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BEHAVIOURAL AND WELFARE EFFECTS OF BASIC INCOME POLICIES: A SIMULATION FOR EUROPEAN COUNTRIES

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* This paper uses EUROMOD version 27a. EUROMOD is continually being improved and updated and the results presented here represent the best available at the time of writing. Any remaining errors, results produced, interpretations or views presented are the authors' responsibility. EUROMOD relies on micro-data from twelve different sources for fifteen countries. This paper uses data from the European Community Household Panel (ECHP) User Data Base made available by Eurostat; the Survey of Household Income and Wealth (SHIW95) made available by the Bank of Italy; and the Family Expenditure Survey (FES), made available by the UK Office for National Statistics (ONS) through the Data Archive. Material from the FES is Crown Copyright and is used by permission. Neither the ONS nor the Data Archive bears any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies for all other data sources and their respective providers.

Behavioural and Welfare Effects of Basic Income Policies: A Simulation for European Countries[1]

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Abstract

We develop and estimate a microeconometric model of household labour supply in four European countries representative of different economies and welfare policy regimes: Denmark, Italy, Portugal and United Kingdom. We then simulate, under the constraint of constant total net tax revenue, the effects of 10 hypothetical tax-transfer reforms which include various alternative versions of a Basic Income policy. We produce various indexes and criteria according to which the reforms can be ranked. The exercise can be considered as one of empirical optimal taxation, where the optimization problem is solved computationally rather than analytically. As long as the ranking of reforms is done according to welfaristic criteria it turns out that the most successful policies are those involving non means-tested versions of basic income and adopting progressive tax-rules. When other criteria (such as the implied top marginal tax rate or the effect on female labour supply) are also taken into account, the picture changes: universalistic policies remain optimal and feasible in countries like Denmark where female participation rates are very high; instead, in countries with low female participation rates (like Italy) universalistic policies appear to be too costly in terms of implied top marginal tax rates and in terms of adverse effects on female participation, and means-tested policies such as Work-Fare or Negative Income Tax seem more desirable.

JEL Classification: C25; H24; H31, I38

Keywords: Basic Income; Minimum Guaranteed Income; Models of Labour Supply; Tax Reforms; Welfare Evaluation

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1. Introduction

The idea of a providing every individual (citizen, worker etc.) with a Minimum Guaranteed Income (MGI) or Basic Income (BI) goes very far back in the history of economic, political and philosophical thought.[2] We focus here on policies that are mainly universalistic (i.e. not strictly tied to specific occupational or economic or demographic conditions) although they might be means-tested. The motivations for the introduction of MGI policies can be classified under three types: redistribution, efficiency and cost-effectiveness.

Redistribution. Most proponents give to MGI the interpretation of a "social dividend", i.e. an income due to some basic common property like natural resources, the electro-magnetic spectrum, or - in more abstract terms – "social capital", "social networks", "social surplus" etc . What is involved in this view is therefore not simply a policy to help the poor (although this might also be an important motivation) but rather the implementation of a fundamental criterion of justice. If one sees private property not as a fundamental right but rather as an efficient alternative to the "free access" regime for managing the "global common", it follows that all the original owners of the common should receive a share of the total revenue in return for the rights to freely access the common property .[3]

Efficiency. A first efficiency argument can be attributed to J. Meade, who argued in favour of a "Citizen's Income" as an integral part of a full-employment policy: assuming that full employment without inflation could only be achieved with a sufficiently low real wage, an alternative source of income (i.e. the citizen's income) would guarantee an equitable and efficient distribution.[4] A second argument is related to the concept of dynamic efficiency. In a dynamic perspective, the traditional efficiency-equality trade-off might be turned upside down. Comparative analyses of developing economies suggest that an egalitarian distribution of endowments might contribute to allocation efficiency. The lesson can be relevant also for modern economies. Typically credit markets are very limited in providing funds for investments in human capital. Many individuals might be trapped in a condition in which - so to speak - they are too poor to be efficient.[5] A public transfer such as MGI might alleviate the problem, allowing the individual to engage in more efficient choices. Obviously the same goal might be pursued with a different redistribution policy, but something like MGI has the appeal of a simple, transparent and permanent solution. A third and different argument, still related to

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[2] See for example VanParijs (1995).

[3] The idea can be traced back to Thomas Paine's *Agrarian Justice*. A form of basic income explicitly motivated on theses argument is actually implemented in Alaska.

[4] Meade (1995).

[5] On these issues see for example Bardhan et al. (1998).

efficiency, points at the opportunity of separating the income support issues from those related to industrial policies. If productive efficiency required a high degree of labour mobility and flexibility, policies inspired by MGI would help alleviating the costs imposed on households.[6]

Cost-effectiveness. Actual social policies tend to be a (sometimes chaotic) composition of interventions originated at different dates and with different motivations, criteria, limitations etc. Universalistic policies like MGI might attain comparable goals at a lower cost and with more transparency.

The study illustrated in this paper focuses on European countries. A 1992 European Union recommendation suggests that European governments should introduce some universal basic income support mechanisms. In a limited and conditional version, some form of basic income support is now implemented in most European countries, acting through the fiscal system or the pension system or transfers related to children or subsidies to education. The dimensions of these interventions, however, are overall limited and still rather selective in character. All the policies actually implemented show a large variation in terms of eligibility, equivalence scales, household definition, monitoring, supplementary measures, duties on the part of recipients etc. The idea of a basic income support close to a universal coverage of the citizens and of an amount sufficient to permanently alleviate a significant portion of the poverty is far from being accepted and implemented. Critical arguments with respect to MGI have been mainly motivated by the assumption that it would introduce strong disincentives to work and require two heavy taxes in order to finance it.

The purpose of this study is analyzing the behavioural, welfare and fiscal implications of the hypothetical implementation in European countries of tax-transfer reforms embodying some version of a basic income policy.

As a main tool for the evaluation we develop a microeconometric model of household labour supply. We estimate the model and simulate the effects of the reforms for four European countries representative of different economies and current welfare policy regimes: Denmark, Italy, Portugal and United Kingdom[7]. The parameter of the reforms are iteratively adjusted in the simulation so that the total net tax revenue collected is the same as the current one.

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[6] This last argument seems to inspire the so-called Flexicurity approach to social and labour market policies, originated in Denmark and other Scandinavian countries and often referred to in various recent documents by the European Commission.

[7] The project mentioned in footnote 1 envisages the extension of the exercise to all the European countries covered by EUROMOD.

For each country we then rank, according to various criteria, the alternative types and versions of tax-transfer reforms. This can be interpreted as an exercise in empirical optimal taxation, close to what is done in Immervoll et al. (2007). Differently from Immervoll et al. (2007), however, we do not apply optimal taxation results derived from theoretical assumptions. Instead, we solve the optimal taxation problem computationally by iteratively running the microeconometric model under the constraint of constant total net tax revenue. Under this methodological aspect, the exercise is close to Aaberge and Colombino (2008).

The structure and the empirical specification of the model are presented in Section 2. Section 3 presents the estimates. Section 4 explains the simulation method. Section 5 defines the alternative policies and the evaluation criteria and illustrates the main results of the simulations. Section 6 contains the final remarks.

The model

2.1 General framework

The basic framework is similar to the one adopted, among others, by van Soest (1995), Aaberge et al. (1995, 1999, 2000, 2004, 2006), Duncan and Giles (1996), i.e. the Random Utility model.[8] We will consider households with two decision-makers (i.e. couples) of age comprised between 18 and 55. Of course there might be other people in the household, but their behaviour is taken as exogenous.

Household *n* is assumed to maximize a utility function $U^n(C, h_F, h_M)$ under the constraints

$$h_F \in \Omega$$
$$h_M \in \Omega$$
$$C^n = R(w_F^n h_F, w_M^n h_M, y^n)$$

where

h_g = average weekly hours of work required by the j-th job in the choice set for partner g, g = F (Female) or M (male);

Ω = set of 12 discrete values (see over);

w_g^n = hourly wage rate of partner G;

y^n = vector of exogenous household gross incomes;

C^n = net disposable household income;

R = tax-transfer rule that transforms gross incomes into net available household income.[9]

The first two constraints say that the hours of work h_i are chosen within a discrete set of values Ω including also 0 hours (i.e. non-participation). This discrete set of h values can be interpreted as the actual choice set (maybe determined by institutional constraints) or as approximations to the true (possibly continuous) choice set.

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[8] Surveys of various approaches to modelling labour supply for tax reform simulation are provided by Blundell and MaCurdy (1999), Creedy and Kalb (2005), Bourguignon and Spadaro (2006) and Meghir and Phillips (2008)

[9] The tax-transfer rule is applied to yearly incomes, which are obtained by multiplying the average weekly incomes by 52.

