Analysis of benefit take-up using UKHLS and UKMOD

Melchior Vella
CeMPA, ISER, University of Essex

2nd UKMOD Fest – Edinburgh

30 June 2023

Background and Motivation

- One of the overlooked issues of delivering social benefits to their target population is imperfect take-up.
- The literature, while limited, shows that a proportion of individuals or households eligible for social benefits do not claim them. This phenomenon is not limited to the UK, but is widespread across countries.
- It is estimated that in many western European countries, more than half of working-age beneficiaries do not claim social benefits even if they are eligible, notwithstanding the generous schemes in some countries (e.g., Currie, 2004; Matsaganis, Paulus, and Sutherland, 2008; Bargain, Immervoll, Viitamäki, 2012; Harnisch, 2019; Fuchs et al., 2020; Hernanz, Ko and Moffitt, 2022).
- This target inefficiency distorts the intended impact of social benefits and increases the degree of uncertainty surrounding estimates of budgetary implications and attainment of social policy objectives.

Explaining Take-Up: RCT and BE

- Rational choice theory: trade-off between the expected benefits and costs of taking advantage of social benefits.
  - Level and duration of expected benefits and transaction costs of applying for social benefits are crucial factors.
- Behavioural economics: recent studies have raised serious doubts to the notion that individuals are rational decision-makers, citing cognitive and behavioural barriers to individual decision-making.
  - Such factors include lack of understanding of the program rules or incentives and the complexity of information, low awareness, procrastination, inattention, or psychological frictions associated with program complexity or hassles involved in claiming, and the stigma associated with enrolment.

Background and Motivation

- Despite its relevance, the topic is however still poorly understood.
  - How have the take-up rates changed over the years? Have they increased or decreased?
  - Why do eligible individuals choose not to claim benefits? Is non-claiming temporary or permanent?
  - Are there groups in society that are more inclined not to claim social benefits?
- Answering these questions will help to move away from the assumption - common in the policy debate - of full compliance to benefit rules, provide new insights to improve policy design, and fill research gaps in the literature.

Background and Motivation

- In examining the reasons for the 'inter-temporal persistence' of take-up behaviour, we can distinguish persistence due to 'state dependency' from 'persistent individual heterogeneity'. (Heckman 1978, 1981).
- **State dependence**: individuals' current take-up behaviour depends on their past behaviour. Positive state dependence arises if taking up a benefit in the last period increases the likelihood that the beneficiary will take up the benefit again in current time period.
- **Persistent individual heterogeneity**: includes both observed and unobserved components.

Background and Motivation

- To date, research in (non-)take-up behaviour has so far examined the influence of the usual socio-economic control variables such as education of head of household, household composition, tenure status, and household finances (debt and savings).
- In contrast, we explore the holistic personality traits of the individual (Big Five taxonomy) and cognitive skills, to advance our understanding of whether individual heterogeneity is important, particularly from an econometric perspective.
  - The hypothesis that personality traits are associated with non-take-up behaviours suggests that the identity-driven "personal" stigma acknowledged by psychologists is important even in the absence of needing to claim the credit in public.
  - This contrasts with the cost of social stigma (prejudice against low-class groups) often recognised by economists (Bhargava and Manoli, 2015).

Background and Motivation

- Finding that personality traits and cognitive skills explain take-up behaviour sheds further light for policy makers on how best to realise the full potential of social benefits.
  - Ignoring individual differences is likely to lead to a spurious relationship of socio-economic control variables and possibly misleading assessments of policies to boost the take-up behaviour.
- By considering personality traits that are unobserved in many studies, we can explicitly test whether unobserved heterogeneity is relevant after all.

Dynamic Probit Model

For an individual i at time t, the dynamic probit model can be expressed as

$$y^*_{i,t} = \alpha y_{i,t-1} \mathbb{1}(y_{i,t-1} > 0) + x'_{i,t}\beta + \nu_{i,t}, \text{ with}$$

$$y_{i,t} = \begin{cases} 1, & \text{if } y^*_{i,t} > 0 \\ 0, & \text{if } y^*_{i,t} \leq 0 \end{cases}$$

where $y^*_{i,t}$ and $y_{i,t}$ are the latent and observed take-up behaviour, $x_{i,t}$ is a vector of observed variables that are expected to affect take-up; and $\nu_{i,t}$ is an error term, capturing the unobserved factors that affect take-up decisions. $\mathbb{1}$ is an indicator function, equal to one when the condition in the bracket is satisfied, and zero otherwise.

