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Analysing the Effects of Tax-benefit Reforms on Income Distribution: A Decomposition Approach*

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Abstract

To assess the impact of tax-benefit policy changes on income distribution over time, we suggest a methodology based on counterfactual simulations. We start by decomposing changes in inequality/poverty indices into three contributions: reforms of the tax-benefit structure (rules, rates, etc.), changes in nominal levels of market incomes and tax-benefit parameters (benefit amounts, tax bands, etc.), and all other changes in the underlying population (market income inequality, demographic composition, employment level, etc.). Then, the decomposition helps to extract an *absolute* measure of the impact of tax-benefit changes on inequality when evaluated against a distributionally-neutral benchmark, i.e. a situation where tax-benefit parameters are adjusted in line with income growth. We apply this measure to assess recent policy changes in twelve European countries. Finally, the full decomposition allows quantifying the *relative* role of policy changes compared to all other factors. We provide an illustration on France and Ireland and check the sensitivity of the results to the decomposition order.

Key Words : Tax-benefit policy, inequality, poverty, decomposition, microsimulation.

JEL Classification : H23, H53, I32

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1 Introduction

How tax-benefit policies affect the distribution of income is a central question in economic and policy analysis. For the policy maker, it is crucial to know whether actual reforms have achieved initial policy objectives and how topical reforms may potentially affect income distribution in the future.[1] Yet, the evolution of poverty and inequality within a country is a complex process that combines changes in the macroeconomic environment, in behaviours and in institutions, and all their possible interactions. It is the role of economists to isolate and gauge the pure contribution of government policies to changes in income distribution.

A traditional approach (Danziger, 1980) is to compare inequality with and without a specific income source, e.g. social transfers, and to repeat the assessment at different points in time, possibly before and after important changes in redistributive policy. This can be done for one instrument or alternatively for the whole tax-benefit system, should household surveys provide all the necessary information about disaggregated income components such as gross incomes, taxes and transfers. Some analyses also make use of factor decomposition of inequality indices, as introduced and axiomatised by Shorrocks (1982) and extended for instance in Lerman and Yitzhaki (1985).[2] However, measuring the contribution of taxes and transfers to overall inequality at different points in time does not necessarily help to disentangle the pure effect of policy changes from their interaction with the underlying population. For instance, increased poverty due to rising unemployment may be partly offset by the presence of social assistance. It is thus difficult to distinguish this safety net effect from possible policy changes, e.g. an increase in the generosity of social transfers, as both effects make this instrument appear more redistributive in the later period.[3]

Another difficulty holds in the fact that a great deal of policy making concerns the uprating of welfare payments, tax bands and other monetary parameters in line – or not – with actual changes in prices or wages. For instance, a relatively faster growth in high incomes compare to low incomes can generate an increase in tax payments that makes the tax system appear more redistributive. Yet, this automatic 'stabilizer effect' occurs if the tax bands of upper brackets are not uprated, or are uprated at a lower

[1] In particular, the EU's Lisbon agenda requires the assessment of policy changes at national levels in order to understand how National Action Plans achieve their objectives in the light of social indicators as those fixed at Laeken in 2001 (Atkinson et al., 2002).

[2] Several variants of these approaches have been used. See for instance Jenkins (1995) for the evolution of inequality in the UK between 1971 and 1986.

[3] This issue has naturally received some attention in the literature on tax progressivity, starting with the statement of Musgrave and Thin (1948, p. 510) that "[...]the less equal the distribution of income before tax, the more potent will be a (given) progressive tax structure in equalizing income". Lambert and Pfähler (1992) and Milanovic (1994) have discussed to what extent this prediction has any significance by examining the effect of pre-tax distributional change on progressivity comparisons. Dardanoni and Lambert (2002) suggest a reformulation of local progression comparisons (Jakobsson, 1976, Kakwani, 1977) when taking into account the differences over time (or across countries) in pre-tax inequality. While this approach is helpful in many ways, it focuses on income taxation, accounts only for synthetic changes in pre-tax income distribution and may be of limited practicality when it comes to the evaluation of actual tax-benefit reforms using a wide range of inequality and poverty measures.

pace than the growth in high incomes. It is therefore important to evaluate policy changes in the light of a relevant benchmark as discussed by Callan et al. (2006).