The third constraint says that net income C is the result of a tax-transfer rule R applied to gross incomes.

We write the utility function as the sum of a systematic part and a random component:

$$\text{(1)} \quad U^n(C, h_F, h_M) = V(C, h_F, h_M; Z^n, \vartheta) + \varepsilon = V(R(w_F^n h_F, w_M^n h_M, y^n), h_F, h_M; Z^n, \vartheta) + \varepsilon$$

where Z^n is a vector of household characteristics ϑ is a vector of parameters to be estimated and ε is a random variable capturing the effect of unobserved (by the econometrician) variables upon the evaluation of (C, h_F, h_M) by household n.

Under the assumption that ε is i.i.d. extreme value, it is well known[10] that the probability that a given household chooses $h_F = f, h_M = m$ is given by

$$\text{(2)} \quad P^n(f, m; \vartheta) = \frac{\exp\left\{V\left(R(w_F^n f, w_M^n m, y^n), f, m; Z^n, \vartheta\right)\right\}}{\sum_{h_F \in \Omega} \sum_{h_M \in \Omega} \exp\left\{V\left(R(w_F^n h_F, w_M^n h_M, y^n), h_F, h_M; Z^n, \vartheta\right)\right\}}$$

2.2 Empirical specification of preferences

We choose a quadratic specification since it is linear-in-parameters and it represents a good compromise between flexibility and ease of estimation:[11]

$$\text{(3)} \quad \begin{aligned} V &= \theta_C C + \theta_F (T - h_F) + \theta_M (T - h_M) + \\ &+ \theta_{CC} C^2 + \theta_{FF} (T - h_F)^2 + \theta_{MM} (T - h_M)^2 + \\ &+ \theta_{CF} C(T - h_M) + \theta_{CM} C(T - h_M) + \theta_{FM} (T - h_F)(T - h_M) \end{aligned}$$

where T denotes total available time.

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[10] See for example Ben -Akiva and Lerman (1985).

[11] The quadratic specification does not allow to impose quasi-concavity of the utility function. The issue of quasi-concavity of the utility function (or convexity of the preferences) is analysed in relation to the estimation of standard continuous labour supply functions by MaCurdy et al. 1990: in that context the quasi-concavity, besides being a local necessary condition for a maximum of the utility function, turns out to be a necessary conditions for the consistency of the estimates (and also for the computational feasibility of maximum likelihood estimation). In the context of random utility models with discrete opportunity sets, however, quasi-concavity is not necessary anymore. Van Soest (1995) proposes a test for quasi-concavity: the test is however limited to the systematic part of the utility function.

Some of the above parameters θs are made dependent on household or individual characteristics:

$$\begin{aligned}
&\theta_F = \beta_{F0} + \beta_{F1}\left(\text{Age of the wife}\right) + \beta_{F2}\left(\#\text{Children}\right) + \beta_{F3}\left(\#\text{Children under 6}\right) + \beta_{F4}(\#\text{Children 6-10}) \\
(4)\quad &\theta_M = \beta_{M0} + \beta_{M1}\left(\text{Age of the husband}\right) + \beta_{M2}\left(\#\text{Children}\right) + \beta_{M3}\left(\#\text{Children under 6}\right) + \beta_{M4}(\#\text{Children 6-10}) \\
&\theta_C = \beta_{C0} + \beta_{C1}\left(\#\text{Children}\right) + \beta_{C2}\left(\#\text{Children under 6}\right) + \beta_{C3}(\#\text{Children 6-10}).
\end{aligned}$$

2.3 Empirical specification of the opportunity sets

We assume that each partner can choose between 10 values (from 1 to 80) of weekly hours of work. Each value is randomly drawn from one of the following ten intervals: 1-8, 9-16, 17-24, 25-32, 33-40, 41-48, 49-56, 57-64, 65-72, 73-80.[12] Moreover they can also choose to be out-of-work, either as non-participants or as unemployed (looking for a job). Therefore each household chooses among 144 alternatives. In order to compute net household income C for each one of the household jobs contained in $\Omega \times \Omega$, we use the EUROMOD Microsimulation model.[13] In other words EUROMOD mimics the tax-transfer rule R. Wage rates for those who are observed as not employed are imputed on the basis of a wage equation estimated on the employed subsample and corrected for sample selection.[14]

Most countries show a more or less pronounced concentration of people around hours corresponding to full-time, part-time and non-working. The model outlined above is typically unable to reproduce these peaks. A useful trick consists in adding dummies.**..** We define the following dummies for part-time, full-time, overtime, non-working and non-working but looking for work, respectively

$$D_{g1}\left(h_g\right) = \begin{cases} 1 \text{ if } 17 \leq h_g \leq 32 \\ 0 \text{ otherwise} \end{cases}$$

$$D_{g2}\left(h_g\right) = \begin{cases} 1 \text{ if } 33 \leq h_g \leq 48 \\ 0 \text{ otherwise} \end{cases}$$

$$(5) \quad D_{g3}\left(h_g\right) = \begin{cases} 1 \text{ if } 49 \leq h_g \\ 0 \text{ otherwise} \end{cases}$$

$$D_{g4}\left(h_g\right) = \begin{cases} 1 \text{ if } 0 < h_g \\ 0 \text{ otherwise} \end{cases}$$

$$D_{g5}\left(h_g\right) = \begin{cases} 1 \text{ if } h_g = 0 \text{ and looking for work} \\ 0 \text{ otherwise} \end{cases}$$

for g = F (female) or M (male).

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[12] An alternative procedure consists in sampling the values of h from a pre-specified distribution. The same distribution would then be used as a weighting factor when estimating and simulating the model. See for example Colombino (1998) for an explanation and application of this more complex procedure. A comparison and evaluation of different procedures to specify the choice set is provided by Aaberge, Colombino and Wennemo (2006). The procedure adopted in this work was chosen because of its simplicity, especially in view of making the model easily replicable, modifiable and accessible to a large audience (for as example the EUROMOD users)

[13] An overview of the EUROMOD project is provided by Bourguignon et al. (2000).

[14] The wage equations are available from the authors upon request.

It can be shown that the dummies can be interpreted as reflecting quantity constraints on the labour market and different availability of opportunities (as in Aaberge et al., 1995, 1999), or specific utility of different types of jobs (as in van Soest, 1995), or both.

We then rewrite the choice probabilities as follows:

$$(6)\quad P^n(f,m;\vartheta)=\frac{\exp\left\{V\left(R(w_F^n f, w_M^n m, y^n), f, m; Z^n, \theta\right)+\sum_{k=1}^{5}\gamma_{Fk}D_{Fk}\left(f\right)+\sum_{k=1}^{5}\gamma_{Mk}D_{Mk}\left(m\right)\right\}}{\sum_{h_F\in\Omega}\sum_{h_M\in\Omega}\exp\left\{V\left(R(w_F^n h_F, w_M^n h_M, y^n), h_F, h_M; Z^n, \theta\right)+\sum_{k=1}^{5}\gamma_{Fk}D_{Fk}\left(h_F\right)+\sum_{k=1}^{5}\gamma_{Mk}D_{Mk}\left(h_M\right)\right\}}$$

where the γs are parameters to be estimated and where Z^n denotes the vector of characteristics (Age of the partners, Number and Age of the children) of household *n*.

If (f^n, m^n) is the observed choice for the n-th household, the ML estimate of ϑ is

$$(7)\quad \vartheta^{ML}=\arg\max_{\vartheta}\sum_{n=1}^{N}\ln P^n(f^n, m^n;\vartheta).$$

3. Estimates

For the estimation and simulation exercise presented in this paper we use datasets from four countries:

Denmark (ECHP[15] 1998), Italy (SHIW[16] 1998), Portugal (ECHP 1998) and United Kingdom (FRS[17] 2003). The selection criteria are as follows:[18]

- Couples (either married or unmarried);
- Both partners employed, or unemployed or inactive (students, self-employed and disabled are excluded);
- Both partners are aged 20 – 55.

Expression (6) can be used with country-specific samples to compute the Likelihood function to be maximized in order to obtain country-specific estimates of the parameters θ and γ. We also follow a different route, consisting of pooling the four country-specific samples into a unique sample and then using expression (6) enriched by allowing θ_{C0}, θ_{F0}, θ_{M0} (expression (4)) and all the γs (expression (6)) to vary between countries. Microeconometric models of labour supply are typically estimated on one country-specific cross section sample: as a consequence, all the households face the same tax rule. On the contrary, with the procedure using the pooled sample, the households face different tax rules. This should provide a sharper identification of the preference parameters.

