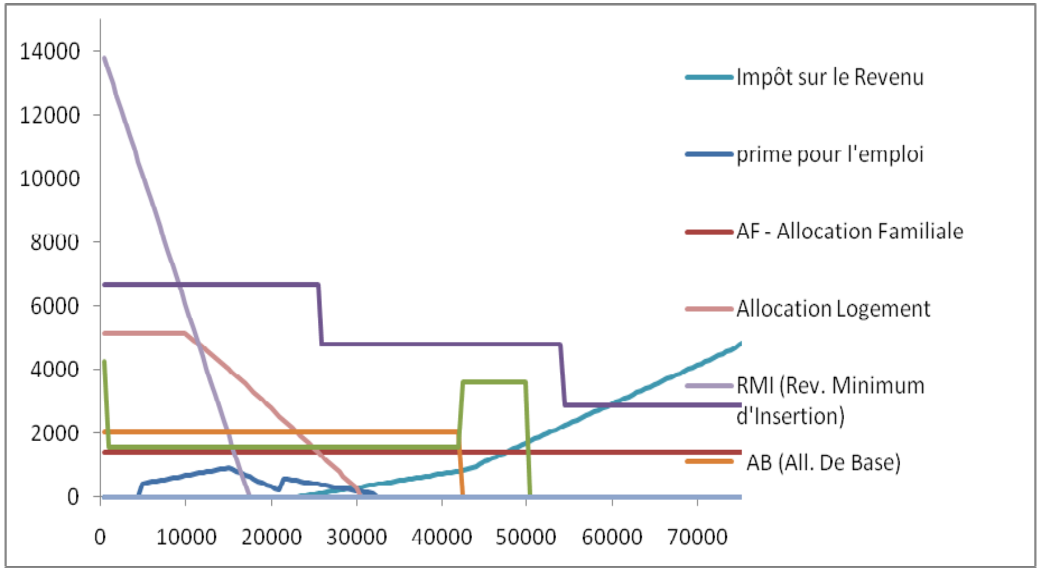
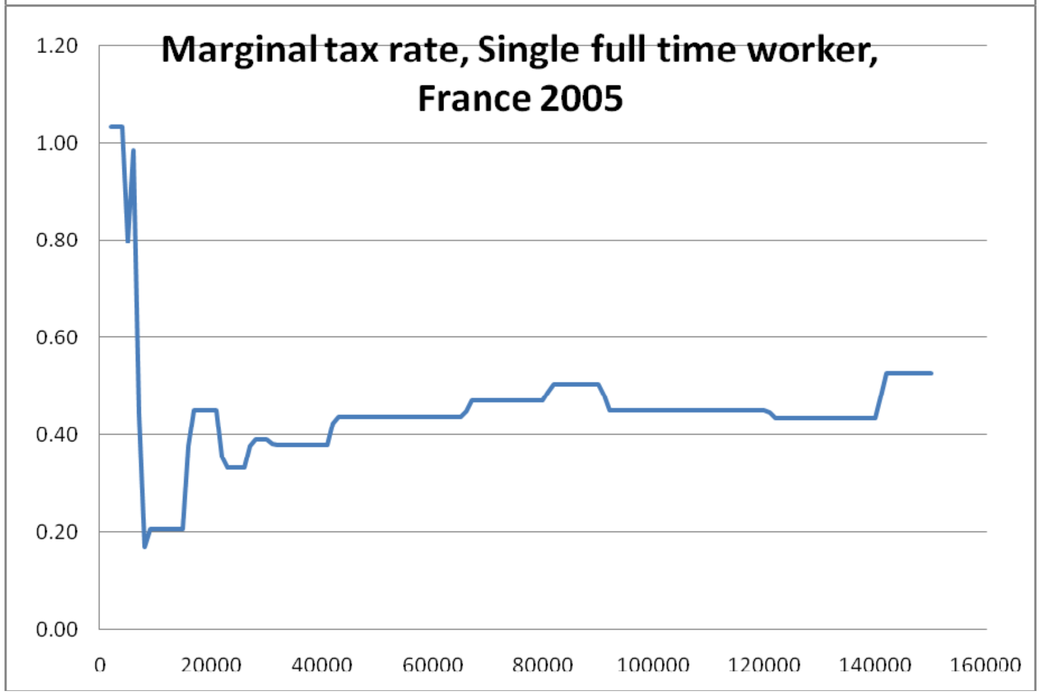
MICROSIMULATION AND THE ANALISYS OF REDISTRIBUTION POLICIES





Outline of the lecture

1) Introduction to microsimulation.
- Theoretical background.
- Construction,
- components (data, algorithm)
- validation and calibration.
- Some example of MsM (Sysiff, GladHispania).

2) Microsimulation analysis in an arithmetical framework.
- A basic income – flat tax exercise.

3) Microsimulation analysis in a behavioural arithmetical framework.
- A basic income – flat tax exercise.

1) Introduction to microsimulation

- **What is the effect of income tax upon different types of families?**
- **What does it cost to raise the age pension by 2 euros a week and what proportion of the aged would benefit?**
- **What will the structure of French society look like in 20 years time?**

These are the sort of questions that microsimulation models (and a little bit of imagination..) are designed to answer !

Definition: Microsimulation models (MSMs) allow simulating the effects of a policy on a sample of economic agents (individual, households, firms) at the *individual* level.
Policy evaluation is based on representations of the economic environment of individual agents, their budget constraints and possibly their behaviour.
A policy simulation then consists of evaluating the consequences of a change in the economic environment induced by a policy reform on a vector of indicators of the activity or welfare for each individual agent in a sample of observations.

- Micro simulation is a technique which is particularly suitable for systems where the decision-making occurs at the **individual** unit level and where the interactions within the system are **complex**.

The idea of applying micro simulation techniques to socio-economic modelling was pioneered by Guy Orcutt in the United States in the late 50's and early 60's (Orcutt, 1957; Orcutt et al., 1961). However, until relatively recently, the enormous cost of the computing resources required by such models and the lack of appropriate microdata had made their development and use for policy formation of questionable value. Only with the development of increasingly powerful computer hardware and the greater availability of individual unit record data has microsimulation modelling become a cost-effective and accessible option.

- The major advantage of micro simulation models for social and economic policy analysis is that they produce results which can be analysed at the individual level. Thus, the distributional impact of a policy measure across different types of families or different geographical regions can be assessed.

- At the same time, estimates of the aggregate outcomes can still be derived easily, by summing the individual results. It is these features which led an exhaustive review of microsimulation in the United States to conclude "… that *no other type of model can match microsimulation in its potential for flexible, fine-grained analysis of proposed policy changes* …" (Citro and Hanushek, 1991, p.115).

