may not be the most rapidly growing.

## Strand 2- Utilitarian

- Unless welfare is linear in income/consumption any measure of aggregate/average welfare has to depend on the distribution of income.
- There is some evidence to support the idea that utility is reasonably well approximated by  $\log(\text{consumption})$ .
- If a comprehensive utility function is specified, issues of consumer surplus do not arise.
- Develops a welfare measure of national income which reflects the distribution of income across households.
- Subject to utility function being well-specified, reflects total welfare and not marginal welfare.

# Recent Work on Welfare

- Jorgenson and Schreyer (2015) suggest statistical offices should produce time series of the average of the log of real household consumption as an indication of living standards (“the level of living”).
- They recognise that households have different consumption patterns and suggest producing quintile-specific deflators to deflate household nominal consumption

# Use of Democratic Deflator

- Use a democratic deflator to deflate the geometric mean of nominal household consumption (adjusting for household size).
- Aitken and Weale (2018) shows that the growth rate of this variable is the growth rate of mean log real consumption.
- No need to work by quintile to produce an aggregate.
- A utilitarian measure of welfare on the assumption that i) utility is logarithmic in real consumption and ii) expenditure shares vary across households but, for given households do not change in response to income changes.
- Our democratic deflator covers all consumption including that provided by NPISH and the Government. We use ONS allocations of education and health expenditure to households and otherwise allocate in proportion to effective household size.



# Consumption or Income?

- Immediate welfare comes from consumption.
- Consumption may represent permanent income.
- But saving also adds to welfare and people are often more interested in the distribution of income than the distribution of consumption.
- Aitken and Weale show that a coherent welfare definition can be given to  $\log(\text{real income})$  with a democratic deflator used to produce real income.
- Utility from income equals utility from consumption plus (saving  $\times$  marginal utility of consumption).
- First order it is fine to apply to utility function to real income per household.

# Household Income or National Income

- Most distributional work focuses on household income.
- Distributional national accounts (Piketty, Saez, Zucman, 2018). Focus predominantly on individuals rather than household.
- We keep the household as the reference unit allowing us to adjust for household size.
- But we allocate the whole of net national disposable income to households.

# The Production Boundary

- A welfare function would ideally also reflect non-market labour (cooking) and leisure time (gardening).
- It also naturally invites acknowledgement of free at point of use (FPU) consumption (the NHS, the National Gallery of Scotland, the British Museum and Facebook) for intertemporal comparisons.
- Exploring welfare separately from GDP should resolve much of the tension about how to address FPU consumption as well as debate about the GDP boundary.
- But we work in the existing production boundary for this paper.

# Primary Household Incomes (£m Fin Year 2015)

	National Accounts	LCFS	Modelling
Wages and Salaries	780,009	721,072	S
Net Operating Surplus (Imputed rent)	119,914		M
Self-employment Income	144,007	73,439	S
Employers' Contributions	155,357	Nets out	
Interest receipts	24,305	6,668?	M
Dividend receipts	76,674	7,669	M
Attr. to insurance holders	23,078	Proportional to insurance	S
Payable on pension rights	74,068		M
Less interest paid	-25,943	-28,399	S
EQUALS Net Primary Income	1,371,469		

# Secondary Redistribution

## (£m Fin Year 2015)

	National Accounts	LCFS	Modelling
Net Primary Income	1,371,469		
Social benefits in cash	97,364	82,788	S
Other social benefits	129,223	107,968	S
Social assistance	121,404	89,926	S
Misc transfers rcd	8,700	2,813	S
Hhlds social contributions	-68,752	-60,299	S
Misc transfers paid	-33,041	-37,539	S
Taxes on employment	-143,438	-74,923	M
Other income tax	-24,203	-5,318	M
Other current taxes	-44,214		M
Pensions supplement	-54,308		
Employers' contributions	-155,357		
EQUALS			
Hhld net disposable income	1,204,847		

# National Disposable Income

(£m FY 2015)

	National Accounts	LCFS	Modelling
Hhld net disposable income (A)	1,204,847		
Employer contributions	64,451		S
Household contributions	12,454	21,008	S
Supplement less service charge	54,308		M
LESS Benefits received	-84,725		S
EQUALS Pensions adjustment (B)	46,419		
Retained earnings of companies (C)	-18,894		
Net income of NPISH (D)	50,882		
Consumption of government	363,480		
PLUS Net saving of government	-50,932		
Net income of government (E)	312,548		
Residual income (F)	2,618		
Net National Disposable Income (A+B+C+D+E+F)	1,598,420		

# Imputed Rent (Operating Surplus)

- Log monthly rent is explained by log income, house type, council tax band, socioeconomic status, time and NUTS1 region.
- The decision to rent or own is explained by the same variables
- The model is identified by the assumption of normality