The estimates based on the pooled sample (which contains 5330 observations) are reported in Table 1.[19] The results are overall satisfactory in terms of statistical significance and economic interpretation. Some of the parameters are allowed to change between countries. When this is the case, the first column of estimates reports the parameter value specific for Italy while the other columns report the difference of the country-specific parameter (respectively for Denmark, Portugal or United Kingdom) with respect to the Italy-specific parameter. Otherwise, the first column reports the estimates of the parameters assumed as common among the countries.

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[15] European Community Household Panel Survey.

[16] Survey of Household Income and Wealth (Bank of Italy).

[17] Family Resources Survey (Department of Work and Pensions).

[18] The sample election criteria adopted are rather common in the literature on behavioural evaluation of tax reforms. The choices of people under 20 or over 55 are not going to be significantly affected by the policies we simulate. On the other hand, the singles and the self-employed are certainly affected, although it remains to be seen whether their responses are significantly different from the couples included in our sample. The inclusion of singles and self-employed is part of a current development of our project.

[19] The estimates and the simulations based on country-specific samples are available upon request from the ayhors. While the country-specific and the pooled estimates might differ based on coefficient by coefficient comparison, the simulation results are very similar.

The marginal utility of income and the marginal utility of wife's and husband's leisure appear to be positive and decreasing (although the parametric form chosen for the utility function does not impose a priori quasi-concavity of the utility function: therefore it is possible that quasi-concavity is violated for some configuration of variables' values).

Wife's and husband's leisure times appear to be complements, in the sense that more leisure of one of them has a positive effect on the marginal utility of leisure of the other one. In the same sense, income is a complement with respect to husband's leisure while it is a substitute with respect to wife's leisure.

The parameters γs reflects differences between the countries with respect to the availability of the various opportunities and with respect to specific utility gains or losses (besides those due to income and leisure) attached to them. In fact there appear to be large differences between the countries in the estimated values of these parameters.

Table 1. Parameters estimates

	Italy (or common)	Denmark - Italy	Portugal - Italy	UK – Italy
β_{F0}	0.272***	0.024	-0.048***	-0.040***
β_{F1}	0.916e-03***			
β_{F2}	0.410e-02***			
β_{F3}	0.013***			
β_{F4}	0.685e-02***			
β_{M0}	0.072***	0.039***	0.027***	-0-046***
β_{M1}	-0.553e-04			
β_{M2}	-0.461e-02**			
β_{M3}	0.839e-03			
β_{M4}	0.223e-02			
β_{C0}	0.536e-03***	0.205e-03**	0.289e-02***	0.141e-03
β_{C1}	0.369e-04			
β_{C2}	0.425e-04			
β_{C3}	0.107e-03**			
θ_{CC}	-2.700e-08***			
θ_{FF}	-0.211e-02***			
θ_{MM}	-0.7912-03***			
θ_{CF}	-0.319e-07***			
θ_{CM}	0.811e-07***			
θ_{FM}	0.798e-03***			
γ_{F1}	1.620***	-1.257***	-2.467***	-2.291***
γ_{F2}	3.238***	-0.254	-1.851***	-3.223***
γ_{F3}	1.658***	0.706	-2.251***	-2.180***
γ_{F4}	-4.203***	4.865***	1.090***	2.658***
γ_{F5}	-1.803***	2.822***	0.102	-0.519**
γ_{M1}	1.638***	-0.996*	-1.027**	-1.626***
γ_{M2}	4.757***	-0.317	-0.108	-2.781***
γ_{M3}	3.582***	0.398	-0.336	-2.426***
γ_{M4}	-2.558***	10.111***	1.229**	1.343***
γ_{M5}	-0.139	6.816***	-1.341***	-0.971**

Note to Table 1:

*** = significance < 1%

** = significance < 5%

* = significance < 10%

For the meaning of the coefficient symbols see respectively eq. 3, 4, and 6

4. Simulation method

The estimated model is used to simulate the effects of alternative tax-transfer rules, and more specifically of alternative basic income policies. Let us suppose we are interested in some alternative tax-transfer rule. Let $P_A^n(f,m;\vartheta^{ML})$ be the corresponding choice probability of (f,m) computed on the basis of the estimated ϑ^{ML} and of the new tax-transfer rule. Suppose we are interested in simulating the expected value of some function $\varphi^n(f,m)$: it might be the net available income under the new rule, or hours worked etc. Then we compute the expected value of that variable after the policy is implemented as follows:

$$E(\varphi^n(f,m)) = \sum_{f\in\Omega}\sum_{m\in\Omega}\varphi^n(f,m)P_A^n(f,m;\vartheta^{ML}). \tag{8}$$

One of the criteria we use in order to evaluate and compare different tax-benefit rule is social welfare. It is computed as a Social Welfare function that takes as arguments the individual welfare level attained by the households under the tax-transfer rule. Let μ be the average (across households) of individual welfare and *I* be the Gini-index of the distribution of individual welfare. Then social welfare is measured by μ(1 – *I*).[20] We present two versions. The first one uses the expected maximum utility attained by the household as the measure of individual welfare, i.e.[21]

$$E\max U^n = \ln\left(\sum_{h_F\in\Omega}\sum_{h_M\in\Omega}\exp\left\{V\left(R(w_F^n h_F, w_M^n h_M, y^n), h_F, h_M; \overline{Z}, \theta\right) + \sum_{k=1}^{5}\gamma_{Fk}D_{Fk} + \sum_{k=1}^{5}\gamma_{Mk}D_{Mk}\right\}\right) \tag{9}$$

where $\overline{Z}$ is the vector of the sample average of the household characteristics. We use a common value of characteristics in order to insure comparability of individual welfare measures.[22]

The second version more simply adopts the expected attained net available income (computed according to expression (8)) as a measure of individual household welfare.

[20] This form is known in the literature as the Sen's Social Welfare Function. It can also be shown that tit is a member of the class of rank-dependent social welfare functions (see Aaberge, 2007).

[21] For the derivation of this expression, see Ben-Akiva and Lerman (1985). This same methodology for empirical welfare evaluation is used by Colombino (1998).

[22] For the foundations of this procedure see for example Deaton and Muellbauer (1980).

5. The tax-transfer policies

We list and explain hereafter the ten hypothetical reforms of the tax-transfer system. During the simulation, the new tax-transfer rules completely replace the current rules. Due to data limitations, we are unable to allocate unearned incomes to the individuals members of the household; therefore we are forced to apply the simulated tax-transfer rules to total household income (joint taxation).

Flat Tax (FT)

This one has been simulated mainly as a reference case. The rule is:

Net income = (1- t)*(Gross income) + *current benefits*

where t is a constant marginal tax rate. We simulate a version with, and a version without, the current benefits.

The marginal tax rate t is endogenously determined by the simulation algorithm so that the net tax revenue is equal to the one collected under the current system.

Negative Income Tax + Flat Tax (NIT + FT)

This is a pure basic version of the widely discussed proposal originally and independently conceived by M. Friedman[23] and J. Tobin.[24] The rule is:

Net income = G if Gross Income <= G

Net income = G + (1 – t)*(Gross Income – G) if Gross Income > G

where t is a constant marginal tax rate,

G = $aP\sigma$ = Minimum Guaranteed Income;

P = basic poverty line = (1/2) median household income in the sample;

a is a proportion (we simulate various versions with different values of a: 1, 0.75, 0.50 and 0.25),

σ is an equivalence scale that adjusts the basic poverty line according to the number of people (N) in the household:[25]

[23] Friedman (1962).

[24] See for example Tobin et al. (1967).

[25] Commissione di Indagine sulla Poverta' (1985).

$$\sigma = \begin{cases} 1.00 & \text{if} \quad N = 2 \\ 1.33 & \text{if} \quad N = 3 \\ 1.63 & \text{if} \quad N = 4 \\ 1.90 & \text{if} \quad N = 5 \\ 2.16 & \text{if} \quad N = 6 \\ 2.40 & \text{for} \quad N \geq 7. \end{cases}$$

The marginal tax rate t is endogenously determined by the simulation algorithm so that the net tax revenue is equal to the one collected under the current system.

Work Fare + Flat Tax (WF + FT).

This is similar to the NIT + FT, but the transfer to households with Gross Income < G is given only if either the husband or the wife (or both) work at least an average of H weekly hours.[26] In the simulation illustrated hereafter we set H = 20. This system is essentially very close to some reforms recently introduce in the US and the UK and currently discussed also in continental Europe (Earnings Tax Credit, In-Work Benefits etc.).

Participation Basic Income + Flat Tax (PBI + FT).

This is discussed among others by A. B. Atkinson (1996, 1998). Under this rule, every household receives a transfer equal to G (computed as above) irrespective of the Gross Income, provided either partner is working (any number of hours). Gross income is then taxed according to FT:

Universal Basic Income + Flat Tax (UBI + FT).

