

Implementing a Negative Income Tax: Labour participation impact

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INTRODUCTION

- 1. Introduction
- 2. NIT Simulation
- 3. Estimation of wages
- 4. Labour supply estimation
- 5. Results

- The tax-benefit system ability to fight against inequality and poverty is limited.
- Among the proposed measures to fight poverty a Basic Income (BI) scheme can be stressed. It could be implemented through:
 1. A periodic, monetary and personal **transfer**
 2. Using the Tax Administration with a **Negative Income Tax (NIT)**.
Advantage: NIT manages combining the tax system and the public benefit system into a single mechanism.
- Criticism: such a reform will make people leave the labour market
- Index:
 - Simulating a NIT
 - Estimation of wages
 - Labour Supply Estimation
 - Changes in labour behavior due to NIT

NIT SIMULATION

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- 2. **NIT Simulation**
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- Base Scenario 2018 Spanish Income Tax (EUROMOD 2018)
- Self-financing reform (revenue neutral)
 - Expenditure side: removal of non-contributory public benefits (no needed due to the negative side of NIT).
 - Positive part of NIT: Changes in tax rates, Simplifying: eliminating joint taxation, dual tax base, removing deductions and tax credits...
- NIT Key Parameters: **BI = ME x TR**
 - BI amount: € 5,550 (General deduction in 2018 PIT) close to minimum non-contributory Social Security pension in 2018 (€5,321.40) $\approx$ 40% Median Equivalent Income (Children 30%)
 - Tax rates (TR): 50% (both for positive and negative side)
 - Minimum Exemption (ME): €11,100

ESTIMATION OF WAGES

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- Database: 2018 EUROMOD
(≈ SILC for Spain)
- Two-step Heckman selection model:
estimating wage salaries
for potential workers
 - First step: estimating the probability of labour participation (Probit) → Inverse of Mills ratio.
 - Second step: use the Mills ratio to estimate wage rates (OLS),

Ln Wage Rate Equation (OLS)

	Women	Men
Experience	0.0529393***	0.0278306***
Experience ² /100	-0.0643393***	-0.0111569**
Education (<Primary as reference)		
Primary	0.1193719	0.1168879***
Secondary	0.0729114	0.1302139***
Secondary+	0.2566916**	0.1306699**
Post-Secondary	0.1283973	0.4483846**
Higher Education	0.7338344***	0.1465729**
Region (Galicia as reference)	...	...
Constant	0.9371978***	1.994635***

Participation Equation (Probit)

	Women	Men
Age	0.1115461***	0.1149692***
Age ² /100	-0.1453415***	-0.1412149***
Income of the partner	-0.00000615	0.0000999***
Number of children	-0.0655665**	0.017160
Education (Primary or less as reference)		
Post-Secondary	0.419810***	0.4169121***
Higher Education	1.156756***	0.8165719***
Immigrant	-0.585827***	-0.5865955***
Region (Galicia as reference)	...	...
Constant	-2.11018***	-1.657727***
Mills Ratio (Lambda)	-0.102821***	-1.302445***
Chi ²	550.36	221.74
N	5831	4468

