Discussion Papers No. 578, February 2009
Statistics Norway, Research Department

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Evaluating Alternative Basic Income Mechanisms
A Simulation for European Countries

Abstract:
We develop and estimate a microeconometric model of household labour supply in five European countries representative of different economies and welfare policy regimes: Denmark, Italy, Norway, Portugal and United Kingdom. We then simulate, under the constraint of constant total net tax revenue, the effects of various hypothetical tax-transfer reforms which include alternative versions of a Basic Income mechanisms. 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.

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

JEL classification: C25; H24; H31; I38

Acknowledgement: This work is part of a CHILD project financed by Compagnia di San Paolo ("Minimum Guaranteed Income: A Crucial Node in the Design of Social Policy in Europe", 2006-8) and by the Italian Ministry of University and Research ("Modelli econometrici per la valutazione dei programmi di reddito minimo garantito", 2007-8). Cathal O'Donoghue created, from the original sources, the datasets in a form appropriate for the estimation of the microeconometric model (Norway excluded). Edlira Narazani and Marilena Locatelli further worked on the preparation of the datasets and performed the initial estimation exercises. Edlira Narazani performed all the most recent estimations and simulations for Denmark, Italy, Portugal and United Kingdom. Tom Wennemo performed the estimations and simulations for Norway. Isilda Shima (now at the European Centre for Social Welfare Policy and Research, Vienna) contributed for a brief period to the estimation and simulation of the model under a research contract with the Department of Economics of Turin.

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1. Introduction

The idea of a providing every individual (citizen, worker etc.) with a Minimum Guaranteed Income or Basic Income (BI) goes very far back in the history of economic, political and philosophical thought.[1] 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 BI policies can be classified under three types: redistribution, efficiency and cost-effectiveness.

Redistribution. Many proponents give to BI the interpretation of a "social dividend", i.e. an income due to some basic "common" like natural resources, the electro-magnetic spectrum etc.[2] 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 "common",[3] it follows that all the original owners of the common should receive a share of the total revenue in return for being deprived of the right to freely access the common property.

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 BI 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 BI has the appeal of a simple, transparent and permanent solution. A third and different argument, still related to efficiency, points at the opportunity of separating the income support issues from those related to industrial

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[1] See for example Van Parijs (1995).

[2] The idea can be traced back to Thomas Paine (1797). A form of basic income that can be interpreted as an implementation of this argument is actually implemented in Alaska.

[3] See for example the discussion on the institute of private property in Milgrom and Roberts (1992).

[4] Meade (1995).

[5] On these issues see for example Bardhan et al. (2000).

policies. To the extent that productive efficiency requires a high degree of labour mobility and flexibility, policies inspired by BI 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 BI might attain comparable goals at a lower cost and with more transparency.

The study presented 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 BI 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. As a matter of fact, recent proposals or implementations of reforms both in Europe and the US seem to favour in-work benefits or work-fare policies.[7] Yet, these policies are not necessarily alternative to some form of universalistic support, and do not respond to the distributive and efficiency issues that are specifically addressed by the universalistic policies.

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.[8] 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] A very useful survey of current transfer policies in Europe and the debate on reforms is provided by Immervoll et al. (2007).

[8] 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.

Among the evaluation criteria, we also use a welfaristic social welfare function. Therefore, with reference to the class of tax-transfer rules considered, we actually approximate computationally the solution to an optimal taxation problem, with special focus on income transfer mechanisms. Interesting examples of recent contributions to the empirical design of income transfer mechanisms are Immervoll et al. (2007), Haan and Wrohlich (2007) and Blundell et al. (2007). These studies start from optimal taxation formulas obtained by Saez (2002) and give numerical values to the parameters appearing in those formulas (typically the labour supply elasticities) either by calibration (as in Immervoll et al. (2007)) or by using previous microeconometric estimates (as in Haan and Wrohlich (2007) and Blundell et al. (2007)). 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, our exercise is close to Aaberge and Colombino (2008). The computational approach to solving optimal taxation problems seems to allow for a more general and flexible representation of preferences, agents' heterogeneity and non-standard constraints on the choice set.[9]

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.

2. The model

The basic framework is similar to the one adopted, among others, by Van Soest (1995), Aaberge et al. (1995, 1999, 2000, 2004, 2009), Duncan and Giles (1996), i.e. the Random Utility model.[10] 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 $U^n\left(C, h_F, h_M\right)$ under the constraints

[9] For example, Immervoll et al. (2007) assume a quasi-linear utility function (i.e. no income effects), do not represent cross-effects between partners, allow little heterogeneity in behaviour and do not account for quantity constraints on the opportunity sets (e.g. limits to the choice of hours of work). Haan and Wrohlich (2007) and Blundell et al. (2007) use the estimates of a flexible microeconometric model but combine them with formulas from Saez (2002) that are based on assumptions not completely consistent with the assumptions of the microeconometric model.