This is the basic version of the system discussed for example by Van Parijs (1995). Under this rule, every household receives a transfer equal to G (computed as above) irrespective of the Gross Income. Gross income is then taxed according to FT:

Net Income = G + (1 – t)*(Gross Income)

The marginal tax rate is endogenously determined by the simulation algorithm so that the net tax revenue is equal to the one collected under the current system.

[26] See for example Fortin et al. (1993).

Progressive Tax (PT).

As well as for FT, this is considered mainly as a reference case. The rule is:

Net income = (Gross income)$^{(1-\tau)}$ + *current benefits*

where τ is a constant, and can be interpreted as an index of progressivity. We simulate a version with, and a version without, the current benefits. The parameter τ is endogenously determined by the simulation algorithm so that the net tax revenue is equal to the one collected under the current system.

Negative Income Tax + Progressive Tax (NIT + PT).

As with NIT + FT, but we use PT instead of FT.

Work Fare + Progressive Tax (WF + PT).

As with WF + FT, but we use PT instead FT.

Participation Basic Income + Progressive Tax (PBI + PT).

As with PBI + FT, but we use PT instead of FT.

Universal Basic Income + Progressive Tax (UBI + PT)

As with UBI + FT, but we use PT instead of FT.

Notice that only UBI and PBI adopt the idea of a not means-tested transfer, which is characteristic of the basic income or citizen income philosophy. NIT and WF are means-tested variants, which are anyway interesting to analyze, possibly as intermediate steps or as compromises that are easier to support politically or financially. FT is presented as benchmark.

The main results of the simulations are presented in Table 2 – 10. They are based on the estimates obtained with the pooled sample (the simulation obtained with the country-specific samples produce very similar results and are available from the authors upon request). For each reform, Tables 2 - 10 report the following variables for Denmark, Italy, Portugal and United Kingdom:

Mean(U) = average household expected maximum utility level (i.e. the sample average of expression (9)).

Mean(U) can be interpreted as a measure of efficiency (in terms of utility) of the reform.

Gini(U) = Gini index of the distribution of U. This is clearly a measure of inequality of the reform (again in terms of utility)

Mean(C) = average household net disposable income. This is also a measure of efficiency, but just in terms of available income.

Gini(C) = Gini index of the distribution of N

hm = average weekly hours worked by the husband

hf = average weekly hours worked by the wife

Taxes = average taxes paid by the household

Gross = average household gross income (before taxes and benefits)

F = net average tax rate = (taxes – benefits)/(gross income)

t = top marginal tax rate (in FT-based rules) or marginal tax rate at (2*average gross household income) (in PT rules)

τ = constant of progressivity (in PT rules)

B = average amount of benefits received by the household

S(U) = Social Welfare (utility-based) = **Mean (U) * (1 - Gini (U))**

S(C) = Social Welfare (income-based) = **Mean (C) * (1 - Gini (C))**

W(U) = proportion of households whose expected maximum utility increase

W(C) = proportion of households whose net available income increase

Tables 5 – 12 report all the detailed results.

Table 2, 3 and 4 present an evaluation summary which focuses on four criteria, S(U), S(C) , W(U) and W(C).

Four each country and each criterion, we "grade" a reform:

with an "A" if it is the best one in that country according to that criterion;

with a "B" if it is the second best in that country according to that criterion;

with a "C" if it fares better than the current tax-transfer system in that country according to that criterion.

Table 2 shows the grades defined above for all the policies and all the countries. Overall, the most successful reforms are PBI and UBI, in particular in their progressive versions. PBI+PT and UBI+PT get 12 "A", 8 "B" and 75 "C". On the other hand, PBI+FT and UBI+FT get 3 "A", 11 "B" and 67 "C". Therefore there seem to be a clear indication of the superiority of non means-tested policies. A partial exception is represented by NIT in Italy, where it shows a performance almost comparable to that attained by PBI and UBI.

A second indication is that progressive systems seem to perform somewhat better than flat systems. We already noted that the progressive versions of PBI and UBI overall get higher grades than their non progressive versions. But this is true also of NIT. The way through which the progressive systems attain a better performance can be identified by looking into the more detailed results reported in Tables 5 – 12. In most cases, the progressive version of a rule is able to generate a higher net available income (C) with respect to the flat version. This is due to the interaction between the pattern of labour supply elasticity and the structure of the tax rule. Progressive rules apply higher marginal tax rates on higher incomes and lower marginal tax rates on lower incomes (as compared to the flat rules). Members of households with higher income tend to show a lower elasticity of labour supply (w.r.t. wage). Therefore the progressive rules seem to exploit more efficiently the elasticity profile and induce the generation of a higher level of income.[27] As said before, so far we have been forced to simulate the reforms as joint taxation system due to data limitations. The better relative performance of progressive rules would probably emerge to a larger extent, were we able to simulate individual taxation system: this is likely to be the case since joint taxation penalizes the wife's labour supply decisions, while on the other hand the wife's labour supply elasticity is typically relatively high and would be better matched by an individual tax rule.[28]

[27] More detailed evidence on the pattern of labour supply elasticity is provided by Aaberge, Colombino and Wennemo (2002) for Italy and by Aaberge and Colombino (2008) for Norway. This last paper computes an optimal tax rule that turn out to require lower (higher) tax rates on lower (higher) incomes as compared to the current rule. A maybe superficial interpretation of the first results reported by Mirlees has contributed to the widespread idea that the optimal tax rule is close to a flat one, and possibly even regressive. More recently this idea has been questioned both on theoretical and empirical basis. See Aaberge and Colombino (2006), Tuomala (1990, 2008), Røed, K. and S. Strøm (2002), Keene et al. (2006). It must be added that these analyses adopt a pure welfaristic criterion, i.e. maximization of social welfare function. There are other dimensions (administrative simplicity, compliance etc.) along which the flat rules might have important advantages (see Keen et al. 2006).

[28] The data limitations that so far have not allowed to simulate individual tax rules will be overcome in a future development of the project.

A third conclusion suggested by Table 2 is that for each country there are many reforms that would improve things according to at least one of the criteria. Italy appears to be the country the most amenable to a reform, in the sense that any type of basic income reform (in some version) would improve upon the current status. In this perspective, United Kingdom is somehow second after Italy, Portugal is third and last comes Denmark. Otherwise said, Denmark has, in relative terms, a very successful policy on income support and it is therefore difficult to improve upon it.

The above picture can change substantially if, besides the welfaristic criteria of Table 2, we also account for other criteria that might be relevant from the perspective of political sustainability. For example it might be argued that policy requiring "too high" top marginal tax rates could not be realistically considered. Table 3 excludes from the rankings the reforms that imply a top marginal tax rate higher than 55%. We choose this figure as a hypothetical politically feasible upper limit because it is close to the top marginal tax rate applied to personal incomes in European countries; in 2000, the four highest top effective marginal tax rates applied in Europe are 60.0% (Netherlands), 55.4% (Sweden), 54.3% Denmark and 53.8% (Germany).[29]

Other constraints to reform design and implementation might come from the implications on the choices or the conditions of specific segments of the population. For example the female participation rate is a matter of concern in the European political-economic debate. In Table 4 we further exclude from the grading the policies implying a reduction of female participation rate.

Table 4 suggests that in the countries with a relatively low female participation rate (Italy and Portugal) many welfare-improving policies do not survive to the application of the additional feasibility constraints: non means-tested policy like UBI or PBI appear to be too costly or have adverse incentives on labour supply; WF or NIT are more likely to be feasible. On the other hand, in Denmark (the country with the highest female participation rate) all the welfare-improving policies survive. United Kingdom represents an intermediate case. Economic systems that have attained a high female participation rate are better equipped to implement universalistic basic income policies. Economic systems with low female participation rates tend instead to face a high price in terms of tax burden and supply disincentives.

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[29] OECD tax database (http://www.oecd.org/ctp/taxdatabase).

6. Conclusions

We have developed a microeconometric model of household labour supply, which allows to simulate the effects of complex reforms of the tax-transfer rules. We have estimated the model for four European countries (Denmark, Italy, Portugal and United Kingdom). We have then simulated the effects of introducing various alternative types of MGI policies keeping total net tax revenue constant. We report many indexes and criteria according to which the performances of the alternative policies can be ranked. As long as the evaluation is based on welfaristic criteria (i.e. a social welfare function or the number of utility-based winners), three general suggestions emerge rather clearly:

i) the non means-tested policies tend to show a better performance;

ii) the progressive tax rules seem able to exploit more efficiently the pattern of behavioural responses;

iii) there is very large policy space in every country for improving upon the current status.