Note: ex ante vs ex post evaluation

By ex ante evaluation we mean quantitative techniques—that can be both micro and macro—to “predict” the likely impact of a change in policy (tax, subsidy, trade policy reform, exchange rate regime) prior to their implementation. But it is also crucial to evaluate ex post the actual impact of policies and, ideally, to measure the difference with ex ante predictions, and on that basis to explore ways to improve their performances.

The desirable characteristics of a microsimulation model:

1) It must be an instrument able to characterise the **starting situation** (estimation stage) and to **simulate reforms** (simulation stage).

2) The tool must be **easy enough to be used for anyone**; even if computing languages are not a skill owned by the user. This does not mean that necessary information for knowing how everything works is not given. The interested researcher could know all the necessary steps followed to elaborate the final product

3) Indicators for **measuring the most relevant effects** of tax parameters must be incorporated (revenue magnitudes, equity and efficiency, poverty, polarization, etc., analysis).

4) The **input data** must incorporate as faithfully as possible the **real world**.

Structure of a microsimulation model:

- Dataset
- Economic Model [Rationality]
- Environment

  -Redistribution system,

  -Market characteristics,

  -etc..

A taxonomy of microsimulation models:

- arithmetical vs behavioural models
- static vs dynamic models
- partial vs general equilibrium models

<u>Dataset</u>:

- representativity,
- underreporting,
- updating,
- net to gross.

<u>Algorithms</u>:

- flexibility vs rigidity;
- policy vs research,
- **2 Examples:**
    1. SYSIFF
    2. GLADHISPANIA: http://www.gladhispania.es/

<u>Validation</u>: what is? How you do it.

Calibration: what is? How you do it.

Table 1: Calibration of GLADHISPANIA (in billions of euros)

		1998			**1999**	
	Official Statistics	Gladhispania	Difference	Official Statistics	Gladhispania	Difference
	(1)	(2)	(3) = (2-1)/1	(4)	(5)	(6) = (5-4)/4
Personal Income Tax collection[(a)]	39.2	39.1	-0.25%	39.54	37.83	-4.33%
Average income Tax rate[(c)] = (net tax/ taxable income)	15.13%	15.59%	3.03%	23.15%	23.87%	3.12%
Employee Social Security contributions[(b)]	13.7	13.37	-2.40%	2,424	14.26	-2.13%

(a) Source: Informe Anual de Recaudación Tributaria de 2001; (b) Source: Anuario de Estadísticas Laborales y de Asuntos Sociales 2002; (c) Source: Memoria de la Administración Tributaria 2001

Definition: **Arithmetical models** show the 'first-round' or 'morning after' effects of policy changes, before individuals have had time to adjust their behaviour to the changes

Theoretical justification of arithmetical microsimulation (1)

Define $V_i(p, y_i)$ as the indirect utility function of that household (indexed *i*):

$$V_i(p,y_i) = U\left[x^M(p,y_i)\right] \text{ with } x^M(p,y_i) = Arg\,max\left\{U_i(x_i) \text{ s.t. } px_i \leq y_i\right\} \quad (1)$$

where y_i is household *i*'s income, *p* the price vector that it faces, $U_i(x)$ its direct utility function and $x^M(p, y_i)$ its vector of Marshallian demand functions.

The welfare effect of a public policy affecting marginally household *i*'s income at constant prices *p* is given by $\Delta V_i = V_y^i \Delta y_i$, where V_y^i is its marginal utility of income.

Inverting this expression, one may express any change in the welfare of individual *i* in an "equivalent" variation of income, Δy_i^*:

$$\Delta y_i^* = \Delta V_i / V_y^i \quad (2)$$

In other words, there is complete equivalence between the change in the welfare income metric, Δy_i^*, and the change in welfare once a value has been selected for the marginal utility of income V_y^i. But the latter is essentially unobserved and has therefore to be chosen arbitrarily on a purely normative basis.

Theoretical justification of arithmetical microsimulation (2)

Consider now a policy change that affects the price vector *p*. Differentiating the indirect utility function yields: $\Delta V_i = \sum_j V_{ij} \Delta p_j$ (3)

where V_{ij} is the derivative of the indirect utility function with respect to the price p_j.
From the envelope theorem, or Sheppard's lemma or Roy theorem, it is known that:

$$V_j = -V_y^i . x_j^M (p, y_i) \quad (4)$$

Replacing in (3) and using the welfare income metric definition (2), the change in the price vector Δp causes a change in the welfare of individual *i* equivalent to a change in income given by:

$$\Delta y_i^* = -\sum_j x_j^i \Delta p_j \quad (5)$$

where x_j^i is the actual consumption of good *j* by household *i.*

The preceding equation fully justifies the arithmetical microsimulation approach.
It implies that the change in the welfare income metric due to a change in price is simply equal to the change in the cost of the consumption basket due to the price change Δp .

Theoretical justification of arithmetical microsimulation (3)

This result generalizes easily to the case where the "consumption" vector *x* also includes labour supply or possibly the production of certain goods by the household itself.

In this more general case, call y_i^0 the income of household *i* that is truly exogenous—that is, income not coming from labour or from the sale of goods. The preceding argument implies that:

$$\Delta y_i^* = -\sum_j x_j^i \Delta p_j + \Delta y_i^0 \qquad (6)$$

where x_j^i is now to be interpreted as the "net" demand of good (or labour service) *j* by the household.

Then, imagine a change in the tax-benefit system that affects the price the household receives for the goods and services it sells on the market, its exogenous income y_i^0 and possibly the price of the goods that it consumes.

The preceding expression shows that the change in the welfare of agent *i* may be obtained by applying the new price system generated by the reform of the tax-benefit system to the agent's initial bundle of consumption, production and labour supply.

Theoretical justification of arithmetical microsimulation (4)

This is exactly the assumption behind the arithmetical microsimulation approach.

Since the preceding argument applies only at the margin, it can be shown moreover that the same reasoning applies when the price system is non-linear, as with tax-benefit systems in most developed countries—through instruments like progressive income taxes or means-tested benefits.
According to the foregoing argument, it is erroneous to present arithmetical *MSMs* as being based on the assumption that agents' behaviour is totally rigid.

Arithmetical *MSMs* not adequate when:

a) evaluating changes in tax revenues or benefit payments due to a reform when strong behavioural responses are expected

b) redistribution or tax-incidence analysis focuses on other criteria than individual welfare. (e.g poverty studies)

Other sources of inaccuracy of arithmetical MsM:
a) the assumption that tax changes are completely passed on to consumers' prices or net wages.
b) Tax evasion and non take-up of the benefits.

BASIC INCOME OR VITAL MINIMUM? A NOTE ON THE DISTRIBUTIVE EFFECTS OF POSSIBLE REFORMS OF THE SPANISH INCOME TAX

Why this work:

a) Academic and political debate about possible reforms of the income tax
b) Necessity of quantifying redistribution effects of alternative scenarios
c) Availability of microsimulation model

What we do: using as a benchmark the 1999 system we analyze reforms based on:

a) a flat tax + a basic income or a vital minimum
b) propositions of the Socialist Party (PSOE, 2002).