# Rent: Data and Estimates (£m)

	LCFS		Blue Book	From Model	
	Rent Paid	Rent Received	Imputed Rent	Imputed Rent	Fitted rent paid
2006	38,986	3,874	157,939	114,838	37,414
2007	41,953	4,530	162,273	118,882	39,820
2008	43,658	3,947	166,822	121,623	43,202
2009	49,466	5,180	167,868	131,182	47,553
2010	53,150	5,102	169,783	139,036	50,107
2011	58,740	5,474	171,296	134,246	57,182
2012	61,513	7,236	177,171	146,379	58,437
2013	65,374	6,983	183,412	151,274	63,650
2014	63,392	9,069	191,679	149,926	61,241
2015	67,629	8,809	199,826	153,967	64,679



# Categorical Imputation using Ordered Probit Models (i)

- We adopt a more flexible approach structured round an ordered probit model for everything except imputed rent.
- We convert the data in our source datasets (SPI for interest & dividend income/WAS for pensions) into a large number of categories (89 for interest & dividend income and 32 for pensions) and fit ordered probit models to these
- Covariates have to be variables available both in the source surveys and in LCFS
- Simulating these models provides stochastic categorical estimates which can be imputed into LCFS

# Categorical Imputation using Ordered Probit Models (ii)

- Compute a fitted value for each latent variable, and add on random terms from the multivariate normal distribution
- Each latent variable is allocated to the relevant category underpinning the probit model
  - Where it lies between 2 cut points, the distance between 2 categories is interpolated on the basis of the latent variable

# The Upper Tail

- Reconciliation with the macro data requires appropriate handling of the upper tail, even though the upper tail has little impact on democratic income.
- Use a Pareto type-1 distribution for observations  $x_i > x_m$  of the form:

$$1 - F(x) = (x_m/x)^\alpha \text{ with } \alpha > 0$$

where the expected value conditional on  $x > x_m$  is  $x_m \alpha / (\alpha - 1)$  if  $\alpha > 1$  but infinite otherwise

- The expected value is used for imputed observations in the top category

# Individuals and Households

- SPI is based on tax records and provides data on individuals but not households
- This is because income tax is levied on individuals
- WAS and LCFS provide both individual and household data
- Investment income is imputed on an individual basis while pension rights are imputed on a household basis

# Taxation

- The LCFS grossly under-records tax payments.
- We calculate the income tax due on the basis of the allowances and rates of the time, and apply this after income figures have been aligned to the national accounts.
- Gives better, but still low figure.
- Likely to omit some allowances and reliefs- e.g. assumes all dividends are taxed while those in shares held in ISAs are not.