The present paper suggests a decomposition methodology which helps on previous counts. It is based on the construction of appropriate counterfactual distributions using microsimulation.[4] The change in the distribution of disposable income – summarized by poverty or inequality measures – is decomposed into three types of effects: the change in tax-benefit policy structure, the change in the nominal levels of policy parameters relatively to change in income levels, and other changes not directly linked to tax-benefit policies. The last effect includes changes in the distribution of gross income, its composition between different sources (capital income, labour income, replacement income, etc.), as well as changes in the demographic structure. Firstly, we extract from this decomposition a measure of the *absolute* effect of policy reforms, i.e. the effect obtained when holding the underlying population constant. This policy impact is assessed against a distributionally neutral benchmark, i.e. a situation where tax-benefit monetary parameters are nominally adjusted in line with income growth. This way, we capture not only the distributional effect of structural policy reforms but also that of possible lack of adjustment of welfare payment, thresholds of tax brackets, etc. This approach is applied to assess policy changes in ten European countries for the period 1998-2001, in France for 1995-2001 and in Ireland for 1994-2000. Secondly, we use the full decomposition to quantify the *relative* role of policy changes compared to other changes in the underlying population (gross income, demographics, etc.).[5] We conduct this exercise on France 1995-2001 and Ireland 1994-2000; we find that some of the results are robust with respect to the decomposition method, i.e. whether counterfactuals of policy changes are based on initial or final data. Others vary with the method – especially for Ireland where important changes take place – in which case the need for regularly updated income survey data, or representative panel data, is emphasised.

The layout of the paper is as follows. Section 2 presents the decomposition approach. Section 3 describes briefly the data. Section 4 reports the absolute effects of policy change on inequality in twelve European countries. Section 5 focuses on France and Ireland to gauge the relative effect of policy changes compared to other factors. Section 6 concludes.

2 A Decomposition Approach

2.1 Overview and Definitions

We first introduce some notations and terminology. We denote by household 'gross income' the total amount of capital, labour and replacement incomes (including unemployment benefits and pensions)

[4] Bourguignon and Spadaro (2006) suggest a comprehensive exposition about microsimulation. Atkinson (2005) emphasizes the role of counterfactual exercises to understand the role of social policies in Europe. An excellent example of counterfactual analysis is the study of Clark and Leicester (2004) who gauge the contribution of British tax-benefit reforms to the growth in income inequality during the 1980s and 1990s.

[5] A few studies, like Nolan and Maitre (2000) for Ireland, suggest a meticulous investigation of policy changes and the way they interact with other factors to explain inequality changes. The present approach provides a framework to disentangle these effects and to quantify the relative contribution of policy changes to variations in income distribution.

before taxes and benefits. 'Disposable income' is the household income that remains after payment of taxes/social contributions and receipt of all transfers; in the context of microsimulation studies, this is the relevant concept for measurement of poverty and inequality.

The distribution of disposable income is represented hereafter as a transformation $d_i(p^j, y^l)$ of the underlying population y^l.[6] The distribution and nominal level of gross income as well as other characteristics like demographics are those of year l. We also consider the possibility to nominally adjust incomes to levels of year k using a parameter α^k. That is, $\alpha^k y^l$ retains the structural characteristics of year l data (gross income inequality, demographics, etc.) but adopts the nominal level prevailing in year k. The definition of th nominal adjustment is discussed further in what follows.

Implicit in transformation d_i is the effect of the tax-benefit system on households with different gross incomes (and different demographic characteristics). Disposable income thus depends on tax-benefit rules and non-monetary parameters (e.g. tax rates); in the above notations, this 'policy structure' is that of year i. It also depends on p^j, the set of monetary parameters for tax-benefit calculations (e.g. maximum benefit amounts, threshold level of tax brackets, etc.). The nominal level of these tax-benefit parameters is that of year j.

With the notations above, we can easily represent counterfactual situations. For instance, $d_0(p^1, \alpha^1 y^0)$ represents disposable incomes when nominal levels of parameters and gross incomes are those of year 1 while the definition of tax-benefit rules and population characteristics (gross income distribution, demographics, etc.) are those of year 0. We are interested in inequality/poverty indices computed from the (simulated) distribution of disposable income for a given year or for counterfactual situations. Denote G any such measure, expressed in what follows as a function $G\left[d_i(p^j, \alpha^k y^l)\right]$ of the distribution of disposable income.

There are, however, some systematic differences between microsimulation estimates of the distribution of income and those based directly on survey measures. In particular, full take-up of transfers is often assumed while there is evidence that non-take-up can be large, hence a quasi-systematic underestimation of poverty by the models (see Hancock et al., 2003). Such differences in levels of poverty need not, however, have much influence on analysis of changes in poverty such as that set out here.

We shall assume that the simulated distribution of disposable income $d_h(p^h, y^h)$ for a given year h is the true distribution for that year. Naturally, there are limits to this assumption. Mantovani and Sutherland (2003) discuss the robustness of the simulations using the European model EUROMOD by comparing simulated and official measures of income distribution for years 1998 and 2001. Comparability is not easy since other sources of information about income distribution may use different definitions of equivalence scales, different datasets and years, incorporate in-kind benefits, etc. There are, however,

[6] Generally speaking, y^l can be thought of as a matrix where each line represents a household by a vector of characteristics, including various incomes, socio-demographic characteristics, etc. However, we refer to it as a simple income vector in the following since income distribution is the main dimension of interest in this study. These are pure notational subtleties since microsimulation models do account for all relevant dimensions (type of income, treatment of family size, etc.) when computing disposable income.

some systematic differences between microsimulation estimates and those based directly on survey measures. In particular, simulations do not take into account possible non-take-up of social benefits, which leads to underestimation of poverty (see Hancock et al., 2003, for take-up correction within microsimulation). In the following empirical application (Section 4), we shall validate our results again external sources.