What we find:

a) Basic income flat tax scenarios are really extremely redistributive overall if compared with the vital minimum scheme and of course even more than the PSOE proposals
b) With a flat tax around 25%-30% it is possible to achieve a strong redistributive performance.

Caveat:

No behavioral reactions.

Why a BIFT or a VMFT?

Advantages	*Disadvantages*
1. Eliminating all the deduction will increase horizontal equity	2. Negative labor supply reactions
3. Increase simplicity and transparency for tax payers	4. Capital flows outside the country
5. Increase simplicity and transparency for tax authority: less costs, less tax avoidance.	6. It may be the case that low flat tax rate favor high income tax payers

BIFT and VMFT: simulated scenarios:

	BIFT		VMFT	
Flat tax	Basic Income		Vital Minimum	
46%	4,632		13,997	
38%	3,526		12,002	
30%	2,421		9,589	
25%	1,730		7,737	

Reference year (tax receipts): 1999

Generalized Lorenz Curves

	1999		1998	46%		38%		30%		25%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Deciles	**Disposable Income**	**Gross Income**	**Disposable Income**	**BIFT (4,632)**	**VMFT (13,997)**	**BIFT (3,526)**	**VMFT (12,002)**	**BIFT (2,421)**	**VMFT (9,589)**	**BIFT (1,730)**	**VMFT (7,737)**
1	2,669	2,904	0,62%	122,18%	0,02%	89,84%	0,02%	57,41%	0,02%	37,19%	0,02%
2	5,110	5,297	-0,34%	42,56%	0,17%	29,36%	0,17%	16,14%	0,17%	7,87%	0,17%
3	6,142	6,428	-1,03%	28,11%	0,64%	18,43%	0,64%	8,74%	0,64%	2,71%	0,57%
4	7,353	7,863	-1,55%	15,99%	2,15%	9,50%	2,15%	3,00%	2,13%	-1,05%	0,99%
5	8,646	9,463	-1,19%	7,86%	4,47%	3,80%	4,47%	-0,29%	3,59%	-2,83%	-0,46%
6	10,131	11,457	-0,84%	1,06%	7,38%	-0,82%	6,82%	-2,70%	1,82%	-3,87%	-1,84%
7	11,880	13,793	-0,40%	-4,23%	8,88%	-4,31%	4,41%	-4,35%	-0,50%	-4,38%	-2,65%
8	14,341	17,127	0,14%	-9,29%	3,40%	-7,40%	-0,13%	-5,54%	-2,34%	-4,39%	-2,95%
9	17,707	21,835	0,78%	-13,33%	-3,03%	-9,69%	-3,80%	-6,07%	-3,48%	-3,80%	-2,64%
10	28,917	39,173	1,46%	-14,75%	-8,40%	-7,63%	-4,00%	-0,55%	1,05%	3,93%	4,65%
Overall mean	11,291	13,536	0%	0%	0%	0%	0%	0%	0%	0%	0%

Inequality and redistribution

	1999		1998	46%		38%		30%		25%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Gini	0,332	0,374	0,337	0,223	0,313	0,259	0,318	0,295	0,326	0,318	0,334
Atk e=0.5	0,103	0,129	0,105	0,046	0,093	0,061	0,097	0,078	0,102	0,091	0,107
Kakwani	0,220		0,199	0,765	0,297	0,577	0,275	0,392	0,238	0,278	0,201
Reynolds-Smolensky	0,044		0,039	0,153	0,062	0,117	0,057	0,080	0,050	0,058	0,042

$$\Pi^{RS} = G_X - G_{X-T} \qquad \Pi^{K} = C_T - G_X$$

The Hot Reforms

	Reform 1	Reform 2	Reform 3	Reform 4	Reform 5
Tax allowances					
Vital minimum	No	No	No	3,386*	No
Tax credits					
Employee social contributions	Yes	Yes	Yes	Yes	No
House investment	Yes	No	Yes	Yes	No
Vital minimum: Euros per person Euros per household	 450 1,352	 450 1,352	 No	 No	 No
Marginal Taxes					
over 34,558	26.3% +14%	25.55% +15%	38%	38%	25% +15%
Basic Income	No	No	2,737*	No	1,168*

Reference year (tax receipts): 1999

Generalized Lorenz Curves

	1999		Ref. 1	Ref. 2	Ref. 3	Ref. 4	Ref. 5
Decile	**Disposable income**	**Gross income**					
1	3,798	4,007	0.02%	0.02%	70.42%	0.02%	42.84%
2	6,827	7,052	0.17%	0.17%	18.37%	0.17%	7.41%
3	9,515	10,120	0.56%	0.61%	10.10%	0.64%	4.78%
4	11,967	12,945	0.57%	0.87%	4.55%	2.15%	2.54%
5	14,442	16,026	0.14%	0.56%	0.59%	4.05%	0.41%
6	17,238	19,823	0.83%	0.99%	-1.68%	3.70%	-0.44%
7	20,561	24,103	0.97%	1.16%	-3.73%	1.59%	-1.42%
8	24,933	29,985	0.93%	0.96%	-5.33%	-0.77%	-2.55%
9	31,619	39,017	-0.19%	-0.29%	-6.46%	-2.76%	-4.40%
10	51,509	70,463	-0.88%	-1.10%	-4.47%	-2.19%	-4.67%
Overall mean	19,244	23,361	0.14%	0.15%	0.04%	-0.09%	-0.57%

Inequality and redistribution

	1999		Ref. 1	Ref. 2	Ref. 3	Ref. 4	Ref. 5
	Disposable income	**Gross income**					
Gini	0.330	0.374	0.329	0.329	0.283	0.322	0.300
Atk e=0.5	0.102	0.129	0.101	0.101	0.071	0.099	0.080
Atk e=2	0.525	0.575	0.524	0.524	0.229	0.522	0.282
Kakwani	0.220		0.221	0.225	0.439	0.252	0.350
Reynolds-Smolensky	0.046		0.046	0.046	0.091	0.053	0.075

Conclusions of the arithmetical exercise

a) **A Basic Income - Flat Tax scenario is really extremely redistributive.**

b) Results show clearly that, **if the objective of the fiscal authority is to reduce inequality, the most appropriate tool is a basic income**. The main reason is that the actual system does not provide any income support to less favored household.

c) With a flat tax around 25%-30% it is possible to achieve a strong redistributive performance with a reform that is **financially neutral and politically feasible**.