[10] 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)

$$h_F \in \Omega$$
$$h_M \in \Omega$$
$$C = R\left(w_F h_F, w_M h_M, y\right)$$

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);

$\Omega =$ set of 12 discrete values (to be defined hereafter);

$w_G =$ hourly wage rate of partner G;

$y =$ vector of exogenous household gross incomes;

$C =$ net disposable household income;

$R =$ tax-transfer rule that transforms gross incomes into net available household income.[11]

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.

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:

$$(1) \qquad U^n\left(C, h_F, h_M\right) = V\left(C, h_F, h_M; Z, \vartheta\right) + \varepsilon = V\left(R\left(w_F h_F, w_M h_M, y\right), h_F, h_M; Z, \vartheta\right) + \varepsilon$$

where Z 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 $\left(C, h_F, h_M\right)$ by household *n*.

Under the assumption that ε is i.i.d. Type I extreme value, it is well known[12] that the probability that a given household chooses $h_F = f, h_M = m$ is given by

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

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

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

We choose a quadratic specification since it is linear-in-parameters and it represents a good compromise between flexibility and ease of estimation:[13]

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

where T denotes total available time.

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

(4)

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

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.[14] 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

[13] 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.

[14] The method of generating the alternatives in the choice set with a probabilistic sampling seems to provide a better performance – especially in reform simulation – in comparison to the most common usage of imputing a fixed and equal set of alternatives to everyone. A comparison and evaluation of different procedures to specify the choice set is provided by Aaberge et al. (2009). The issue of the choice set representation was first analyzed by McFadden (1978). See also Colombino (1998) for an explanation and application of McFadden's results. Aaberge et al. (1999) also adopt a complex sampling and weighting of alternatives. Here we adopt a simpler method, especially in view of making the model easily replicable, modifiable and accessible to a large audience (for as example the EUROMOD users).

contained in $\Omega \times \Omega$, we use a microsimulation model.[15] 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.[16]

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

$$
(5) \qquad
\begin{aligned}
D_{G1}(h_G) &= \begin{cases} 1 \text{ if } 17 \le h_G \le 32 \\ 0 \text{ otherwise} \end{cases} \\
D_{G2}(h_G) &= \begin{cases} 1 \text{ if } 33 \le h_G \le 48 \\ 0 \text{ otherwise} \end{cases} \\
D_{G3}(h\ ) &= \begin{cases} 1 \text{ if } 49 \le h_G \\ 0 \text{ otherwise} \end{cases} \\
D_{G4}(h_G) &= \begin{cases} 1 \text{ if } 0 < h_G \\ 0 \text{ otherwise} \end{cases} \\
D_{G5}(h_G) &= \begin{cases} 1 \text{ if } h_G = 0 \text{ and looking for work} \\ 0 \text{ otherwise} \end{cases}
\end{aligned}
$$

for $G = F$ (female) or M (male).

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:

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

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

[15] For Denmark, Italy, Portugal and United Kingdom the EUROMOD algorithm was used. An overview of the EUROMOD project is provided by Bourguignon et al. (1997). For Norway we used the tax-transfer microsimulation model LOTTE available at Statistics Norway.

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

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

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

3. Data

For the estimation and simulation exercise presented in this paper we use datasets from five countries: Denmark (ECHP[17] 1998), Italy (SHIW[18] 1998), Portugal (ECHP 1998), United Kingdom (FRS[19] 2003) and Norway (Norwegian Survey of Level of Living 2001). The selection criteria are as follows:[20]

- Couples (either married or unmarried);
- Either partners employed, or unemployed or inactive (students 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.

The parameter estimates for the five countries are available upon request.

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 $P_A^n\left(f, m; \vartheta^{ML}\right)$ be the corresponding choice probability of $\left(f, m\right)$ 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 $\varphi^n\left(f, m\right)$: 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:

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

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[17] European Community Household Panel Survey.

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

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

[20] The sample selection 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.

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 $\mu(1-I)$.[21] We present two versions. The first one uses the expected maximum utility attained by the household as the measure of individual welfare, i.e.[22]

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

where $\bar{Z}$ 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.[23]

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

5.The tax-transfer policies

We list and explain hereafter the simulated hypothetical reforms of the tax-transfer system. In 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).

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[24] and J. Tobin.[25] 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),

[21] 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).

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

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

[24] Friedman (1962).