Also, it must be kept in mind that tax-benefit changes also affect the distribution of gross income and demographics by changing incentives to work, save, have children, marry, etc. This study provides a first step in the assessment of pure policy effects and therefore ignores these 'indirect' or secondary effects.[7]

2.2 Decomposition

Characterize total change Δ in the inequality/poverty index G between initial period 0 and final period 1 as:

$$\Delta = G\left[d_1(p^1, y^1)\right] - G\left[d_0(p^0, y^0)\right]$$

This change in the distribution of disposable income – as summarized by index G – can be decomposed into the contribution of the change in the tax-benefit policy ('policy effect') and the contribution of other factors like variations in the underlying gross income distribution, in demographics, etc. ('data effect'). Remark that a straightforward application of the initial (final) policy on the final (initial) data may not be correct. For instance, consider the following decomposition:

$$\begin{aligned}\Delta &= \left\{G\left[d_1(p^1, y^1)\right] - G\left[d_1(p^1, y^0)\right]\right\} + \left\{G\left[d_1(p^1, y^0)\right] - G\left[d_0(p^0, y^0)\right]\right\} \\ &= \text{(data effect conditional on policy 1) + (policy effect conditional on data 0)}\end{aligned}$$

This decomposition might be acceptable as a first approximation if initial and final years are close enough. However, the term $d_1(p^1, y^0)$ indicates that we apply the system of year 1 to the data of year 0, ignoring the fact new monetary parameters (benefit amounts, levels of tax allowance, etc.) may have been adjusted to account to some extent for price and wage inflation over the period. For instance, the eligibility threshold of social benefits may have been adjusted in line with wage inflation; in this case, the new system will appear more redistributive than it is if assessed on data 0 (that is, on lower gross income levels). It is thus necessary to evaluate the policy changes in the light of nominally adjusted data (see Callan et al., 2006). To do so, we apply to both monetary parameters and income levels of year 0 the coefficient α^1. The counterfactual $\alpha^1 y^0$ then corresponds to the distribution (and composition) of year 0 incomes nominally adjusted to year 1. As for parameters, the nominally adjusted schedule is written $\alpha^1 p^0$. This is not equivalent to p^1, that represents the actual set of parameters in year 1, i.e. as decided by the authorities. In effect, as stated above, the actual parameters are not necessarily adjusted in line with progression in price or wages. The default option for what happens to welfare payment rates and tax

[7] Nonetheless, the suggested approach could well be combined with behavioural models; in particular, it could incorporate labour supply responses in a partial equilibrium (see, among others, Creedy et al., 2006) or more complex effects in a CGE framework. We ignore these effects and isolate key issues which would also arise in such wider framework.

bands (the 'opening budget') varies a lot across countries.[8]

Then we can suggest a first complete decomposition:

$$\begin{aligned}\Delta &= \left\{G\left[d_1(p^1,y^1)\right]-G\left[d_0(\alpha^1p^0,y^1)\right]\right\} && \text{(change in policy)} \\ &+\left\{G\left[d_0(\alpha^1p^0,y^1)\right]-G\left[d_0(\alpha^1p^0,\alpha^1y^0)\right]\right\} && \text{(change in data)} \\ &+\left\{G\left[d_0(\alpha^1p^0,\alpha^1y^0))\right]-G\left[d_0(p^0,y^0)\right]\right\} && \text{(change in nominal levels)}\end{aligned} \tag{1}$$

where the last term extracts the effect of levelling up both the initial tax-benefit monetary parameters and the initial incomes. Conditional on the policy structure of year 0, and for nominal levels of year 1, the second term corresponds to the change in data (underlying distribution of gross income, demographic structure, etc.). The first term captures the effect of the tax-policy change over the period, conditional on final year data. Interestingly, and in line with our objective, it reflects the change in policy structure (d_0 to d_1) but also the actual change in nominal levels of monetary parameters (p^1) compared to a distributionally neutral situation where monetary parameters are exactly in line with average income growth over the period (α^1p^0).