*p<0,1; **p<0,05; ***p<0,01

Source: Own calculations using EUROMOD

LABOUR SUPPLY ESTIMATION

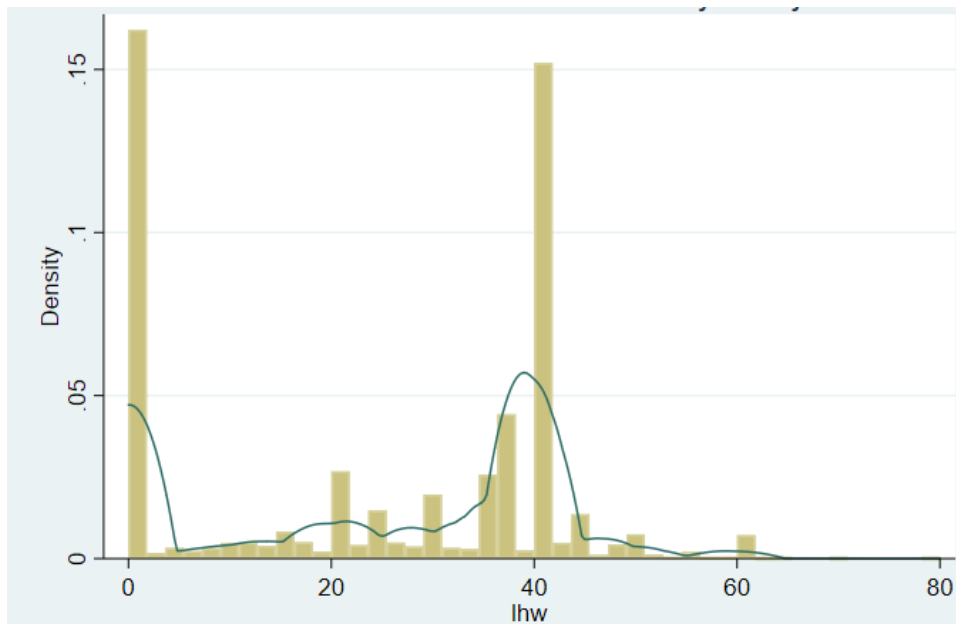
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- Having wages and hours of work for men and women, we can now estimate labour behaviour. We perform a structural labour supply model: labour supply as a discrete choice problem, considering family as a unitary agent (Aaberge et al., 1995; Van Soest, 1995; Creedy & Kalb, 2005; Sommer, 2016; Paniagua, 2015; Oliver & Spadaro, 2017).
- For individuals, we consider three categories, based on [working hours distribution](#), both for males and females:
 - No work (if they declare 8 or less hours of work per week)
 - Part-time work (9 or more hours, and less than 30 hours),
 - Full-time work (30 or more hours of work per week).
- For couples: nine different possibilities
- We have actual data of one of these options (choice), but we need to know what would happen under the remaining alternatives.

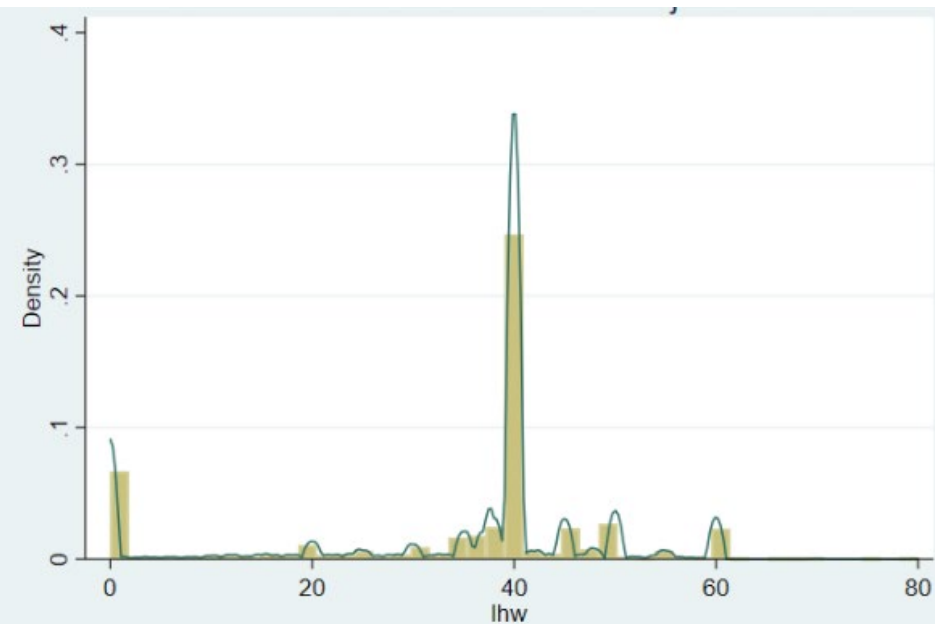
LABOUR SUPPLY ESTIMATION: Working hours distribution in Spain

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Female



Male



LABOUR SUPPLY ESTIMATION

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- Starting from actual decision, we calculate net income for individuals and couples, and assume a very simple utility function, depending on leisure and disposable income.

$$U^* = \underbrace{\beta_h h + \beta_y y}_{\text{U deterministic utility function}} + \underbrace{v}_{\text{Error term which extreme value type I density function: } f(v) = e^{-v} e^{-e^{-v}}}$$

- This model is estimated by maximum likelihood: find the **parameters** that produce the highest probability of observing the actual hour values.
- In the case of couples, the deterministic utility function takes this form:

$$U = \beta_{h_f} h_f + \beta_{h_m} h_m + \beta_y y$$

LABOUR SUPPLY ESTIMATION

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- The estimators are as expected: utility increases with income and decreases with leisure, but both functions are convex.
- We use these estimators to calculate utilities for each individual in the dataset, using net income and leisure under each situation (non-working, full-time, part-time) described before.
- And we know how the actual behaviour of this individual was.