Now: behavioral microsimulation

Work Incentives, Redistribution Policies and The Equity-Efficiency Trade Off

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Introduction

- Several papers analyze the effects on efficiency or welfare of a PIT reform with behavioral msm [Aaberge et al. (95), Van Soest (95), Bingley & Walker (97), Blundell et al. (97), Hoynes (96)...]
- But, they use sub-samples. This feature is somewhat in contradiction with the standard microsimulation practice (retain all of the population heterogeneity)
- No studies for the Spanish case

Aims

- Combine arithmetic and behavioural microsimulation
- First attempt to estimate a household discrete choice model in Spain
- Potential of behavioural microsimulation tools for ex-ante evaluation of public policies
- Analyze the impact of the Spanish tax reforms on efficiency and household and social welfare
- Analyze the effects of potential reforms with a flat tax (i.e. the BIFT and the VMFT)

Scenarios

- We use the 1999 system as base line (when the last structural PIT reform has been implemented)
- We analyze the:
  - 1998 (pre-reform tax-benefit system)
  - VMFT (vital minimum – flat tax)
  - BIFT (basic income – flat tax)

Simulated scenarios (2)

- Main differences between 1998 and 1999 PIT:
  1. Almost all the tax credits are transformed in tax allowances
  2. Reduction of the tax brackets and the tax rates (but asymmetrically)

1998				1999	
Single Person's income tax return		**Family income tax return**		**Single person's and family income tax return**	
Bracket	Tax rate	Bracket	Tax rate	Bracket	Tax rate
0-2,806.73	0	0-5,415.12	0	0-3,606.07	0.18
2,806.73-6,977.75	0.2	5,415.12-13,492.72	0.2	3,606.07-12,621.25	0.24
6,977.75-13,793.23	0.23	13,492.72-19,028.04	0.246	12,621.25-24,641.50	0.283
13,793.23-21,005.37	0.28	19,028.04-26,390.44	0.29	24,641.50-39,666.08	0.372
21,005.37-30,621.57	0.32	26,390.44-35,255.37	0.33	39,666.08-66,111.33	0.45
30,621.57-40,838.77	0.39	35,255.37-47,485.97	0.39	> 66,111.33	0.48
40,838.77-51,837.29	0.45	47,485.97-59,716.56	0.45		
51,837.29-63,106.27	0.52	59,716.56-72,938.83	0.53		
> 63,106.27	0.56	> 72,938.83	0.56		

3. Scenarios (3)

- The VMFT replaces the 1999 PIT and consists in:
  - A vital minimum: a tax allowance
  - A flat tax (just one tax rate) that taxes the income that exceeds the vital minimum
- The BIFT replaces the 1999 PIT and consists in:
  - A basic income: an amount of money given to every adult (independently on his economic status)
  - A flat tax
- These reforms can produce strong efficiency effects

Scenarios

- BIFT and VMFT simulated scenarios (in euros):

	BIFT	VMFT
Flat tax	Basic Income	Vital Minimum
46%	4,632	13,997
38%	3,526	12,002
30%	2,421	9,589
25%	1,730	7,737

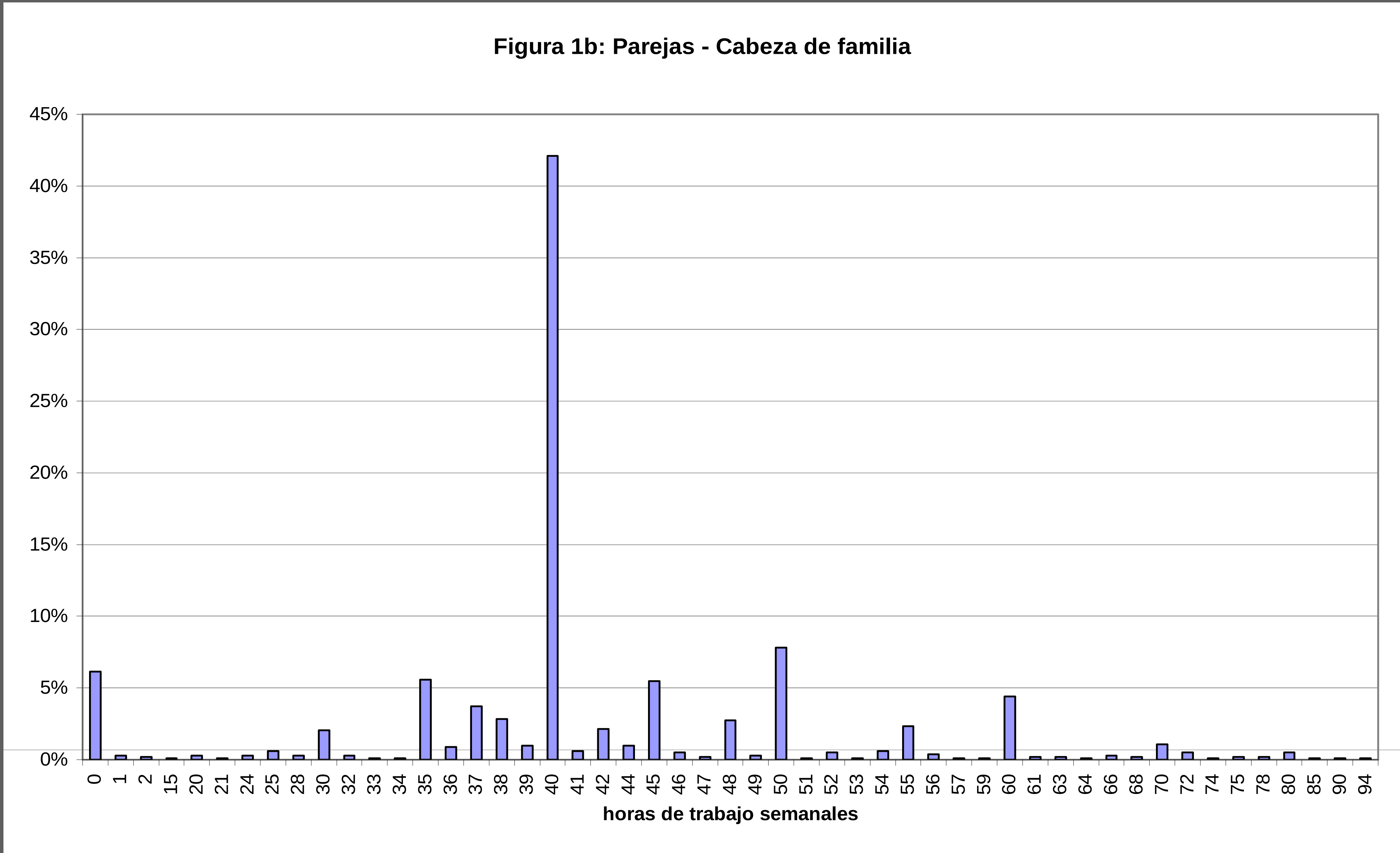
Note 1: the amounts are selected in order to respect the tax collection of the 1999 system (because we want to focus on the redistribution effects)

Note 2: the basic income or the vital minimum are per equivalent adult (computed as the square root of the number of members in the household)