We also introduce the alternative decomposition where the effect of policy changes is conditional on initial rather than final data. Here too, policy changes combine structural changes (from d_0 to d_1) and parameter changes (from α^1p^0 to p^1). Therefore, the policy effect must be conditional on the initial data expressed in nominal levels of the final data. This yields the decomposition:

$$\begin{aligned}\Delta &= \left\{G\left[d_1(p^1,y^1)\right]-G\left[d_1(p^1,\alpha^1y^0)\right]\right\} && \text{(change in data)} \\ &+\left\{G\left[d_1(p^1,\alpha^1y^0)\right]-G\left[d_0(\alpha^1p^0,\alpha^1y^0)\right]\right\} && \text{(change in policy)} \\ &+\left\{G\left[d_0(\alpha^1p^0,\alpha^1y^0))\right]-G\left[d_0(p^0,y^0)\right]\right\} && \text{(change in nominal levels)}\end{aligned} \tag{2}$$

where the third term is unchanged compared to (1). The first term is the effect of other changes (gross income distribution, demographics, etc.) conditional on the policy structure and nominal levels of the final period.

We finally discuss the choice of parameter α. Notice first that governments have many options to uprate tax-benefit parameters, as mentioned above. Three of them are fairly standard: (1) no uprating, (2) uprating according to the level of price inflation, (3) uprating according to the level of wage inflation. When it comes to assessing the distributional impacts of actual practices, price-indexation seems an appealing and intuitive benchmark (see, for instance, Mitrusi and Poterba, 2000). However, Callan et al. (2006) argue that it may not be the appropriate one. For instance, the relative situation of the poorest would worsen in this case if real wages increase while welfare payments are held constant in real terms (i.e. are indexed in line with price inflation). Callan et al. (2006) show that wage indexation gives

[8] With non-indexation of tax brackets in progressive systems, income growth generates some fiscal drag (the so-called 'bracket creep' as studied by Immervoll, 2005). In contrast, some countries have elements of price and/or wage indexation built into parts of the tax and welfare code. In the UK, for example, key parameters in the income tax code are indexed to changes in the retail price index.

rise to similar growth in real incomes across the income distribution, and is therefore a distributionally-neutral benchmark against which actual policy changes can be evaluated.[9] We opt here for a very similar backdrop where α is defined as the *actual change in average gross income levels* between the years 0 and 1. This choice simply reflects the fact that parameter α is also used to nominally adjust the initial data ($\alpha^1 y^0$) in order to assess the 'data effect' in the above decompositions. For this purpose, it seems reasonable that y^1 and the counterfactual population $\alpha^1 y^0$ have the same average gross income.[10]

2.3 Homogeneity Property and Simplification

We argue that the tax-benefit system is often linearly homogenous,[11] that is:

$$d_i(\alpha p^j, \alpha y^l) = \alpha d_i(p^j, y^l).$$

Clearly, the adaptation of tax rules following the introduction of the Euro has been straightforward in most EU countries. This property can be illustrated by looking at an over-simplified system that captures the essence of most tax-benefit systems. Assume that the first instrument is a progressive tax schedule composed of two brackets with marginal rates t_z and thresholds H_z ($z = 1, 2$). A universal child benefit grants an amount C for each child if household gross income is lower than a threshold F. Finally, a minimum income is computed as a basic income B minus a proportion γ of other incomes. Then disposable income of a household with income y and x children is:

$$\begin{aligned} d &= c + \max(0, B - \gamma c) \\ \text{with } c &= y - \{(y - H_2)t_2 + (H_2 - H_1)t_1\} + \mathbf{1}(y < F).xC \end{aligned}$$

Homogeneity is straightforward when multiplying income y and all monetary parameters B, H_2, H_1, F and C by the same coefficient.

Consequently, a simultaneous change in nominal levels of both incomes and parameters should not affect the relative location of households in the distribution of disposable income. Then, for well-behaved measures G of income distribution which do not change with nominal levels, the function $G \circ d$ should be homogenous so that:

$$G\left[d_0(\alpha^1 p^0, \alpha^1 y^0))\right] = G\left[d_0(p^0, y^0)\right] \tag{3}$$

[9] Similar choices are made in Thoresen (2004) and Clark and Leicester (2004) who thoroughly analyze tax reforms in Norway and the UK respectively.

[10] It would be possible to check the sensitivity of the absolute policy effect to the indexation choice (income growth or inflation), as done in Clark and Leicester (2004). However, it would not make much sense, in our framework, to use price indexation. This choice would imply that the 'data effect' in (1) or (2) captures more than the change in underlying population (gross income inequality, demographic structure, etc.). In effect, it would also account for the difference between price-indexed incomes ($\alpha^1 y^0$) and actual incomes of the final period (y^1), introducing artificial differences between actual and counterfactual data.