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

σ is an equivalence scale that adjusts the basic poverty line according to the number of people (N) in the household:[26]

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

The marginal tax rate t is endogenously determined by the simulation algorithm so that the net tax revenue is equal to the one raised 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.[27] In the simulation illustrated hereafter we set H = 20. This system is essentially very close to some reforms recently introduced 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.

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 of FT.

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

[27] See for example Blinder and Rosen (1985) and Fortin et al. (1993).

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 a benchmark.

The main results of the simulations are presented in Tables 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, Norway, 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 C. This is also a measure of efficiency, but just in terms of available income.[28]

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

h(M) = average weekly hours worked by the husband

h(F) = average weekly hours worked by the wife

TMTR = top marginal tax rate; it is t (defined above) in FT-based rules; in PT-based rules it is the marginal tax rate computed at gross income = 2*average gross household income

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

[28] Income variables are measure in Euros in Denmark, Italy, Portugal and United Income, and in Norwegian Kroner in Norway.

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 4– 13 report all the detailed results.

Tables 1, 2 and 3 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 1 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. Partial exceptions are represented by Italy and Norway, where NIT and WF emerge as possibly more promising mechanisms.

A second indication is that progressive systems seem to perform somewhat better than flat systems. We have already noted that the progressive versions of PBI and UBI overall get higher grades than their non progressive versions. But this is the case 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 4 – 13. 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.[29] 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.[30]

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 come Denmark and Norway. Otherwise said, Denmark and Norway have, in relative terms, successful policies on income support and it is therefore difficult to improve upon them.

Norway appears as an outlier case in the sense that we are never able to identify feasible public revenue-constant mechanisms with a BI level higher than 50% or 75% of the poverty line. One reason for this to happen might be found in the very equal distribution of gross income, leading to a relatively high median income (and poverty line). Another reason might be the relatively high labour supply elasticity for certain segments of the population in Norway, which makes participation rates and consequently tax revenue particularly sensible with respect to the level of income support.

Immervoll et al. (2007) find that in-work benefits (close to our Work-fare) dominate – on a social welfare basis – more universalistic transfer policies (close to our UBI or NIT). The picture emerging from our exercise is less clear-cut: as a matter of fact, a social welfare-based evaluation would suggest a slight superiority of the universalistic policies. [31]

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[29] More detailed evidence on the pattern of labour supply elasticity is provided by Aaberge et al. (2002) for Italy and by Aaberge et al. (2008) for Norway. The latter paper computes an optimal tax rule that turns 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 Mirrlees (1971) 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 (2008), Tuomala (1990, 2008), Røed and Strøm (2002), Keen 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).

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

[31] As noted in Section 1, the analysis of Immervoll et al. (2007) is based on theoretical optimal taxation results (Saez, 2002) that require restrictive assumptions on preferences and choices (no income effects, no interaction among partners, little heterogeneity in behaviour), which might contribute to explaining the differences between their results and ours.

The above picture can change substantially if, besides the welfaristic criteria of Table 1, 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 2 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).[32]

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 3 we further exclude from the grading the policies implying a reduction of female participation rate.

Table 3 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; more selective policies such as WF or NIT are more likely to be feasible. On the other hand, in Denmark (the country with the highest female participation rate) and Norway most 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. Norway represents an interesting case that seems to require (as welfare-improving reforms) mechanisms that improve labour supply incentives.

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 five European countries (Denmark, Italy, Norway, Portugal and United Kingdom). We have then simulated the effects of introducing various alternative types of BI 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 (less so for Italy and Norway);

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

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 or in countries with a highly responsive labour supply behaviour (like Norway), the price of supporting pure universalistic policies seems too high and policies like NIT or WF emerge as possibly more appropriate. It might of course be the case that more complex transfer mechanisms could be designed that successfully combine the good properties of strictly universalistic policies such as UBI with the good properties of more selective policies such as WF. Future research work will also explore these perspectives.

Table 1. Summary evaluation of alternative basic income policies. All the policies

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

Table 2. Summary evaluation of alternative basic income policies, excluding policies implying a top marginal tax rate > 55%

