Introduction of behavioural responses to EUROMOD - Applying the Austrian family tax credit

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EUROMOD

The 2019 Austrian Family Tax Credit...

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Berechnen Sie Ihren persönlichen Vorteil:
familienbonusplus.at

... The Family Bonus Plus - "FBP"

"[...] the biggest family relief in history."

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What is it?

- up to € 1500 (500) tax credit per year per child<18 (>18)
- direct € 250 tax reimbursement for low income lone parents and single earners
- cannot reduce initial tax burden below zero
- claimable 100 % or 50:50 (mandatory split between alimony debtor & creditor)
- replacing existing child allowance & deductibility of child care costs

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Why including behavioral responses?

- Expanding static EUROMOD model
- Reducing uncertainty about actual distributive & fiscal effects (of any other policy)
- **Contributions**, among others, *Van Soest (1995)*, *Hoynes (1996)*, *Creedy and Kalb (2006)*, Löffler et al. (2013), *Bargain et al. (2014)*

Labor Supply Model

Estimating labor supply responses induced by changes in the tax-benefit system via a structural discrete choice model **in four steps:**

1. Specifying a model explaining labor supply behavior: Utility maximizing individuals in the trade-off between leisure and consumption
2. Calculation of budget constraint according to household composition and tax benefit system (conducted in EUROMOD) for each discrete labor supply level.
3. Estimating model using individual's labor supply and budget constraint (disposable income) at different discrete labor supply levels.
4. Estimated model parameters then used as an „EUROMOD Add-On" for simulating (labor supply side) second-order effects of any policy changes.

Basic Model

Discrete set of income-leisure combinations $(y_{ij}, l_{ij}^f, l_{ij}^m)$,

where...
y_{ij} *denotes disposable income of household* i *choosing alternative* j
l_{ij}^k $(k = f, m)$ *denotes leisure choice of partners in couple household*

Labor supply choices of households:

- Female (male) individual choice set of 6 (4) alternatives, given by the average working hours in intervals: $0, 1-10, 11-20, 21-30, 31-40, > 40$ $(0, 1-20, 21-40, > 40)$.
- Coordinated couple households optimize across 24 choice combinations, singles across 6 (4) alternatives.
- Non-couple households with two (three) employable members are duplicated (tripled), each time allowing one member to choose and keeping labor supply choice of other half (two thirds) fixed.

Calculation of Disposable Income y_{ij} in EUROMOD

$$y_{ij} = d(w_i^f h_{ij}^f, w_i^m h_{ij}^m, I_i, X_i), \tag{1}$$

where...
w_i^k *denotes before tax hourly wage rate (exogenous and independent of the chosen alternative)*
$h_{ij}^k = 1 - l_{ij}^k$ *denotes normalized time endowment*
I_i *and* X_i *denote non-labor income and household characteristics, respectively*

- A standard **Heckman-corrected wage equation** is estimated to predict observed and unobserved wages (Van Soest, 1995).
- **Wage prediction errors** are **taken into account**, as ignoring them would subsequently yield inconsistent estimates of the preference parameters (Creedy & Kalb, 2005).

Utility Function (1)

- Households choose utility maximizing working hours.
- Total utility given by:

$$V_{ij} = U_{ij}(y_{ij}, l_{ij}^{f}, l_{ij}^{m}, X_i) + \epsilon_{ij}, \tag{2}$$

where...
U_{ij} describes the deterministic component
ϵ_{ij} describes random component, following an Extreme Value distribution type I

- Deterministic part U_{ij} given by:

$$\begin{aligned} U_{ij} \quad = \quad & \alpha_{yi} ln(y_{ij}) + \alpha_{cc}(ln(y_{ij}))^2 + \alpha_{li}^{f} ln(l_{ij}^{f}) + \alpha_{li}^{m} ln(l_{ij}^{m}) + \alpha_{ll}^{f}(ln(l_{ij}^{f}))^2 \\ & + \alpha_{ll}^{m}(ln(l_{ij}^{m}))^2 + \alpha_{lll}^{f}(ln(l_{ij}^{f}))^3 + \alpha_{lll}^{m}(ln(l_{ij}^{m}))^3 + \alpha_{yl}^{f} ln(y_{ij}) ln(l_{ij}^{f}) \\ & + \alpha_{yl}^{m} ln(y_{ij}) ln(l_{ij}^{m}) - \eta_i^{f}.1(l_{ij}^{f} < 1) - \eta_i^{m}.1(l_{ij}^{m} < 1), \end{aligned} \tag{3}$$

where...
η_i^k is a separate term to account for fixed cost of work

Utility Function (2)