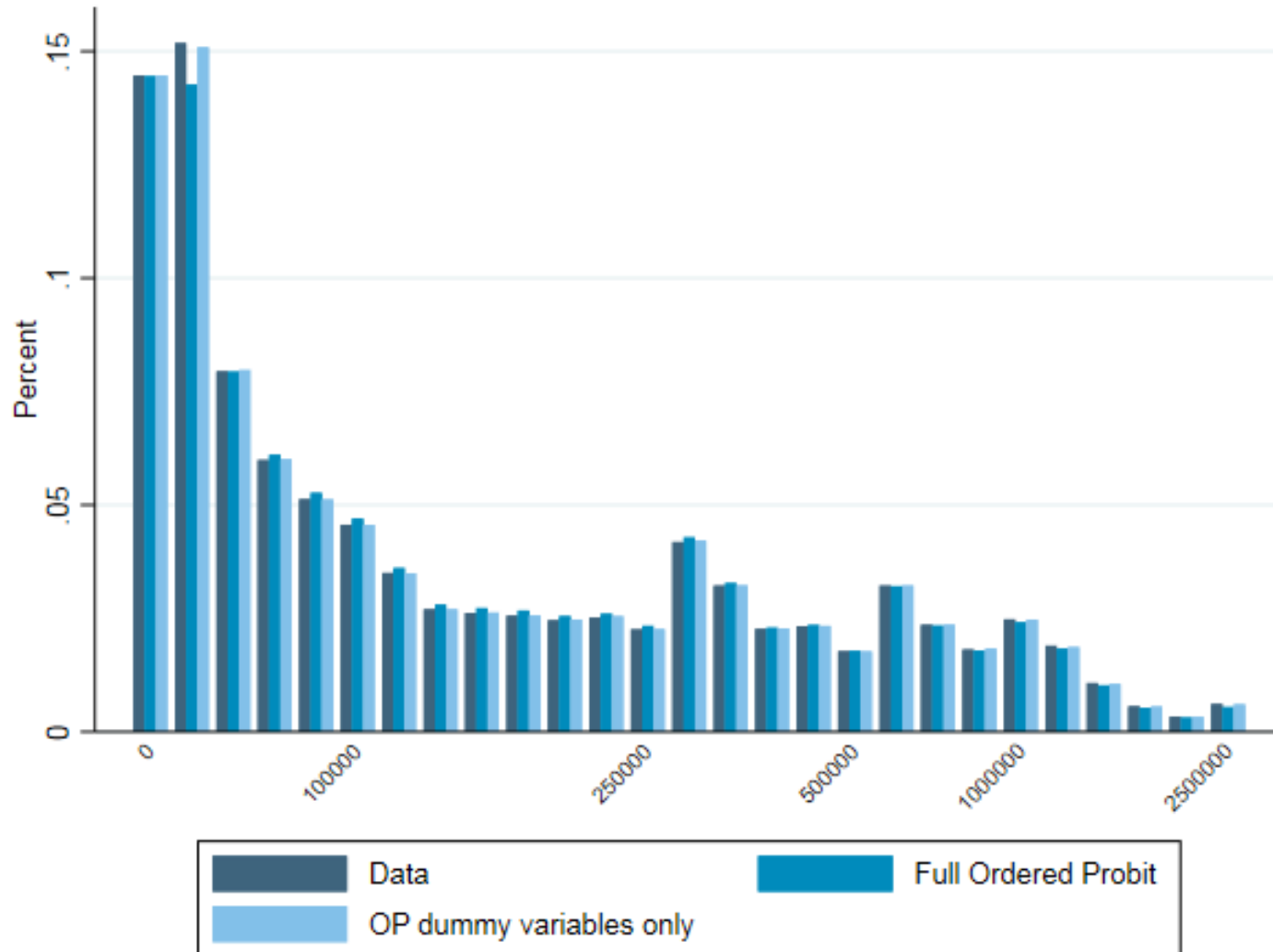
# Covariances

- Need to take into account correlation between random components of imputed variables
- Use best source of data for pension wealth (WAS) and interest & dividend income (SPI), therefore not able to jointly estimate our models to estimate correlations simultaneously with parameters
- Estimate a correlation matrix using WAS (which does allow joint estimation but is not the ideal source) for the random components

# Pension income

- Use ordered probit with waves 3 and 4 of WAS to allocate pension and insurance income to categories
  - Include age, age<sup>2</sup>, No. adults, No. children, tenure type, marital status, labour or pension income
  - Estimate separately for under 65 (with & without labour income) and over 65 (with & without pension income)
- Waves 1 and 2 do not provide satisfactory income measures for use as covariates

