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# Means-testing and tax rates on earnings\*

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# 1 Summary and key findings

The setting of income tax rates and the generosity and structure of income support programmes generate substantial controversy among policy-makers and economists. At the centre is a trade-off between the goals of equity and efficiency: governments want to transfer resources from the rich to the poor; on the other hand, such transfers reduce people's incentive to work.

The key insight from the standard "optimal income tax model" developed by James Mirrlees is that marginal rates of tax and benefit withdrawal should be higher when people's choices of how much to work are relatively unresponsive to them and when the government is relatively keen to redistribute resources from rich to poor. Furthermore, the government should apply high marginal rates at points in the earnings distribution where there are few taxpayers relative to the number of taxpayers who have earnings exceeding this amount. Using data on the UK earnings distribution, we show that the optimal structure of marginal rates in this simplified model has a U-shaped pattern, with high marginal rates imposed on high and low earners and lower marginal rates on those in the middle. We show how this structure changes as both the assumed responsiveness of hours of work and the government's assumed preferences for redistribution vary.

The way that incomes have responded to the large changes in top marginal tax rates over the past 40 years suggests that if the richest 1% see a 1% fall in the proportion of each additional pound of earnings that is left after tax, then the income they report will rise by less than half that - only 0.46%. Although a tentative estimate, this suggests that the government would maximise the revenue it collects by imposing an overall marginal rate on the highest earners of 56.6%, very close to the 53.0% currently charged in the UK (including income tax, national insurance contributions and indirect taxes). So there does not seem a powerful case for increasing the income tax rate on the very highest earners, even on redistributive grounds - it would not generate much if any extra revenue to transfer to the less well off.

When the optimal tax model is enriched by allowing individuals to respond to taxes and benefits by deciding whether or not to work, as well as how hard, then the optimal structure of marginal rates changes dramatically. In particular, when the decision whether to work becomes relatively more important to the decision about how much to work, then marginal rates and the proportion of gross income taken in tax and withdrawn benefits when people

enter work should be set low (and perhaps even negative) for potential low earners rather than set high as the standard model suggests. We also discuss how the design of taxes and benefits affecting an individual should be affected by the presence of a co-resident partner or dependent children, although it is difficult to reach definitive conclusions. We argue that the practical operation of benefits and tax credits for low-income families is important and that they would be of greatest help to beneficiaries if they were assessed over short periods and paid promptly without retrospective adjustment.

These insights from optimal tax theory are contrasted with the work incentives inherent in the current UK tax and benefit system. Four key deficiencies are identified:

1. The amount of gross income taken in tax and withdrawn benefits when people enter work at low earnings is too high: for most groups it is close to 100% before individuals are entitled to the working tax credit, and they remain high even with it.
2. The marginal rate of 73.4% that many low to moderate earners face when having tax credits withdrawn is likely to be above the optimum rate even if people's decision to work a little harder is relatively unresponsive.
3. Housing Benefit, the main means-tested programme through which the government helps people on relatively low incomes with their housing costs has an extremely high withdrawal rate. This exacerbates the problem of undesirably high marginal rates. It is also hard to administer and is not claimed by many working families entitled to it.
4. While the system for administering income tax and national insurance contributions in the UK is simple and efficient, tax credits, housing benefit and council tax benefit are all burdensome to claim, relatively expensive for the government to administer, and prone to significant fraud and error.

Given this diagnosis, we suggest a set of changes to the existing tax and benefit structure that could be made immediately based on the lessons from our analysis. Our package of "immediate reforms" involves:

- Increasing the amount people can earn before they have means-tested benefits withdrawn. This would increase the financial gain to entering work at low earnings;

- Increasing the amount that second earners can earn before a family's tax credits are withdrawn. This would improve the financial incentive for a second earner to enter work, especially if they have children;
- Reducing the rate at which child and working tax credits are withdrawn with every extra pound earned;
- Targeting increases in working tax credit on groups other than lone parents.

This would cost around £9 billion per year. If it had to be financed from within the income tax and benefit system, the money could be raised by cutting child benefit and/or increasing the basic rate of income tax. Neither would undo the objectives of the reform package to improve work incentives, although both would pose big political challenges.

We also suggest a more radical and comprehensive plan for reforming the UK household tax and benefit system that attempts to deal not only with these work incentive issues, but also the administrative failings that we identify. Our plan replaces the existing piece-meal benefits for low-income families (income support, working and child tax credits, housing benefit and council tax benefit) with a single Integrated Family Support (IFS) programme which provides stronger and simpler incentives for work at the bottom, reduces compliance costs for families, and is means-tested by employers' withholding from earnings in the same way as National Insurance contributions. We show how, after including an assessment of the behavioural responses, the IFS manages to redistribute more income with minimal impact on total earnings and total net tax revenue, by targeting net tax cuts where incentives to work are currently at their weakest.