When other criteria, possibly coming from political feasibility arguments, are also taken into account, clearly the size of the feasible policies is reduced. If for example we set an upper limit of 55% to the top marginal tax rate and drop the policies that imply a reduction in female participation rate, the country-specific results tend to diverge. On the one hand, countries (like Denmark) with a high female participation rate seem still able to support universalistic and generous basic income systems as optimal policies. On the other hand, in countries (like Italy) with a low female participation rate, the price of supporting pure universalistic policies seems too high and policies like NIT or WF emerge as more appropriate.

Table 2. Summary evaluation of alternative basic income policies. All the policies.

		Denmark				Italy				Portugal				United Kingdom			
		S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)
NIT + FT	a=1.00					A	C	C		C	C						
	a=0.75					C		C								C	C
	a=0.50							A	C								C
	a=0.25							C	C								C
WF + FT	a=1.00					C	C	C	C	C	C			C	C		
	a=0.75						C	C	C						C	C	C
	a=0.50						C	C	C								C
	a=0.25								C								C
PBI + FT	a=1.00	C	A	C	B	C	B	C	C		A			C	C	C	
	a=0.75			C	C	C	C	C	C	B	C			B	B	C	
	a=0.50			C	C	C	C	C	C	C	C			C	C	C	C
	a=0.25						C	C	B	C					C	C	C
UBI + FT	a=1.00	C	B	B	A	B		C	C	C	C			C	C	C	
	a=0.75	C		C	C	B		C	C	C	C			B	C	C	
	a=0.50			C	C			C	C	C	C			C	C	C	C
	a=0.25							C	C						C	C	C
NIT + PT	a=1.00					A	C	C		C	C			C	C	C	
	a=0.75					C	C	C								C	C
	a=0.50					C		B	C								C
	a=0.25							C	C								C
WF + PT	a=1.00					C	C	C	C	C	C			C	C		
	a=0.75					C	C	C	C						C	C	C
	a=0.50						C	C	C								C
	a=0.25								C								C
PBI + PT	a=1.00	B	C	A	C	C	A	C	C	C	B	C	C	C	C	C	
	a=0.75	C		C	C	C	C	C	C	B	C	A	C	A	A	C	C
	a=0.50			C		C	C	C	C	C	C	C	C	C	C	C	C
	a=0.25						C	C	A			B	C		C	B	A
UBI + PT	a=1.00	A	C	A	C	B		C		C	C	C	C	C	C	C	
	a=0.75	C		C	C	B	C	C		A	C	C	C	A	C	C	
	a=0.50						C	C	C	C	C	C	C	C	C	C	C
	a=0.25						C	C	C			C	C	C	C	A	B

Table 3. Summary evaluation of alternative basic income policies, excluding policies implying a top marginal tax rate > 55%

		Denmark				Italy				Portugal				United Kingdom			
		S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)
NIT + FT	a=1.00									C	C						
	a=0.75					C		C								C	C
	a=0.50							A	C								C
	a=0.25							C	C								C
WF + FT	a=1.00					C	C	C	C	C	C			C	C		
	a=0.75						C	C	C						C	C	C
	a=0.50						C	C	C								C
	a=0.25								C								C
PBI + FT	a=1.00	C	A	C	B												
	a=0.75			C	C					B	C						
	a=0.50			C	C	C	C	C	C	C	C			C	C	C	C
	a=0.25						C	C	B	C					C	C	C
UBI + FT	a=1.00	C	B	B	A												
	a=0.75	C		C	C					C	C						
	a=0.50			C	C			C	C	C	C			C	C	C	C
	a=0.25							C	C						C	C	C
NIT + PT	a=1.00									C	C			C	C	C	
	a=0.75					C	C	C								C	C
	a=0.50					C		B	C								C
	a=0.25							C	C								C
WF + PT	a=1.00									C	C			C	C		
	a=0.75					C	C	C	C						C	C	C
	a=0.50						C	C	C								C
	a=0.25								C								C
PBI + PT	a=1.00	B	C	A	C												
	a=0.75	C		C	C					B	C	A	C				
	a=0.50			C		C	C	C	C	C	C	C	C	C	C	C	C
	a=0.25						C	C	A			B	C		C	B	A
UBI + PT	a=1.00	A	C	A	C												
	a=0.75	C		C	C												
	a=0.50						C	C	C	C	C	C	C	C	C	C	C
	a=0.25						C	C	C			C	C	C	C	A	B

Table 4. Summary evaluation of alternative basic income policies, excluding policies implying a top marginal tax rate > 55% and policies implying a reduction in female participation rate.

		Denmark				Italy				Portugal				United Kingdom			
		S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)	S(U)	S(C)	W(U)	W(C)
NIT + FT	a=1.00																
	a=0.75																
	a=0.50																C
	a=0.25							C	C								C
WF + FT	a=1.00																
	a=0.75						C	C	C						C	C	C
	a=0.50						C	C	C								C
	a=0.25								C								C
PBI + FT	a=1.00	C	A	C	B												
	a=0.75			C	C												
	a=0.50			C	C												
	a=0.25						C	C	B	C					C	C	C
UBI + FT	a=1.00	C	B	B	A												
	a=0.75	C		C	C												
	a=0.50			C	C									C	C	C	C
	a=0.25														C	C	C
NIT + PT	a=1.00													C	C	C	
	a=0.75															C	C
	a=0.50																C
	a=0.25							C	C								C
WF + PT	a=1.00																
	a=0.75					C	C	C	C								
	a=0.50						C	C	C								C
	a=0.25								C								C
PBI + PT	a=1.00	B	C	A	C												
	a=0.75	C		C	C												
	a=0.50			C													
	a=0.25																
UBI + PT	a=1.00	A	C	A	C												
	a=0.75	C		C	C												
	a=0.50																
	a=0.25													C	C	A	B

Table 5. Denmark – Flat rules

	Mean(U)	Gini(U)	Mean(C)	Gini (C)	hm	hf	Taxes	Gross	F	t	B	S(U)	S(C)	W(U)	W(C)
Current	35,29	0,02	3371,00	0,33	38,06	27,93	1830,00	4113,00	0,07	0.54	1552,00	34,58	2265,31		
Flat without benefits	35,09	0,03	3241,00	0,49	39,29	31,23	277,00	3970,00	0,07	0,08	0,00	34,18	1662,63	42,93	43,72
Flat with benefits	35,10	0,02	2996,00	0,30	36,66	25,18	2090,00	3960,00	0,13	0,60	1577,00	34,34	2109,18	32,46	34,82
NIT + FT															
a=1.00	35,27	0,02	3259,00	0,36	38,25	29,26	659,00	3989,00	0,07	0,28	381,00	34,46	2075,98	42,93	42,94
a=0.75	35,20	0,02	3248,00	0,41	38,60	29,89	499,00	3977,00	0,07	0,20	222,00	34,37	1916,32	42,15	42,67
a=0.50	35,14	0,02	3242,00	0,45	38,91	30,47	377,00	3971,00	0,07	0,13	99,00	34,27	1786,34	43,46	42,67
a=0.25	35,10	0,03	3241,00	0,48	39,15	30,95	301,00	3969,00	0,07	0,10	23,00	34,20	1698,28	43,19	43,46
WF + FT (H = 20)															
a=1.00	35,26	0,02	3279,00	0,37	38,91	29,74	636,00	4011,00	0,07	0,27	358,00	34,46	2082,17	41,62	43,72
a=0.75	35,19	0,02	3259,00	0,41	39,05	30,21	485,00	3990,00	0,07	0,19	207,00	34,36	1916,29	42,15	42,41
a=0.50	35,14	0,02	3248,00	0,45	39,16	30,65	369,00	3977,00	0,07	0,13	92,00	34,27	1786,40	43,46	42,93
a=0.25	35,10	0,03	3243,00	0,48	39,24	31,02	299,00	3972,00	0,07	0,10	21,00	34,20	1696,09	42,93	43,46
PBI + FT															
a=1.00	35,46	0,02	3365,00	0,29	38,22	29,41	1854,00	4105,00	0,07	0,51	1577,00	34,71	2375,69	68,58	60,47
a=0.75	35,37	0,02	3329,00	0,34	38,52	29,90	1460,00	4067,00	0,07	0,41	1182,00	34,58	2197,14	57,59	52,36
a=0.50	35,28	0,02	3289,00	0,39	38,79	30,37	1066,00	4032,00	0,07	0,30	788,00	34,45	2012,87	51,57	47,12
a=0.25	35,18	0,02	3269,00	0,44	39,05	30,81	672,00	4000,00	0,07	0,19	394,00	34,31	1837,18	45,81	45,81
UBI + FT															
a=1.00	35,46	0,02	3362,00	0,29	38,16	29,37	1855,00	4103,00	0,07	0,51	1577,00	34,71	2373,57	69,11	60,21
a=0.75	35,37	0,02	3328,00	0,34	38,48	29,88	1461,00	4065,00	0,07	0,41	1183,00	34,59	2196,48	57,85	52,36
a=0.50	35,28	0,02	3297,00	0,39	38,77	30,36	1066,00	4032,00	0,07	0,30	788,00	34,46	2017,76	51,57	47,12
a=0.25	35,18	0,03	3269,00	0,44	39,04	30,81	672,00	4000,00	0,07	0,19	394,00	34,30	1837,18	45,81	45,81