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

Table 3. 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				Norway			
	a	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)	S(U)	S(C)	W(U)	W(C)
NIT + FT	1.00																				
	0.75																				
	0.50																C				
	0.25							C	C								C				
WF + FT	1.00																				
	0.75						C	C	C						C	C	C				
	0.50						C	C	C								C				
	0.25								C								C		B	C	C
PBI + FT	1.00	C	A	C	B																
	0.75			C	C																
	0.50			C	C																
	0.25						C	C	B	C					C	C	C			C	C
UBI + FT	1.00	C	B	B	A																
	0.75	C		C	C																
	0.50			C	C									C	C	C	C				
	0.25														C	C	C				
NIT + PT	1.00													C	C	C					
	0.75															C	C				
	0.50																C				
	0.25							C	C								C				
WF + PT	1.00																				
	0.75					C	C	C	C												
	0.50						C	C	C								C				
	0.25								C								C	B	A	B	C
PBI + PT	1.00	B	C	A	C																
	0.75	C		C	C																
	0.50			C																	
	0.25																				
UBI + PT	1.00	A	C	A	C																
	0.75	C		C	C																
	0.50																				
	0.25													C	C	A	B				

Table 4. Denmark – Flat rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini (C)	S(U)	S(C)	W(U)	W(C)
Current	0.54	38.06	27.93	35.29	0.02	3371.00	0.33	34.58	2265.31		
NIT + FT											
a=1.00	0.28	38.25	29.26	35.27	0.02	3259.00	0.36	34.46	2075.98	42.93	42.94
a=0.75	0.20	38.60	29.89	35.20	0.02	3248.00	0.41	34.37	1916.32	42.15	42.67
a=0.50	0.13	38.91	30.47	35.14	0.02	3242.00	0.45	34.27	1786.34	43.46	42.67
a=0.25	0.10	39.15	30.95	35.10	0.03	3241.00	0.48	34.20	1698.28	43.19	43.46
WF + FT (H = 20)											
a=1.00	0.27	38.91	29.74	35.26	0.02	3279.00	0.37	34.46	2082.17	41.62	43.72
a=0.75	0.19	39.05	30.21	35.19	0.02	3259.00	0.41	34.36	1916.29	42.15	42.41
a=0.50	0.13	39.16	30.65	35.14	0.02	3248.00	0.45	34.27	1786.40	43.46	42.93
a=0.25	0.10	39.24	31.02	35.10	0.03	3243.00	0.48	34.20	1696.09	42.93	43.46
PBI + FT											
a=1.00	0.51	38.22	29.41	35.46	0.02	3365.00	0.29	34.71	2375.69	68.58	60.47
a=0.75	0.41	38.52	29.90	35.37	0.02	3329.00	0.34	34.58	2197.14	57.59	52.36
a=0.50	0.30	38.79	30.37	35.28	0.02	3289.00	0.39	34.45	2012.87	51.57	47.12
a=0.25	0.19	39.05	30.81	35.18	0.02	3269.00	0.44	34.31	1837.18	45.81	45.81
UBI + FT											
a=1.00	0.51	38.16	29.37	35.46	0.02	3362.00	0.29	34.71	2373.57	69.11	60.21
a=0.75	0.41	38.48	29.88	35.37	0.02	3328.00	0.34	34.59	2196.48	57.85	52.36
a=0.50	0.30	38.77	30.36	35.28	0.02	3297.00	0.39	34.46	2017.76	51.57	47.12
a=0.25	0.19	39.04	30.81	35.18	0.03	3269.00	0.44	34.30	1837.18	45.81	45.81

Table 5. Denmark – Progressive rules

Denmark	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini(C)	S(U)	S(C)	W(U)	W(C)
Current	0.54	38.06	27.93	35.29	0.02	3371.00	0.33	34.58	2265.31		
NIT + PT											
a=1.00	0.29	38.26	29.32	35.29	0.02	3273.00	0.36	34.51	2094.72	45.03	44.50
a=0.75	0.20	38.61	29.93	35.21	0.02	3258.00	0.41	34.39	1928.74	42.15	43.46
a=0.50	0.14	38.91	30.49	35.15	0.02	3249.00	0.45	34.28	1796.70	43.98	43.45
a=0.25	0.10	39.14	30.96	35.11	0.03	3246.00	0.47	34.21	1707.40	43.72	43.98
WF + PT(H = 20)											
a=1.00	0.28	38.92	29.79	35.28	0.02	3292.00	0.36	34.50	2100.30	44.76	44.76
a=0.75	0.20	39.05	30.24	35.20	0.02	3270.00	0.41	34.37	1932.57	42.15	43.72
a=0.50	0.14	39.15	30.67	35.15	0.02	3255.00	0.45	34.30	1796.76	43.98	43.72
a=0.25	0.10	39.24	31.03	35.11	0.03	3247.00	0.47	34.20	1707.92	43.72	43.98
PBI + PT											
a=1.00	0.52	38.36	29.65	35.49	0.02	3400.00	0.28	34.74	2437.80	72.25	64.39
a=0.75	0.42	38.63	30.11	35.39	0.02	3358.00	0.33	34.61	2249.86	62.04	54.97
a=0.50	0.31	38.89	30.54	35.29	0.02	3318.00	0.38	34.48	2057.16	52.62	49.48
a=0.25	0.20	39.14	30.97	35.19	0.02	3283.00	0.43	34.32	1861.46	46.59	45.55
UBI +PT											
a=1.00	0.52	38.35	29.64	35.49	0.02	3399.00	0.28	34.78	2437.08	72.25	64.39
a=0.75	0.41	38.63	30.09	35.39	0.02	3358.00	0.33	34.61	2246.50	62.04	54.97
a=0.50	0.31	38.88	30.54	35.29	0.02	3318.00	0.38	34.48	2057.16	52.62	49.47
a=0.25	0.20	39.14	30.96	35.19	0.02	3283.00	0.43	34.35	1864.74	46.59	45.55

