

# Optimal Household Labor Income Tax and Transfer Programs\*

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## Abstract

This paper proposes an overview of the lessons that have been learned over the last 30 years in the economics literature for the optimal design of household tax and transfer programs and offers an application to the case of the United Kingdom. We review the tax and transfer system in the United Kingdom as well as its effects on labor supply. In particular, we investigate the link between top incomes and top marginal income tax rates since the 1960s. We derive simple optimal tax rate formulas in the context of the Mirrlees optimal income tax model and propose simulations based on the actual UK earnings distribution and empirically estimated labor supply elasticities. We analyze the effects of introducing participation labor supply responses, migration effects, and discuss the optimal tax treatment of couples. In each case, we discuss the empirical evidence and derive the consequences for optimal tax and transfer design. Finally, we propose a simple plan for reforming the UK household tax and transfer system based on the lessons from the analysis.

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# 1 Introduction

There have been three major developments in the tax and transfer policies for households in industrialized countries over the last century. First, during the twentieth century, most industrialized countries have adopted progressive individual income taxation, whereby each slice of income is taxed at progressively higher rates. For example, the United Kingdom adopted a progressive super-tax on comprehensive income in 1908 (Atkinson, 2007). Today, the progressive income tax in the United Kingdom raises about 30% of all government revenue. It exempts very low incomes and imposes a top marginal tax rate of 40% (OECD, 2006). There has been a decline in income tax progressivity in many countries including the United Kingdom with drastic cuts in top tax rates.

Second, since the end of World War II, industrialized countries have also set in place extensive social insurance programs primarily for health and disability insurance and retirement benefits. Those programs are financed in general with specific social security contributions on labor income. The United Kingdom currently imposes payroll taxes on employees and employers. The average total payroll tax rate on labor income is around 16% and those taxes collect about 20% of all government revenue.

Finally, industrialized countries have also developed income support programs targeting specifically low income families and individuals. Traditional welfare programs used to provide support for families with no income and be means-tested. These means-tested traditional welfare programs create, in general, very high implicit tax rates for low-income eligible families, and these can lead to significant negative labour supply responses. Today in the United Kingdom, the Job-seekers Allowance/Income Support program effectively creates a 100% tax rate on the first £3,000 of annual earnings (for a single adult with or without children) as support is lost pound for pound as earnings rise. Those support programs have been blamed for inducing many low-income families to stay out of the labour force, and be dependent on welfare assistance. As a result, a number of industrialized countries, and in particular the United Kingdom and the United States, have scaled down traditional welfare benefits and introduced in-work benefits in order to provide more incentives to work for low income families, and counter-act the negative effects of traditional welfare. Indeed, the United Kingdom has had some form of in-work support since 1971, now delivered through the working tax credit

which can provide up to £3,300 a year for low income earners who work at least 16 hours a week. Several evaluations have shown the success of in-work benefits in inducing individuals to start working (Blundell, 2001, Blundell and Hoynes, 2004, Brewer and Browne, 2006, Mulhiern and Pisani, 2007).

The levels of income tax rates and the generosity and structure of redistributive programs for low income generate substantial controversy among policy makers and economists. At the center of the controversy is an equity-efficiency trade-off. On the one hand, governments value redistribution and want to transfer resources from the middle and high income earners toward low income individuals. On the other hand, such transfers are generally costly in terms of economic efficiency. First, raising taxes to finance the income transfer programs may reduce labor supply and entrepreneurship incentives of the middle and high income earners who have to pay the extra-taxes. Second, transfer programs may also reduce labor supply incentives of the low income recipients. As a result, these adverse labor supply effects may raise substantially the cost needed to improve the living standards of low income families. The equity-efficiency trade-off is reflected in the political debate. Left-of-centre political parties emphasize the redistributive benefits of transfer programs and their important role in raising the welfare of the most needy individuals and families. Right-of-centre political parties emphasize the efficiency costs, blaming the welfare system for creating dependence and loss of economic self-sufficiency and high income tax rates for blunting work and entrepreneurship incentives.

The goal of this chapter is to provide an overview of the problem of household taxes and transfers from an economic perspective. The problem of redistribution is tackled in two steps in economics research. The first step is a positive analysis where economists develop models of individual behavior to understand how individuals work decisions respond to various transfer programs. The central part of the positive analysis is the empirical estimation of the models of individual behavior in order to assess the quantitative magnitudes of behavioral responses. In the United States and the United Kingdom, there is a very broad literature trying to estimate the size of the behavioral responses to taxes and government transfer programs (see e.g. Blundell and MaCurdy, 1999 for a recent survey). In the chapter, we will provide an overview of the key elements and the evolution of the tax and transfer system in the United Kingdom and summarize the most important results of the literature on the behavioral

responses to taxes and transfers. The chapter by Meghir et al. in this volume provides a detailed summary of empirical studies on the effects of taxes and transfers on labor supply in the United Kingdom.

The second step is the normative analysis or optimal policy analysis. Using models developed and estimated in the positive analysis, the normative analysis investigates what is the structure and size of the transfer and tax system that should be implemented to maximize social welfare. Following the seminal contribution of Mirrlees (1971), economists call this line of research optimal tax theory. The social welfare criterion used by the government defines the redistributive tastes of the government. Presumably, a liberal government would use a more redistributive criterion than a conservative government. The normative analysis is crucial for policy making because it shows how programs should be set or reformed in order to best attain the goals of the policy maker. In particular, the normative analysis allows to assess separately how changes in the redistributive tastes of the government and changes in the size of the behavioral responses to taxes and transfers affect the optimal redistributive program.<sup>1</sup> This chapter will provide a summary of the key results that have been obtained in the optimal tax theory and that can be used to inform the policy debate. We will also develop applications specific to the United Kingdom.

In this chapter, we will push the analysis further and actually propose a specific plan for reform for taxes and transfers in the United Kingdom based on the best lessons learned from optimal tax theory. Optimal tax theory uses simplified models which leave aside a number of important practical issues such as administrative burden for the government and employers, ease of use for families.<sup>2</sup> Those issues have always been important in practice and the recent “behavioral economics” literature is starting to incorporate them in the analysis. Therefore, our reform plan is trying to address the main practical issues that have arisen in the case of current transfer programs in the UK.

The discussion in this chapter is organized as follows. Section 2 describes the current UK tax and transfer system with particular emphasis on the incentive effects it might create

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<sup>1</sup>In actual policy debates, these two elements, which are conceptually distinct, are often confused. Right-of-centre policy makers rarely state explicitly that they have little taste for redistribution per-se but rather justify their lack of taste for redistribution because they believe negative behavioral responses to redistributive programs are large. Conversely, left-of-centre policy makers emphasize the redistributive virtues of transfer programs and often assume that negative incentive effects are negligible.

<sup>2</sup>A number of those issues are discussed in more detail in the chapter by Slemrod et al. in this volume.

on labor supply decisions. Section 3 considers the standard optimal income tax model of Mirrlees (1971), derives simple optimal tax formulas, and proposes an optimal tax simulation application for the United Kingdom. We also discuss the literature on behavioral responses to tax rates and present an analysis of the response of top incomes to the large cuts in top marginal tax rates that have taken place in the United Kingdom over the last 30 years. Section 4 introduces labor supply participation effects which are particularly important at the bottom of the earnings distribution and shows that, in that context, traditional welfare programs ought to be replaced by in-work benefits such as the Working Family Credit. Section 5 analyzes a set of additional issues such as migration induced by the tax system, the treatment of families, as well as limited take-up and imperfect rationality of individuals. We discuss how those elements should affect the optimal design of taxes and transfers. Finally, Section 6 provides a simple plan for reforming the UK tax and transfer system based on what we have learned from the analysis.

## 2 The Current Household Tax and Transfer System in the United Kingdom

This section describes briefly the main taxes and transfers in the UK<sup>3</sup>, and the net schedule that UK families face when adding all those taxes: individual income tax, payroll tax (employer+employee), work family credit, and other welfare transfers (note that the benefits system works on a weekly basis, and the tax system on an annual basis).

Figure 1A shows how the annual net income of a one earner couple with two children varies with annual gross earnings (or more correctly, the annual employer cost).<sup>4</sup> While it could be argued that this does not represent a “typical” family, it does illustrate nicely some of the key features of the UK tax and transfer system. Figure 1B then shows how the associated participation tax rate (discussed later) and marginal tax rate varies with earnings: the effective marginal tax rate (MTR) measures how much of a small change in earnings is lost to direct tax payments and foregone benefit and tax credit entitlements.

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<sup>3</sup>In April 2006: not all parameters for April 2007 were known at the time of writing.

<sup>4</sup>Throughout this section we assume that there are no housing or child-care costs. Due to the hours rules in the tax system, the actual budget constraint will depend upon the wage received. We assume that the wage rate is equal to the minimum wage of £5.35 per hour up to £10,000 of annual income (which corresponds to a full year-full time worker). Above £10,000, we assume that annual hours worked stay at 2,000 and that the wage rate increases.

<INSERT FIGURE 1 HERE>

Panel A: Budget constraint as a function of labor cost

Panel B: MTR and Participation tax rate

Families with no earnings are potentially entitled to jobseekers' allowance or income support (depending on whether they are expected to look for work as a condition of receiving benefits; henceforth, these two are collectively referred to as income support), and those with children would receive child-contingent support through a non-means-tested child benefit, and a means-tested child tax credits. In total, a single adult would receive just under £60 a week, and a lone parent and two children with no private income would receive around £158.68 of support a week. After an extremely small earnings disregard of £5/wk (higher for lone parents) of earnings, a 100% withdrawal rate applies to income support until families earn too much (or work too many hours: see below) to be entitled: families therefore face no direct financial incentive to increasing their earnings above the very low disregard.

The UK welfare system makes use of hours rules: individuals working 16 or more hours may not claim income support, but may instead claim the working tax credit. For a lone parent working at the minimum wage, there is a large discontinuity in the budget constraint at 16 hours a week, with net income increasing by 12.5% at this point (there is a further (but smaller) discontinuity at 30 hours a week (or annual earnings of around £12,500 for a minimum wage worker) due to the full-time premium offered by the working tax credit). Although no tax is due and tax credits have not yet begun to be withdrawn, the large increase in income at 16 hours/wk work begins to reduce entitlement to council tax benefit, and the effective marginal tax rate is around 20%. Once weekly earnings have reached £89, both the employee and the employer becomes subject to National Insurance contributions on earnings above this. Since the employer contributions act to raise the cost of employing an individual, this tax effectively raises the marginal rate faced by an individual (to almost 44% in this case; henceforth, all effective marginal rates referred to will be corrected for the employer National Insurance contributions unless explicitly noted otherwise).

As earnings increase beyond £100 a week, entitlement to tax credits falls, and this leads to a very high marginal tax rate of 68% for the individual (including CTB/HB), plus 12.8% on the employer (71.6% overall). This is increased further when the individual is liable to the

basic rate of income tax (to 76% for the individual plus 12.8% on the employer (78.7% overall) once we allow for employer National Insurance contributions). This represents the peak in marginal rates faced by individuals working 16 or more hours a week: marginal tax rates fall when entitlement council tax benefit is zero (something which varies considerably between individuals representing local variations in house prices and tax rates). Including employer payroll taxes, marginal rates remain at around 73%, however, and do so until personal earnings have reached around £23,000, at which point the withdrawal or tax credits stops. The lone parent then faces the most common marginal rate of 40.6% (basic-rate income tax, employee and employer NI contributions), which increases to 47.7% when earnings are sufficiently high for the higher-rate of income tax to be liable: the small region where the MTR dips reflects the discrepancy between the upper earnings limit for National Insurance, and the earnings at which the individual becomes subject to the higher rate of income tax. For personal earnings between £50,000 and a little under £60,000 the family element of the Child Tax Credit is withdrawn, so producing a slightly higher marginal rate over this range.

Figure 1B provides an alternative way of summarising information from the budget constraint. Using the same family type we show how the average tax rate varies with earnings. The average tax rate is 0% for very low earnings, and then increases gradually as we enter the region where the couple is subject to a 100% marginal tax rate. Following this, the average tax rate starts to fall with earnings. There is a discrete fall at the point where the family becomes entitled to Working Tax Credit, and begins to increase when they are subject to its withdrawal. This same pattern is observed once they become entitled to the the full-time premium. Following this, however, the average tax rate is decreasing, approaches the marginal tax rate of 47.7% as earnings get very large.

Such descriptions of the marginal rate schedule can be heavily dependent on the choice of family circumstances, but we can make some general comments about variations across family types. Marginal rates of tax given earnings would, though, be identical for a primary earner in a couple with children to the schedule shown here. The presence and number of children makes a large impact on the marginal rate schedule for low to middle earners. Each additional (or fewer) child would increase (decrease) the point at which the marginal rate falls from 73% to 40.6% by just over £5,000 (personal earnings). Individuals without dependent children would also not be entitled to tax credits until they work 30 hours a week, and so marginal rates (and

average tax rates) would be lower than those for individuals with children working between 16 and 29 hours/wk. Because of the various hours rules in the UK tax and transfer system, assuming higher wages would change the pattern of marginal (and average) tax rates at the very bottom of the earnings distribution, but obviously not at the top, where income tax and payroll tax and child tax credit depend only on weekly or annual earnings. One significant omission from the Figures has been the impact of housing benefit - a means-tested support to help people pay for rented accommodation - which further increases marginal withdrawal rates once an individual is no longer entitled to income support.

To summarize, the UK tax/transfer system imposes confiscatory tax rates at the very bottom due to the 100% phasing-out rate of income support. The development and expansion of the working credit reduces the participation rate rate to around 55% (for part-time workers at the minimum wage). However, the phasing-out of the working credit combined with the income tax creates very high marginal tax rates around 75% over a very broad range of earnings (from about £7,500 to £25,000 in the illustrative graphical example). Those rates reach about 80% if we include the 17% Value-Added-Tax.

## **2.1 The main developments in the personal tax and transfer system since 1978**

Much has changed to the personal tax and transfer system in the UK since the first Meade report, and we give a summary below. [note to eds: we will need to cross-refer to whatever is in the Adam-Browne-Heady chapter. How much do you want here?]