# The Distribution of Pension Rights simulated for 2013 using Ordered Probit Models applied to WAS Data

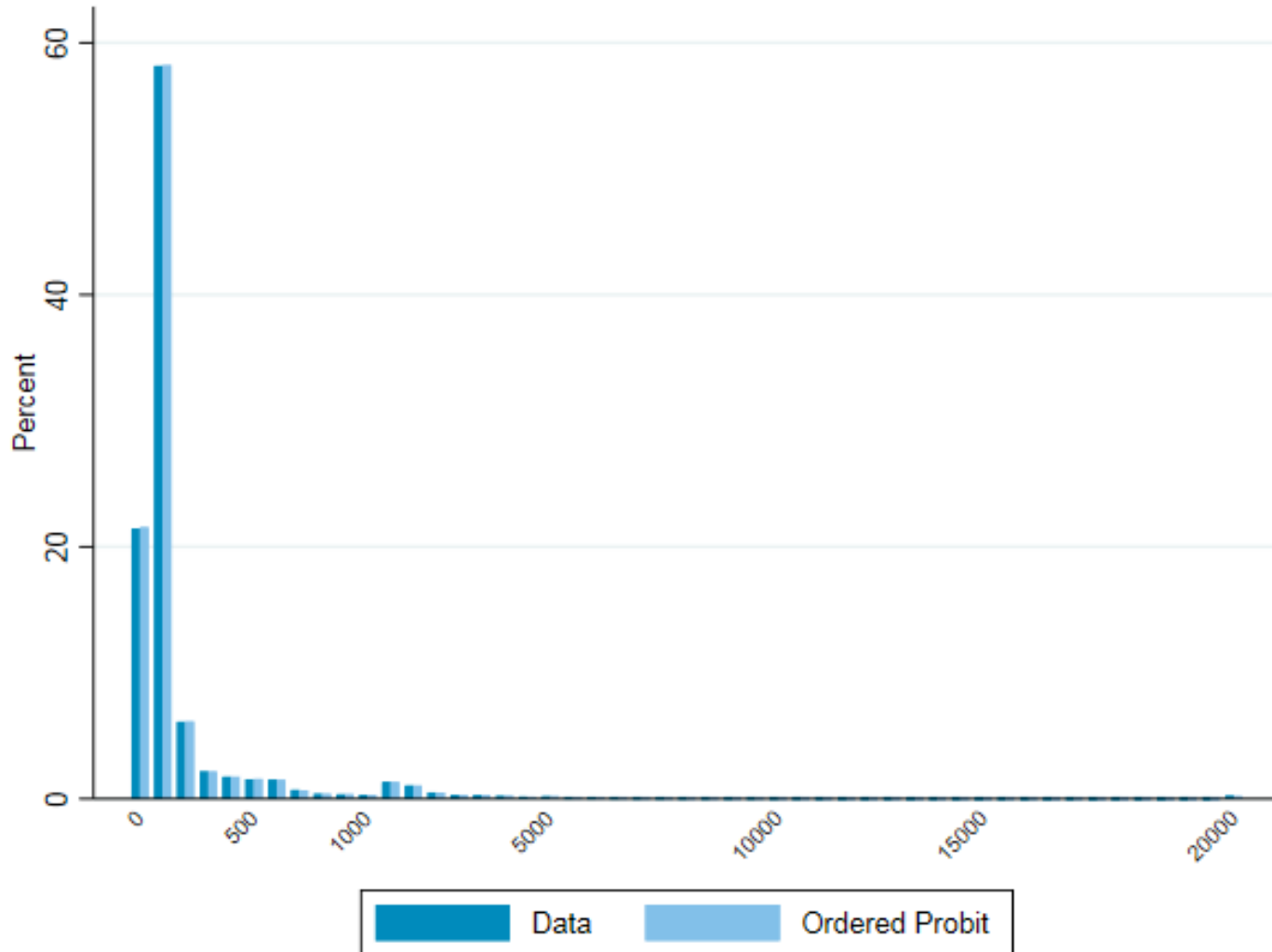




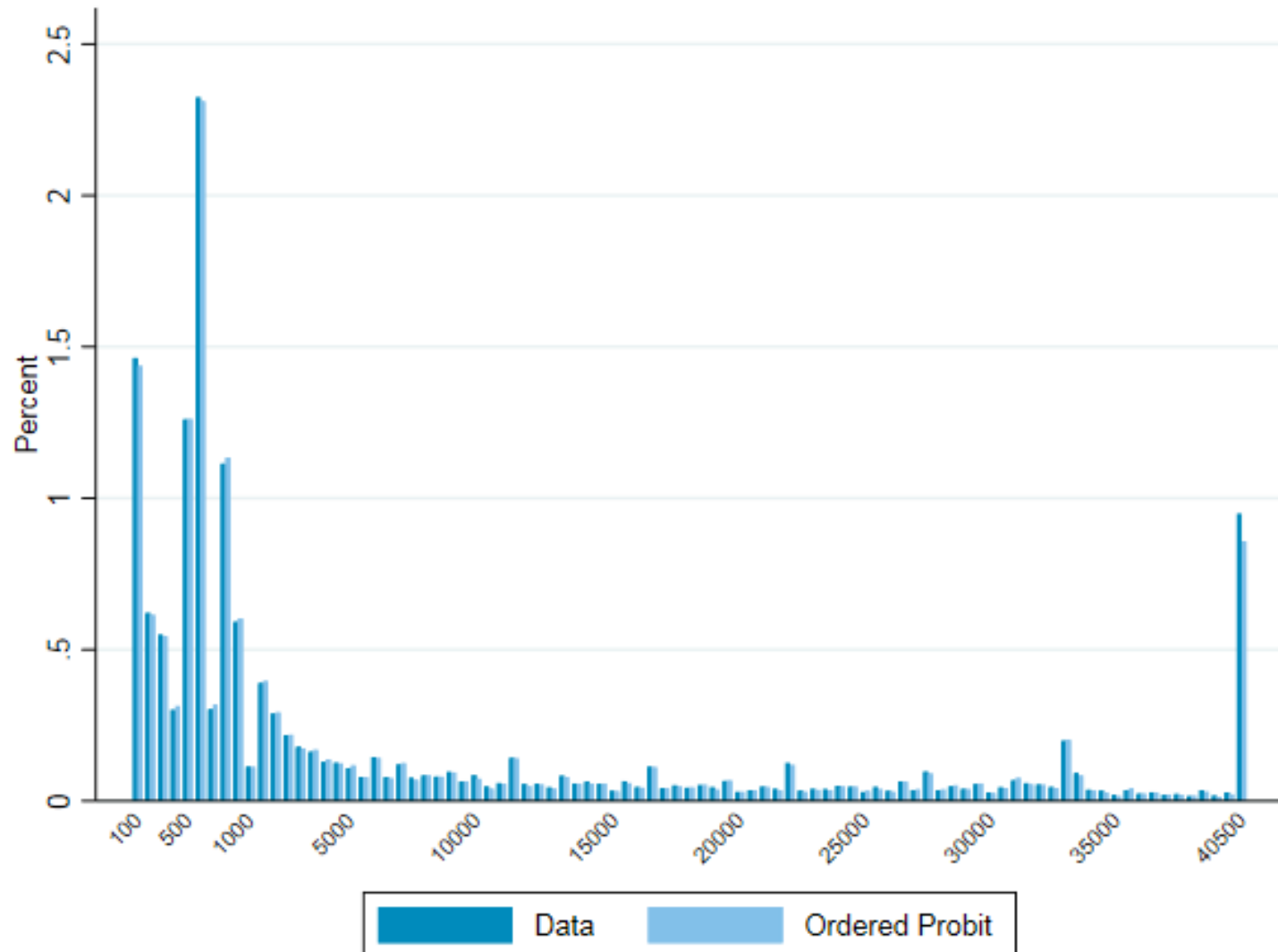
# Interest & dividend income

- Use ordered probit with SPI to allocate interest & dividend income to categories
  - Include age bands, log labour income, regional dummies
  - Estimate separately for men and women and by year