Table 6. Italy – Flat rules

Italy	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini (C)	S(U)	S(C)	W(U)	W(C)
Current	0.42	35.79	14.38	19.64	0.02	1815.00	0.24	19.23	1388.48		
NIT + FT											
a=1.00	0.77	32.32	11.96	19.68	0.02	1589.00	0.12	19.29	1406.27	63.81	40.75
a=0.75	0.45	33.92	13.22	19.66	0.02	1701.00	0.18	19.27	1398.22	70.00	39.85
a=0.50	0.29	35.11	14.04	19.63	0.02	1770.00	0.23	19.24	1359.36	77.19	64.33
a=0.25	0.21	36.02	14.59	19.61	0.02	1819.00	0.26	19.22	1342.42	56.76	68.29
WF + FT (H = 20)											
a=1.00	0.50	36.19	14.05	19.64	0.02	1811.00	0.16	19.25	1526.67	56.24	56.79
a=0.75	0.34	36.39	14.45	19.63	0.02	1829.00	0.21	19.23	1450.40	62.05	79.04
a=0.50	0.25	36.49	14.69	19.61	0.02	1839.00	0.24	19.22	1390.28	53.61	75.39
a=0.25	0.20	36.56	14.83	19.61	0.02	1844.00	0.27	19.21	1355.34	46.51	71.29
PBI + FT											
a=1.00	0.78	35.75	13.48	19.66	0.02	1777.00	0.12	19.26	1569.09	60.97	56.54
a=0.75	0.62	36.05	13.89	19.65	0.02	1804.00	0.14	19.26	1546.83	62.69	59.68
a=0.50	0.47	36.29	14.26	19.64	0.02	1823.00	0.18	19.25	1491.21	66.27	68.16
a=0.25	0.32	36.47	14.60	19.62	0.02	1838.00	0.23	19.23	1417.94	69.41	82.36
UBI + FT											
a=1.00	0.90	32.15	11.66	19.68	0.02	1562.00	0.11	19.28	1390.18	63.38	43.42
a=0.75	0.69	33.65	12.73	19.68	0.02	1669.00	0.13	19.28	1455.27	66.57	47.33
a=0.50	0.50	34.84	13.58	19.66	0.02	1744.00	0.17	19.26	1440.54	71.21	54.91
a=0.25	0.33	35.81	14.29	19.63	0.02	1802.00	0.23	19.24	1394.75	76.55	77.11

Table 7. Italy – Progressive rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini(C)	S(U)	S(C)	W(U)	W(C)
Current	0.42	35.79	14.38	19.64	0.02	1815.00	0.24	19.23	1388.48		
NIT + PT											
a=1.00	0.80	32.32	11.93	19.68	0.02	1587.00	0.11	19.29	1414.02	64.46	41.74
a=0.75	0.48	33.93	13.21	19.66	0.02	1702.00	0.17	19.27	1409.26	71.39	43.63
a=0.50	0.32	35.12	14.02	19.64	0.02	1771.00	0.23	19.24	1370.75	78.36	67.21
a=0.25	0.23	36.02	14.57	19.62	0.02	1819.00	0.26	19.22	1351.52	60.15	70.52
WF + PT (H = 20)											
a=1.00	0.53	36.19	14.04	19.64	0.02	1811.00	0.15	19.25	1537.54	58.73	58.61
a=0.75	0.36	36.39	14.43	19.63	0.02	1830.00	0.20	19.24	1460.34	66.52	79.82
a=0.50	0.27	36.49	14.67	19.62	0.02	1839.00	0.24	19.23	1399.48	58.61	77.02
a=0.25	0.21	36.55	14.81	19.61	0.02	1844.00	0.26	19.21	1364.56	49.78	72.29
PBI + PT											
a=1.00	0.81	35.68	13.39	19.66	0.02	1769.00	0.11	19.27	1576.18	61.53	56.71
a=0.75	0.65	35.99	13.81	19.65	0.02	1799.00	0.13	19.26	1563.33	63.94	60.33
a=0.50	0.50	36.25	14.20	19.64	0.02	1820.00	0.17	19.25	1506.96	67.56	67.34
a=0.25	0.34	36.45	14.56	19.62	0.02	1836.00	0.22	19.23	1430.24	72.37	82.83
UBI + PT											
a=1.00	0.93	32.08	11.59	19.67	0.02	1553.00	0.11	19.28	1385.28	63.29	43.29
a=0.75	0.72	33.59	12.64	19.68	0.02	1661.00	0.12	19.28	1466.66	66.99	48.02
a=0.50	0.53	34.79	13.51	19.66	0.02	1740.00	0.16	19.27	1456.38	71.86	55.85
a=0.25	0.35	35.78	14.25	19.64	0.02	1800.00	0.22	19.24	1409.40	77.19	77.19