**Statutory rates of tax have fallen at the top, but effective marginal tax rates have not necessarily fallen.** In 1978, the highest marginal tax rate paid on earned income was 83%; a decade later, it had fallen to 40%, the rate that applies now (but with extensions of payroll tax, the true marginal rate on top earnings is now 47.6%.<sup>5</sup>). But this tells us only about the change in the marginal tax rate facing the very richest in the UK; in fact, income tax rates are generally lower than in 1978, but effective marginal tax rates across the whole distribution are not necessarily lower now than in 1978, partly because of the expansion of income-related in-work programmes. Adam et al. (2006) show the change in the distribution of effective marginal tax rates facing prime age workers in the UK (unfortunately, all these

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<sup>5</sup>Section 3.2 below shows changes in top rates of tax since the 1960s.



numbers exclude employer NI, which saw rises in the main rate and the coverage over this period; Adam-Browne-Heady chapter may be updating these figures to include payroll taxes); the median EMTR fell by just 1 ppt over this period, from 34% to 33%, but EMTRs are now more dispersed than in 1979: in 1979, 10% of workers had EMTRs below 29%; in 2005, it was 23%; in 1979, only 10% of workers had EMTRs above 36.5%, in 2005, 10% had EMTRs above 68%. This sharp rise in high EMTRs helps explain why the mean EMTR has risen from 35.65% to 37.65%. Figure 2 shows how the distribution of marginal tax rates has changed since 1979.

<INSERT FIGURE 2 HERE>

Show mean, median, P10, P90 for MTR distribution since 1979

**Income tax is assessed at the individual level, not jointly, but many couples still face some form of joint assessment of their incomes** because of the expansion of means-tested benefits for the over 60s and income-related in-work programmes. Income tax became individualised in 1990, and there have been few political pressures to reverse this reform. Instead, there has been a trend of increasing use of means-tested benefits or income-related in-work programmes that depend upon the joint income of a couple (whether legally married or not).

**Traditional transfer programmes administered through the social security system have declined in favour of refundable tax credits, some conditional on work.** In fact, the UK has had a programme to support low-income working families since 1972 – before the EITC was introduced in the US – but the importance of in-work benefits/programmes in the tax and transfer system as a whole is significantly greater now than in 1978. In-work programmes increased in importance during the early to mid 1990s, under a conservative government, partly as a response to the growing proportion of children living in a lone parent family. But their importance has changed almost beyond recognition in a series of changes between 1999 and 2003. The working tax credit now supports families with or without children who have a low income but at least 1 adult in work, and the child tax credit – a programme which evolved from traditional means-tested benefits to families with children – is now received by around 90% of all families with children, and costs the government more than child benefit

(Adam and Brewer, 2004). Although these tax credits are administered by the tax authority, they still have elements which feel more like welfare programmes: they are paid regularly direct to recipients’ bank accounts, and never reduce income tax liabilities in any formal sense (for example, individuals who file self-assessment returns for income tax purposes and who are also eligible for the child tax credit have to fill in separate forms for each, and may end up simultaneously owing extra tax to HMRC while HMRC is paying them the child tax credit). This partly reflects a policy that the child tax credit should be paid to a child’s main carer – which means that it has to be paid direct to people who are often not working and have no taxable income, rather than being delivered as a tax cut for the main carer’s partner – and that payments of tax credits should not lag too much behind actual circumstances: the need to preserve “real-time work incentives” (Walker and Wiseman, 1997) means that the current Government has rejected the option of paying the working tax credit annually in arrears (like the EITC), for example.

### 3 The standard Mirrlees model with intensive responses

#### 3.1 Theory

This subsection relies on Saez (2001).

- **Labor Supply Model**

We consider a standard two good model. Individual  $n$  maximizes a well-behaved individual utility function  $u = u^n(c, z)$  which depends positively on consumption  $c$  and negatively on earnings  $z$ . Individual skills or ability are embodied in the individual utility function. Assuming that the individual faces a linear budget constraint  $c = z(1 - \tau) + R$ , where  $\tau$  is the marginal tax rate and  $R$  is virtual (non-labor) income. The first order condition of the individual maximization program,  $(1 - \tau)u_c + u_z = 0$ , defines implicitly a Marshallian earnings supply function  $z = z(1 - \tau, R)$  which describe how earnings  $z$  depend on the net-of-tax marginal rate  $1 - \tau$  and the virtual (non-labor) income  $R$ . The latter effect is the income effect. As shown in Diamond (1998) and Saez (2001), the presentation of the theory of optimal taxation is considerably simplified when there are no income effects. Therefore, in what follows, we will rule out income effects<sup>6</sup> and assume that earnings depend only on the net-of-tax rate  $z(1 - \tau)$ .

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<sup>6</sup>We will discuss informally how results may be affected in the presence of income effects.

With no income effects, we can define a single elasticity  $e$  of earnings with respect to the net-of-tax rate:<sup>7</sup>

$$e = \frac{1 - \tau}{z} \frac{\partial z}{\partial(1 - \tau)}. \quad (1)$$

The elasticity captures the size of the behavioral response to marginal tax rate and hence the efficiency costs of taxation. It is always positive.

### • Optimal top tax rate

Let us assume that the government imposes an income tax with a constant marginal tax rate  $\tau$  in the top bracket of earnings above  $\bar{z}$ . In the case of the UK individual income tax,  $\tau = 0.4$ ,  $\bar{z} = \text{£}30,000$ . Let us denote by  $z$  the *average* income reported by taxpayers in the top bracket.<sup>8</sup>

In order to determine the optimal  $\tau$  for the government, let us consider a reform that changes the top tax rate  $\tau$  by a small amount  $d\tau$  (with no change in the tax schedule for incomes below  $\bar{z}$ ). This small tax reform has two effects on tax revenue. First, there is a mechanical increase in tax revenue due to the fact that taxpayers face a higher tax rate on their incomes above  $\bar{z}$ . Hence, the total mechanical effect is

$$dM = N[z - \bar{z}]d\tau > 0.$$

This mechanical effect is the projected increase in tax revenue, absent any behavioral response.

Second, the increase in the tax rate triggers a behavioral response which reduces the average reported income in the top bracket by  $dz = -e \cdot z \cdot d\tau / (1 - \tau)$  on average and hence produces a loss in tax revenue equal to

$$dB = -N \cdot e \cdot z \cdot \frac{\tau}{1 - \tau} d\tau < 0.$$

The tax reform also has a negative effect on the welfare of the top bracket taxpayers. The welfare effect (expressed in dollar terms) is equal to minus the mechanical effect on tax revenue.<sup>9</sup> Let us assume that the government values at  $g$ , giving 1 additional Pound to the

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<sup>7</sup> Compensated and uncompensated elasticities are equal when there are no income effects.

<sup>8</sup> This average income is the average of the individuals  $z^n(1 - \tau)$  for all individuals in the top bracket.

<sup>9</sup> The behavioral response does not generate a first order effect on welfare because of the envelope theorem.

average top bracket taxpayer. If the government values redistribution,  $g$  will be strictly less than one, and will be zero if the government has strong redistributive tastes and considers that the marginal value of consumption for top taxpayers is negligible relative to the average person in the economy. Hence, the small tax reform also creates a social welfare cost equal to:

$$dW = -g \cdot N[z - \bar{z}]d\tau < 0.$$

Summing the mechanical and the behavioral tax revenue effect and the welfare effect, we obtain the net effect of the reform from the government perspective:

$$dM + dB + dW = Nd\tau(z - \bar{z}) \cdot \left[ 1 - g - e \cdot \frac{z}{z - \bar{z}} \cdot \frac{\tau}{1 - \tau} \right].$$

At the optimum, this expression must be zero. Let us denote by  $a$  the ratio  $z/(z - \bar{z})$ . Note that  $a \geq 1$ . The optimum  $\tau$  can then be expressed as:

$$\tau^* = \frac{1 - g}{1 - g + a \cdot e}. \quad (2)$$

Unsurprisingly, the optimal tax rate is decreasing in  $g$  - the value that the government sets on the marginal consumption of high incomes -, decreasing in the elasticity  $e$  of behavioral responses, and decreasing in  $a$ , the parameter which measures the thinness of the top of the income distribution. The case  $g = 0$  gives an upper bound on the optimal top rate equal to  $1/(1 + a \cdot e)$ . This corresponds to the tax rate maximizing tax revenue from top bracket taxpayers: the so-called Laffer rate.

Empirically, the parameter  $a$  is very stable (around 2) at any threshold  $\bar{z}$  above £50,000. This is not surprising as it is well known that top tails of income distributions are Pareto distributed,<sup>10</sup> in which case the parameter  $a$  does not vary with  $\bar{z}$  and is exactly equal to the Pareto parameter.<sup>11</sup> As an illustration, in 2000, for the top 1% income cut-off in the United Kingdom. For an elasticity estimate  $e = 0.5$ , corresponding to the mid to upper range of the estimates from the literature (see below), the Laffer rate would be  $1/(1 + 0.5 * 2) = 50\%$ .

<sup>10</sup>A Pareto distribution has a density function of the form  $f(z) = C/z^{1+\alpha}$  where  $C$  and  $\alpha$  are constant parameters.  $\alpha$  is called the Pareto parameter.

<sup>11</sup>When  $\bar{z}$  reaches the level of the very highest income earner,  $z = \bar{z}$  and  $a$  is infinite and the optimal tax rate is zero, which is the famous Sadka-Seade zero top result. However, this zero top result is a very misleading result for practical tax policy as the empirical  $a$  does not go to infinity except when one reach the very highest income earner.

• **Optimal marginal tax schedule**

We have derived the optimal (flat) tax rate in the top bracket. Using a similar methodology, we can derive the optimal marginal tax rate at any point of the income distribution. Assume that the government impose a possibly non-linear tax schedule  $T(z)$ . This tax schedule incorporates both transfers (when  $T(z)$  is negative) and taxes (when  $T(z)$  is positive). Let us denote by  $H(z)$  the cumulative distribution of individuals (fraction of taxpayers with income less than  $z$ ) and by  $h(z)$  the density distribution of taxpayers.

Suppose that the government increases the marginal tax rate  $T'(z)$  by  $d\tau$  in a small band of income  $(z, z + dz)$ . As above, this reform has three effects on government tax receipts and welfare.

First, the reform increases taxes by  $d\tau dz$  for every taxpayer above the small band, and hence collects extra taxes:

$$dM = (1 - H(z))d\tau dz.$$

Second, those extra taxes generate a welfare cost to tax filers. If we denote by  $G(z)$  the average social value for the government of distributing £1 uniformly among taxpayers with income above  $z$ , the welfare cost is simply  $dW = dM \cdot G(z)$ . If the government values redistribution,  $G(z)$  will be decreasing in  $z$ . The no income effect assumption implies that  $G(0) = 1$ .<sup>12</sup> It will be equal to the  $g$  introduced above when  $z$  is large (top bracket). The more redistributive the tastes of the government, the smaller  $G(z)$ .

Third, the marginal tax rate increase  $d\tau$  in the small band reduces earnings by  $-e \cdot z \cdot d\tau / (1 - T'(z))$  for taxpayers in the small band. There are  $h(z)dz$  such taxpayers in the small band. Hence produces a loss in tax revenue equal to

$$dB = -e \cdot z \cdot \frac{T'(z)}{1 - T'(z)} d\tau \cdot h(z) dz.$$

At the optimum, we have again  $dM + dW + dB = 0$ , which generates the following optimal tax rate formula:<sup>13</sup>

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<sup>12</sup>Distributing 1 Pound uniformly among all individuals does not generate behavioral responses and hence has a cost of exactly 1 Pound for the government.

<sup>13</sup>This formula is not exactly accurate but very close for discussion and intuition purposes. In the exact formula,  $h(z)$  should be replaced with the “virtual” density  $h^*(z)$ , which is the density of earnings at  $z$  that would arise if the tax system were replaced by the linearized tax system at  $z$ . See Saez (2001) for complete

$$\frac{T'(z)}{1 - T'(z)} = \frac{1}{e} \cdot \frac{1 - H(z)}{zh(z)} \cdot (1 - G(z)) \quad (3)$$

The optimal marginal tax rate  $T'(z)$  is decreasing with the elasticity  $e$  which measures the size of the behavioral response. If high  $z$  individuals have higher elasticities, they should face relatively lower marginal tax rates.

$T'(z)$  is also decreasing with  $G(z)$  which measures the social marginal value of consumption for earners above  $z$ . If the government values redistribution more,  $G(z)$  will be smaller, and the marginal tax rates relatively higher across the board.  $G(z)$  is decreasing in  $z$ , hence the term  $1 - G(z)$  is a force toward making  $T'(z)$  increase with  $z$ .

Finally,  $T'(z)$  is decreasing with the hazard ratio  $(1 - H(z))/(zh(z))$  which measures the thinness of the distribution. As shown in the proof, the larger the number of individuals above  $z$  relative to the density of individual at  $z$ , the more efficient it is to increase the marginal tax rate at  $z$ .<sup>14</sup>

Figure 3 shows how the hazard ratio  $(1 - H(z))/(zh(z))$  varies with earnings in the UK. The figure shows that the hazard ratio is very high at the bottom, decreases as income increases, and then increases slightly till it becomes flat around 0.6 (due to the Pareto property). Thus, this hazard term tends to make marginal tax rates high at the bottom. High marginal tax rates at the bottom combined with a positive transfer  $-T(0)$  at the bottom is the most efficient way to redistribute toward lower incomes in Mirrlees (1971) model: it allows the government to target transfers to low incomes. The behavioral responses at the bottom are not prohibitively costly because those workers would have had modest earnings even without taxes or transfers.

**<INSERT FIGURE 3 HERE>**

Plots hazard ratio  $(1 - H(z))/(zh(z))$  using UK survey and tax data from  $z = \pounds 0$  to  $z = \pounds 400,000$

It is also worth noting that negative marginal tax rates are never optimal. If the marginal tax rate were negative in some range then increasing it a little bit in that range would de-

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details.

<sup>14</sup>In the case of a Pareto distribution with parameter  $a$ , this ratio is constant and equal to  $1/a$ . For large  $z$  and Pareto top tail, formula (3) is equivalent to the optimal top rate formula (2) with  $G(z) = g$  that we obtained above.

crease earnings of taxpayers in that range but this behavioral response would increase tax receipts because the tax rate is *negative* in that range. Therefore, this small tax reform would unambiguously increase social welfare.