# The Distribution of Interest Income in the 2013 SPI and the Distribution Fitted by the Ordered Probit Models (Unweighted)



# The Distribution of Dividend Income in the 2013 SPI and the Distribution Fitted by the Ordered Probit Models (Unweighted)



# Covariances Implementation (i)

- We impute six variables per household
    1. Interest income- first adult
    2. Interest income- second adult
    3. Dividend income- first adult
    4. Dividend income- second adult
    5. Pension rights- household
    6. Imputed rent- household (done on house value)
- This gives 15 covariances

# Covariances Implementation (ii)

- Base covariances on coarse multivariate OP models fitted to WAS. Use financial asset holdings of first and second household members as proxies for investment income, together with household holding of pension rights.
- The model cannot be estimated for all types of household
- We use the estimated correlations we can find and take the arithmetic average

# Covariances Implementation (iii)

People aged under 65: WAS Wave 4

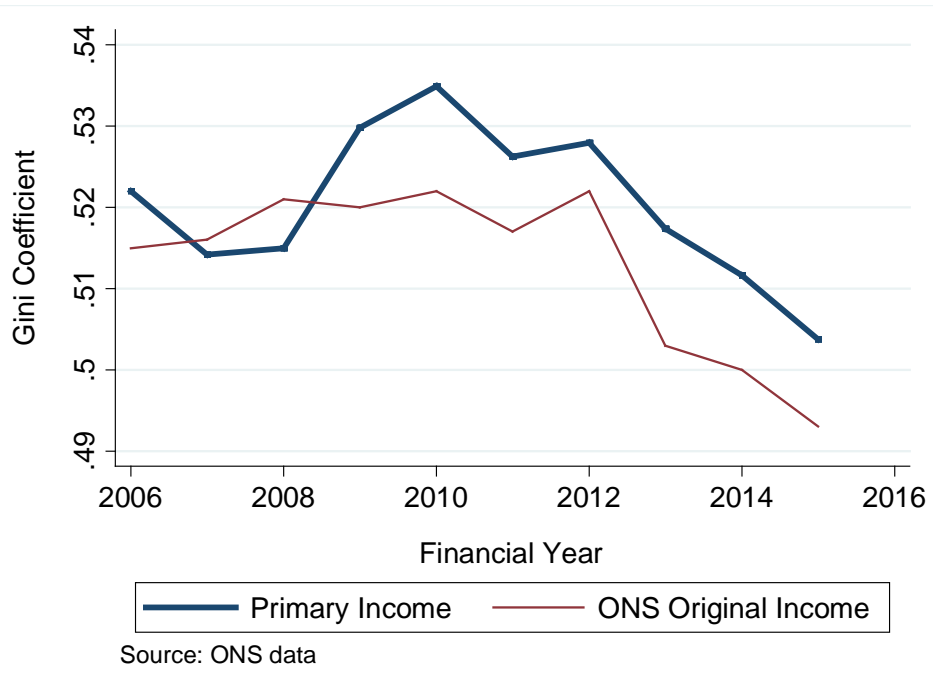
$\rho_{12}$	0.71	$\rho_{34}$	0.81
$\rho_{13}$	0.43	$\rho_{35}$	0.44
$\rho_{14}$	0.38	$\rho_{36}$	0.39
$\rho_{15}$	0.38	$\rho_{45}$	0.42
$\rho_{16}$	0.27	$\rho_{46}$	0.39
$\rho_{23}$	0.36	$\rho_{56}$	0.41
$\rho_{24}$	0.41		
$\rho_{25}$	0.36		
$\rho_{26}$	0.27		

High correlations across couples for interest (0.71) and dividends (0.81). Otherwise modest.