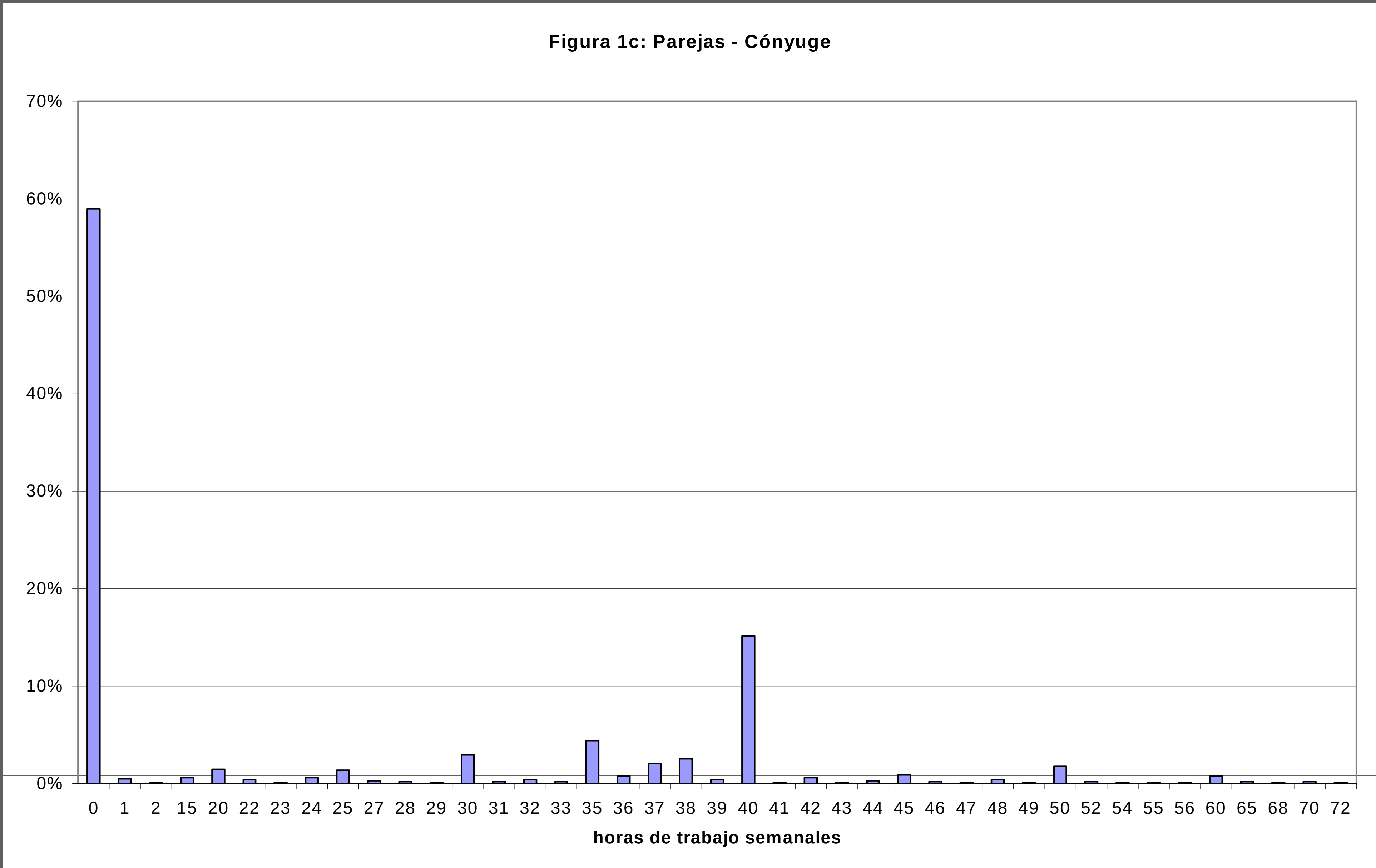
What is GLADHISPANIA?

- It is a microsimulation model of the Spanish Tax-Benefit system
- It is a:
  - Static
  - Partial equilibrium
  - With behavior
- It focuses on direct taxation (PIT and SS)
- It allows to simulate any change in those figures
- It uses the Spanish ECHP as a database (because it is a representative sample with detailed information about socio-demographic characteristics and income sources)

Empirical distribution of labor supply (head of household)



Empirical distribution of labor supply (second member)



Model specification and estimation: Aaberge et al. (1995) and van Soest (1995).

Specification

- Characteristics:
  - An utility function is estimated directly
  - There are a finite number of alternatives (K)

    $h_j = \{h_1, h_2, \ldots, h_K\}$
- Procedure:
  - There are *i* individuals and *j* alternatives

$$U_{ij} = U(y_{ij}, L_j, X_i; v_j) + \varepsilon_{ij} \qquad y[h_i] = w_i h_i + \mu - T(h_i, w_i, \mu; Z_i)$$

  - *y = disposable income – fixed costs*
  - It is assumed that individuals choose the alternative that maximizes his utility

Model specification and estimation: Estimation

- We have run separate estimations for the sub-samples:
  - Singles (with or without children)
  - Couples (with or without children)
- We use a quadratic utility function,

  i.e. in the couples' case:

$$U(y,h) = \alpha_{yy} y^2 + \alpha_{hmhm} h_m{}^2 + \alpha_{hfhf} h_f{}^2 + \alpha_{hmhf} h_m h_f + \alpha_{yhm} y h_m + \alpha_{yhf} y h_f + \beta_y y + \beta_{hm} h_m + \beta_{hf} h_f + \varepsilon$$

with observed heterogeneity through the betas

$$\beta_y = \beta_{y0} + \beta'_y X$$
$$\beta_{hm} = \beta_{hm0} + \beta'_{hm} X$$
$$\beta_{hf} = \beta_{hf} + \beta'_{hf} X$$

Model specification and estimation: Log-likelihood

- We assume that ε follows a Weibull distribution

$$P_{ik} = \Pr(V_{ik} \geq V_{ij}, \forall j = 1,\ldots,J) = \frac{\exp\left[U(y_{ik,} L_k, X_i; v_k)\right]}{\sum_{i=1}^{J} \exp\left[U(y_{ij,} L_j, X_i; v_j)\right]}$$

- The log-likelihood function:

$$\ln L = \sum_{i=1}^{N} \sum_{j=1}^{J} d_j \ln(P_{ij})$$

- This is the McFadden or conditional logit model

Singles estimation

Variable	Coefficient	Standard error
$Income^2$	-0.41	0.50
Hours of $leisure^2$	-236.95	32.44
Income x Hours of leisure	29.06	5.81
Income	-25.54	6.77
x Age	0.50	0.25
x Education	0.04	0.84
x Children	0.19	0.16
Hours of leisure	458.94	65.24
x Age	-0.49	1.53
x Educ1	-4.19	3.93
x Educ2	0.39	2.89
Fixed costs	2.40	0.50
Number of observations	259	
Log likelihood	-273.84	