[11] An interesting exception in Europe is the quadratic form of the German income tax system.

and decompositions (1) and (2) simplify to:[12]

$$\begin{aligned}\Delta &= \left\{G\left[d_1(p^1,y^1)\right] - G\left[d_0(\alpha^1 p^0,y^1)\right]\right\} && \text{(change in policy)} \\ &+ \left\{G\left[d_0(\alpha^1 p^0,y^1)\right] - G\left[d_0(p^0,y^0)\right]\right\} && \text{(change in data)}\end{aligned} \tag{I}$$

and

$$\begin{aligned}\Delta &= \left\{G\left[d_1(p^1,y^1)\right] - G\left[d_1(p^1,\alpha^1 y^0)\right]\right\} && \text{(change in data)} \\ &+ \left\{G\left[d_1(p^1,\alpha^1 y^0)\right] - G\left[d_0(p^0,y^0)\right]\right\} && \text{(change in policy)}\end{aligned} \tag{II}$$

Then the first term of (I) and the second of (II) are measures of the absolute effect of the policy change on disposable income distribution against a distributionally-neutral situation. On practical grounds, the first measure requires the knowledge of data 1 while the second requires data 0. Typically, microsimulation studies use cross-sections of the initial year (year of data collection) while data of the final year are not available. This can be due to infrequency of data collection or simply the fact that period 1 corresponds to future budgets or hypothetical systems. In consequence, our first empirical exercise (Section 4) will apply the measure suggested by decomposition (II):

$$G\left[d_1(p^1,\alpha^1 y^0)\right] - G\left[d_0(p^0,y^0)\right] \tag{4}$$

using base period data only.

3 Data and Simulation

Simulations for all countries except France and Ireland are performed using the tax-benefit calculator EUROMOD. This model has been designed to simulate the tax-benefit systems of the EU-15 countries. For each country, it computes all direct taxes and monetary transfers, and hence disposable income, for all the households of a representative dataset (see description in Sutherland, 2001). The choice of initial system (1998) and final system (2001) is constrained by what is made available in the latest version of EUROMOD. In addition, we simulate the French system in 1995 and 2001 using the microsimulation model SYSIFF, described in Bargain and Terraz (2001) and based on the Household Budget Survey made available by INSEE. Simulations of the Irish system for 1994 and 2000 are based on the model SWITCH, described in Callan et al. (1996), and rely on the Living in Ireland Survey made available by the Economic and Social Research Institute.

The data used to assess policy effects in the next Section are described in Table 1. As aforementioned, the absolute measure of the policy effect using (II) requires data for the initial period only, that is, 1995

[12] Simulations confirm that Lorenz curves obtained using $d_0(p^0,y^0)$ and $d_0(\alpha^1 p^0,\alpha^1 y^0)$) overlap. This result naturally requires the use of a unique factor on all types of incomes (the growth in average gross income here). If differentiated α coefficients were used for each income source (e.g. labour income, pensions, etc.), the distribution of gross income would change, i.e. $G(\alpha^1 y^0) \neq G(y^0)$.

for France, 1994 for Ireland and 1998 for all the other countries. As indicated in Table 1, however, the year of collection matches the initial year of simulation only for Austria, Finland, Germany, France and Ireland. For other countries, datasets are a bit older so that the previous methodology cannot be applied perfectly. For those, 1998 data are obtained by updating monetary variables using differentiated coefficients for different income sources – but necessarily assuming that there were no other changes (in gross income composition and distribution, in demographic structure, etc.) between the two years. The last column provides the updating coefficient α^1 that allows nominal adjustment between years 0 and 1 for all countries as previously described. It is calculated as the growth rate of average gross income over the relevant period.

The second exercise presented in Section 5 consists in applying the full decompositions to capture the relative effect of policy changes. In this case, decompositions (I) and (II) require data for both initial and final periods. For that purpose, we focus on France and Ireland for which such data are available. Initial data for France (1995) and Ireland (1994) are described in Table 1. In addition, we use the French Household Budget Survey 2001, which contains 25,803 observations, and the Living in Ireland Survey 2000, which contains 11,450 observations.

Table 1: Data Desciption

Country	Data	Collection year	no. of observations	no. households (weighted)	updating factor*
Austria	European Community Household Panel	1998	7,386	3,238,520	5.7%
Belgium	Panel Survey on Belgium Households	1997	7,057	4,028,723	7.2%
Denmark	European Community Household Panel	1995	7,044	2,531,183	6.2%
France	Household Budget Survey	1994/5	29,158	23,487,099	14.2%
Finland	Income Distribution Survey	1998	25,010	2,355,000	7.4%
Germany	German Socio-Economic Panel	1998	18,227	38,259,778	10.7%
Greece	European Community Household Panel	1995	15,062	3,720,085	15.5%
Ireland	Living in Ireland Survey	1994	14,585	1,130,695	36.1%
Italy	Survey of Households Income and Wealth	1996	23,924	19,816,115	14.2%
Portugal	European Community Household Panel	1996	14,468	3,211,572	9.8%
Spain	European Community Household Panel	1996	18,991	12,347,454	23.9%
UK	Family Expenditure Survey	1995/6	16,586	24,490,138	6.8%