Saez (2001) shows how the analysis changes when income effects are introduced. Income effects encourage work for middle and upper income earners because taxes reduce disposable income and discourage work for bottom income earners because transfers increase disposable income. Hence income effects make taxing less costly but make redistribution more costly. Therefore, keeping the compensated elasticity  $e$  and the curve of welfare weights  $G(z)$  constant, income effects lead to higher marginal tax rates at the upper end. This allows the government to redistribute more toward the low end. In contrast, income effects make redistribution at the low end more costly. Hence, the net effect on the level of transfers is ambiguous. If income effects are concentrated at the bottom, then they are likely to reduce optimal transfers at the bottom. If income effects are spread evenly throughout the distribution, then numerical simulations by Saez (2001) show that income effects allow the government to increase the level of transfers.

If consumption and leisure are separable in the utility function,<sup>15</sup> then income effects are related to the concavity of utility of consumption as individuals are willing to work more when net income is lower. Under a utilitarian criterion, that would imply that the curve of marginal weights  $G(z)$  is decreasing more sharply when there are income effects. This additional effect through  $G(z)$  suggests that income effects are an indicator of concavity of the utility and hence should lead to more redistribution (higher transfers and higher marginal tax rates).<sup>16</sup> A more systematic analysis of the role of income effects on optimal taxes and transfers would certainly be valuable.

## 3.2 Application to the UK case

### • Empirical Behavioral Elasticities

We want a quick summary of the "standard labor supply responses to taxation literature" in the UK, but we will wait to see what comes out of Costas' review piece before writing

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<sup>15</sup>Such separability can be tested using behavior under risk as in Chetty (2006).

<sup>16</sup>This effect was not incorporated in Saez (2001) simulations as those simulations kept the curve  $G(z)$  constant across specifications.

anything (indeed, maybe all we do in the final report is to cross-refer?).

### • Top Incomes and Top Marginal Tax Rates

Although there is a large literature in the United States analyzing the effects of changes in marginal tax rates on reported incomes using tax return data (see e.g., Saez, 2004 for a recent survey), there is hardly any study for the British case. This is especially surprising given that the United Kingdom has experienced a dramatic drop in marginal tax rates at the top. Indeed up to 1978, the top marginal tax rate on earnings was 83%<sup>17</sup>. Under the Thatcher administrations, the top rate dropped dramatically to 60% in 1979, and then dropped further to 40% in 1988. Dilnot and Kell (1988) try to analyze this issue but have only access to a single year of micro-tax returns and have to rely on aggregate numbers for their time series analysis. More recently, Preston and Blow (2002) have used micro tax data for two years 1985 and 1995 to analyze responses to tax rates but they focus exclusively on the self-employed and do not look specifically at top incomes.

In this Chapter, we propose a very preliminary analysis of the link between top marginal tax rates and top incomes building on the top income share series constructed recently by Atkinson (2007).<sup>18</sup> Those series estimate the share of total personal income accruing to various upper income groups such as the top decile, or the top percentile. They measure how top incomes evolve relative to the average. We have computed the average marginal tax rate faced by various upper income groups from 1962 to present.<sup>19</sup> Panel A in Figure 4 displays the marginal tax rate on earnings faced by the top 1% (on the left axis) and top 1% income share (on the right axis) from 1962 to 2003. It shows a dramatic decline in top 1% marginal tax rate close to 80% in the two key reforms of 1979 and 1988. The top income share series shows an erosion of the top 1% income share up to 1978, followed by sharp upturn starting in 1979, exactly when the top rate was reduced, suggesting that top income shares did respond to the marginal tax rate cut. From a long-term perspective, the top 1% income share doubled from 6% in 1978 to 12.6% in 2003 and the net-of-tax rate (one minus the marginal tax rate) tripled from

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<sup>17</sup>The top rate on earnings had been even higher at 91% in the mid-1960s. The top rate on capital income was even higher and reached the extraordinary level of 98%.

<sup>18</sup>Atkinson and Leigh (2004) have analyzed the link between top income shares and the top statutory marginal tax rate in five English speaking countries including the UK but their study does not estimate effective marginal tax rate and does not focus specifically on the UK case.

<sup>19</sup>Our computations are described in appendix.



$1 - .79 = 21\%$  in 1978 to  $1 - .41 = 59\%$  in 2003. If all the increase in top incomes (relative to the average) can be attributed to the reduction in marginal tax, this would imply a substantial elasticity of 0.72.<sup>20</sup>

Panel B displays the marginal tax rate and income share the next 4% (income earners between the 95th and the 99th percentile). In contrast to the top 1%, this group did not experience much of a reduction in marginal tax rates: the marginal tax rate in the late 1960s was virtually identical the current marginal tax rate. This illustrates the fact that the Thatcher reforms cut the progressivity of the income tax only within the top 1% but had relatively small effects in the rest of the distribution. However, the next 4% income share also shows a sharp break in 1979: the income share stayed about constant around 12% before 1979 and then increases steadily from 12% to 15% from 1979 to 2003. Two interpretations are possible.

First, it could be evidence that the change in high incomes is not due entirely to the marginal tax rate cuts and could have been due to other reforms enacted by the Thatcher administration that were favorable to high incomes. In that case, our previous estimate of 0.72 is biased upward. Second, it is conceivable that income earners in the next 4% group were also motivated to work harder by the prospect of facing much lower rates should they succeed in getting promoted and become part of the top 1% in coming years.<sup>21</sup> In that case, the standard model actually understates the effects of tax rate cuts and the elasticity estimated above should be adjusted upward.

**<INSERT FIGURE 4 HERE>**

Panel A: display top 1% income share (left axis) and top 1% MTR from 1962 to 2003.

Panel B: display top 5-1% income share (left axis) and top 5-1% MTR (right axis) from 1962 to 2003.

This very rough analysis shows that identifying the elasticity of top incomes, a key ingredient in the optimal tax rate formulas derived above, is not simple. It would certainly be very interesting to explore this issue in more detail using the rich UK tax return data that has now

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<sup>20</sup>The elasticity is estimates as:  $\log(12.6/6.0)/\log((1 - .41)/(1 - .79)) = .718$ . Note that the effective marginal tax rates on top incomes was even higher due to the surtax on capital income. Including the surtax would magnify the drop in marginal tax rates and hence reduce our estimated elasticity.

<sup>21</sup>In the US literature, Gentry and Hubbard (2004) have tried to estimate such effects in a model of entrepreneurship.

become available to researchers.

- **Numerical Simulations**

We have performed numerical simulation of optimal tax rates in the Mirrlees model described above based on the UK income distribution and various elasticity assumptions. The full details of the simulation methodology are presented in appendix. In those simulations, we assume that the tax revenue net of transfers from the optimum schedule is equal to the current tax revenue (including individual income tax, payroll taxes, and consumption taxes) net of transfers (Income support and Working and Family Credits).

In order to focus specifically on the income tax, we have also computed the optimal income tax schedule when we keep consumption taxes (VAT and excise taxes) at their current level (assuming that they are equivalent to a flat tax of 17%).

Figure 5 shows the optimal schedule for the optimal income tax schedule (both inclusive and exclusive of the current average consumption tax) assuming an elasticity of 0.25 and  $\gamma = 1$ . For very low levels of earnings, individuals face a marginal tax rate on income of around 70%. This decreases relatively quickly with income, reaching 36% as incomes approach £30,000 per year. As incomes increase further, so too does the marginal tax rate, eventually settling at around 64% for incomes above £200,000. Remembering that this top marginal rate includes both employee and employer national insurance contributions, it is somewhat higher than the current top rate of 47.6%. The U-shape pattern of optimal marginal tax rates is not surprising in light of our theoretical discussion and is driven by the U-shape of the hazard ratio  $(1 - H)/(zh)$  as well as the decreasing shape for  $1 - G(z)$  (which is the main contributor to the increasing rates at the top).

<INSERT FIGURE 5 HERE>

Optimal tax schedule,  $\gamma = 1$ ,  $e=0.25$ , with and without consumption tax

We now consider how our views regarding the optimal schedule depend on the labour supply elasticity. Panel A of Figure 6 displays an optimal schedule, exclusive of consumption tax and assuming that individuals labour supply is more responsive to changes in income (an elasticity of 0.5). The figure demonstrates that we want lower marginal rates right across the

earnings distribution, falling as low as 20% with a top rate of 45% which is slightly below the existing rate. The intuition for the difference here and in Figure 5 is simple. When individuals are more responsive to tax changes, they will react more adversely to high marginal rates by reducing their labour supply. This therefore places a limit on how high marginal rates can go.

<INSERT FIGURE 6 HERE>

Panel A: show optimal MTR for elasticity 0.25 vs 0.5 ( $\gamma = 1$ )

Panel B: show optimal MTR for  $\gamma = 1$  versus Rawlsian case

Now we consider how the preferences of government affect our view of the optimal schedule (again, exclusive of consumption tax). An interesting case to consider is known as the Rawlsian case, which is derived from John Rawls' famous Theory of Justice (1971), and seeks to maximise the welfare of the least well off member of society. The Rawlsian criteria can therefore be seen as a bound on the maximum level of redistribution that the government wishes to do. As Panel B of Figure 6 shows, under this criteria, we would have a higher lump sum grant and higher marginal tax rates across the entire distribution of earnings. The Rawlsian case corresponds to the case where  $G(z) \equiv 0$ . Hence, rates are higher at the bottom and are the same as the utilitarian case at the top. Therefore, with a Rawlsian criterion, the optimal shape becomes close to an L than U-shape.

The table below shows the optimal average marginal rate (exclusive of consumption tax), together with the optimal lump-sum grant under these different scenarios.

Redistribution strength	Elasticity	Average marginal tax rate	Lump-sum grant
$\gamma = 1$	0.25	45%	5580
Rawlsian	0.25	73%	8150
$\gamma = 1$	0.50	31%	4270
Rawlsian	0.50	58%	6760

## 4 Optimal taxes and transfers when there are participation effects

The model described in the previous section assumes that individuals respond to taxation only along the intensive margin by varying their earnings as a function of the marginal tax rate they face. However, empirical labour market studies have demonstrated that participation responses are poorly captured within such a framework (e.g., Blundell and MaCurdy, 1999). Indeed, the

empirical evidence indicates that people choose either to stay out of the labour market or to work at least some minimum number of hours. Hence, we do not observe infinitesimal working hours for those who enter the labour market following a marginal increase in the net gain of work, but rather that they enter employment at, say, twenty or forty hours. Such extensive labor supply responses are particularly important at the bottom of the income distribution and can be modelled using fixed costs of work. As shown in Diamond (1980) and Saez (2002), introducing participation effects modifies radically the structure of optimal transfers for low income families that we obtained above.

#### 4.1 Theory

We consider a simple model where individuals respond only along the extensive margin: they simply choose whether or not to work. We assume that skills vary and that an individual with skill  $z$  who chooses to work would find a job paying  $z$ . The government implements a possibly nonlinear income tax schedule  $T(z)$ . An individual with skill  $z$  who decides to work will get  $z - T(z)$  in disposable income. If the individual decides not to work, she will get  $-T(0)$  in disposable income. We assume that individual utility is simply  $u = c - q$  where  $c$  is disposable income and  $q$  are costs of work. Hence, the individual will work if the net return to work  $z - T(z) + T(0)$  exceed her costs of working which we denote by  $q$ . Therefore, if we assume that costs of work  $q$  are distributed with a (cumulated) distribution  $P(q|z)$  among individuals with skill  $z$ , the number of individuals of skill  $z$  who work is simply  $P(z - T(z) + T(0)|z)$ . We can define the elasticity of participation with respect to the net return to work as:

$$\eta_{(z)} = \frac{z - T(z) + T(0)}{P} \cdot \frac{\partial P}{\partial q}. \quad (4)$$

To derive an optimal tax formula, let us consider a small increase in  $dT$  in  $T(z)$  but only at skill level  $z$ . As there are only extensive responses, this reform affects only individuals with skill  $z$ . As above, this reform has three effects on government tax receipts and welfare.

First, the reform increases taxes by  $dT$  for every taxpayer with skill  $z$  who works and hence collects extra taxes  $dM = P(q|z)dT$ .

Second, those extra taxes generate a welfare cost to workers with skill  $z$ . If we denote by  $g(z)$  the social value for the government of distributing 1 Pound among taxpayers with income  $z$ , the welfare cost is simply  $dW = dM \cdot g(z) = P(q|z)g(z)dT$ . If the government

values redistribution,  $g(z)$  will be decreasing in  $z$ . The no income effect assumption implies that the average  $g(z)$  across the full population is equal to one.<sup>22</sup>

Third, the tax increase  $dT$  at income level  $z$  induces some of the workers at  $z$  to drop out of work. All those with fixed cost of work  $q$  between  $z - T(z) + T(0) - dT$  and  $z - T(z) + T(0)$  drop out. There are  $dT \partial P / \partial q = dT \eta P / (z - T(z) + T(0))$  such workers. The fiscal cost of this behavioral response is

$$dB = \frac{T(z) - T(0)}{z - T(z) + T(0)} \cdot \eta \cdot P(q|z) dT.$$

Note that those dropping out of the labor force are indifferent (within  $dT$ ) between working and not working and there is only an infinitesimal number of switchers. Hence the welfare effect on movers is second order relative to the welfare effect on those who work and can be neglected.<sup>23</sup> It is useful to introduce the average tax rate on work (vs. non-working):

$$t(z) = \frac{T(z) - T(0)}{z}.$$

$1 - t(z)$  measures the increase in disposable income (relative to earnings) when an individual decides to work. At the optimum, we have again  $dM + dW + dB = 0$ , which generates the following optimal tax rate formula:

$$\frac{t(z)}{1 - t(z)} = \frac{1}{\eta} \cdot (1 - g(z)) \quad (5)$$

This formula is a simple inverse elasticity tax rule for the average tax rate on work. The average tax rate decreases with the elasticity  $\eta$  and also decreases with  $g(z)$  the social value of marginal consumption for individuals earning  $z$ .