Couples estimation

Variable	Coefficient	Standard Error
$Income^2$	-0.71	0.16
Hours of leisure of the household's $head^2$	-83.69	6.30
Hours of leisure of the $spouse^2$	91.98	8.01
Income x Hours of leisure of the household's head	-2.74	1.51
Income x Hours of leisure of the spouse	-1.69	1.01
Hours of leisure of the household's head x Hours of leisure of the spouse	-44.8	7.98
Income	8.20	2.37
x Age of the household's head	-0.60	0.48
x Age of the spouse	1.54	0.55
x Age of the spouse ^{2}	-0.63	0.19
Hours of leisure of the household's head	197.53	17.25
x Education of the household's head	-5.68	1.81
x Age of the household's head	2.19	0.67
Hours of leisure of the spouse	-117.38	17.65
x Education of the spouse	-11.1	1.20
x Age of the spouse	2.02	0.61
x 1(one dependent child)	2.82	0.95
x 1(two or more dependent children)	5.05	0.90
Fixed costs	-0.35	0.26
Number of observations	1024	
Log likelihood	-1553.81	

Results: Efficiency

- We use transition matrixes to measure the efficiency cost of the reform
- Couples

		BIFT38									
	hm_hf	0_0	0_25	0_40	40_0	40_25	40_40	50_0	50_25	50_40	Total
1999	0_0	5									5
	0_25		5								5
	0_40	1		52	5						58
	40_0	1			396						397
	40_25			1	6	52		1			60
	40_40	1		1	14	1	169	8			194
	50_0	3			2			199			204
	50_25			1					23		24
	50_40			2	2			1		63	68
	Total	11	5	57	425	53	169	209	23	63	1015

Results: Efficiency

- Transition matrixes

		BIFT38				
		0	30	40	50	Total
1999	0	50				50
	30	2	31	1		34
	40	3	1	120	4	128
	50	2	1		44	47
Total		57	33	121	48	259

		VMFT38				
		0	30	40	50	Total
1999	0	49		1		50
	30		33	1		34
	40		1	126	1	128
	50			3	44	47
Total		49	34	131	45	259

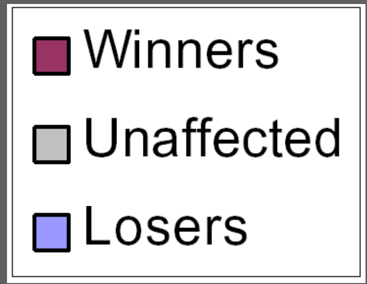
Results: Efficiency

- From this analysis we may conclude:
  - Almost all the households are on the diagonal.
  - Comparing the 1998 with 1999 system there is not a clear effect on labor supply.
  - Rising the marginal tax increases the reactions.
  - The effect of the VMFT on labor supply is neutral, some household increase and others decrease.
  - The reduction in labor supply of BIFT is small (in the worst case, BIFT-46%, there is a reduction around 5% of the hours of work).