Table 8. Norway – Flat rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini(C)	S(U)	S(C)	W(U)	W(C)
Current system	0.55	35.21	25.43	47.45	0.055	319584	0.211	44.84	252152		
NIT + FT											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	---	---	---	---	---	---	---	---	---	---	---
a = 0.50	---	---	---		---	---	---	---	---	---	---
a = 0.25	0.25	35.86	25.40	47.44	0.054	327944	0.271	44.88	239071	54.63	55.19
WF + FT(H=20)											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	0.52	30.11	22.90	47.36	0.056	280245	0.204	44.71	223075	34.69	24.44
a = 0.50	0.31	35.68	25.35	47.48	0.055	325454	0.246	44.87	245392	61.10	60.62%
a = 0.25	0.24	37.42	26.42	47.46	0.054	340011	0.255	44.90	253308	57.96	61.60
PBI + FT											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	---	---	---	---	---	---	---	---	---	---	---
a = 0.50	0.70	24.06	18.03	46.96	0.056	220330	0.199	44.33	176484	27.78	11.79
a = 0.25	0.38	33.39	23.76	47.46	0.055	304886	0.250	44.85	228665	59.20	53.40
UBI + FT											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	---	---	---	---	---	---	---	---	---	---	---
a = 0.50	---	---	---	---	---	---	---	---	---	---	---
a = 0.25	0.39	32.66	23.13	47.45	0.055	298375	0.256	44.84	221991	54.75	46.98

Table 9. Norway – Progressive rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini(C)	S(U)	S(C)	W(U)	W(C)
Current system	0.55	35.21	25.43	47.45	0.055	319584	0.211	44.84	252152		
NIT + PT											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	---	---	---	---	---	---	---	---	---	---	---
a = 0.50	---	---	---		---	---	---	---	---	---	---
a = 0.25	0.28	35.68	25.19	47.46	0.054	325786	0.266	44.90	239127	55.86	55.99
WF + PT(H=20)											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	0.57	30.15	22.76	47.38	0.055	279374	0.196	44.77	224617	36.36	25.74
a = 0.50	0.34	35.67	25.15	47.50	0.054	324258	0.241	44.94	246112	64.14	63.58
a = 0.25	0.26	37.17	26.18	47.48	0.054	337113	0.250	44.92	252835	59.44	62.10
PBI + PT											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	---	---	---	---	---	---	---	---	---	---	---
a = 0.50	0.76	22.96	17.34	46.85	0.056	208923	0.180	44.23	171317	27.16	10.99
a = 0.25	0.42	33.02	23.36	47.47	0.054	300435	0.242	44.91	227730	58.21	51.48
UBI + PT											
a = 1.00	---	---	---	---	---	---	---	---	---	---	---
a = 0.75	---	---	---	---	---	---	---	---	---	---	---
a = 0.50	---	---	---		---	---	---	---	---	---	---
a = 0.25	0.43	32.24	22.68	47.45	0.054	293268	0.248	44.89	220538	53.27	45.00