Table 6. Denmark – Progressive rules

Denmark	Mean(U)	Gini(U)	Mean(C)	Gini(C)	hm	hf	Taxes	Gross	F	t	τ	B	S(U)	S(C)	W(U)	W(C)
Current	35,29	0,02	3371,00	0,33	38,06	27,93	1830,00	4113,00	0,125	0.543		1317,00	34,58	2265,31		
PT without benefits	34,99	0,03	3059,00	0,49	39,58	31,17	512,00	4028,00	0,127	0,150	0,01	0,00	34,09	1563,15	37,43	43,98
PT with benefits	35,20	0,02	3056,00	0,29	37,46	26,19	1944,00	4024,00	0,127	0,556	0,07	1431,00	34,45	2172,82	37,43	36,39
NIT + PT																
a=1.00	35,29	0,02	3273,00	0,36	38,26	29,32	656,00	4004,00	0,069	0,287	0,03	381,00	34,51	2094,72	45,03	44,50
a=0.75	35,21	0,02	3258,00	0,41	38,61	29,93	499,00	3988,00	0,070	0,202	0,02	221,00	34,39	1928,74	42,15	43,46
a=0.50	35,15	0,02	3249,00	0,45	38,91	30,49	378,00	3979,00	0,070	0,139	0,01	100,00	34,28	1796,70	43,98	43,45
a=0.25	35,11	0,03	3246,00	0,47	39,14	30,96	301,00	3975,00	0,070	0,100	0,01	23,00	34,21	1707,40	43,72	43,98
WF + PT(H = 20)																
a=1.00	35,28	0,02	3292,00	0,36	38,92	29,79	635,00	4026,00	0,069	0,278	0,03	356,00	34,50	2100,30	44,76	44,76
a=0.75	35,20	0,02	3270,00	0,41	39,05	30,24	484,00	4001,00	0,069	0,195	0,02	207,00	34,37	1932,57	42,15	43,72
a=0.50	35,15	0,02	3255,00	0,45	39,15	30,67	369,00	3985,00	0,070	0,136	0,01	92,00	34,30	1796,76	43,98	43,72
a=0.25	35,11	0,03	3247,00	0,47	39,24	31,03	298,00	3977,00	0,070	0,099	0,01	21,00	34,20	1707,92	43,72	43,98
PBI + PT																
a=1.00	35,49	0,02	3400,00	0,28	38,36	29,65	1855,00	4144,00	0,067	0,517	0,06	1577,00	34,74	2437,80	72,25	64,39
a=0.75	35,39	0,02	3358,00	0,33	38,63	30,11	1461,00	4098,00	0,068	0,415	0,05	1182,00	34,61	2249,86	62,04	54,97
a=0.50	35,29	0,02	3318,00	0,38	38,89	30,54	1066,00	4054,00	0,069	0,308	0,03	788,00	34,48	2057,16	52,62	49,48
a=0.25	35,19	0,02	3283,00	0,43	39,14	30,97	672,00	4016,00	0,069	0,197	0,02	394,00	34,32	1861,46	46,59	45,55
UBI +PT																
a=1.00	35,49	0,02	3399,00	0,28	38,35	29,64	1855,00	4143,00	0,067	0,517	0,06	1576,00	34,78	2437,08	72,25	64,39
a=0.75	35,39	0,02	3358,00	0,33	38,63	30,09	1461,00	4097,00	0,068	0,410	0,05	1182,00	34,61	2246,50	62,04	54,97
a=0.50	35,29	0,02	3318,00	0,38	38,88	30,54	1066,00	4053,00	0,069	0,308	0,03	788,00	34,48	2057,16	52,62	49,47
a=0.25	35,19	0,02	3283,00	0,43	39,14	30,96	672,00	4015,00	0,069	0,197	0,02	394,00	34,35	1864,74	46,59	45,55

Table 7. Italy – Flat rules

Italy	Mean(U)	Gini(U)	Mean(C)	Gini (C)	hm	hf	Taxes	Gross	F	t	B	S(U)	S(C)	W(U)	W(C)
Current	19,64	0,02	1815,00	0,24	35,79	14,38	539,00	2268,00	0,16	0.42	166,00	19,23	1388,48		
FT without benefits	19,59	0,02	1848,00	0,28	36,61	14,92	373,00	2326,00	0,16	0,17	0,00	19,19	1337,95	42,99	68,20
FT with benefits	19,62	0,02	1811,00	0,26	35,76	14,41	540,00	2264,00	0,16	0,25	189,00	19,21	1331,90	19,23	27,02
NIT + FT															
a=1.00	19,68	0,02	1589,00	0,12	32,32	11,96	712,00	2056,00	0,18	0,77	339,00	19,29	1406,27	63,81	40,75
a=0.75	19,66	0,02	1701,00	0,18	33,92	13,22	551,00	2172,00	0,17	0,45	178,00	19,27	1398,22	70,00	39,85
a=0.50	19,63	0,02	1770,00	0,23	35,11	14,04	449,00	2245,00	0,17	0,29	77,00	19,24	1359,36	77,19	64,33
a=0.25	19,61	0,02	1819,00	0,26	36,02	14,59	395,00	2295,00	0,16	0,21	23,00	19,22	1342,42	56,76	68,29
WF + FT (H = 20)															
a=1.00	19,64	0,02	1811,00	0,16	36,19	14,05	519,00	2288,00	0,16	0,50	146,00	19,25	1526,67	56,24	56,79
a=0.75	19,63	0,02	1829,00	0,21	36,39	14,45	435,00	2306,00	0,16	0,34	63,00	19,23	1450,40	62,05	79,04
a=0.50	19,61	0,02	1839,00	0,24	36,49	14,69	393,00	2316,00	0,16	0,25	20,00	19,22	1390,28	53,61	75,39
a=0.25	19,61	0,02	1844,00	0,27	36,56	14,83	376,00	2322,00	0,16	0,20	3,50	19,21	1355,34	46,51	71,29
PBI + FT															
a=1.00	19,66	0,02	1777,00	0,12	35,75	13,48	1685,00	2253,00	0,17	0,78	1312,00	19,26	1569,09	60,97	56,54
a=0.75	19,65	0,02	1804,00	0,14	36,05	13,89	1355,00	2281,00	0,16	0,62	982,00	19,26	1546,83	62,69	59,68
a=0.50	19,64	0,02	1823,00	0,18	36,29	14,26	1025,00	2300,00	0,16	0,47	653,00	19,25	1491,21	66,27	68,16
a=0.25	19,62	0,02	1838,00	0,23	36,47	14,60	698,00	2315,00	0,16	0,32	326,00	19,23	1417,94	69,41	82,36
UBI + FT															
a=1.00	19,68	0,02	1562,00	0,11	32,15	11,66	1750,00	2029,00	0,18	0,90	1378,00	19,28	1390,18	63,38	43,42
a=0.75	19,68	0,02	1669,00	0,13	33,65	12,73	1406,00	2139,00	0,17	0,69	1033,00	19,28	1455,27	66,57	47,33
a=0.50	19,66	0,02	1744,00	0,17	34,84	13,58	1061,00	2218,00	0,17	0,50	689,00	19,26	1440,54	71,21	54,91
a=0.25	19,63	0,02	1802,00	0,23	35,81	14,29	717,00	2277,00	0,16	0,33	344,00	19,24	1394,75	76,55	77,11