- Coefficients on consumption, leisure and fixed cost of work are given by:

$$\alpha_{yi} = \alpha_y^0 + Z_i^y \alpha_y, \quad (4)$$

$$\alpha_{li}^k = \alpha_l^{0k} + Z_i^{lk} \alpha_l^k + u_i^k, \quad (5)$$

$$\eta_i^k = \eta^{0k} + Z_i^k \eta^k, \quad (6)$$

where...
$k = f, m$
Z_i denotes taste shifters (age, presence of children, elderly dependents, education, family status...)
u_i^f and u_i^m are error terms capturing ***unobserved heterogeneity*** *in preferences. Halton draws (for computational reasons so far only 1) guarantee more symmetric coverage than independent random draws from the normal distribution (Train, 2003)*

- **Restrictions to the model:** Interior points of the budget set are excluded. Utility must increase with income in some relevant region of the (y, l^f, l^m) space (Van Soest, 1995). No restriction with respect to leisure.

Likelihood Function (1)

- If households choose alternative j for which V_{ij} is largest & if random component follows extreme value type I distribution, conditional probability for each household i to choose alternative j is given by:

$$P_{ij}(U_{ij} > U_{ik}, \forall k \neq j) = \frac{\exp(U_{ij})}{\sum_{k=1}^{M} \exp(U_{ik})} \tag{7}$$

- To obtain the unconditional probability one has to integrate out both, wage error term and unobserved heterogeneity error term u_i^k.

$$L = \prod_{i=1}^{N} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \sum_{j=1}^{M} \left(\frac{\exp(U_{ij}(y_{ij}, l_{ij}^f, l_{ij}^m, X_i \mid \hat{w}_i^f, \hat{w}_i^m, u_i^f, u_i^m))}{\sum_{k=1}^{M} \exp(U_{ik}(y_{ik}, l_{ik}^f, l_{ik}^m, X_i \mid \hat{w}_i^f, \hat{w}_i^m, u_i^f, u_i^m))} D_{ij} \right) f_w(\hat{w}^f, \hat{w}^m) g_u(u^f, u^m) d\hat{w}^f d\hat{w}^m du^f du^m, \tag{8}$$

where...
D_{ij} denotes an indicator variable turning 1 for the observed choice
$f_w(\hat{w}^f, \hat{w}^m)$ denotes density for pred. wages and $g_u(u^f, u^m)$ density for (u^f, u^m)

Likelihood Function (2)

- Consideration of several random components complicates Maximum Likelihood estimation considerably. ► Method of **simulated maximum likelihood** has to be applied to obtain estimates for preference parameters (Train, 2009), (Loeffler et al., 2014).
- In practice achieved by averaging conditional probability over a large number of draws R.

$$ln(SL) = \sum_{i=1}^{N} \ln \left(\sum_{j=1}^{M} \frac{1}{R} \sum_{r=1}^{R} \frac{\exp(U_{ij}(y_{ij}, l_{ij}^{f}, l_{ij}^{m}, X_i \mid \hat{w}_{ir}^{f}, \hat{w}_{ir}^{m}, u_{ir}^{f}, u_{ir}^{m}))}{\sum_{k=1}^{M} \exp(U_{ik}(y_{ik}, l_{ik}^{f}, l_{ik}^{m}, X_i \mid \hat{w}_{ir}^{f}, \hat{w}_{ir}^{m}, u_{ir}^{f}, u_{ir}^{m}))} D_{ij} \right) \quad (9)$$