Table 10. Portugal – Flat rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini (C)	S(U)	S(C)	W(U)	W(C)
Current	0.35	41.44	24.49	19.52	0.05	896.00	0.35	18.62	581.24		
FT without benefits	0.07	42.71	25.31	19.49	0.06	936.00	0.46	18.42	506.38	27.22	39.00
FT with benefits	0.13	41.69	24.59	19.51	0.05	922.00	0.41	18.50	542.14	13.89	16.67
NIT + FT											
a=1.00	0.39	39.19	22.05	19.44	0.04	834.00	0.28	18.66	601.31	41.78	35.56
a=0.75	0.22	40.66	23.66	19.48	0.05	886.00	0.37	18.57	560.84	29.67	30.78
a=0.50	0.13	41.69	24.53	19.49	0.05	913.00	0.42	18.50	534.11	20.67	27.89
a=0.25	0.09	42.34	25.01	19.49	0.05	928.00	0.44	18.44	517.82	25.44	34.11
WF + FT (H = 20)											
a=1.00	0.32	41.35	23.42	19.48	0.04	874.00	0.30	18.65	609.18	39.00	38.33
a=0.75	0.19	42.08	24.49	19.49	0.05	908.00	0.38	18.55	567.50	26.78	36.44
a=0.50	0.12	42.48	24.97	19.50	0.05	924.00	0.42	18.49	537.77	21.67	34.00
a=0.25	0.09	42.65	25.17	19.49	0.05	931.00	0.44	18.44	518.57	25.67	36.56
PBI + FT											
a=1.00	0.70	39.76	21.05	19.37	0.03	780.00	0.17	18.75	646.62	56.00	51.22
a=0.75	0.52	40.72	22.48	19.46	0.04	835.00	0.24	18.74	631.26	56.78	52.33
a=0.50	0.35	41.49	23.59	19.49	0.04	876.00	0.32	18.66	597.43	53.44	50.78
a=0.25	0.21	42.14	24.52	19.50	0.05	909.00	0.39	18.55	554.49	50.33	58.89
UBI + FT											
a=1.00	0.73	38.49	20.27	19.34	0.03	755.00	0.16	18.72	631.94	54.67	49.11
a=0.75	0.52	39.96	22.05	19.45	0.04	823.00	0.24	18.73	624.66	56.44	49.67
a=0.50	0.36	41.04	23.35	19.49	0.04	870.00	0.32	18.66	594.21	53.55	48.89
a=0.25	0.21	41.93	24.41	19.50	0.05	906.00	0.39	18.55	552.66	50.33	57.22

Table 11. Portugal – Progressive rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini(C)	S(U)	S(C)	W(U)	W(C)
Current	0.35	41.44	24.49	19.52	0.05	896.00	0.35	18.61	581.24		
NIT + PT											
a=1.00	0.40	39.19	22.07	19.44	0.04	826.00	0.27	18.68	606.28	43.44	37.00
a=0.75	0.22	40.66	23.67	19.48	0.05	882.00	0.36	18.58	567.13	32.33	32.89
a=0.50	0.14	41.69	24.52	19.49	0.05	910.00	0.41	18.52	538.72	23.11	31.67
a=0.25	0.10	42.33	24.99	19.49	0.05	926.00	0.44	18.46	522.26	27.00	38.22
WF + PT (H = 20)											
a=1.00	0.33	41.34	23.44	19.48	0.04	868.00	0.29	18.67	616.28	39.00	38.44
a=0.75	0.19	42.06	24.49	19.50	0.05	904.00	0.37	18.58	571.33	28.22	40.44
a=0.50	0.13	42.46	24.95	19.50	0.05	921.00	0.41	18.50	541.55	24.00	38.44
a=0.25	0.09	42.63	25.15	19.49	0.05	929.00	0.44	18.52	522.10	27.44	40.33
PBI + PT											
a=1.00	0.75	39.53	20.64	19.32	0.03	756.00	0.15	18.72	645.62	55.89	50.67
a=0.75	0.54	40.55	22.21	19.43	0.04	818.00	0.22	18.75	638.86	58.11	53.00
a=0.50	0.37	41.38	23.45	19.49	0.04	865.00	0.30	18.68	606.37	56.78	51.67
a=0.25	0.22	42.08	24.45	19.50	0.05	903.00	0.38	18.56	560.76	57.44	63.22
UBI + PT											
a=1.00	0.77	38.23	19.83	19.28	0.03	731.00	0.14	18.70	629.39	54.67	48.55
a=0.75	0.55	39.80	21.78	19.43	0.03	805.00	0.22	18.77	631.12	57.78	51.44
a=0.50	0.37	40.94	23.20	19.49	0.04	859.00	0.30	18.69	603.02	57.22	49.89
a=0.25	0.21	41.87	24.33	19.50	0.05	900.00	0.38	18.56	559.80	56.78	61.44