Table 8. Italy – Progressive rules

	Mean(U)	Gini(U)	Mean(C)	Gini(C)	hm	hf	Taxes	Gross	F	t	τ	B	S(U)	S(C)	W(U)	W(C)
Current	19,64	0,02	1815,00	0,24	35,79	14,38	539,00	2268,00	0,154	0,417		189,00	19,23	1388,48		
PT without benefits	19,61	0,02	1869,00	0,27	36,58	14,93	351,00	2325,00	0,151	0,169	0,02	0,00	19,21	1361,19	49,91	67,99
PT with benefits	19,62	0,02	1809,00	0,26	35,74	14,38	541,00	2263,00	0,156	0,265	0,03	189,00	19,21	1342,28	18,89	25,26
NIT + PT																
a=1.00	19,68	0,02	1587,00	0,11	32,32	11,93	712,00	2053,00	0,182	0,801	0,15	339,00	19,29	1414,02	64,46	41,74
a=0.75	19,66	0,02	1702,00	0,17	33,93	13,21	549,00	2173,00	0,171	0,476	0,06	177,00	19,27	1409,26	71,39	43,63
a=0.50	19,64	0,02	1771,00	0,23	35,12	14,02	449,00	2245,00	0,166	0,315	0,03	77,00	19,24	1370,75	78,36	67,21
a=0.25	19,62	0,02	1819,00	0,26	36,02	14,57	395,00	2295,00	0,162	0,226	0,02	23,00	19,22	1351,52	60,15	70,52
WF + PT (H = 20)																
a=1.00	19,64	0,02	1811,00	0,15	36,19	14,04	519,00	2288,00	0,163	0,533	0,07	146,00	19,25	1537,54	58,73	58,61
a=0.75	19,63	0,02	1830,00	0,20	36,39	14,43	435,00	2307,00	0,161	0,361	0,04	63,00	19,24	1460,34	66,52	79,82
a=0.50	19,62	0,02	1839,00	0,24	36,49	14,67	392,00	2316,00	0,161	0,268	0,03	20,00	19,23	1399,48	58,61	77,02
a=0.25	19,61	0,02	1844,00	0,26	36,55	14,81	376,00	2321,00	0,160	0,210	0,02	4,00	19,21	1364,56	49,78	72,29
PBI + PT																
a=1.00	19,66	0,02	1769,00	0,11	35,68	13,39	1684,00	2245,00	0,166	0,810	0,15	1311,00	19,27	1576,18	61,53	56,71
a=0.75	19,65	0,02	1799,00	0,13	35,99	13,81	1355,00	2275,00	0,164	0,652	0,09	982,00	19,26	1563,33	63,94	60,33
a=0.50	19,64	0,02	1820,00	0,17	36,25	14,20	1026,00	2298,00	0,162	0,495	0,06	653,00	19,25	1506,96	67,56	67,34
a=0.25	19,62	0,02	1836,00	0,22	36,45	14,56	698,00	2313,00	0,161	0,335	0,04	326,00	19,23	1430,24	72,37	82,83
UBI + PT																
a=1.00	19,67	0,02	1553,00	0,11	32,08	11,59	1750,00	2018,00	0,185	0,925	0,23	1377,00	19,28	1385,28	63,29	43,29
a=0.75	19,68	0,02	1661,00	0,12	33,59	12,64	1406,00	2132,00	0,175	0,717	0,11	1033,00	19,28	1466,66	66,99	48,02
a=0.50	19,66	0,02	1740,00	0,16	34,79	13,51	1061,00	2214,00	0,168	0,527	0,07	689,00	19,27	1456,38	71,86	55,85
a=0.25	19,64	0,02	1800,00	0,22	35,78	14,25	717,00	2276,00	0,164	0,349	0,04	344,00	19,24	1409,40	77,19	77,19

Table 9. Portugal – Linear rules

	Mean(U)	Gini(U)	Mean(C)	Gini (C)	hm	hf	Taxes	Gross	F	t	B	S(U)	S(C)	W(U)	W(C)
Current	19,52	0,05	896,00	0,35	41,44	24,49	132,00	1076,00	0,07	0,35	60,00	18,62	581,24		
FT without benefits	19,49	0,06	936,00	0,46	42,71	25,31	72,00	1130,00	0,06	0,07	0,00	18,42	506,38	27,22	39,00
FT with benefits	19,51	0,05	922,00	0,41	41,69	24,59	133,00	1106,00	0,06	0,13	69,00	18,50	542,14	13,89	16,67
NIT + FT															
a=1.00	19,44	0,04	834,00	0,28	39,19	22,05	191,00	1016,00	0,07	0,39	119,00	18,66	601,31	41,78	35,56
a=0.75	19,48	0,05	886,00	0,37	40,66	23,66	134,00	1075,00	0,07	0,22	62,00	18,57	560,84	29,67	30,78
a=0.50	19,49	0,05	913,00	0,42	41,69	24,53	100,00	1105,00	0,06	0,13	29,00	18,50	534,11	20,67	27,89
a=0.25	19,49	0,05	928,00	0,44	42,34	25,01	83,00	1121,00	0,06	0,09	11,00	18,44	517,82	25,44	34,11
WF + FT (H = 20)															
a=1.00	19,48	0,04	874,00	0,30	41,35	23,42	166,00	1061,00	0,07	0,32	94,00	18,65	609,18	39,00	38,33
a=0.75	19,49	0,05	908,00	0,38	42,08	24,49	119,00	1099,00	0,07	0,19	47,00	18,55	567,50	26,78	36,44
a=0.50	19,50	0,05	924,00	0,42	42,48	24,97	93,00	1117,00	0,06	0,12	21,00	18,49	537,77	21,67	34,00
a=0.25	19,49	0,05	931,00	0,44	42,65	25,17	80,00	1125,00	0,06	0,09	8,50	18,44	518,57	25,67	36,56
PBI + FT															
a=1.00	19,37	0,03	780,00	0,17	39,76	21,05	599,00	956,00	0,08	0,70	527,00	18,75	646,62	56,00	51,22
a=0.75	19,46	0,04	835,00	0,24	40,72	22,48	467,00	1017,00	0,07	0,52	395,00	18,74	631,26	56,78	52,33
a=0.50	19,49	0,04	876,00	0,32	41,49	23,59	335,00	1063,00	0,07	0,35	263,00	18,66	597,43	53,44	50,78
a=0.25	19,50	0,05	909,00	0,39	42,14	24,52	203,00	1099,00	0,07	0,21	131,00	18,55	554,49	50,33	58,89
UBI + FT															
a=1.00	19,34	0,03	755,00	0,16	38,49	20,27	602,00	928,00	0,08	0,73	530,00	18,72	631,94	54,67	49,11
a=0.75	19,45	0,04	823,00	0,24	39,96	22,05	469,00	1004,00	0,07	0,52	397,00	18,73	624,66	56,44	49,67
a=0.50	19,49	0,04	870,00	0,32	41,04	23,35	337,00	1057,00	0,07	0,36	265,00	18,66	594,21	53,55	48,89
a=0.25	19,50	0,05	906,00	0,39	41,93	24,41	204,00	1097,00	0,07	0,21	132,00	18,55	552,66	50,33	57,22

Table 10. Portugal – Progressive rules

	Mean(U)	Gini(U)	Mean(C)	Gini(C)	hm	hf	Taxes	Gross	F	t	τ	B	S(U)	S(C)	W(U)	W(C)
Current	19,52	0,05	896,00	0,35	41,44	24,49	132,00	1076,00	0,059	0,350		69,00	18,61	581,24		
PT without benefits	19,52	0,06	944,00	0,46	42,73	25,34	64,00	1130,00	0,057	0,066	0,01	0,00	18,43	513,54	30,89	41,00
PT with benefits	19,52	0,05	919,00	0,41	41,66	24,55	133,00	1103,00	0,058	0,141	0,01	69,00	18,51	546,81	14,44	17,11
NIT + PT																
a=1.00	19,44	0,04	826,00	0,27	39,19	22,07	191,00	1008,00	0,071	0,397	0,05	119,00	18,68	606,28	43,44	37,00
a=0.75	19,48	0,05	882,00	0,36	40,66	23,67	134,00	1071,00	0,067	0,224	0,02	62,00	18,58	567,13	32,33	32,89
a=0.50	19,49	0,05	910,00	0,41	41,69	24,52	100,00	1102,00	0,064	0,141	0,01	29,00	18,52	538,72	23,11	31,67
a=0.25	19,49	0,05	926,00	0,44	42,33	24,99	83,00	1119,00	0,064	0,099	0,01	11,00	18,46	522,26	27,00	38,22
WF + PT (H = 20)																
a=1.00	19,48	0,04	868,00	0,29	41,34	23,44	165,00	1054,00	0,067	0,332	0,04	94,00	18,67	616,28	39,00	38,44
a=0.75	19,50	0,05	904,00	0,37	42,06	24,49	118,00	1095,00	0,065	0,187	0,02	47,00	18,58	571,33	28,22	40,44
a=0.50	19,50	0,05	921,00	0,41	42,46	24,95	93,00	1114,00	0,065	0,126	0,01	21,00	18,50	541,55	24,00	38,44
a=0.25	19,49	0,05	929,00	0,44	42,63	25,15	80,00	1123,00	0,064	0,089	0,01	8,00	18,52	522,10	27,44	40,33
PBI + PT																
a=1.00	19,32	0,03	756,00	0,15	39,53	20,64	599,00	929,00	0,078	0,748	0,13	527,00	18,72	645,62	55,89	50,67
a=0.75	19,43	0,04	818,00	0,22	40,55	22,21	467,00	998,00	0,072	0,543	0,08	395,00	18,75	638,86	58,11	53,00
a=0.50	19,49	0,04	865,00	0,30	41,38	23,45	335,00	1051,00	0,069	0,372	0,05	263,00	18,68	606,37	56,78	51,67
a=0.25	19,50	0,05	903,00	0,38	42,08	24,45	203,00	1094,00	0,066	0,218	0,02	131,00	18,56	560,76	57,44	63,22
UBI + PT																
a=1.00	19,28	0,03	731,00	0,14	38,23	19,83	602,00	900,00	0,080	0,772	0,14	530,00	18,70	629,39	54,67	48,55
a=0.75	19,43	0,03	805,00	0,22	39,80	21,78	469,00	984,00	0,073	0,552	0,08	397,00	18,77	631,12	57,78	51,44
a=0.50	19,49	0,04	859,00	0,30	40,94	23,20	337,00	1045,00	0,069	0,372	0,05	265,00	18,69	603,02	57,22	49,89
a=0.25	19,50	0,05	900,00	0,38	41,87	24,33	204,00	1091,00	0,066	0,212	0,02	132,00	18,56	559,80	56,78	61,44