** This factor is computed for the period 1998-2001, except for Ireland (1994-2000) and France (1995-2001).*

4 Absolute Effect of Tax-Benefit Policies

Measure G could be chosen among many inequality and poverty indices. In this section, we simply use the Gini coefficient to illustrate the methodology suggested above. Results are presented in Table 2. The Gini for the initial year corresponds to $G\left[d_0(p^0, y^0)\right]$ in (4), also expressed as $G\left[d_1(\alpha^1 p^0, \alpha^1 y^0)\right]$ due to homogeneity, while the Gini for final year, $G\left[d_1(p^1, \alpha^1 y^0)\right]$, is obtained by grossing up the data using coefficient α^1. As explained above, the absolute measure captures the distributional impact of changes

in policy structure and the actual adjustments in monetary parameters compared to adjustments in line with the growth of average gross incomes. The period considered is 1998-2001 for all countries except France and Ireland.

First of all, the Gini for period 0, as calculated using microsimulation models, are broadly in line with other findings as indicated by the comparison of the first and last columns of Table 2. Differences may be due to the non take-up of certain benefits in microsimulation models, the use of different equivalence scales, the imputation of rental values or other choices made when computing inequality indices (see the discussion and extensive comparison between EUROMOD and the ECHP in Mantovani and Sutherland, 2003).

Then, our results point out towards a substantial equalising effect of policy changes in Greece and the UK. This is confirmed by Callan et al. (2006) who find larger gains for the lower quintiles and in particular the first one in both countries. In Greece the boost to the low income group is associated with marked increases in real terms of certain retirement benefits (social pensions, farmers' basic pension and pensioner social solidarity benefit), coupled with changes in the policy structure (e.g. introduction of a social contribution rebate for low earners in 2000). For the UK, the main policy factors driving these changes were structural developments, particularly the extension in 1999 of the refundable tax credit for low-earner families with children. It may also reflect substantial nominal adjustments: council taxes have been regularly raised above inflation, affecting more families with high incomes, and income support for pensioners has been increased.[13]

In contrast, policy changes in Finland and Ireland have contributed to increase inequalities. In Finland, this is partly the result of a reduction in the progressivity of the tax system. In effect, the flat-rate State tax has been increased while the progressive municipal taxation was decreased. Results for Ireland – as well as for France – are explained in detailed in the next Section. In both countries, they cover a larger period than the 3-year span 1998-2001 used for other countries, which may partly explain that the change for Ireland is the largest in magnitude. Interestingly, Förster and d'Ercole (2005) study the overall change in the Gini during 1994-1999, which can be compared to the change in inequality due to the sole policy effects as captured here for a similar period. It turns out that the equalising trend for France is reported in both studies while results are complete opposite for Ireland. Precisely, Förster and d'Ercole report a significant decrease in inequality while we find that recent Irish policy developments must have contributed to increase the Gini. This means that the policy effect and other factors must play in the same direction in France but in opposite ways in Ireland, a result which is confirmed and more precisely quantified in the next Section.

[13] See the in-depth analysis of Brewer et al. (2004) who confirm the equalizing effect of the working family tax credit and especially its effect poverty reduction among children and pensioners. They indicate, however, that actual inequality has decreased only slightly and that the redistributive measures of the Labour government have reduced the increase in inequality that would have occurred otherwise.

Table 2: Absolute Effect on Inequality of the Change in Tax-benefit System

Country	Gini on disposable income				Gini from other sources**	
	Period 0	Period 1*	policy effect (absolute)	policy effect (% change)	source	Gini
Austria	24.5	24.2	-0.3	-1.1%	Dennis and Guio (2003)	26
Belgium	25.3	25.3	0.0	0.1%	Socio-Economic Panel 97	24.8
Denmark	25.4	25.1	-0.3	-1.2%	Danish register data 97	25.7
France	29.9	29.4	-0.5	-1.8%	ECHP, Eurostat, 1995	30
Finland	25.8	26.5	0.7	2.8%	Riihelä et al. (2005)	26
Germany	26.5	26.6	0.1	0.4%	Dennis and Guio (2003)	25
Greece	35.3	34.2	-1.1	-3.0%	Dennis and Guio (2003)	34
Ireland	29.0	30.4	1.4	4.8%	Dennis and Guio (2003)	32
Italy	35.1	34.7	-0.4	-1.1%	Italian Household Budget 98	34.3
Portugal	38.1	38.6	0.5	1.2%	Dennis and Guio (2003)	36
Spain	33.1	33.7	0.5	1.6%	Dennis and Guio (2003)	33
UK	31.9	30.7	-1.1	-3.6%	Dennis and Guio (2003)	32