As described above, if the government values redistribution,  $g(z)$  should be decreasing in  $z$  and should average one across the full distribution. This implies that  $g(z)$  should be above one for low incomes and below one for high incomes. Formula (5) implies that the tax rate on work  $t(z)$  should then be negative. In other words, low income workers should receive a subsidy for working. Hence in sharp contrast to the intensive model, the extensive model implies that

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<sup>22</sup>The  $g(z)$  of this section and the  $G(z)$  of previous section are related by the formula  $G(z)(1 - H(z)) = \int_z^\infty g(z)h(z)dz$ .

<sup>23</sup>This is directly equivalent to the situation from Section 2 where behavioral responses do not create a first order welfare effect.

subsidy schemes such as the working tax credit should be part of an optimal tax/transfer system. This result is robust to introducing income effects as formula (5) remains valid with income effects.

The intuition for this result can be understood as follows. Starting from a transfer system with positive tax rate at the bottom, suppose the government contemplates increasing incentives for low skilled workers earning  $z$  by reducing  $T(z)$ . Ignoring behavioral responses, this is a desirable reform because low income earners have a social marginal value of consumption  $g(z)$  above one. In the extensive model, the behavioral response is only on the participation margin and thus decreasing  $T(z)$  induces low skilled individuals to start working and earn  $z$ . This labor supply response does increase tax collected because the transfer system has a positive tax rate. Hence, this reform is unambiguously desirable which implies that positive tax rates at the bottom are sub-optimal in the extensive model.

However, in the intensive model, in addition to inducing some of the unemployed to work, decreasing  $T(z)$  would make it more attractive to workers earning more than  $z$  to reduce their labor supply so as to earn  $z$  and benefit from the tax decrease. As a result, increasing  $T(z)$  has ambiguous effects on labor supply in the intensive model.

A government contemplating increasing incentives at the bottom must precisely weigh the positive participation effect and the negative intensive labor supply effect. The models developed here give precise formulas to trade-off optimally these two effects.

- **Tax Evasion Interpretation**

Earnings  $z$  can be interpreted as earnings reported to the government for tax and transfer purposes. Suppose that low income earners can decide to either work as employees in the formal sector (and hence cannot avoid income taxes), or work informally as self-employed providing child care, cleaning, gardening services, etc. which are not reported to fiscal authorities. In that case, the decision to work vs. not work is replaced by the decision to work and pay taxes vs. work informally and not pay taxes. In that case (and keeping tax enforcement efforts constant), the same results go through and formula (5) remains valid. However, the government recognizes that those reporting no earnings might actually be better off than low income workers and hence  $g(0)$  is not necessarily smaller than  $g(z)$  for low and positive  $z$  and

the subsidy finding we obtained remains valid.<sup>24</sup>

## 4.2 Application to the UK case

### • Empirical Extensive Elasticities

The most recent empirical evidence from the UK on the labour market response to changes in tax credits and welfare programme comes from a set of evaluations of the Working Families' Tax Credit and contemporaneous reforms (roughly speaking, a set of reforms between 1999 and 2002), with most papers examining the response of lone parents.

Several papers have made use of the fact that the reforms in question affected families with children far more than families without children, suggesting an evaluation based on the idea of a natural experiment. The principle is that the labour market trends exhibited by adults without dependent children can be taken as a good guide as to the trends that would have been exhibited by otherwise-equivalent adults with children had the WFTC and related changes not happened. Using different data-sets, slightly different time periods and different specifications of this conditional difference-in-difference estimate, three papers estimate that WFTC and related reforms increased lone parents' participation in the labour market by between 1 percentage point to 7 percentage points (from a base of around 45 per cent in work in 1998).<sup>25</sup>

Such estimates tell us little about the participation elasticities, but they can be used to validate estimates of the impact of WFTC that are derived from structural models of lone parents' labour supply; one advantage of a structural model of labour supply is that it can estimate elasticities. A structural model of lone mothers' (sic; lone fathers, who comprise around a tenth of lone parents in the UK, are omitted) labour supply is presented in Brewer, Duncan, Shephard and Suarez (2005, 2006) [and a variant in Blundell and Shephard (forthcoming)].

These estimates strongly suggest that the participation response to changes in financial incentives for lone mothers in the UK is strong, and arguably more important than the intensive response/elasticity. Brewer, Duncan, Shephard and Suarez (2006) calculate that the response

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<sup>24</sup>However, low income subsidies might induce individuals to over-report self-employment income. In the US, Saez (2002b) shows that there is evidence of bunching at the maximum of the EITC for the self-employed (and not for wage earners) strongly suggesting that self-employed individuals manipulate their reported earnings to take advantage of the EITC.

<sup>25</sup>See Brewer and Browne (2006) for a comparison; the original papers in question are Francesconi and van der Klauw (2004), Gregg and Harkness (2003) and Blundell, Brewer and Shephard (2005).

to the WFTC reform is equivalent to a labor force participation elasticity of almost 1; for comparison, the range of equivalent estimates made for lone parents in the US is of 0.69 to 1.16 (Hotz and Scholz (2003)).

- **Numerical Simulations Incorporating Extensive and Intensive Margins**

Blundell and Shephard (2007) allow for both intensive and extensive responses by using a discrete choice model of labour supply (refer to review chapter), which acts as a starting point for examining problems related to the optimality of the tax and transfer system. Their analysis focuses exclusively on lone parents, and begins by estimating the implicit trade off between income and hours of work, and how this varies across individuals. With estimates of these behavioural responses, the labour responses of individuals can be simulated as the tax and transfer system is varied. This then allows them to solve for the tax and transfer system that maximises social welfare subject to a government budget constraint.

The optimal tax and transfer system is solved separately for different groups. Their empirical analysis suggests that lone parents with very young children are much less responsive to changes in financial work incentives than are lone parents with children of school age. In the former case - where the marginal value of leisure is high - it is better to offer high levels of income support together with high marginal tax rates when in work. In the latter case, where leisure is valued less highly, it is more desirable to have a lower level of income support and lower marginal tax rates (possibly even a pure tax credit) to encourage them to work. Heterogeneity therefore appears to be very important, and Blundell and Shephard argue that to the extent that individuals do differ in how responsive they are to changes in financial work incentives it may appear desirable from an optimality perspective to reflect this in the design of the tax and transfer system.

A further paper (Adam, 2005) has examined the related issue of the marginal efficiency cost of redistribution (MECR) in the UK, over time and across different groups in society. Adam (2005) uses methods developed in Immervoll et al. (2007) to estimate the MECR in the UK, using calibrated labour supply elasticities, and detailed information on the effective marginal tax rates facing a large sample of individuals in the UK from each year since 1979. The paper compares the MECR for two policies: both increase tax rates, but one redistributes the revenue to all individuals (a demogrant), and the other only to workers (an in-work credit).



The efficiency loss associated with a marginal in-work benefit applied to the whole population has consistently been low (and occasionally negative): even at its current 25-year high, the policy would cost losers only £1.30 per pound that the gainers gained. By contrast, losers from a demogrant would currently lose £4.30 per pound that gainers received, higher than at other times over the last 15 years but still well short of the peak of £8.02 seen in 1981. More interestingly from the point of view of this study, Adam (2005) finds that increases in-work benefits or cuts in tax rates for lone parents would have provided opportunities for Pareto-improving reforms to the tax and benefit system for most of the period since 1979: in other words, given the elasticities used to calibrate his calculations, the effective marginal tax rates facing lone parents were beyond the Laffer bound: cuts in marginal tax rates would have raised revenue.

## 5 Other household tax rate topics

### 5.1 Migration issues in the EU context

Taxes and transfers might affect migration in or out of the country. For example, high tax rates on skilled workers in continental Europe might induce some of them to move to the United Kingdom or the United States where top tax rates are lower. Symmetrically, generous benefits in continental Europe for lower incomes might encourage migration of low skilled workers toward those countries.<sup>26</sup>

Suppose that the only behavioral response to taxes is migration.<sup>27</sup> Migration is actually conceptually very close to the extensive response model described in Section 4. One simply needs to replace not working (and collecting transfers) by being out of the country (and hence neither receiving transfers or paying taxes in the domestic economy). Let us denote by  $P(c|z)$  the number of resident individuals earning  $z$  when disposable income is  $c$ . With the income tax, we have  $c = z - T(z)$ .

We can consider as in Section 3 a small reform which increases taxes by  $dT$  for those earning  $z$ . The mechanical effect net of welfare is  $dM + dW = (1 - g(z))P(c|z)dT$ ,

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<sup>26</sup>The government can use other tools such as immigration policy that are taken here as given. Note that democracies typically do not control emigration. In the European Union context, emigration and immigration across EU country is almost completely deregulated and hence our analysis is relevant in this context.

<sup>27</sup>Mirrlees (1982) proposed such a model of optimal taxes with migration. Simula and Trannoy (2006) propose an extensive theoretical analysis of the problem.

The net fiscal cost of somebody earning  $z$  emigrating is  $T(z)$ . We can define an elasticity of migration with respect to disposable income  $\eta_m = [(z - T(z))/P(c|z)] \cdot \partial P/\partial c$ . Hence the fiscal cost is  $dB = -T(z) \cdot P(c|z) \cdot \eta/(z - T(z))$ . Marginal emigrants are indifferent between emigrating or staying and hence the welfare cost is second order in this case as well if we assume that the government cares equally about a person whether he or she is a domestic resident or not. At the optimum, we have  $dM + dW + dB = 0$ , which implies:

$$\frac{T(z)}{z - T(z)} = \frac{1}{\eta_m} \cdot (1 - g(z)). \quad (6)$$

In the EU context, the most interesting application of the migration model is at the high income. Indeed, there have been heated discussions of brain-drain issues across EU countries due to differential tax burden levels at the top across countries. If we assume that high incomes respond both along the intensive margin as in Section 3 with elasticity  $e$ , and along the migration margin with elasticity  $\eta_m$ . Then, it is easy to show that the optimal top rate becomes:

$$\tau^* = \frac{1 - g}{1 - g + a \cdot e + \eta_m}. \quad (7)$$

For example if  $a = 2$ ,  $e = 0.25$ , the Laffer rate with no migration is  $\tau^* = 1/(1 + 2 \cdot 0.25) = 2/3$ . If there is migration with elasticity  $\eta_m = 0.5$ , then the Laffer rate decreases to  $\tau^* = 1/(1 + 2 \cdot 0.25 + 0.5) = 1/2$ . Thus, migration threat might actually decrease significantly the ability of European countries to tax high incomes. As is well known, in the presence of migration, single countries do not recognize the external cost they might impose on others by cutting their top tax rates.<sup>28</sup> In that case, some form of harmonization across countries can be beneficial.

Data from the GHS and LFS labor force surveys since the early 1970s report the country of birth and Nationality (since 1992) and allow to illustrate this issue. The data show that the fraction of foreign born workers was 6 to 7 percent and about constant across decile groups of the earnings distribution in the 1970s.<sup>29</sup> Interestingly, the fraction foreign born increases

<sup>28</sup>As the example of Irish economic miracle over the last 15 years has shown, this issue of tax competition is even more important in the case of corporate taxation.

<sup>29</sup>Before 1992, our estimates are based on the GHS which is a smaller sample than LFS. As a result, the year to year results are fairly noisy. XX ANDREW, WHICH PERCENTILE DOES TOP CODE HIT IN GHS?, CAN YOU COMPUTE FRACTION FOREIGN IN TOP 1% AVERAGED ACROSS 1972-1979, 1980-1990, 1991-1996?

sharply during the 1980s, but only at the top of the distribution, so that the fraction foreign born reaches about 15% in 1992 in the top 1%. Since 1992, the fraction foreign born has increased across all decile groups to about 10% across the nine first deciles and reaches about 18% in the top 1% in 2005. We can provide an illustrative estimate of the migration elasticity using those numbers if we are willing to assume that the sharp increase in foreign born from 7% to 15% from the 1970s to 1992 was entirely due to the drop in top tax rates. According to Piketty and Saez (2007), the average income tax rate (including income and payroll taxes) for the top 1% decreased from about 56% in 1970 to around 40% in 2000. Hence the net-of-tax rate increased from 0.44 to 0.6, i.e., by 36%. The statistics from GHS and LFS suggest that the net flow of foreigners was around 8% (increase from 7% to 15%). This would translate into a migration elasticity  $\eta_m = 8/36 = .22$ . Clearly, the flow of foreigners might have been accompanied by a flow of wealthy UK nationals back into the UK following the tax cuts that we cannot measure. If that flow is comparable to the flow of foreigners, that would double the elasticity to 0.44. The assumption that the increase in foreigners was entirely tax driven is also highly questionable and was made for illustrative purposes only.<sup>30</sup>

## 5.2 Treatment of the Family

The models we have considered thus far were based on individuals and so abstracted from family issues. In practice, a majority of individual adults live in couples, and can be assumed to pool income to some extent for consumption purposes. Over the past three decades, there has been an international trend from joint to individual taxation of husbands and wives, and today the majority of OECD countries use the individual as the basic unit of taxation ([reference: anything in Adam-Browne-Heady chapter?]), with the United Kingdom moving from a family-based income tax to an individual-based income tax in April 1990. Under individual-based taxation, tax liability is assessed separately for each family member and is therefore independent of the income of other individuals living in the household. By contrast, in a system of fully joint taxation of couples, as operated by the United States (for example), tax liability is assessed at the family level, and depends on total family income. Interestingly, transfers for low incomes in the UK and most/every other OECD country are based on total

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<sup>30</sup>It is also important to note that the elasticity estimated from our top income share analysis in Section X.X implicitly incorporated such migration effects as migration will affect top income shares.

family income, and there has been much less impetus to move to an individually-based system for assessing transfers. There are three important considerations:

First, if there is any degree of consumption-sharing or income-pooling within a family, a person with a low-income living with a high-income spouse could be considerably better off than a person with the same low income but living with a low income partner. Therefore, if the government values redistribution and thinks that consumption-sharing or income-pooling does take place, two women (for example) with the same labour income ought not to be taxed identically if their partners' incomes are very different. This redistributive principle is achieved to some extent by having a progressive income tax system based on family income, since it imposes higher tax rates on women living with (in the US, married to) high-income partners than on women living with low-income men. By contrast, an individual-based income tax imposes the same tax burden on individuals irrespective of their partner's earnings, and so does not meet this redistributive criterion.