Dynamic Probit Model

The lagged dependent variable $y_{i,t}$ is included in the right-hand side to capture the dynamics of take-up behaviour.

The assumption that $\nu_{i,t}$ is independent across time for the same individual becomes invalid if unobserved individual heterogeneity affects take-up behaviour.

Failure to take into account for unobserved individual heterogeneity in this case will lead to an estimate of state dependency that is biased upward because people who take-up benefits will always be observed doing so (Wooldridge, 2005).

Dynamic Probit Model

An advantage of panel data is that it provides a way to control for unobserved individual heterogeneity through decomposing $\nu_{i,t}$ into

$$\nu_{i,t} = \eta_i + \epsilon_{i,t}$$

where η_i represents unobserved time invariant individual heterogeneity; $\epsilon_{i,t}$ represents unobserved time variant determinants or shocks to take-up behaviour, and is independent of the observed variables and η_i.

Dynamic Probit Model

To allow the unobserved time invariant individual effects to be correlated with observed variables:

$$\eta_i = \lambda y_{i,0} \mathbb{1}(y_{i,0} > 0) + \bar{x}_i' \pi + \mu_i$$

where μ_i $N(0, \sigma_\mu^2)$ and is uncorrelated with any observed variables and the transitory error $\epsilon_{i,t}$. $\bar{x}_i$ stands for the within-unit averages of the explanatory variables where the averages are based on all periods $t = 0, ..., T$.

Here, $y_{i,0}$ represents the initial value of the take-up variable.

Dynamic Probit Model: Orme Method

In order to account for unobserved heterogeneity and initial conditions problems I follow Orme (1997, 2001) suggested two-step procedure:

1. First, fit the initial condition probit, and then generate the generalised residual variable
2. Then, estimate the dynamic model by also adding the generalised residual variable as an additional regressor

- Orme estimators are best secured using instruments that are appropriate for the initial condition. These explanatory variables explain take-up probabilities in the initial year but do not also explain take-up likelihood in subsequent years.
- Studies generally use pre-sample information. I use pre-sample personality traits and cognitive skills scores. Robustness checks indicate similar results to the Wooldridge method.
- Apply longitudinal weights that ensures balanced panel.

Measuring Take-up

$$\text{Take-up rate} = \frac{\text{claimants}}{\text{eligible individuals}}$$

- Estimates of take-up rates is estimated by dividing the number of actual recipients by the number of eligible beneficiaries.
- Two types of measurement errors:
  - Type I error: people in the survey fail to report that they are taking the benefit, or the microsimulation model falsely predicts eligibility, which would incorrectly identify them as non-take-ups
  - Type II error: the person is not eligible but benefit is still claimed