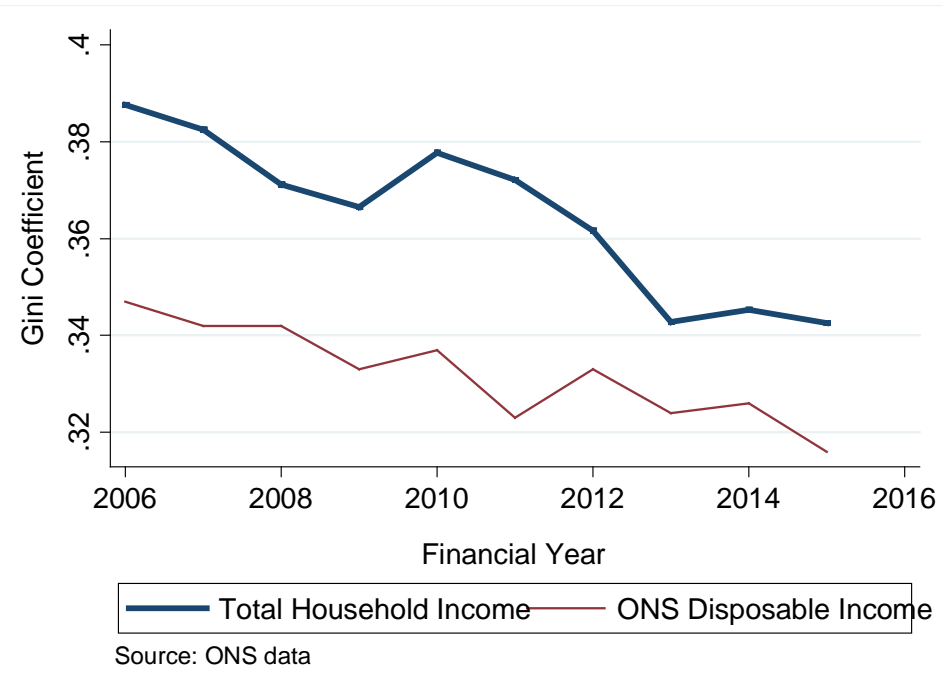
# Simulations

- Examine the effect of including imputed pension and investment income on measures of inequality such as Gini & geometric mean of income