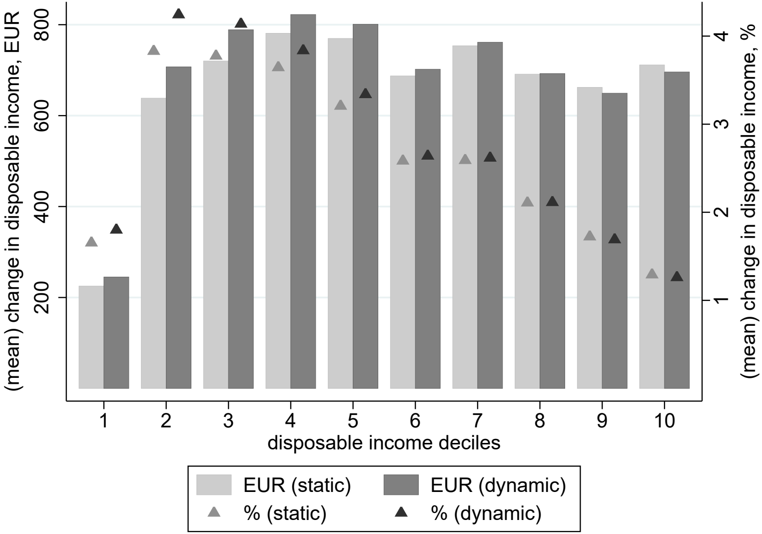
Labor Supply Elasticity Elasticities across Subgroups

10 % increase in gross income yields x % change in labor supply

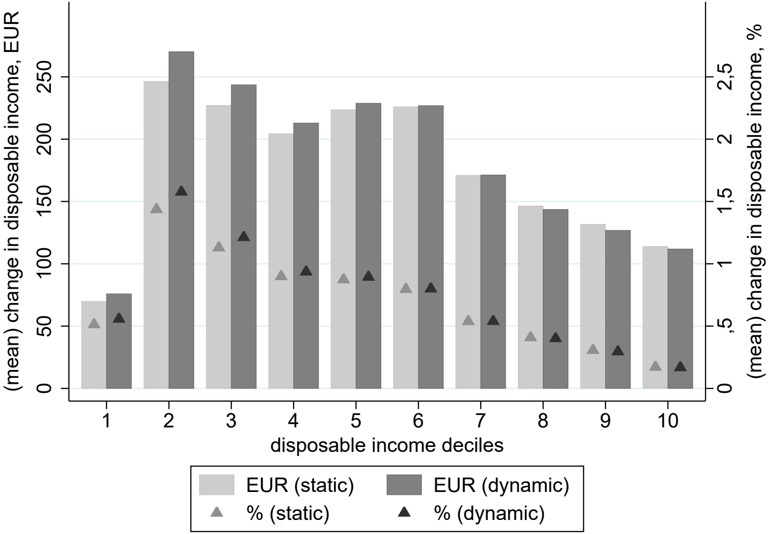
		single		couple	
		female	male	female	male
average hours	baseline	*28.64*	*36.48*	*25.12*	*39.77*
	scenario	*28.99*	*36.63*	*25.49*	*40.02*
elasticity	overall	*.1210*	*.0399*	*.147*	*.0615*
	extensive	*.1045*	*.0330*	*.058*	*.0465*
	intensive	*.0165*	*.0069*	*.089*	*.0150*
cross wage elasticity	overall			*.005*	*-.002*
	extensive			*-.003*	*-.001*
	intensive			*.008*	*-.001*

Data

Distributive Effects of FBP: Only Families



Distributive Effects of FBP: Entire Population



Main Findings

	Status Quo	Satus Quo w/o KBK & KFB	static FBP w/o KMB	static FBP	dynamic FBP
Gini	0.249	0.253	0.247	0.246	0.244
Δ tax revenue in million €		500	-1540	-1560	-1536

where... KBK = deduction of child care costs, KFB = child allowance, KMB = direct reimbursement for low income lone parents, FBP= „Family Bonus Plus“

- Implementation of a „EUROMOD Add-On“ tool accounting for second order effects.
- Weak labor supply elasticities found for recent Austrian data.
- Regarding implementation of 2019 „FBP“: Compared to static assessment a dynamic one slightly decreases both, inequality and loss in tax revenue.

- SILC 2016 contains 6.000 households with 13.016 individual observation.
- Remaining 3.518 employable individuals in Heckman-corrected wage equation.
- Among them 2.272 singles and 1.246 couples.
- $\sim$ 292.000 distinct households with $\sim$ 608.000 individuals taking into account 4, 6 or 24 labor supply choices and 10 wage draws.

back