Second, joint taxation is highly likely to create a marriage subsidy or penalty, as the income tax owed by a couple might change if they decide to marry.<sup>31</sup> If the joint tax system is progressive (as in the United States today), couples with very unequal incomes benefit from a marriage subsidy, while couples with similar incomes face a marriage penalty ([reference? Ellwood and Liebman? Something more recent?]). Although the marriage penalty/subsidy attracts substantial public attention<sup>32</sup>, it becomes relevant for optimal taxation only if the decision to marry is sensitive to those fiscal incentives. In the UK, there have been fewer studies; one that made use of the large expansion of jointly assessed in-work credits estimated that a (very large) £100/wk couple penalty (in this case, a penalty that arises from the welfare and in-work credit system, not from income tax) would reduce the probability of having a partner by about 7 percentage points (Anderberg, 2006; an analysis of the extent to which couples in the UK face penalties and subsidies is Anderberg et al., 2006). Of course, even if partnership decisions are relatively insensitive to fiscal consequences, we might expect that how individuals report their family circumstances to the revenue authorities (or the bodies administering transfer programmes) would be affected by sufficiently large couple penalty and

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<sup>31</sup>In practice, individual-based taxation can include marriage subsidies in the form of larger exemptions for married individuals.

<sup>32</sup>In the UK, see for example Civitas (2002) and Kirby (2005); a discussion of some options for reforming the current system is given in Brewer (2007).

subsidies. In the UK, HMRC and DWP each estimate the extent of money lost to such fraud (based on random compliance checks); powerful circumstantial evidence that such fraud exists comes from the fact that the UK Government is paying child-contingent support to more lone parents than are thought to live in the UK (Brewer and Shaw, 2006).

Third, the empirical labor supply literature has shown that the labor supply of secondary earners is more elastic with respect to taxes than the labour supply of primary earners (see Blundell and MaCurdy, 1999, for a recent survey). Therefore, following the traditional Ramsey optimal taxation principle, the labour income of secondary earners should be taxed at a lower rate than the labor income of primary earners for efficiency reasons (see Boskin and Sheshinski, 1983). This goal is achieved to some extent by a progressive individual-based income tax, since primary earners have higher incomes, and hence will face higher marginal tax rates than secondary earners. By contrast, a family-based income tax generates identical marginal tax rates across members of the same family, and thus does not meet this efficiency principle.

Kleven, Kreiner, and Saez (2006) consider a simple model of couples where the primary earner responds along the intensive margin only (as in Section 3) and the secondary earner responds along the extensive margin only (as in Section 4). In contrast to the separable and linear tax system in Boskin and Sheshinski, 1983, they consider the fully general joint taxation. Naive intuition based on (5) suggests that for redistributive reasons, the tax on the secondary earner should be higher when the earnings of the primary earner are larger (as the social value of marginal consumption  $g(z)$  decreases with total family income). Kleven et al. (2006) show that the reverse is actually true: the tax rate on the secondary earner should be decreasing with the earnings of the primary earner and symmetrically the primary earner should face a lower marginal tax rate if his spouse works.

The correct intuition is the following: Conditional on the earnings of the primary earner, two-earner couples are always better off than one-earner couples. Hence, the government would like to redistribute from two-earner couples to one-earner couples. The value of such redistribution is larger for couples with low primary earnings because the contribution of the secondary earner to household utility is then more important. Therefore, the redistributive virtue of taxing secondary earnings is actually higher at the bottom of the primary earnings distribution, explaining why the tax rate on secondary earner is decreasing with the primary

earner income.

If the tax schedule for two-earner couples is seen as the base schedule, the schedule for one-earner couples is obtained from that base schedule by giving a dependent spouse tax allowance, which is larger for couples with low primary earnings than for couples with high primary earnings. This shrinking tax allowance generates of course an implicit tax on secondary earners which decreases with primary earnings.

Those results suggest that joint progressive taxation actually goes in the wrong direction and that neutral individual taxation is closer to the optimum. However, it is important to note that, in practice, transfers programs at the bottom are almost always based on joint family income and the phasing-out of those programs creates implicit taxes on secondary earners which are actually decreasing with primary earnings. For example, the United Kingdom has an individual income tax system, but Income Support and child and working tax credits are family-based. That means that a secondary earner in the United Kingdom with modest earnings would face a relatively high tax rate when her partner's earnings are low (because the second adult's earnings reduce tax credit entitlements), and would face a low tax if her partner's earnings are high, because the secondary earner then faces solely the individual income tax with low rates for initial earnings. Hence, these optimal tax results for the treatment of couples are quite consistent with the actual tax and transfer systems of many OECD countries, and of the United Kingdom in particular.<sup>33</sup>

### • **Collective Labor Supply Model**

How disposable income is allocated among family members raise interesting issues. Empirical findings by Lundberg et al. (1997) show that giving the children allowance to the mother directly instead of giving it to the main income earner as a reduction in withheld taxes increases significantly spending on children. This shows that families do not fit the unitary model whereby a family maximizes a single utility function subject to a family budget constraint. Chiappori (1988, 1992) has developed a collective labor supply where consumption is allocated within family members in a Pareto efficient way but that the weights that each family member has in the global maximization can depend on their relative incomes or on

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<sup>33</sup>Such a system creates a couple penalty at the bottom. Kleven et al. (2006) show that if marriage decisions respond to tax incentives, this penalty should be reduced but not entirely eliminated.

whom is entitled to the government transfers.

Suppose that within couples, husbands have too much power and can get a larger fraction of consumption than the spouses. The government would like to have fairer distributions within families. The findings by Lundberg et al. (1997) show that the government can actually modify within family consumption allocations at no fiscal cost simply by transferring the children allocation from husband to wife. As shown in the formal analysis of Kroft (2006), by transferring enough resources from husband to wife, the government is able to restore a fair allocation within spouses. In sharp contrast to the previous models we have considered so far, this within-family redistribution is first best (it does not create any efficiency costs) as long as the within family bargaining is Pareto efficient (as assumed in the theory of Chiappori 1988, 1992).

Hence, within family distributional issues can be solved using such non-distortionary government transfers within families. Once those within-family distributional issues are fully resolved at no efficiency costs, we are back to the standard problem of redistribution across families that we have discussed earlier. The important point to note is that the collective labor supply model does not affect the validity of the optimal tax lessons for couples derived in the unitary model. Each issue (within or across) can be tackled independently of each other.

### **5.3 Treatment of children**

In the UK, discussions about marginal rates of tax and the presence of couple penalties or subsidies are mostly concerned with the tax treatment of families with dependent children. This is because welfare benefits and in-work tax credits in the UK pay additional allowances or credits for each dependent child, and this in turn means that the range of income over which an individual is likely to face a withdrawal or benefit or tax credits is longer if that individual is in a family with dependent children. The current UK government is also particularly concerned about the relatively low (by international standards) employment rates of lone parents, who make up a relatively high proportion of all families with dependent children, and the relatively high levels of relative child poverty; this concern (and the tough quantified targets that accompanied this concern) led to particularly large increases in entitlements to welfare benefits and tax credits for families with dependent children since 1998; by contrast, families without dependent children have seen no real rise in the level of out-of-work benefits

since at least 1988 (when the current income support was introduced), and, although there is now (since 2003) a working tax credit for low-income working individuals without children, entitlements are not high, and take-up is very low (HMRC, 2007).

The implication of the large increase in entitlements to welfare benefits and tax credits for families with dependent children compared to those without is that the amount of state financial support that is conditional on having children has risen substantially since 1997. Adam and Brewer (2004) examine trends in child-contingent transfers since 1975, showing how they vary by family circumstances, by family income, and over time. The key finding is that the value of child-contingent transfers per child grew by around a half in real terms between 1997 and 2003, more than it had risen by in the previous 22 years. They show that, in the UK, child-contingent transfers are generally negatively related to income (although there are exceptions) and higher for the first child than subsequent children, and that changes since 1997 have accentuated these features.<sup>34</sup>

In an optimal tax setting, the government's preferences for redistributing to families may well be affected by the presence of children, either because a government feels that a family with children deserves more support than an otherwise equivalent family without children, or because the presence of children is being used as a tag (because it correlates with low income, or because it is correlated with a labour supply elasticity).

But it is also possible that the presence of children in a family is affected by the generosity of child-contingent transfers. In the US, there is little conclusive evidence of any effect (see Hoynes, 1997). In the UK, there is less research available [but we hope that Brewer and Smith, forthcoming, will say something]. If fertility does respond to financial incentives, then this introduces another dimension to the optimal tax problem.

## 5.4 Administration Issues

The administration of the child and working tax credit has been extensively criticised, particularly in their first 2-3 years (see Brewer (2006) and references therein [look for more recent ones]). But these administrative problems mostly derive from policy choices, so it is worth discussing these briefly (some of this is drawn from Brewer, 2006).

One of the programmes that existed before the child and working tax credit was the

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<sup>34</sup>Adam et al. (2007) extends these estimates to 2006/7.



Working Families' Tax Credit (WFTC). WFTC awards were based on claimants' previous circumstances: when applying, claimants had to provide evidence that they were in work and of their recent earnings and childcare costs. Once the value of the weekly WFTC award had been determined, this was fixed for 6 months, regardless of any changes in the circumstances of the family that had applied for it: any changes in circumstances, of course, would be reflected in the next award, if the family re-applied after 6 months. Because awards were based on information verified at the time of claim, there was no need to re-assess awards in the future. But this system means that claimants' awards need not have reflected their current circumstances: in effect, WFTC awards were always lagging behind claimants' circumstances by up to 6 months.

But the government felt both that WFTC was not sufficiently responsive, and that this process of providing verified income details twice a year would be onerous for claimants whose circumstances were not changing, and so the design of the child and working tax credit represents the [then] government's attempt to reconcile these tensions. The idea behind the design of the child and working tax credits is that they should now depend, in principle, on current circumstances. But the tax authorities do not automatically know about all of the details on which tax credits depend – the gross earnings of both adults (if in a couple), the number of children, whether any adult is working for 16 or more hours, or 30 or more hours, and how much is being spent on formal childcare. So tax credits rely on two things happening:

- there is considerable responsibility on claimants to tell HMRC when there is a change in their circumstances – such as whether they are living with a partner, how many children they have and also what they are spending on childcare – in real time/as it happens (from April 2007, within a month).
- Tax credits are initially assessed on the last verified value of the claimant's annual income (in other words, they are usually based on the previous year's annual income) and are then re-assessed when HMRC knows with certainty the claimant's income in the current tax year (or when the claimant tells HMRC that their income in the current tax year is likely to be significantly different from the previous verified income level).

In the first two years of the operation of tax credits, this end-of-year reconciliation led to many more instances than had been expected of people having been over-paid tax credits. The Government responded by changing the rules so that tax credits still depend upon current

family circumstances, but are a little more like a retrospective system because they are now more likely to depend upon the previous year's income. However, there is an asymmetry: claimants whose income is lower than last year can always ask to have tax credits assessed on their (best estimate of their) current income, but claimants whose income is higher now than last year can continue to have their tax credits assessed on last year's income, provided that is within £25,000 of their current income.

So tax credits now feel very different from the rest of the personal tax system. For many families, the amount of tax credits received in a given year will not depend upon income in that year. Some aspects of the child and working tax credits are similar to traditional means-tested benefits – changes in family circumstances will have to be reported very quickly – and other parts are similar to previous in-work benefits in the UK such as family credit WFTC, because awards will be fixed with regard to income rises.

## **6 A Reform Plan for the United Kingdom**

This reform is designed to improve upon the current tax and tax credit system along three key dimensions: first, to alter financial work incentives and labour supply incentives so that they better match the lessons from optimal tax theory discussed earlier in this chapter; second, that any reform/programme should be simple to understand, and simple for families to claim; thirdly, that any reformed system should seek to minimise administration and compliance costs (including enforcement) for employers and the government (reference other chapter).

Our analysis has shown that the present UK tax and transfer system suffers from three important defects. First, the participation tax rates at the very bottom remain high: they are close to 100% before the Working Credit and remain at about 60% (when including the VAT) even when workers become entitled to the Working Credit. Those rates appear much too high in a context where theory suggests that participation rate should be low, possibly even negative. Second, the phasing-out of work-credit, combined with payroll and income taxes (and the VAT) generates marginal tax rates around 80% for a large number of low and moderate earners which is above the optimum rate even with modest behavioral responses. Third, while the income and payroll tax administration system in the UK is simple and efficient,<sup>35</sup> the

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<sup>35</sup>Withholding is achieved through the PAYE system with end of year adjustment so that the vast majority of individuals do not have to actually file a tax return.

current transfer system is administratively burdensome for beneficiaries and does not adjust quickly to the economic situation of beneficiaries. The comprehensive reform we are proposing improves the current tax and transfer system among all those dimensions.

The centre-piece of our new tax and transfer system is a new programme, called Family Allowance, which acts a replacement for child tax credit, working tax credit, income support and child benefit. Family Allowances are paid directly by the government to families but the tapering of the Family Allowances is achieved through the current system of income and payroll tax withholding. We then describe changes to income tax, and then set out some of the operational implications of the new Family Allowance. Only minor changes are proposed to the current payroll taxes and no changes at all for consumption taxes. At this stage, we do not claim that we have identified, yet alone resolved, all of the operational and administrative difficulties of the Family Allowance. We have also not sought to consider how the Family Allowance would interact with all of the various out-of-work benefits, although we are confident that these present no insurmountable barriers. It has been assumed that none of the reforms described below would apply to those over the pension age.

- **Family Allowance**

The centre-piece of our new tax and transfer system is a new programme, called Family Allowance, which acts a replacement for child tax credit, working tax credit, income support (and perhaps child benefit). The allowance will be worth £40 a week for a single adult family, £66 a week for a couple family with no children, £80 a week for a lone parent, £82 for couples with children, and £47.60 a week for each dependent child in the family: these amounts broadly mirror the support currently delivered through tax credits, although under the Family Allowance, these amounts would also apply to non-working individuals.