# Gini Coefficients: Comparison with Official Data



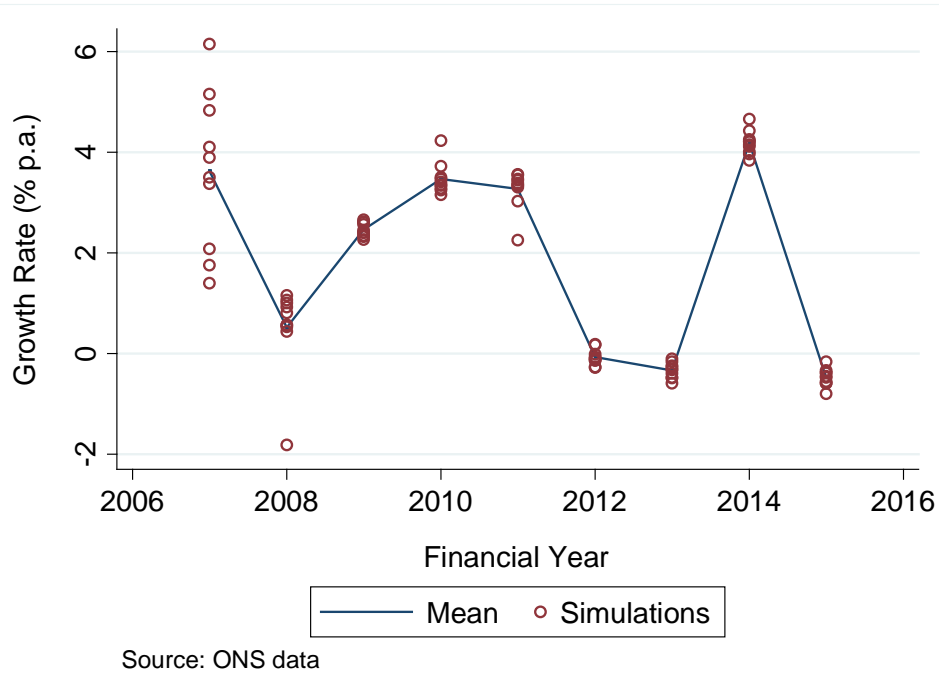
Primary Income



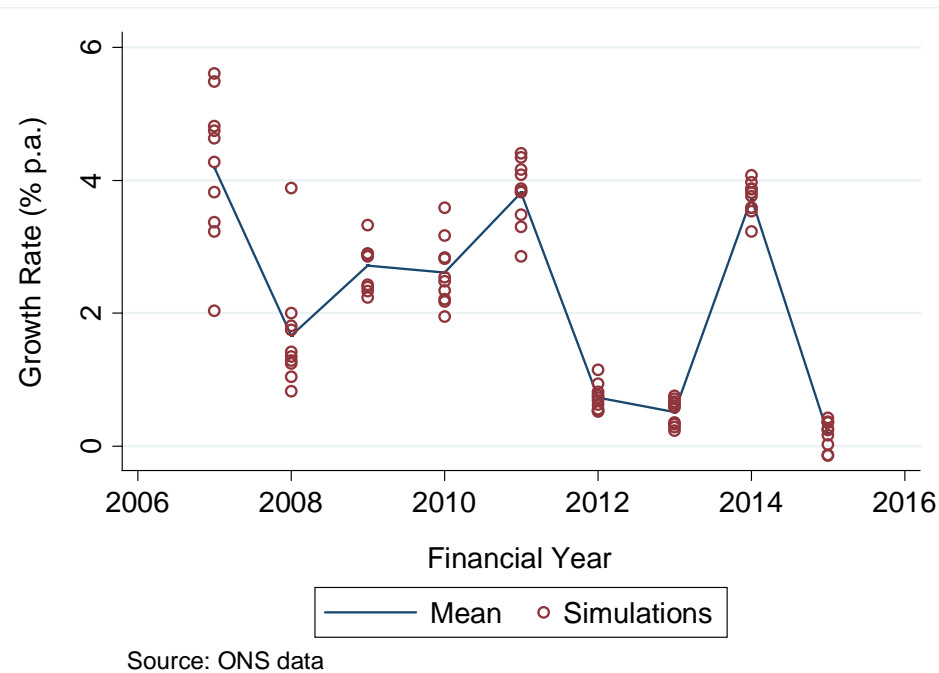
Household Income



# Growth Rates of Income per Household

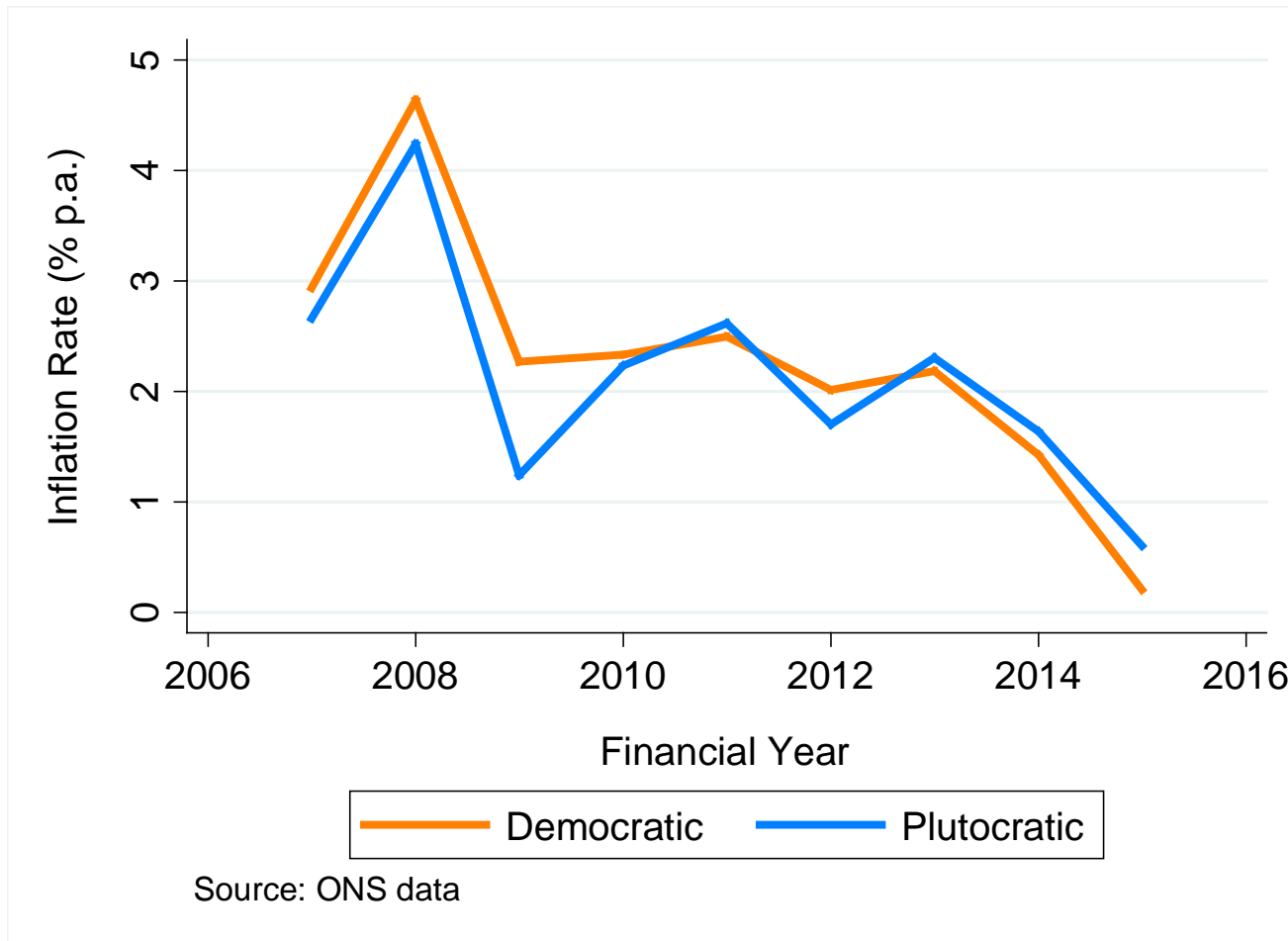


Plutocratic Nominal Income Growth per Household

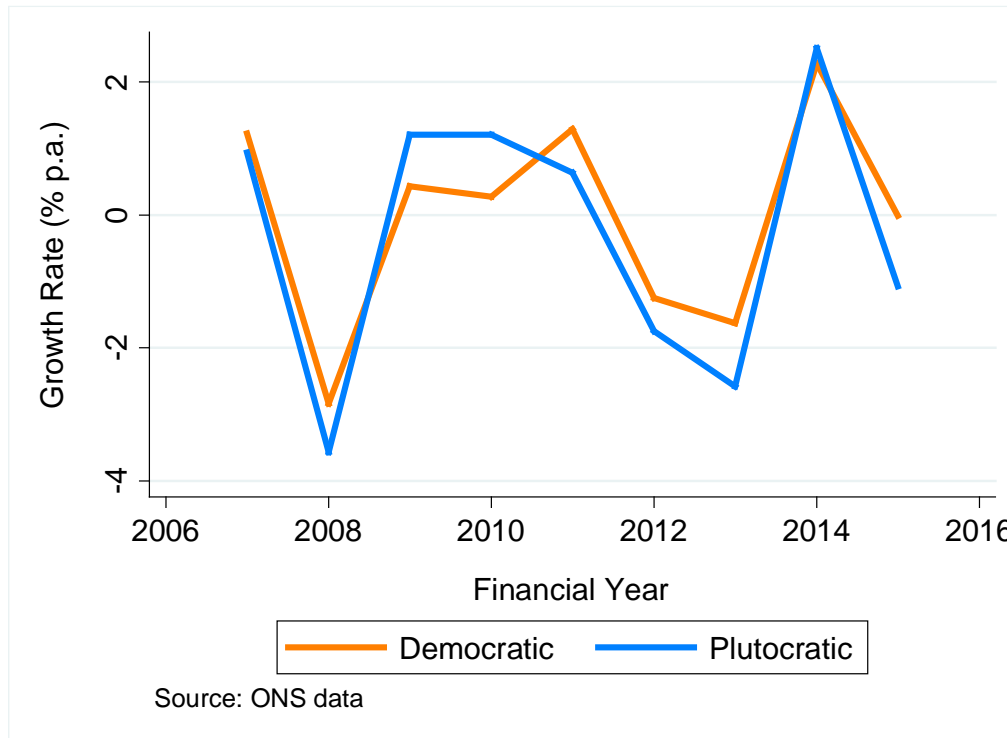


Democratic Nominal Income Growth per Household

# Deflation



# Real Income Growth per Household (adjusted for household size)



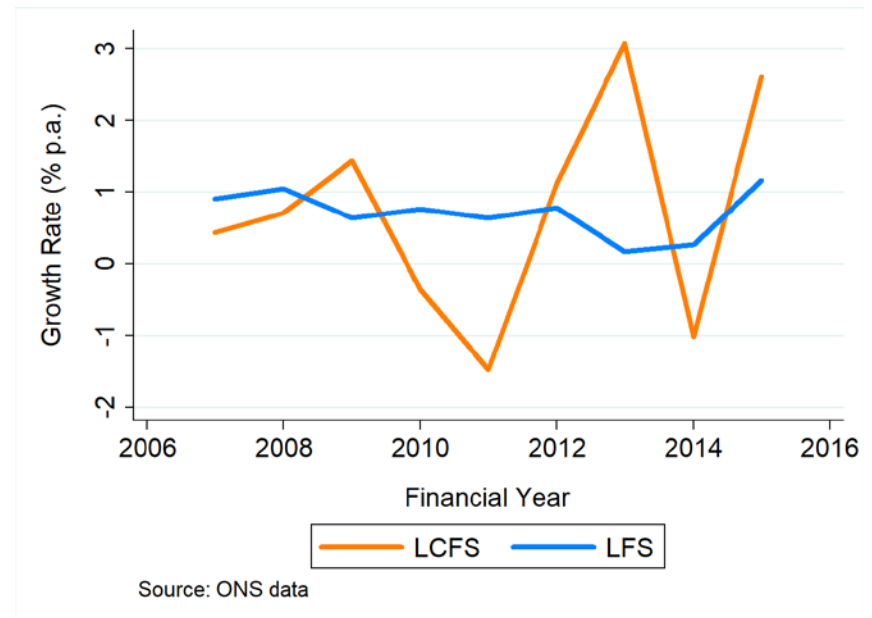
## Average Growth Rates 2006-2015

	Plutocratic	Democratic	Difference
Nominal Growth	1.8%	2.2%	0.4%
Growth in Deflator	2.1%	2.3%	0.1%
Growth in Real Income	-0.3%	0.0%	0.2%

# Issues still to be resolved

- The estimate of the total number of household in LCFS fluctuates considerably.
- The LFS definition of households is more widely used and more stable.

## Number of Households Growth Rate



# Future Work?

- Democratic indicators of income growth by originating industry.
- Need to classify labour income to industrial sector for each household (LCFS probably poor at this) but PAYE possible source.....
- Dividends and retained earnings allocated on proportional basis.
- Need a model of redistribution (IGOTM) to allocate taxes to a common pot.
- Eventually democratic growth accounting may be possible.

# Conclusions

- Drawing on a range of sources, we have allocated national disposable income across households.
- The broad income measure shows declining inequality as do official measures of inequality.
- But we have to address the implications of different definitions of household, and verify that our plutocratic figures align with the macro data.

- The paper shows a practical means of producing a welfare indicator on a regular basis.
- Democratic growth can be explained to the public as the average of each household's income growth rate.
- It is also a first-order approximation to the growth in accruing welfare, when utility is logarithmic.