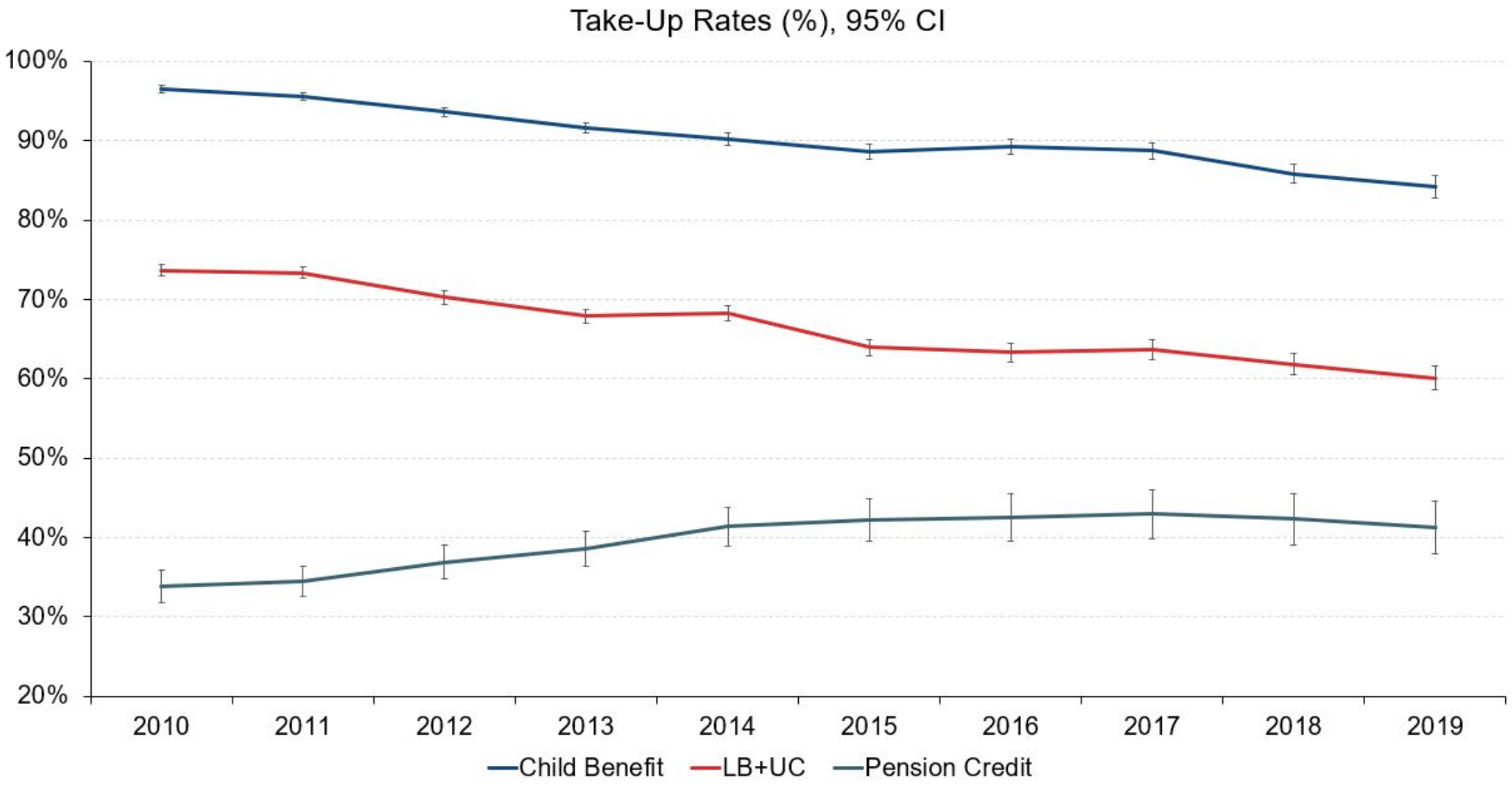
Data

- The data used in this study are drawn from the first nine waves (i.e., 2010-2019) of the UK Household Longitudinal Study (UKHLS) and eligibility simulations are based on the UKMOD tax-benefit calculator.
- The new dataset of Bronka, Popova, and Richiardi (2023) combines these two elements where the same individuals are followed over many years and their taxes and benefits are simulated in UKMOD.
- UKMOD identifies whether an individual is entitled to a specific benefit, while UKHLS allows us to identify whether individuals have received the benefit.

Benefits Considered

- Child benefits (CB)
- Legacy benefits (LB): Income-based Jobseekers Allowance; Income-related Employment and Support Allowance; Income Support; Housing Benefit; Child Tax Credit; Working Tax Credit
- Universal Credit (UC): so far combined with LB
- Pension credit

Estimated Take-up Rates



Probability of receipt at $t = 1$ (initial conditions)

	Child Benefit	LB+UC	Pension Credit
Log Simulated Benefit	1.320***	.305***	.300***
	(.375)	(.055)	(.082)
Age	.016	-.023*	.009
	(.020)	(.011)	(.012)
Responsible for Housing Costs			
Yes	.057	.011	.044
	(.197)	(.181)	(.259)
Marital Status (Base: Single)			
Married	-.596	1.103***	.059
	(.417)	(.247)	(.325)
Divorced/Separated/Widowed	-.563*	.405*	.411**
	(.305)	(.237)	(.284)
Educational Attainment (Base: non-Tertiary)			
Tertiary Education	-.080	-354***	.009
	(.154)	(.133)	(.281)
Gender (Base: Female)			
Male	-.507*	-.141	-.324
	(.263)	(.201)	(.201)
Ethnic Group (Base: White British)			
Mixed	-.125	.033	
	(.570)	(.454)	
Asian or Asian British Chinese	-.969***	-.969***	-.493**
	(.210)	(.218)	(.509)
Black or Black British	-.855***	-1.077***	.660
	(.288)	(.275)	(.405)
Arab and any other	-1.085*	-.496	
	(.599)	(.515)	