The Allowance would be related to family income: earnings below £100 a week would not reduce the allowance, and a taper/phase-out rate of 45% would apply above this value. Unlike tax credits now, this disregard would apply to each adult, not each family (for example, consider a family with two parents and two children. The basic allowance is £177.20 (=  $82 + 2 \times 47.60$ ). Suppose one parent works and earns £300/wk, then the allowance is reduced by £90 =  $(300 - 100) \times 0.45$ ). Suppose both parents work and earn £300 and £200. Then the allowance is reduced by £135 =  $(300 - 100) \times 0.45 + (200 - 100) \times 0.45$ . Non-earned income

would in principle reduce the family allowance; it seems sensible to use a definition of income as close as possible to that for income tax purposes, perhaps with small disregards covering various forms of income (as is currently the case for various forms of unearned income for the child and working tax credits).

Families would need to actively register with the government in order to receive Family Allowance (and hereafter such families are referred to as “allowance families”). There would be a presumption that allowances for children would be sent to the *mother* (so that spending is more closely directed toward children following the analysis by Lundberg et al. 1997) and those for the adults would be split between the two adults in a couple. All would be paid on a fortnightly or monthly basis directly to individuals’ accounts.

- **Income and payroll taxes**

Structurally, income tax will remain as an individually-based tax, but there would be significant increases to allowances, and to rates. Increases in allowances aim to lower the very high MDRs that can exist in the current system by ensuring that income tax does not start to be deducted until the Family Allowance has been completely withdrawn. For single adults (with or without children), this can be achieved by introducing an additional personal allowance restricted to the basic rate equal to  $(£40 \times 52/0.45)$ ; a lone parent would have an additional allowance of  $((£80 + kids \times 47.60) \times 52/0.45)$ . This would represent a substantial increase in personal allowances from their current value of £5,220 to, for example, £25,465 for a lone parent with two children, although note that all individuals would start paying higher-rate tax once their gross income reaches the same amount: £39,825.

Couples would receive a transferable personal allowance restricted to the basic rate worth  $(£66 \times 52/0.45)$  or  $(£82 \times 52/0.45)$ , depending whether they had children. Couples with children also receive extra (transferable, with restrictions) allowances for their children worth  $(kids \times £47.60) \times 52/0.45$

These substantial increases in income tax allowances would require tax rises to ensure that the whole reform is revenue neutral. To accomplish this, the 10% starting rate of income tax would be abolished, the basic rate increased from 22% to 25%, the 40% rate would not change, and there would be a new higher rate of 46.5%. The point at which income tax is due at 40% remains unchanged at £39,825 (gross earnings, not taxable earnings), and the starting point

for the 46.5% rate would be around £60,000 a year. This higher rate of tax creates a fairly high tax rate of 63% when one includes the uncapped employer payroll tax and the consumption tax rate of 17%. Such a higher rate is desirable only if elasticity of top incomes is less than 0.3 (according to the formulas derived above).

The payroll tax on employees and employers would remain with broadly the same structure as it is now. The Upper Earnings Limit (where employee NI falls to 1%) will be raised to be aligned with the point at which 40% income tax starts. To make the reform revenue neutral, a rise in NI rates of 2.5ppts would be needed: economically, it should make no difference whether this is added to the employer or employee rate (indeed, the rise could be shared between both rates, so long as the total rise is 2.5 ppts).

#### • **Administrative considerations**

We provide in appendix a description of a number of administrative issues related to the Family Allowance, which we summarize here. The key improvement of the Family Allowance relative to current transfer programs is that it would be administered “as-you-go” so that family allowances would depend on the current economic situation of families. As mentioned above, the government would send directly to families the maximum amount of the Family Allowance. The tapering of the Family Allowance away from better-off families (hereafter known as “withholding”) would occur, wherever possible, through the current withholding system for payroll and income tax.

Unlike tax credits in the UK’s recent history which have been administered through PAYE (Working Families’ Tax Credit and Working Tax Credit until April 2006), this would not involve employers paying out positive entitlements to tax credits - all allowance families would have their family’s full entitlements to Family Allowance paid directly to them - but instead deducting from earnings the Family Allowance that is withheld as earnings rise. Accordingly, and to keep administration simple, the Family Allowance will not be an annual system but instead will be operated on a non-cumulative basis, with a periodicity equal to the frequency of pay. This weekly or monthly system will also allow families to obtain support directly at the time they need it most: in other words, the net payments of Family Allowance will reflect current earnings, rather than past earnings (as is the case under EITC or, to some extent, under the child and working tax credits).

Under our proposed Family Allowance system, slightly more information would need to be transmitted at each stage between the employees, employers, and the government, but the mechanisms for interacting would remain the same (and we further assume that the vast majority of these interactions between employers and HMRC would in the near future be done electronically).

## Appendix

### • Tax Rate Computations

The series on top income levels was taken from Atkinson (2007) and updated by the authors to include 2001/2 - 2003/4 using the Survey of Personal Incomes. Total adult population in those years taken from Population Trends. It did not prove possible to replicate the series for total income in Atkinson (2007): accordingly, total income in 2001/2 to 2003/4 was assumed to grow at the same rate as SPI income grew for those years, and these used to estimate top income shares.

Marginal rates of tax applying to top incomes over time was calculated by the authors. For years 1975-2003/4, the calculation used TAXBEN, the IFS' tax and benefit microsimulation model. For previous years, they were based on the authors' understanding of the tax system drawing on an unpublished document, A Guide to the Tax and Benefit System. Marginal rates are those applying to earned income, and are calculated for a single-earner couple with two children (family status and the presence of and number of dependent children affects tax liability in some but not all years under consideration). For years before 1973, calculations assume all income is earned (the marginal rate of tax depended on the composition of total income as well as the income source of the marginal pound). For years after 1984, marginal rates include payroll taxes, because employer NI was liable on all earned income from April 1985 (the levels of earnings shown in the Figures was always too high for employee NI to be liable for a marginal increase in earnings), multiplied by the fraction of income made up of earnings for the income band in question (this fraction was calculated by the authors using the Survey of Personal Incomes in 1985, 1995, and 1997/8 to 2003/4. Missing years were interpolated).

### • Numerical Simulations

The optimal Mirrlees tax simulations proceed as follows. We assume that individuals differ in their ability  $n$  only. The utility function takes the following quasi-linear and iso-elastic form:

$$u(c, z, n) = c - \frac{n}{1 + 1/e} \cdot \left(\frac{z}{n}\right)^{1+1/e},$$

where  $c$  is disposable after tax and transfer income available for consumption,  $z$  is earnings, and  $e$  is a positive constant parameter.  $u$  is increasing in  $c$  and decreasing in  $z$  as earnings requires labor supply. With a nonlinear income tax,  $c = z - T(z)$  and each individual chooses  $z$  to maximize  $u(z - T(z), z, n)$ . The first order condition for  $z$  is  $1 - T'(z) = (z/n)^k$ , which can be rewritten as:

$$z = n \cdot (1 - T')^e.$$

Hence  $e$  is the elasticity of reported earnings with respect to the net-of-tax rate  $1 - T'$ . As there are no income effects, this elasticity is both the compensated and uncompensated elasticity. Note that with no marginal tax,  $z = n$  so that ability  $n$  represents undistorted potential earnings. We assume that  $n$  has a distribution  $F(n)$  with density  $f(n)$ . We normalize the total population to one.

We estimate  $f(n)$  based on the actual earnings distribution as follows. We denote by  $H_0(z_0)$  the actual distribution of annual earnings among all individuals in the UK of working age. This distribution is obtained from merging the Family Resources Survey data (for those with earnings below 60,000 Pounds) and the individual income tax returns (from the Survey of Personal Incomes for those with earnings above 60,000). We assume that the distribution of earnings above 300,000 follows a Pareto distribution with parameter  $a = 1.6$ . Earnings are defined as the sum of wages (inclusive of employee and employer payroll taxes) and self employment earnings. For each individual, we estimate the corresponding marginal tax rate using the TAXBEN microsimulation model, where we include in the marginal tax computation the individual income tax, the payroll taxes (both employee and employer), the main transfers for low income earners (including housing benefit, council tax benefit, income support and in-work tax credits), and a flat value added tax (equal to 17.2%, this is computed as the ratio of VAT collected divided by total consumption from National Accounts).

We then estimate potential earnings  $n$  for an individual with earnings  $z$  and facing an actual marginal tax rate  $T'$  as  $n = z / (1 - T')^e$  (using the equation above). This allows us to obtain a distribution of potential earnings  $n$ . We smooth the distribution of potential earnings  $f(n)$  to obtain a smooth schedule of optimal tax rates.

We assume that the government maximizes:



$$\int \frac{u^{1-\gamma}}{1-\gamma} \cdot f(n)dn,$$

subject to the budget constraint

$$\int T(z)f(n)dn \geq E,$$

where  $E$  is government spending (excluding redistributive transfers).  $\gamma$  measures the strength of the redistributive tastes of the government. In the simulations, we assume that  $E$  is equal to average tax revenue net of transfers. Specifically, the revenue requirement is calculated by adding together total household income tax receipts, total (employees', employers', and self-employed persons') national insurance contributions, and consumption tax revenue. Consumption tax revenue is calculated by aggregating all product taxes from National Accounts and scaling by the proportion of non-pensioners in the total population. From this we deduct, contributory and non-contributory Job Seekers Allowance Expenditure, income tax credits and reliefs, and child benefit. We also deduct the amount of housing benefit, council tax benefit and income support that are received by the working age population using expenditure figures from the Department of Work and Pensions. We then divide by the total working age population to calculate the revenue requirement  $E$ . Hence our optimal tax system keeps government spending (outside of direct redistribution) constant.

In our simple model, the optimal Mirrlees formula takes the following form:

$$\frac{T'}{1-T'} = \frac{1}{e} \cdot \frac{1}{n \cdot f(n)} \cdot \int_n^\infty \left(1 - \frac{u(m)^{-\gamma}}{\lambda}\right) f(m)dm,$$

where  $\lambda$  is the multiplier of the budget constraint. The transversality condition implies that:

$$\lambda = \int_0^\infty u(n)^{-\gamma} f(n)dn.$$

We select a (log) grid for  $n$ , from  $\underline{n} = 1$  to  $\bar{n} = 10^6$  with 2000 elements:  $(n_k)_k$ . Integration along the  $n$  variable is carried out using the trapezoidal approximation in Matlab.

We start with given  $T'$  vector, derive all the vector variables  $z$ ,  $u$ ,  $T$ ,  $\lambda$ , etc. which satisfy the government budget constraint and the transversality conditions.<sup>36</sup> We then use the first

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<sup>36</sup>We adjust the constants for  $T(0)$  until all those constraints are satisfied. This is done using a secondary iterative procedure.

order condition (??) to compute a new vector  $T'$ . We then repeat the algorithm.

This procedure converges to a fixed point in most circumstances. The fixed point satisfies all the constraints and the first order conditions. We check that the resulting  $z$  is non-decreasing so that the fixed point is implementable. So the fixed point is expected to be the optimum.

In the paper, we present simulations for two cases:  $e = 0.25$  and  $e = 0.5$ . We choose  $\gamma = 1$ . We assume that there is an atom of non-workers (fixed by assumption of the intensive margin model) and equal to xx% of the population.

The overall MTRs we obtain should replace all VAT, individual income tax, transfers, and payroll taxes. We plot on the graphs the difference between the optimum and the actual schedules.

To facilitate discussion of reform, we compute an income tax/transfer schedule that would be optimum if the UK kept in place (1) the current VAT, (2) the current VAT and the current payroll tax. This is done by assuming that  $(1 - MTR_{income}) \cdot (1 - \tau_{VAT}) = (1 - MTR_{total})$ .

#### • Family Allowance Administrative Details

##### **Basic plan: withholding through PAYE.**

The aim of the Family Allowance is to create a transfer programme for low-income families that provides more transparency and certainty than child and working tax credits, as well as lowering marginal deduction rates at low levels of earnings. Achieving the first of these overwhelming suggests that the tapering of the Family Allowance away from better-off families (hereafter known as “withholding”) should occur, wherever possible, through PAYE. Unlike tax credits in the UK’s recent history which have been administered through PAYE (Working Families’ Tax Credit and Working Tax Credit until April 2006), this would not involve employers paying out positive entitlements to tax credits - all allowance families would have their family’s full entitlements to Family Allowance paid directly to them - but instead deducting from earnings the Family Allowance that is withheld as earnings rise. Accordingly, and to keep administration simple, the Family Allowance will not be an annual system but instead will be operated on a non-cumulative basis, with a periodicity equal to the frequency of pay. This weekly or monthly system will also allow families to obtain support directly at the time

they need it most: in other words, the payments will reflect current earnings, rather than past earnings (as is the case under EITC or to some extent under the child and working tax credits).

Implementing this arrangement requires employers to know how much to withhold from allowance families. For single adults with or without children, the design of the new income tax personal allowances means that employers would need to withhold earnings at the Family Allowance withholding rate until earnings reach the point at which income tax is due, at which point the employer would stop withholding Family Allowance, and start deducting income tax. In other words, to operate this system, an employer would need to know whether the employee was in an allowance family, and the level of his or her personal allowance (in a worse case scenario where FA withholding became de-coupled from income tax for some reason, the employer would need to know over what earnings range to withhold the FA, and the level of the employee's personal allowance). If a person has multiple jobs, earnings in all jobs other than the first are taxed as if there is no personal allowance, and people in allowance families would be subject to the Family Allowance withholding with no disregard. On each job, withholding stops when a sum corresponding to the total family allowance has been withheld (still haven't worked this out for 2nd jobs).

To operate the current PAYE system in the UK, employers need to know a tax code for all of their employees. Employers initially learn this from a new employee's P45, and HMRC then tell employers about changes in tax codes after that date. Under our proposed system, slightly more information would need to be transmitted at each stage, but the mechanisms for interacting would remain the same (and we further assume that the vast majority of these interactions between employers and HMRC would in the near future be done electronically).

### **Couples.**

For couples (with or without children), the operation becomes slightly more complicated. The principle is that earnings of each adult above £5,000 lead to withholding of the Family Allowance; the drawback is that neither an individual employer nor the Revenue authority will know the level of earnings of both adults in a couple in real-time.

For single-earner couples, or two-earner couples where one adult earns less than £5,000 a year (£100/wk), the couple will want to allocate the transferable (child or adult) tax allowance(s) to the main earner, and the government will want to withhold the Family Allowance

from the same person. The government would need to rely on such couples nominating who was the main earner.