Table 11. United Kingdom – Linear rules

	Mean(U)	Gini(U)	Mean(C)	Gini (C)	hm	hf	Taxes	Gross	F	t	B	S(U)	S(C)	W(U)	W(C)
Current	14,58	0,04	2523,00	0,21	44,92	23,49	472,00	3007,00	0,09	0,40	199,00	13,95	1990,14		
FT without benefits	14,53	0,04	2628,00	0,26	46,93	24,77	274,00	3114,00	0,09	0,09	0,00	13,89	1949,98	42,98	73,59
FT with benefits	14,54	0,04	2537,00	0,24	45,34	23,49	472,00	3023,00	0,09	0,17	191,00	13,90	1925,58	23,94	33,51
NIT + FT															
a=1.00	14,58	0,04	2396,00	0,17	42,62	21,32	547,00	2860,00	0,10	0,43	274,00	13,95	1983,89	47,81	33,33
a=0.75	14,57	0,04	2516,00	0,22	44,67	23,07	383,00	2991,00	0,09	0,23	109,00	13,94	1962,48	54,12	62,11
a=0.50	14,55	0,04	2582,00	0,25	45,98	24,11	303,00	3065,00	0,09	0,15	29,00	13,91	1949,41	45,44	76,14
a=0.25	14,54	0,04	2615,00	0,26	46,66	24,59	278,00	3100,00	0,09	0,11	4,00	13,90	1948,18	44,12	74,65
WF + FT (H = 20)															
a=1.00	14,58	0,04	2528,00	0,19	45,22	22,76	452,00	3003,00	0,09	0,34	178,00	13,96	2055,26	43,86	47,72
a=0.75	14,56	0,04	2583,00	0,23	46,12	23,84	335,00	3064,00	0,09	0,20	61,00	13,93	2001,83	51,14	81,32
a=0.50	14,55	0,04	2612,00	0,25	46,64	24,45	285,00	3096,00	0,09	0,14	11,00	13,91	1969,45	44,12	78,68
a=0.25	14,54	0,04	2623,00	0,26	46,84	24,68	274,00	3108,00	0,09	0,11	0,50	13,90	1954,14	43,95	75,26
PBI + FT															
a=1.00	14,60	0,04	2364,00	0,13	42,57	20,65	1953,00	2823,00	0,10	0,74	1679,00	13,99	2061,41	57,63	47,72
a=0.75	14,61	0,04	2451,00	0,15	43,98	21,87	1533,00	2919,00	0,09	0,56	1259,00	14,00	2085,80	59,12	49,47
a=0.50	14,60	0,04	2521,00	0,18	45,13	22,93	1113,00	2997,00	0,09	0,40	839,00	13,98	2059,66	59,65	55,18
a=0.25	14,57	0,04	2579,00	0,22	46,09	23,89	693,00	3060,00	0,09	0,24	419,00	13,94	2011,62	68,42	81,84
UBI + FT															
a=1.00	14,60	0,04	2309,00	0,13	41,60	20,09	1957,00	2765,00	0,10	0,76	1684,00	13,98	2015,76	57,11	44,74
a=0.75	14,61	0,04	2422,00	0,15	43,43	21,56	1536,00	2888,00	0,00	0,57	1536,00	14,00	2061,12	58,95	47,37
a=0.50	14,60	0,04	2506,00	0,18	44,83	22,77	1115,00	2981,00	0,09	0,40	842,00	13,98	2047,40	59,91	53,42
a=0.25	14,57	0,04	2573,00	0,22	45,97	23,83	695,00	3054,00	0,09	0,24	421,00	13,94	2004,37	69,21	81,58

Table 12. United Kingdom – Progressive rules

	Mean(U)	Gini(U)	Mean(C)	Gini(C)	hm	hf	Taxes	Gross	F	t	τ	B	S(U)	S(C)	W(U)	W(C)
Current	14,58	0,04	2523,00	0,21	44,92	23,49	473,00	3007,00	0,093	0,400		192,00	13,95	1990,65		
PT without benefits	14,53	0,04	2619,00	0,26	46,91	24,73	281,00	3112,00	0,090	0,104	0,01	0,00	13,89	1948,54	43,25	65,35
PT with benefits	14,55	0,04	2535,00	0,24	45,29	23,44	472,00	3020,00	0,093	0,180	0,02	192,00	13,91	1934,21	22,98	33,25
NIT + PT																
a=1.00	14,59	0,04	2395,00	0,17	42,62	21,32	546,00	2860,00	0,096	0,460	0,05	272,00	13,97	1997,43	50,70	35,79
a=0.75	14,57	0,04	2515,00	0,22	44,66	23,06	382,00	2991,00	0,092	0,253	0,03	108,00	13,94	1971,76	58,25	66,23
a=0.50	14,55	0,04	2581,00	0,24	45,96	24,09	302,00	3063,00	0,089	0,158	0,02	29,00	13,91	1956,40	48,77	77,72
a=0.25	14,54	0,04	2613,00	0,25	46,64	24,55	278,00	3098,00	0,088	0,118	0,01	4,00	13,90	1954,52	45,44	75,79
WF + PT (H = 20)																
a=1.00	14,59	0,04	2526,00	0,18	45,20	22,75	452,00	3001,00	0,091	0,367	0,04	178,00	13,97	2066,52	47,19	49,82
a=0.75	14,56	0,04	2582,00	0,22	46,11	23,82	335,00	3063,00	0,089	0,218	0,02	61,00	13,93	2011,38	57,19	82,37
a=0.50	14,55	0,04	2610,00	0,24	46,61	24,42	285,00	3095,00	0,089	0,148	0,01	11,00	13,92	1975,77	46,84	79,04
a=0.25	14,54	0,04	2621,00	0,25	46,82	24,64	274,00	3106,00	0,088	0,118	0,01	0,00	13,90	1965,75	45,35	76,14
PBI + PT																
a=1.00	14,60	0,04	2344,00	0,12	42,36	20,45	1953,00	2802,00	0,098	0,771	0,13	1679,00	13,99	2065,06	58,07	47,98
a=0.75	14,61	0,04	2441,00	0,14	43,81	21,70	1533,00	2908,00	0,094	0,590	0,08	1259,00	14,01	2099,26	60,53	50,70
a=0.50	14,60	0,04	2513,00	0,17	45,00	22,80	1113,00	2986,00	0,092	0,423	0,05	839,00	13,99	2075,74	61,75	55,44
a=0.25	14,57	0,04	2574,00	0,22	46,02	23,81	693,00	3055,00	0,090	0,258	0,03	419,00	13,95	2020,59	71,32	82,63
UBI + PT																
a=1.00	14,59	0,04	2288,00	0,12	41,40	19,89	1958,00	2742,00	0,100	0,788	0,14	1684,00	13,98	2018,02	57,28	44,91
a=0.75	14,61	0,04	2413,00	0,14	43,27	21,39	1536,00	2877,00	0,095	0,599	0,08	1263,00	14,01	2077,59	60,53	48,59
a=0.50	14,60	0,04	2498,00	0,17	44,71	22,64	1115,00	2971,00	0,092	0,426	0,05	842,00	13,99	2063,35	61,93	53,59
a=0.25	14,58	0,04	2569,00	0,22	45,89	23,75	695,00	3049,00	0,090	0,261	0,03	421,00	13,96	2016,67	71,93	82,11

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