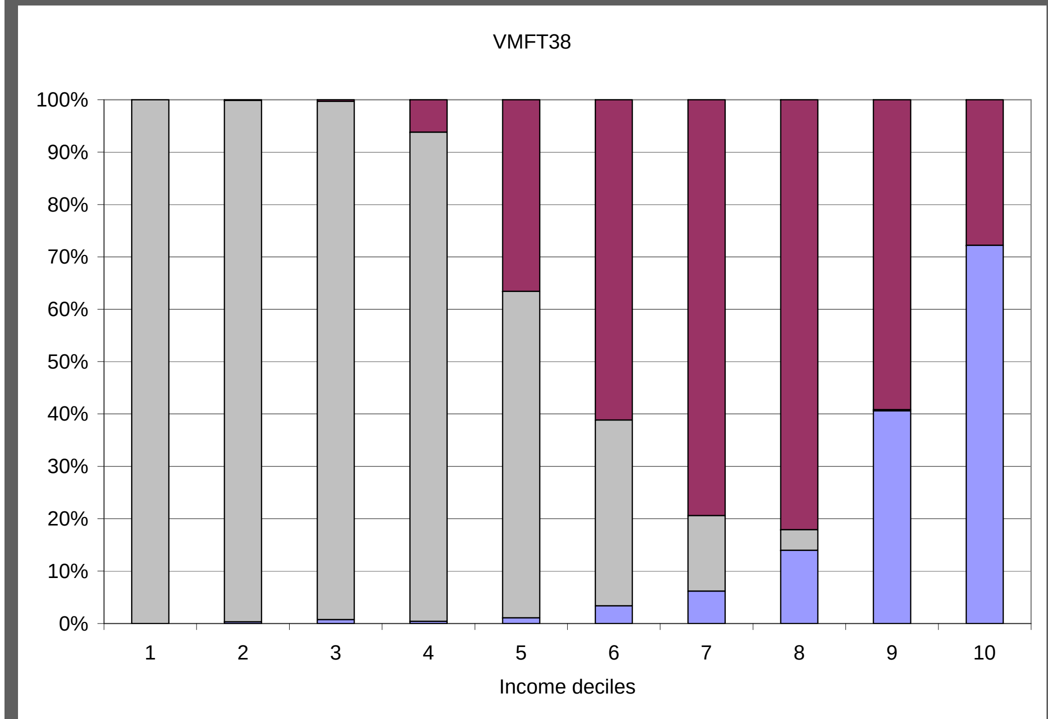
Results: Winners and Losers

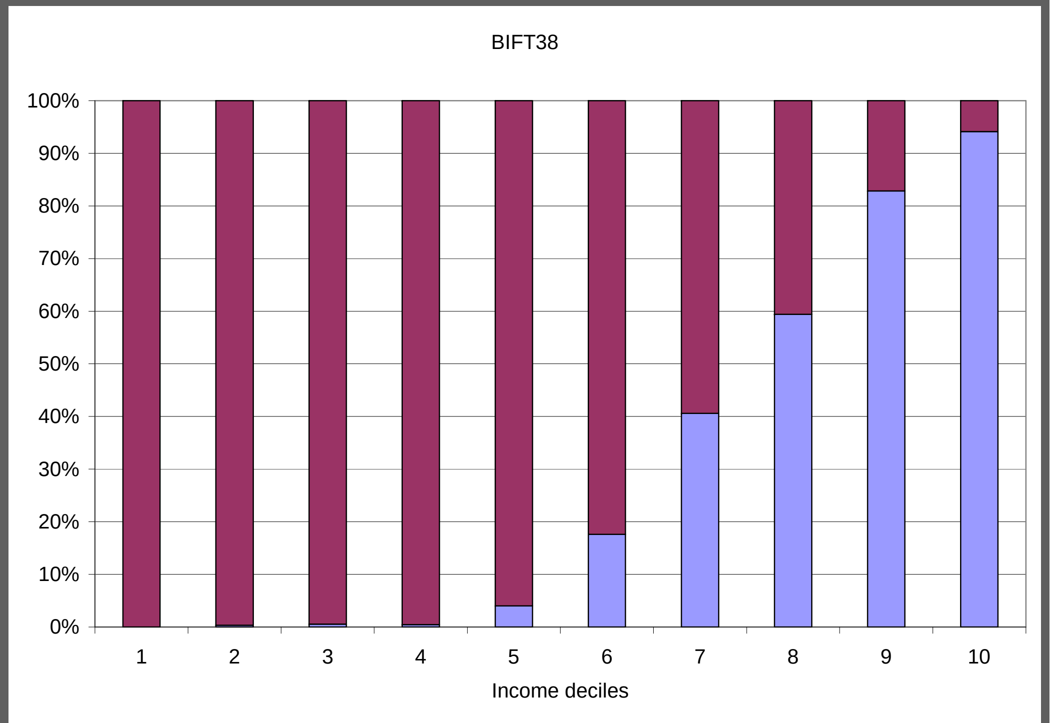
Singles

VMFT-38%



BIFT-38%

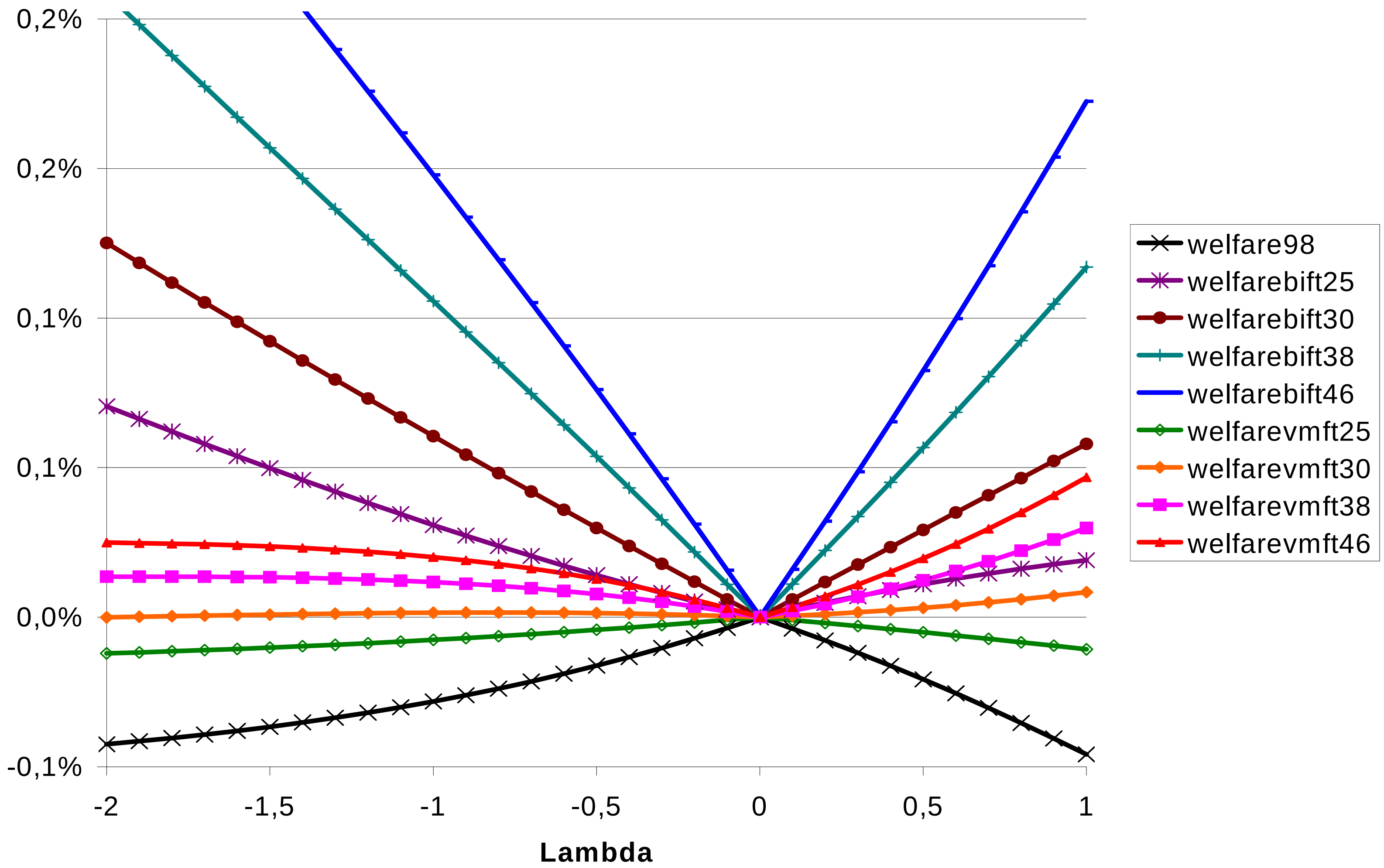




Results: Welfare (using a SWF)

$$W = \frac{1}{\lambda} \sum U(y, L, X)^{\lambda}$$

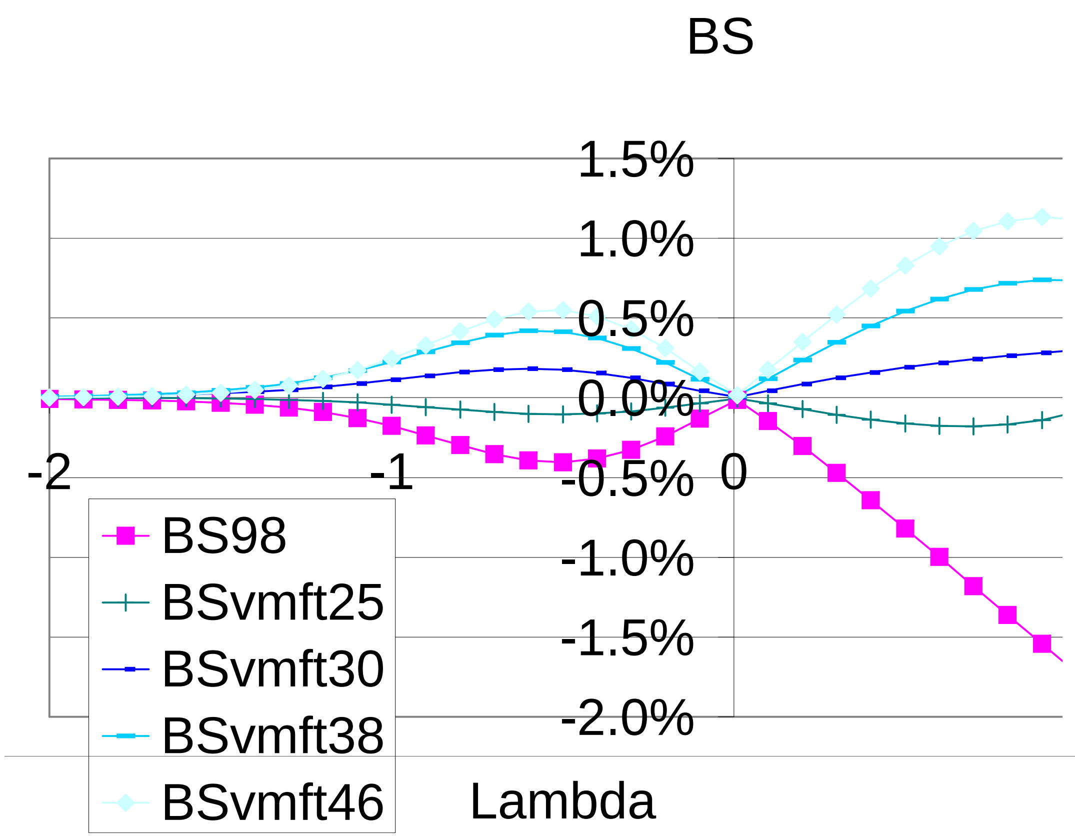
Figure 3: Social welfare variations with respect to the reference scenario (1999). Whole sample