For couples where both earn at least £5,000 a year (£100/wk), the government will need to decide what is the maximum Family Allowance that can be withheld from each adult, so that employers can be told how much earnings to withhold. For example, the government could decide that only the higher earner in a family be subject to Family Allowance withholding, or that the two adults share the withholding equally, or that each adult be subject to the full withholding of the Family Allowance. All options will involve under- or over-withholding in certain circumstances, and so it is inevitable that some periodic reconciliation of Family Allowance withholding will be needed for two-earner couples (for example, the first proposal would under-withhold from families where the higher-paid adult does not earn enough for all of the Family Allowance to be withheld from his earnings; the second proposal would under-withhold from families where the lower-paid adult does not earn enough for half of the Family Allowance to be withheld from her earnings, and the third proposal would over-withhold from some families).

The simplest of these to operate would be the last: the government could instruct employers to withhold up to the full value of the Family Allowance from both adults in a two-earner couple. Although this is likely to lead to over-withholding, this will only affect relatively well-off Allowance families, who could be refunded when the Government learns about the over-withholding, or who could opt out of the scheme entirely (it would be fairly simple for the Government to advise families on when they were likely to be subject to over-withholding based on the earnings of each adult and the number of children in the family). But the drawback of this scheme is that, because the extra tax allowances for children can't be duplicated, this proposal would involve high MDRs in the short-run for adults in families facing over-withholding.

#### **Other forms of income.**

Other forms of income such as asset income or self-employment income should also count in the phase-out of the Family Allowance. Those sources of income are reconciled when a tax return is filed. In that case, the phase-out of the Family Allowance would be charged as an extra income tax at the time of tax filing on an annualized basis. This is the only link between

the income tax and Family Allowance. Only those with self-employment or asset income who already file tax returns would be affected.

### **Under-payments and over-payments.**

Under this design of a Family Allowance, there is little concept of under-payments or over-payments of the sort which bedevilled the child and working tax credit (see Brewer 2006). If there is excess withholding (over and above the family allowance), the government could refund the excess as soon as it learns about this from employers. Of course, families who consider that they are facing excess withholding are able to opt-out of the Family Allowance programme at any time if their earnings are above the break-even point at which net entitlement to Family Allowance is zero. If there is insufficient withholding (perhaps through a mistake by the employer, or as may arise through one of the suggested ways of implementing the Family Allowance withholding for couples), then the government could recover the excess Family Allowance by reducing the Family Allowance payments for a period of time. But a strong principle must be to reduce to an absolute minimum the occasions when wage-earning families have to send Family Allowance payments back to the government, as this puts considerable hardship on low-income and credit-constrained families.

### **Compliance/enforcement issues.**

Like any transfer programme assessed against income, there are incentives to hide income streams from the revenue authorities. One virtue of the new system is that it exempts very low incomes from Family Allowance withholding, so the incentives to keep low-paid (below £100/wk) labour in the informal sector is much reduced, compared with the current tax and transfer system, especially for second earners. Individuals earning more than £100/wk would have an incentive to avoid the Family Allowance withholding, but it is harder for higher-wage individuals to evade withholding without outright collusion with the employer.

Compared with a cumulative system of in-work support, the Family Allowance creates some incentives for seasonal work or manipulating the timing of earnings (for example, individuals subject to Family Allowance withholding would be better off receiving their earnings over as many weeks as possible so as to make maximum use from the weekly £100 Family Allowance earnings disregard).

Like many transfer programmes assessed against the combined income of a couple, there

would be an incentive for some couples (with or without children) to claim to the revenue authorities that they were in fact living apart because a couple is entitled to less Family Allowance than if the two adults were living apart (because the additional allowance for the extra adult is only £1,000, compared to £3,000 for the first adult). But, because each adult in a couple has their own disregard against FA withholding, this feature - the so-called couple penalty - would be less than under the current tax credit system in the UK.

### **Take-up.**

The desire to raise take-up (programme participation rates) of in-work support was cited by the government of the time as one reason to replace WFTC with the child and working tax credits. One way this was achieved was by extending entitlement to child tax credit to all but the richest 10% of families with children, increasing the likelihood that families would expect to be entitled, and minimising the degree to which the programme was perceived as something for the poor. Around half of families with children would be entitled to the Family Allowance, compared to around 85% entitled to CTC now. But the fact that its operation is very closely linked to the operation of the new income tax personal allowances for children means that a government could introduce a single method of claiming both programmes. Both the new income tax personal allowances for children and the Family Allowance rely on parents informing the revenue authorities that they have children, and the revenue authorities passing information on to employers (to deduct less income tax and/or withhold earnings against the Family Allowance). All families with children, then, would be entitled to at least one of the child-related income tax allowances or the Family Allowance.

As we noted above, the mechanism for withholding earnings might mean that some couples with children face over-withholding, and this fear may deter some families from claiming the Family Allowance. However, the families affected in this way would be relatively well-off Allowance families.

Finally, if the government, using earnings and tax records, assesses that a family is not registered for the Family Allowance but has earnings low enough to qualify, the government could send a notice to the family to encourage registration.

### **The link between Family Allowance and out-of-work welfare benefits.**

As set out here so far, the Family Allowance programme broadly delivers to non-working

individuals income which they currently would receive from current income support and JSA programmes. These existing programmes have requirements to engage in job-search or work-related activities as a condition of receipt. It would be relatively straight-forward to introduce such requirements into the Family Allowance: claimants could be asked to say whether they are not working, and in these cases receipt of Family Allowance could become subject to whatever work-related or job-search activities are deemed necessary given the individual's circumstances (and it is beyond the scope of this project to consider what these should be), or in employment, in which case they would be expected to provide details of their employer or self-employment income, so that withholding could take place. Alternatively, a residual (and much less generous) set of out-of-work benefits could remain alongside (ie on top of) the Family Allowance (the Family Allowance is not intended as a direct replacement for benefits and programmes for individuals who are long-term sick, disabled or carers).

## References

- Adam, S. and Brewer, M. (2004), *Supporting families: The financial costs and benefits of children since 1975*, The Policy Press: Bristol.
- Adam, S. and Brewer, M. (2006), *The poverty trade-off: work incentives and income redistribution in Britain*, The Policy Press: Bristol.
- Adam, S., Brewer, M., Browne, J. and Phillips, D. (2007), “[Comparing Support for Children in Northern Ireland to the Rest of the UK.]”, forthcoming, NICCY: Belfast.
- Adam, S. and Reed, H. (2004), Options for Raising Revenue, in R. Chote, C. Emmerson and Oldfield, Z. (eds), *The IFS Green Budget 2004*, London: IFS.
- Atkinson, Anthony 2007. “Top Incomes in the United Kingdom over the Twentieth Century.” Forthcoming in Atkinson, Anthony and Thomas Piketty, eds., *Top Incomes from a Historical and International Perspective*. Oxford: Oxford University Press.
- Anderberg, D., Kondylis, F. and Walker, I. (2006), “Partnership Penalties and Bonuses Created by Two Major UK Benefit Programs”, mimeo.
- Anderberg, D. (2006), “Tax Credits, Income Support and Partnership Decisions”, mimeo.
- Atkinson, Anthony and Andrew Leigh 2004, “Understanding the Distribution of Top Incomes in Anglo-Saxon Countries over the Twentieth Century”, Working Paper.
- Blow, Laura and Ian Preston, 2002. “Deadweight Loss and Taxation of Earned Income: Evidence from Tax Records of the UK Self-Employed”, IFS Working Paper No. 02/15.
- Blundell, R., 2001. *Welfare to Work: Which Policies Work and Why?*, Keynes Lecture in Economics.
- Blundell, R., Brewer, M., Haan P. and A. Shephard (2006) “Optimal Income Taxation of Lone Mothers: an Empirical Comparison for Germany and the UK”, mimeo.
- Blundell, R., Brewer, M. and Shephard, A. (2005), “Evaluating the labour market impact of Working Families’ Tax Credit using difference-in-differences” , HM Customs and Revenue, Working Paper 4 (available online from <http://www.hmrc.gov.uk/research/>).
- Blundell, R., Hoynes, H., 2001. “Has In-Work Benefit Reform Helped the Labour Market?” in R. Blundell, D. Card and R. Freeman (eds.), *Seeking a Premier League Economy: The*



*Economic Effects of British Economic Reforms, 1080-2000*, Chicago: University of Chicago Press.

Blundell, R., MaCurdy, T., 1999. Labor Supply: A Review of Alternative Approaches. In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labor Economics*, Volume 3A, North-Holland, Amsterdam.

Boskin, Michael and Eytan Sheshinski (1983). "Optimal Tax Treatment of the Family: Married Couples." *Journal of Public Economics* 20, 281-297.

Brewer, M., (2006), Tax Credits Fixed or Beyond Repair in R. Chote, C. Emmerson, R. Harrison and D. Miles (eds), *The IFS Green Budget 2006*, London: IFS.

Brewer, M. (2007). "Supporting Couples with Children Through the Tax System" in R. Chote, C. Emmerson, A. Leicester and D. Miles (eds) *The IFS Green Budget 2007*, London: IFS.

Brewer, M., Browne, J., 2006. "The effect of Working Families' Tax Credit on Labour Force Participation", IFS briefing note 69 (available online from [www.ifs.org.uk](http://www.ifs.org.uk)).

Brewer, M., Duncan, A., Shephard, A., Suarez, M.J., 2006 "Did working families' tax credit work? The final evaluation of the impact of in-work support on parents' labour supply and take-up behaviour". *Labour Economics*, December 2006.

Brewer, Michael and Shaw, Jonathan (2006), "How Many Lone Parents are Receiving Tax Credits?", Institute for Fiscal Studies Briefing Note 70.

Brewer, Michael and Smith, S. (2007), "The fertility effect of the working families tax credit", unpublished mimeo.

Chetty, Raj (2006) "A New Method of Estimating Risk Aversion" *American Economic Review* 96(5), 1821-1834.

Chiappori, Pierre-André. "Rational Household Labor Supply." *Econometrica*, 56(1):63-90, 1988.

Chiappori, Pierre-André. "Collective Labor Supply and Welfare". *Journal of Political Economy*, 100(3):437-467, 1992.

Civitas (2002), *The Lone Parent Trap*, London: Civitas.

Diamond, Peter (1980) "Income Taxation with Fixed Hours of Work," *Journal of Public Economics*, 13, 101-110.

Diamond, Peter (1998). "Optimal Income Taxation: An Example with a U-Shaped Pattern of Optimal Marginal Tax Rates." *American Economic Review* 88, 83-95.

Dilnot, Andrew, and Michael Kell (1988). "Top-Rate Tax Cuts and Incentives: Some Empirical Evidence." *Fiscal Studies* 9, 70-92.

Duflo, Esther. "Grandmothers and Granddaughters: Old Age Pension and Intra-Household Allocation in South Africa." *World Bank Economic Review*, 17(1):1-25, 2003.

Feldstein, Martin, 1995. The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act. *Journal of Political Economy*, 103(3), 551-572.

Feldstein, Martin, 1999. Tax Avoidance and the Deadweight Loss of the Income Tax. *Review of Economics and Statistics*, 81, 674-680.

Francesconi, M. and Van der Klaauw, W. (2004), 'The consequences of "in-work" benefit reform in Britain: new evidence from panel data', Institute for Social and Economic Research, Working Paper 2004-13.

Gentry, William R. and Glenn Hubbard (2004) "Success Taxes, Entrepreneurial Entry, and Innovation", NBER Working Paper No. 10551.

Gregg, P. and Harkness, S. (2003), 'Welfare reform and lone parents employment in the UK', Centre for Market and Public Organisation, Working Paper 03/072.

Gruber, Jon, and Saez, Emmanuel, 2002. The Elasticity of Taxable Income: Evidence and Implications, *Journal of Public Economics*, 84, 1-32.

HMRC (2007), "Child Tax Credit and Working Tax Credit Take-up rates 2004-05" (available online from <http://www.hmrc.gov.uk/stats/personal-tax-credits/takeup-rates2004-05>)

Hotz, V.J., Scholz, J.K., 2003. "The earned income tax credit". In: Moffitt, R. (Ed.), *Means-Tested Transfer Programs in the U.S.* University of Chicago Press.

Hoynes, H. (1997) "Work, welfare and family structure" in Auerbach, A. (ed) *Fiscal policy: Lessons from economic research*.

Immervoll, Herwig, Henrik Kleven, Claus Kreiner, and Emmanuel Saez, 2007. "Welfare

Reform in European Countries: Microsimulation Analysis”, *Economic Journal*, 1-44.

Kirby, J. (2005), *The Price of Parenthood*, London: Centre for Policy Studies.

Kleven, Henrik, Claus Kreiner, and Emmanuel Saez, 2006. “The Optimal Taxation of Couples”, NBER Working Paper No. 12685.

Kroft, Kory, 2006. “A Note on Intra-household Allocation and Optimal Income Transfers”, UC Berkeley unpublished Working Paper.

Lundberg, Shelly J., Robert A. Pollak, and Terence J. Wales (1997). “Do Husbands and Wives Pool Their Resources: Evidence from the United Kingdom Child Tax Credit.” *Journal of Human Resources*, 32(3), 463–480.

Meyer, B., Rosenbaum, D., 2001. Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers. *Quarterly Journal of Economics*, 116, 1063-1114.

Mirrlees, J., 1971. An Exploration in the Theory of Optimal Income Taxation. *Review of Economic studies*, 38, 175-208.

Mirrlees, James A. (1982) “Migration and Optimal Income Taxes.”, *Journal of Public Economics*, 18(3), 319-41.

OECD (2006). *Revenue Statistics: 1965-2005*, OECD: Paris.

Mulheirn, I. and Pisani, M. (2006) "Estimating the Labour Supply Effect of the Working Tax Credit for Childless Households in the UK" (available online from <http://www.hha.dk/nat/cmsdocs/ccp/lower>)

Piketty, Thomas and Emmanuel Saez (2007). “How Progressive is the U.S. Federal Tax System? A Historical and International Perspective.” *Journal of Economic Perspectives* 21(1), 3-24.

Saez, Emmanuel (2001). “Using Elasticities to Derive Optimal Income Tax Rates.” *Review of Economic Studies* 68, 205-229.