Modelling deterministic utility

Disposable Income (Yd)	0. 0047734***
Yd x Yd	-3.88e-07***
Yd x L	-.000029***
Leisure (L)	-.2334928***
L x age	0.0013593***
L x gender	0. 0195699***
L x L	0. 002002***
N	22623

Source: Own calculations using EUROMOD

LABOUR SUPPLY ESTIMATION

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- **Calibration process:** we add random draws from the extreme value distribution to the deterministic utility function in order to obtain U^* . Draws are only kept if the resulting hours derived by maximizing U^* are the same as the observed in the data. We perform 100 'good' draws for each case (Baseline Scenario).
- **Performing the NIT proposal:**
 - We re-calculate disposable income for every unit, considering the new NIT and removing prior benefits. We do that for every possible scenario (3 cases for individuals, 9 cases for couples)
 - We calculate the utility of individual / couples under these different scenarios: new disposable income and different work situation after the reform. We make individuals / households choice the new best option after NIT.
 - We compare the labour behaviour before and after the reform.

RESULTS: ONE-EARNER HOUSEHOLDS

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Transition matrix of working hours (one-worker households) before and after the NIT reform					
a) ALL THE PEOPLE		Individual working hours after NIT			Total
		0	20	40	
Current individual working hours	0	88,39%	0,54%	11,07%	100.0%
	20	5,56%	82,68%	11,76%	100.0%
	40	9,85%	1,93%	88,22%	100.0%
Total		103,80%	85,14%	111,06%	
b) MALES		Individual working hours after NIT			Total
		0	20	40	
Current individual working hours	0	69,02%	0,86%	30,12%	100.0%
	20	1,14%	73,53%	25,33%	100.0%
	40	5,44%	1,11%	93,45%	100.0%
Total		75,61%	75,50%	148,90%	
c) FEMALES		Individual working hours after NIT			Total
		0	20	40	
Current individual working hours	0	95,75%	0,42%	3,84%	100.0%
	20	7,79%	87,30%	4,91%	100.0%
	40	13,83%	2,67%	83,50%	100.0%
Total		117.37%	90.38%	92.25%	

Shorrocks (1978)

$$\widehat{M}_S(P) = \frac{n - \text{trace } P}{n - 1}$$

Bartholomew (1973)

$$\widehat{M}_B(P) = \sum_{i=1}^n \sum_{j=1}^n r_{ij} |i - j| r_i$$

Net Bartholomew Index

$$\widehat{M}_N(P) = \widehat{M}_B(+) - \widehat{M}_B(-)$$

Mobility indexes of one-worker households. NIT reform			
	Male	Female	Total
Shorrocks index: $\widehat{M}_S(P)$	0.32004472	0.167257872	0.203551361
Bartholomew index: $\widehat{M}_B(P)$	0.22206230	0.206782454	0.212962472
Positive part: $\widehat{M}_B(+)$	0.13549508	0.032774438	0.074320382
Negative part: $\widehat{M}_B(-)$	0.08656721	0.174008016	0.138642090
Net Bartholomew Index: $\widehat{M}_N(P)$	0.04892787	-0.141233578	-0.064321708

Source: own calculations

RESULTS: TWO-EARNER HOUSEHOLDS

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Transition matrix of working hours (two-worker households) before and after the NIT reform							
		Total household working hours after NIT					Total
		0	20	40	60	80	
Current total working hours	0	45.5%	0.0%	21.4%	6.6%	26.4%	100.0%
	20	2.0%	24.6%	24.5%	9.3%	39.6%	100.0%
	40	0.4%	0.1%	82.8%	1.9%	14.8%	100.0%
	60	0.8%	0.1%	6.1%	69.2%	23.8%	100.0%
	80	0.1%	0.0%	0.3%	0.0%	99.7%	100.0%
Total		48.8%	24.8%	135.2%	87.0%	204.3%	

Mobility indexes of two-worker households. NIT reform	
	Total
Shorrocks index: $\widehat{M}_S(P)$	0.445551223
Bartholomew index: $\widehat{M}_B(P)$	0.107078900
Positive part: $\widehat{M}_B(+)$	0.093711928
Negative part: $\widehat{M}_B(-)$	0.013367006
Net Bartholomew Index: $\widehat{M}_N(P)$	0.080344923

Bartholomew (1973)

$$\widehat{M}_B(P) = \sum_{i=1}^n \sum_{j=1}^n r_{ij} |i - j| r_i$$

Net Bartholomew Index

$$\widehat{M}_N(P) = \widehat{M}_B(+)-\widehat{M}_B(-)$$

Source: own calculations

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GRACIAS!

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