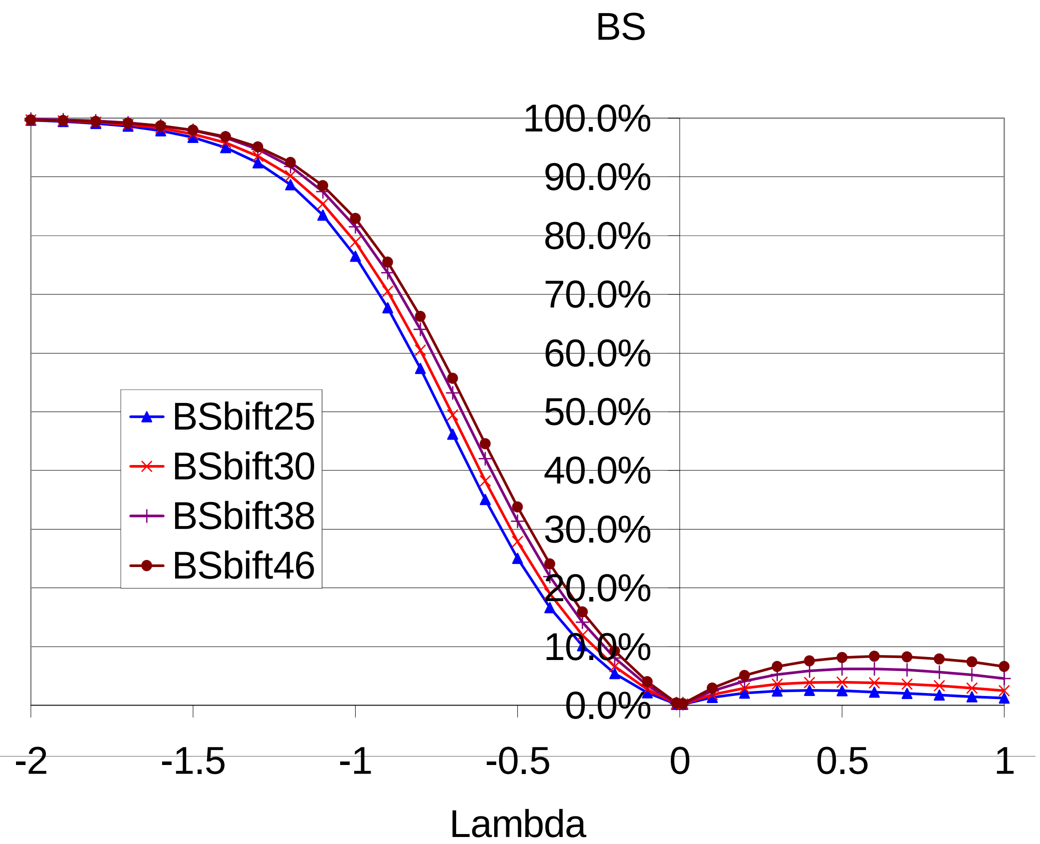


Results: Welfare (using equivalent incomes)

$$BS = \frac{1}{N\lambda}\sum (Ye)^{\lambda} \quad \text{where} \quad Ye = y^{0} + VE$$

Figure 4: Social welfare variation using equivalent incomes (with respect to the reference scenario, 1999). Whole sample





$$Max_j\left[U(y_{ij}^1, h_j, Z_i; \nu_j) + \varepsilon_{ij}\right] = Max_k\left[U(y_{ik}^0 + VE_i, h_k, Z_i; \nu_k) + \varepsilon_{ik}\right]$$

VE is defined by the amount of money which must be awarded to (or subtracted from) household *i* before the reform, in order for the household to be unaffected by the reform.

Equivalent variation is a variable which depends on the distribution of the error term, disposable income prior to and following the reform and, finally, household characteristics. The optimal post-reform choice, *j*, is not necessarily the same as choice *k*, the optimal choice with the equivalent variation.[1] As is often the case in simulation studies, we assume that policy reforms do not affect the error terms. A positive/ negative equivalent variation indicates households whose utility increases/decreases following the reform.

[1] Note that for non-potential workers (inactive, self-employed), the equivalent variation may be computed as the difference in disposable income prior to and following the reform.

Conclusions

- We have estimated a discrete choice model of labor supply that fits the Spanish data
- A few families change their labor supply $\Rightarrow$ Small cost in efficiency terms (exception BIFT-38% or BIFT-46% where the efficiency cost is moderate)
- BIFT reforms reach higher levels of welfare than VMFT reforms or the 1999 system. These results are robust to different social welfare evaluation techniques
- Obviously, the results are conditioned by the assumptions and limitations made (by the microsimulation model, by the econometric estimation, by the data used…)

To finish we cite a Nobel Prize:

"...There are, it seems to me, only two promising approaches to making well-based recommendations about public policy.
One is to use a welfare function of some form and develop the theory of optimal policy.
The other is to model the existing state of affairs in some manageable way, and on that basis to display the likely effects of changes in government policy, these effects being displayed in sufficient detail to make rational choice among alternative policies possible.
If a welfare function were used to evaluate the changes predicted, the second approach would come fairly close to the first, and in fact, there is a closer theoretical relationship"

in Mirrlees, (1986) "The Theory of Optimal Taxation", in Handbook of Mathematical Economics, vol. III, Arrow and Intriligator eds, North Holland, Amsterdam. Chap. 24, pag. 1198.