Gini are based on equivalized income using the modified OECD scale (zeros are bottom-coded as 10E-1)
Period 0 is 1998 for all countries except Ireland (1994) and France (1995); period 1 is 2001 for all countries except Ireland (2000)
** Disposable incomes for period 1 are simulated on the basis of period 0 incomes, nominally adjusted to period 1.*
*** Measures in Dennis and Guio (2003) are based on the ECHP for 1998 incomes; measures based on Danish register Data 1997 are published in the Luxembourg Income Study; those from 'Italian Household Budgets 1998' are published by the Bank of Italy (2000).*

5 Relative Effect of Tax-benefit Policies: France and Ireland

In this section, we decompose the role of policy changes versus other factors in explaining changes in income distribution. Other factors are complex, including changes in the macroeconomic environment, the effect of other policies (unemployment benefits, minimum wage, etc.) and the indirect effect of tax-benefit policies via behavioural responses. We apply both decompositions I and II on France (period 1995-2001) and Ireland (period 1994-2000).

Table 3 presents the results for a battery of indicators. Inequality, as measured by the Gini coefficient and the Atkinson index ($\varepsilon = 0.5$) has slightly decreased in France, by between 2 and 4.5 per cent. In Ireland, there is a somewhat greater fall (between 4 and 8 per cent).[14] The two countries diverge when higher aversion to inequality is assumed: the Atkinson index ($\varepsilon = 1.5$) increases in Ireland and decreases in France. This reflects that income growth has been more homogenous in France while inequality reduction has occurred mostly within the second half of the distribution in Ireland. This is confirmed by the ratio of upper incomes to median, which decreases in Ireland while the gap between upper and lower incomes widens. In addition, the headcount ratio with poverty line at 60% of the median falls slightly in France but rises by around 50% in Ireland.

[14] Table 2 shows that the simulated Gini for France is close to the measure obtained using the ECHP. It is however overstated compared to measures using the tax revenue data (INSEE-DGI, *enquete Revenus Fiscaux*, 1996), giving a Gini around 0.27. For Ireland, a Gini of 0.29 in the initial period is lower than measures from the ECHP (0.32) and from the raw data in the Living in Ireland Survey (0.33), probably reflecting the extent of unclaimed benefit in the actual data. Trends observed in Table 3 are nonetheless confirmed by these other sources.

What is the relative role of tax-benefit policy and of other factors in these developments? In France, policy changes explain most of the change in inequality and poverty measures; this result is confirmed using either decomposition. Other factors play a small role, often not significant or with a diverging sign depending on the index under consideration; in particular, they contribute to an increase in the headcount ratio with a line at 60% of the median but to a decrease in the headcount ratio with line at 50% (not represented) and in the Atkinson index with $\varepsilon = 1.5$.

There was little policy change in the late 1990s and welfare payment rates have been raised only after 1997 to catch up with average income (the most noticeable increase concerns the unemployment assistance, *Allocation de Solidarité Spécifique*, in 1998). It seems that the trend captured in our results rather stems from structural changes of years 2000-2001, and in particular the reform of housing benefits and the introduction of a modest refundable tax credit for low-wage individuals, two measures that have benefited primarily to the lowest part of the distribution (see CERC, 2006). Outside of tax-benefit policy, key factors have been the economic recovery of the 1997-2001 period and declining unemployment (from 11.3% in 1995 down to 8.8% in 2001). Recent growth has taken some time to trickle down to poverty levels (see the detailed analyses in CERC, 2006, and Demailly and Raynaud, 2006). The number of people on welfare ('RMI' recipients) continued to climb until 1999 then decreased from 1,12 million in 1999 to 1.05 in 2001. Moreover, wage moderation has accompanied the implementation of the new legislation on reduced working time in 2001.

While decompositions I and II lead to similar conclusions in France, results seem more sensitive to the method for Ireland. This is primarily due the fact that effects are much larger in this country, following the dramatic change in the economy in the late 1990s and the very large fall in unemployment rate (from 15% to 5% over the period). Nevertheless, some key results are robust with respect to the choice of decomposition method. The Gini and Atkinson indices, along with the percentile ratios P90/P10 and P50/P10, confirm that the direct influence of policy changes over the period was to increase inequality while other factors tended to decrease it. Both policy changes and other effects contribute to increase the head count, poverty gap ratio and weighted poverty gap ratio with poverty line at 60% median as well as the Atkinson index with high inequality aversion.