Probability of receipt at $t = 1$ (initial conditions)

	Child Benefit	**LB+UC**	**Pension Credit**
Number of rooms	.064	-.087*	-.209***
	(.059)	(.048)	(.064)
Social-rented household	-.137	0.447*	-.056
	(.282)	(.208)	(.343)
Personality Traits			
Openness to Experience	-.034	.049	.137*
	(.079)	(.087)	(.081)
Conscientiousness	-.228***	-.011	.064
	(.078)	(.091)	(.080)
Extraversion	.121	-.077	-.156**
	(.074)	(.095)	(.077)
Agreeableness	.129	.171**	-.050
	(.087)	(.066)	(.086)
Neuroticism	.039	-.007	-.033
	(.078)	(.095)	(.076)
Cognitive Ability	-.191*	.056	-.048
	(.099)	(.078)	(.079)
General Health	.112	-.058	-.013
	(.093)	(.077)	(.080)
Constant	-4.548**	1.012	-1.246
	(1.874)	(.668)	(1.073)
Household characteristics	x	x	x
N	1,380	849	400

Dynamic effects probit models of the probability of receipt

	Child Benefit	LB+UC	Pension Credit
Lag take up $(t-1)$	2.040***	1.740***	1.327***
	(.141)	(.115)	(.125)
Simulated Benefits (in logs)	.462***	.181***	.358***
	(.110)	(.051)	(.065)
Generalised error from $t=1$ probit	.540***	.301***	.556***
	(.128)	(.085)	(.115)
Age	-.259**	-.087	-.064
	(.103)	(.076)	(.131)
Tertiary Education	-.399***	-.070	-.012
	(.101)	(.098)	(.295)
Number of rooms	-.097***	.063*	-145*
	(.031)	(.033)	(.060)
General Health	-.175**	-.089	.043
	(.073)	(.067)	(.070)
Time-average simulated benefits (in logs) Mean	.687***	.325***	.015
	(.222)	(.086)	(.122)
Constant	-6.575***	-4.278***	-.776
	(1.241)	(.744)	(1.088)
Time-average characteristics	x	x	x
Household characteristics	x	x	x
lnsig2u	-1.267***	-2.885*	-1.358**
	(.455)	(1.584)	(.594)
rho	.219	.253	.205
	(.078)	(.111)	(.097)
N	5,044	2,733	1,169

Estimation Results

- The lag take-up coefficient is positive and significant meaning that there are dynamics of genuine state dependence once the initial condition and the contribution of UH have been accounted for.
- As expected, the more generous the entitlement the higher is the likelihood of claiming that benefit. Younger individuals are less likely to claim benefits, expect for pension credit.
- The take-up of pension credit is not predicted by educational attainment, age or health.

Estimation Results

- Next, we turn to the set of coefficients of the variables capturing UH: (i) the initial condition (generalised residual); and (ii) the within-unit averages of time-varying explanatory variables.
- Here, we observe a statistically significant and substantial positive effect of the initial condition on take-up behaviour.
  - This indicates that these characteristics are positively correlated with take-up behaviour or that, said differently, these households/individuals are characterised by time-constant unobserved factors that increase the likelihood of take-up behaviour.
- Some of the time-average characteristics are significant, indicating the presence of individual UH.

Take-way points

- Strong state dependence of take-up behaviour.
- Unobserved heterogeneity plays an important role for take-up behaviour for social benefits: partly explained by personality traits and cognitive skills.
- Education and household tenure status also predicts initial take-up of LB/UC: social stigma cost.
- Mixed ethnic background seems to be related to costs of claiming; regional differences also not big.
- Agreeableness increases the probability of LB/UC take-up, while conscientiousness decreases the likelihood of CB take-up.

Policy Implications

- Public expenditure: while non-take-up behaviour is expected to reduce public expenditure on benefits in the short run, it can exacerbate public spending in the longer term, for example, through the scarring effects of poor nutrition, delayed health care, and an impoverished environment
- Incentives for take-up: offers an alternative to directly intervening with traditional fiscal policy tools (e.g. modifying eligibility conditions or benefit amount)
- Effect on social outcomes: move away from perfect take-up assumption and its effect on social outcomes

Thank you for your attention.

mvella@essex.ac.uk