Saez, Emmanuel, (2002a). “Optimal Income Transfer Programs: Intensive Versus Extensive Labor Supply Responses.” *Quarterly Journal of Economics*, 117.

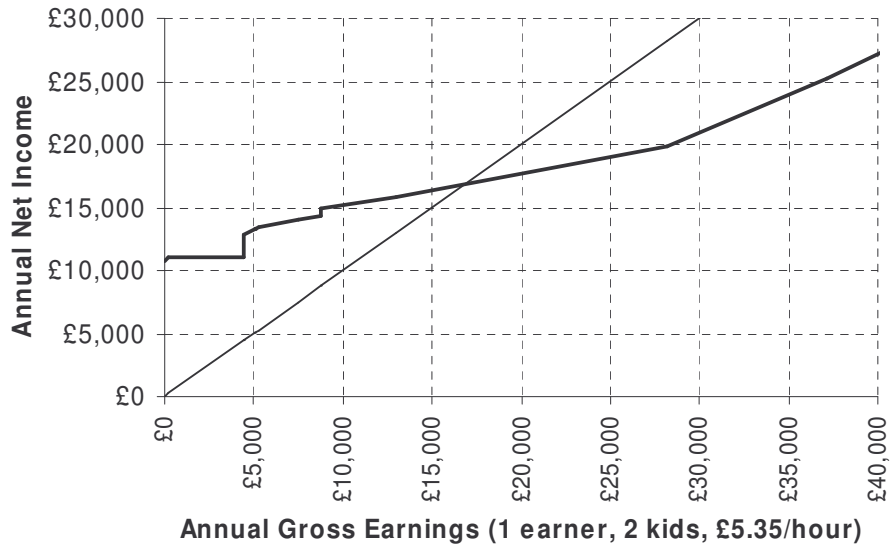
Saez, Emmanuel, (2002b). “Do Taxpayers Bunch at Kink Points?” UC Berkeley Working Paper.

Saez, Emmanuel (2004). “Reported Incomes and Marginal Tax Rates, 1960-2000: Evidence and Policy Implications.” in Ed. James Poterba, *Tax Policy and the Economy*, 18.

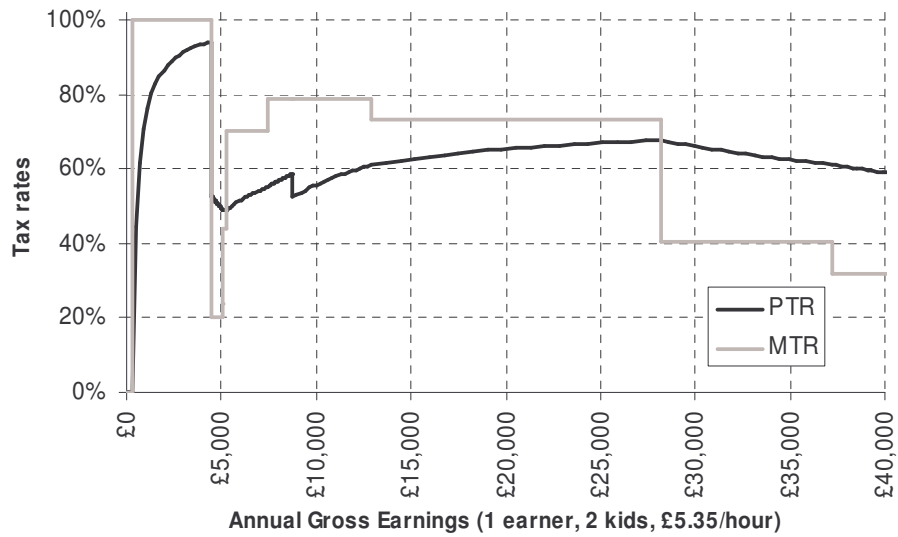
Simula, Laurent and Alain Trannoy (2006). “Optimal Non-Linear Income Tax when Agents Vote with their Feet”, EHESS Working Paper.

Walker, R. and Wiseman, M. (1997), *Fiscal Studies*.

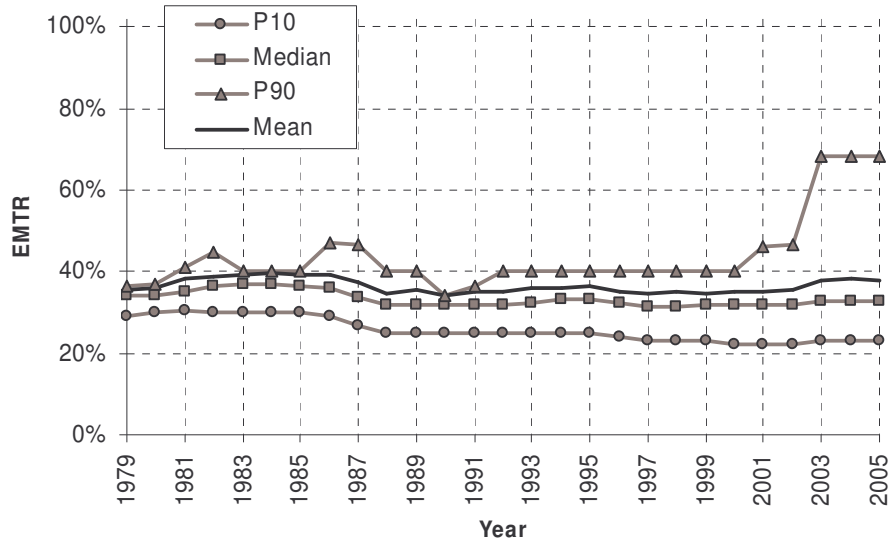
**Figure 1A: Budget Constraint**



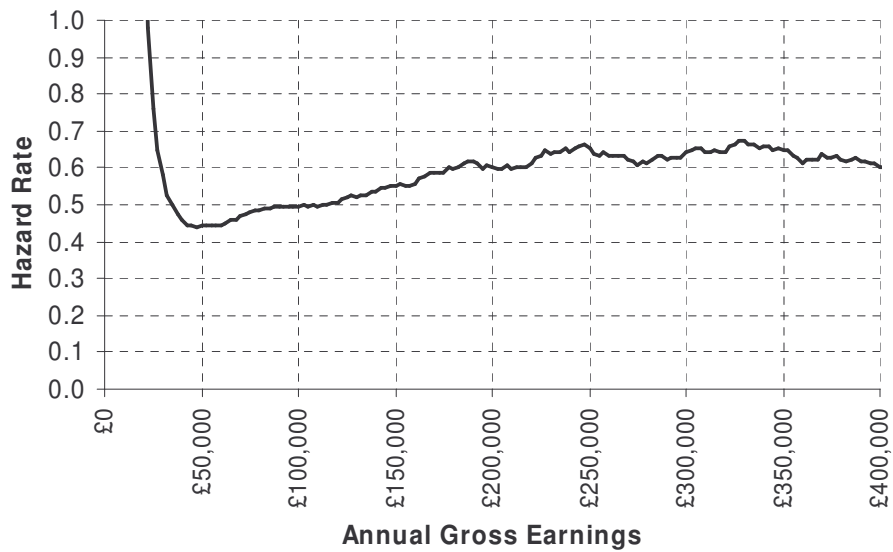
**Figure 1B. Participation tax rate and marginal tax rate**



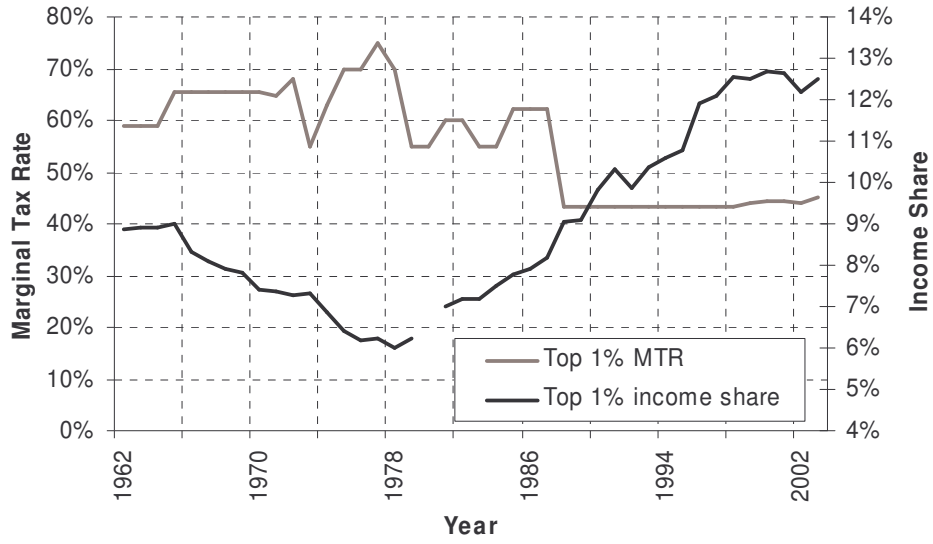
**Figure 2. The changing distribution of EMTRs**



**Figure 3: Hazard rate in the UK, 2003/04**



**Figure 4A. Top 1% Income and MTR, 1962-2003**



**Figure 4B. Top 5-1% Income and MTR, 1962-2003**

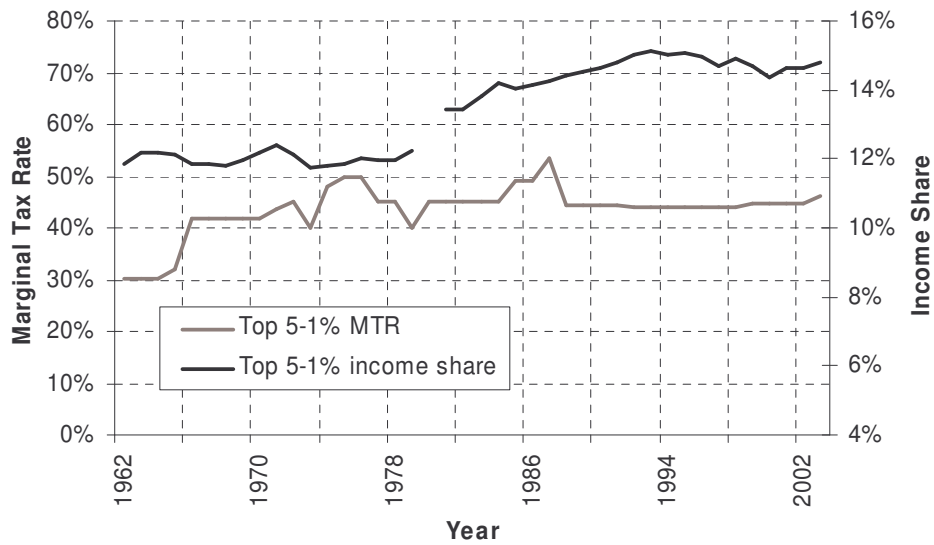


Figure 5: Optimal tax schedule

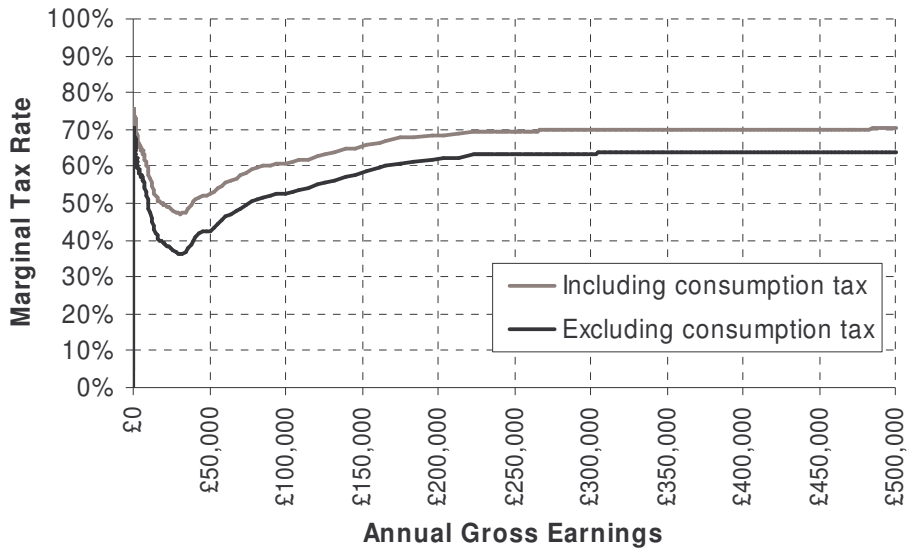
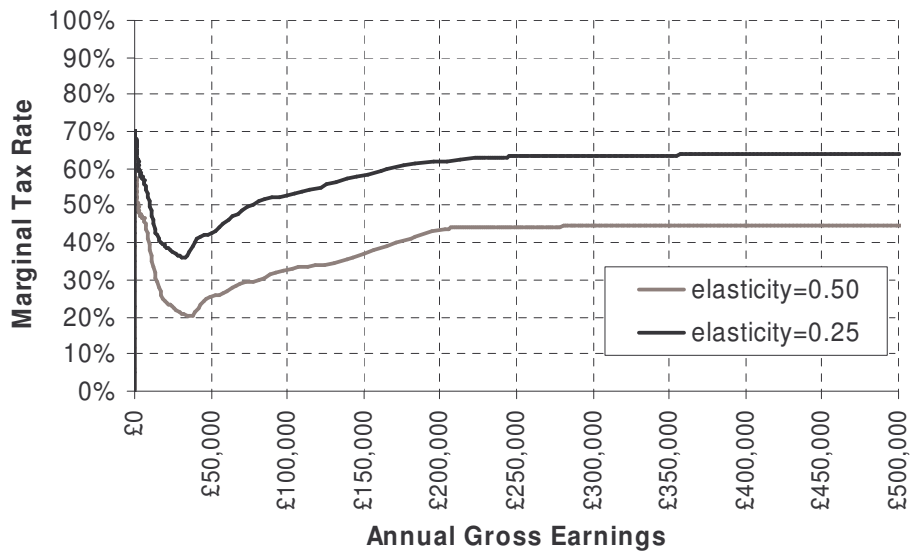


Figure 6A: Optimal tax sensitivity: labor elasticity





**Figure 6B: Optimal tax sensitivity: redistribution preference**