As far as policy changes are concerned, income tax cuts have clearly reduced the progressivity of the system and contributed to widen the gap between the second half of the distribution and the bottom, as indicated by the percentile ratios. In addition, welfare payment rates have failed to keep pace with the growth in labour income so that the relative position of the poorest disimproved in the second half of 1990s, as translated by poverty trends.[15]

As for other factors, not directly due to taxes and benefits, it turns out that the sharp fall in unemployment has acted to reduce most of the inequality measures. There is less indication of the widening in earnings dispersion which accompanied the rapid economic growth in the 1990s. As noted by Nolan and Maitre (2000), this trend has been primarily driven by relatively rapid increases for those at the very

[15] Nolan and Maitre (2000) show that the share of social transfers declined substantially in the period 1994-1997, confirming that social welfare support rates lagged behind the very rapid pace of growth in earnings.

top of the distribution, which is not captured by the P90 percentile reported here. According to Nolan and Maitre, there was no indication that the bottom has been falling behind the median, as confirmed here by the quasi-stagnation of the P50/P10 ratio for 'other effects'. When the focus is on the poorest, however, the impact of these other factors was to raise the poverty indices (and the Akinson index with $\varepsilon = 1.5$). Instances where falling unemployment has been associated with a rise in the risk of relative poverty have also been found in Immervoll et al. (2005a).

Table 3: Changes in Income Distribution over Time: Decomposition between Policy Effects and Other Factors

				Decomposition I		Decomposition II	
	Period 0	Period 1	Total change	tax-benefit policy effect	Other effects	tax-benefit policy effect	Other effects
Ireland 1994-2000							
Gini (%)	29.0	27.7	-1.3	0.7	-2.0	1.4	-2.7
Atkinson 0.5	6.7	6.2	-0.5	0.3	-0.8	0.7	-1.2
Atkinson 1.5	18.3	20.6	2.3	1.0	1.3	2.0	0.3
P90/P10	3.5	3.8	0.2	0.3	-0.1	0.5	-0.3
P90/P50	2.0	1.9	-0.2	0.0	-0.2	0.0	-0.2
P50/P10	1.7	2.0	0.3	0.2	0.1	0.3	0.0
FGT0(%)	13.4	19.8	6.4	2.8	3.6	6.0	0.5
FGT1(%)	1.5	4.4	2.9	1.3	1.6	1.7	1.2
FGT2(%)	0.4	1.5	1.1	0.5	0.7	0.4	0.7
France 1995-2001							
Gini (%)	29.9	29.2	-0.7	-0.6	0.0	-0.5	-0.1
Atkinson 0.5	7.4	7.2	-0.2	-0.3	0.1	-0.2	0.1
Atkinson 1.5	20.9	19.8	-1.2	-0.7	-0.3	-0.5	-0.6
P90/P10	3.5	3.4	-0.2	-0.1	0.0	-0.1	0.0
P90/P50	2.0	2.0	0.0	0.0	0.0	0.0	0.0
P50/P10	1.8	1.7	-0.1	0.0	-0.1	-0.1	0.0
FGT0(%)	13.3	12.7	-0.6	-1.5	1.0	-1.0	0.5
FGT1(%)	2.8	2.4	-0.4	-0.4	0.0	-0.2	-0.1
FGT2(%)	1.0	0.9	-0.1	-0.1	0.0	-0.1	-0.1

The tax-benefit policy effect is measured on the basis of data at period 0 (resp. 1) in decomposition I (resp. II). Income is equivalised using the modified OECD scale. Poverty lines are fixed at 60% of the median.

6 Concluding Comments

This paper suggests a decomposition of the trends in inequality and poverty into the contribution directly due to tax-benefit policy changes and the contribution of other factors, including changes in gross income distribution. This allows us to establish an absolute measure of the policy effect in which the benchmark is distributionally neutral, i.e. in line with income growth over the period. Policy changes which do

not adjust monetary tax-benefit parameters along these lines may affect (disposable income) inequality. While not unique, the measure proposed has the merit not requiring the data for the final year while being consistent with the suggested decomposition.

We also apply the full decomposition to two countries. We find that policy changes have had important influences in both Ireland and in France over the late 1990s. For France, policy impacts have tended to equalize incomes and reduce relative income poverty; for Ireland, the reverse is the case. In the Irish case, overall inequality falls because of other factors, including changes in the distribution of gross income as unemployment fell sharply. For France, policy changes were the main driving force in the change in inequality over this period. These results show the value of evaluating policy reforms in conjunction with other structural changes in the population if their influence on inequality is to be understood and measured accurately.

The objective of the analysis suggested for France and Ireland was primarily illustrative of the suggested methodology. Further research should focus on at least two aspects. First, a closer analysis of policy impacts would require the use of more regular (ideally, annual) data in order to assess more precisely the role of specific reforms, years after years, as performed for instance in Clark and Leicester (2004). Second, results are potentially sensitive to the decomposition method, i.e. either based on the initial or the final underlying population. This is not the case for France, where overall effects are small, but some differences have been observed for Ireland and deserve further investigation. In particular, the regressive effect of recent policy changes appears larger in absolute terms when estimated on the more equal distribution of gross income (i.e. on the final year using decomposition II).

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