Table 12. United Kingdom – Linear rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini (C)	S(U)	S(C)	W(U)	W(C)
Current	0.40	44.92	23.49	14.58	0.04	2523.00	0.21	13.95	1990.14		
NIT + FT											
a=1.00	0.43	42.62	21.32	14.58	0.04	2396.00	0.17	13.95	1983.89	47.81	33.33
a=0.75	0.23	44.67	23.07	14.57	0.04	2516.00	0.22	13.94	1962.48	54.12	62.11
a=0.50	0.15	45.98	24.11	14.55	0.04	2582.00	0.25	13.91	1949.41	45.44	76.14
a=0.25	0.11	46.66	24.59	14.54	0.04	2615.00	0.26	13.90	1948.18	44.12	74.65
WF + FT (H = 20)											
a=1.00	0.34	45.22	22.76	14.58	0.04	2528.00	0.19	13.96	2055.26	43.86	47.72
a=0.75	0.20	46.12	23.84	14.56	0.04	2583.00	0.23	13.93	2001.83	51.14	81.32
a=0.50	0.14	46.64	24.45	14.55	0.04	2612.00	0.25	13.91	1969.45	44.12	78.68
a=0.25	0.11	46.84	24.68	14.54	0.04	2623.00	0.26	13.90	1954.14	43.95	75.26
PBI + FT											
a=1.00	0.74	42.57	20.65	14.60	0.04	2364.00	0.13	13.99	2061.41	57.63	47.72
a=0.75	0.56	43.98	21.87	14.61	0.04	2451.00	0.15	14.00	2085.80	59.12	49.47
a=0.50	0.40	45.13	22.93	14.60	0.04	2521.00	0.18	13.98	2059.66	59.65	55.18
a=0.25	0.24	46.09	23.89	14.57	0.04	2579.00	0.22	13.94	2011.62	68.42	81.84
UBI + FT											
a=1.00	0.76	41.60	20.09	14.60	0.04	2309.00	0.13	13.98	2015.76	57.11	44.74
a=0.75	0.57	43.43	21.56	14.61	0.04	2422.00	0.15	14.00	2061.12	58.95	47.37
a=0.50	0.40	44.83	22.77	14.60	0.04	2506.00	0.18	13.98	2047.40	59.91	53.42
a=0.25	0.24	45.97	23.83	14.57	0.04	2573.00	0.22	13.94	2004.37	69.21	81.58

Table 13. United Kingdom – Progressive rules

	TMTR	h(M)	h(F)	Mean(U)	Gini(U)	Mean(C)	Gini(C)	S(U)	S(C)	W(U)	W(C)
Current	0.40	44.92	23.49	14.58	0.04	2523.00	0.21	13.95	1990.65		
NIT + PT											
a=1.00	0.46	42.62	21.32	14.59	0.04	2395.00	0.17	13.97	1997.43	50.70	35.79
a=0.75	0.25	44.66	23.06	14.57	0.04	2515.00	0.22	13.94	1971.76	58.25	66.23
a=0.50	0.16	45.96	24.09	14.55	0.04	2581.00	0.24	13.91	1956.40	48.77	77.72
a=0.25	0.12	46.64	24.55	14.54	0.04	2613.00	0.25	13.90	1954.52	45.44	75.79
WF + PT (H = 20)											
a=1.00	0.37	45.20	22.75	14.59	0.04	2526.00	0.18	13.97	2066.52	47.19	49.82
a=0.75	0.22	46.11	23.82	14.56	0.04	2582.00	0.22	13.93	2011.38	57.19	82.37
a=0.50	0.15	46.61	24.42	14.55	0.04	2610.00	0.24	13.92	1975.77	46.84	79.04
a=0.25	0.12	46.82	24.64	14.54	0.04	2621.00	0.25	13.90	1965.75	45.35	76.14
PBI + PT											
a=1.00	0.77	42.36	20.45	14.60	0.04	2344.00	0.12	13.99	2065.06	58.07	47.98
a=0.75	0.59	43.81	21.70	14.61	0.04	2441.00	0.14	14.01	2099.26	60.53	50.70
a=0.50	0.42	45.00	22.80	14.60	0.04	2513.00	0.17	13.99	2075.74	61.75	55.44
a=0.25	0.26	46.02	23.81	14.57	0.04	2574.00	0.22	13.95	2020.59	71.32	82.63
UBI + PT											
a=1.00	0.76	41.40	19.89	14.59	0.04	2288.00	0.12	13.98	2018.02	57.28	44.91
a=0.75	0.60	43.27	21.39	14.61	0.04	2413.00	0.14	14.01	2077.59	60.53	48.59
a=0.50	0.43	44.71	22.64	14.60	0.04	2498.00	0.17	13.99	2063.35	61.93	53.59
a=0.25	0.26	45.89	23.75	14.58	0.04	2569.00	0.22	13.96	2016.67	71.93	82.11

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