## 2 Introduction

The setting of income tax rates, and the generosity and structure of income support (or transfer) programmes generate substantial controversy among policy-makers and economists. At the centre is an equity-efficiency trade-off. On the one hand, governments value redistribution, and so want to transfer resources from the rich to the poor, usually by taxing the incomes of the rich and subsidising the incomes of the poor. On the other hand, this redistribution is generally costly in terms of economic efficiency because of the disincentive effects of taxes and transfers (we explain this in more detail in section 3). The costs arise for two reasons : first,

raising income taxes may weaken the labour supply and entrepreneurship incentives of middle and high income individuals who face the taxes. Second, income transfer programmes may weaken the labour supply incentives of their recipients. These two responses can substantially raise the cost of improving the living standards of low income families.

The goal of this chapter is to provide an overview of the way economists think about the design of taxes and benefits affecting households, and to apply the lessons from this literature to the design of the UK tax and benefit system.

In economics research, the problem of designing taxes and benefits is tackled in two steps. The first step is a positive analysis, where economists develop models of individual behaviour to understand how individuals' work decisions respond to taxes and benefits. The central part of the positive analysis is the empirical estimation of models of individual behaviour, and there is a very broad literature that tries to estimate the size of the behavioral responses to taxes and benefits.<sup>1</sup>

The second step is the normative analysis, or optimal policy analysis. Using models developed in the positive analysis, the normative analysis investigates what structure and size of the tax and benefit system would best meet a given set of policy goals; following Mirrlees (1971), economists call this line of research "optimal tax theory". Despite its name, optimal tax theory concerns itself just as much with the design of benefits as it does the setting of income tax rates: one of the key concepts of optimal tax theory is that of a net tax function, whereby people with high incomes pay some of that income in positive taxes to the government, and people with a low income receive money from the government (by paying negative taxes); no conceptual distinction is made between net recipients from and net contributors to the state's finances.<sup>2</sup>

At its heart, optimal tax theory says that the two desirable features of a tax and benefit system are that it be fair, and that it minimise disincentive effects.<sup>3</sup> But the problem of having two desirable features is that one has to know how much weight to give to each. For example, a poll tax (under which all individuals have to pay the same level of tax) might have

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<sup>1</sup>The way that these models are estimated, and the key insights, are summarised in Meghir and Phillips, this volume.

<sup>2</sup>One difference between the tax system and the transfer system is that the former is usually cheaper to administer, and these distinctions can be reflected in more complicated optimal tax models.

<sup>3</sup>More complicated models can allow for other desirable features: one might be that a tax and transfer system is cheap to administer; Shaw et al, this volume, consider how this alters optimal tax models.

no disincentive effects, but is rather unfair to those on low incomes. As Heady (1993, p17) says, “the approach of the optimal tax literature is to use economic analysis to combine these criteria into one”. It does this by saying that the objective of the government when designing the tax and benefit system should be to maximise social welfare (subject to a need to raise a certain amount of revenue). Precisely how social welfare is expressed is not relevant at this stage, but the idea is that it reflects in a single index (or number) the desire both to have the economy as large as possible (because this directly increases people’s well-being) but also to have the income distributed as equally as possible. The expression for social welfare precisely quantifies the trade-off between these two desiderata: returning to the previous example of an economy with only a poll-tax, replacing that with an income tax which raised the same amount of money would give a more equal distribution of income, but - if there any disincentive effects to taxation - a smaller economy.

The normative analysis is crucial for policy-making because it shows how taxes and benefits should be designed in order to best attain the goals of the policy-maker. In particular, the normative analysis allows one to assess separately how changes in the redistributive criterion of the government, and changes in the size of the behavioural responses to taxes and transfers, affect the optimal tax and benefit programme. Conversely, the normative analysis makes it explicit that one cannot hope to say how best to design taxes and transfers without both knowing how individuals will respond, and without specifying what one is trying to achieve overall. Often, these two elements are confused in policy debates: right-of-centre policy-makers rarely state explicitly that they have little taste for redistribution, but instead justify their lack of taste for redistribution because they believe that the adverse behavioural responses to high taxes or generous benefits are large. Conversely, left-of-centre policy-makers emphasize the redistributive virtues of benefits and assume that adverse behavioural responses to these and the high tax rates needed to fund them are negligible.

We provide this overview as follows: section 3 introduces the standard optimal tax model developed in Mirrlees (1971). This shows directly how the the optimal tax and benefit system is determined by both the social welfare criterion used by the government and the size of behavioural responses to taxation. Despite the simplifications inherent in the model, we can use it to analyse the optimal tax rate that should apply to top incomes, where we present new, albeit tentative, evidence on the response of top incomes to the large changes in top marginal

tax rates that have taken place in the UK over the last 40 years. Section 4 extends the optimal tax model to allow for labour supply participation effects, and shows that allowing for such responses can drastically change the optimal tax system affecting low income individuals: instead of traditional welfare programmes with high withdrawal rates, large in-work benefits such as Working Tax Credit in the UK or the Earned Income Tax Credit from the US, which can have very low or negative withdrawal rates, can be optimal.<sup>4</sup> We also discuss the issue of migration and tax design, which can be dealt with in optimal tax models in a similar manner to the issue of labour market participation. Throughout Sections 3 and 4, we make use of the summary of the literature on the behavioural response to taxation provided in Meghir and Phillips, this volume.

In Section 5, we analyze a set of additional issues relevant to the design of the tax and benefit system affecting households. First, we discuss how the family should be taxed: the models considered in sections 3 and 4 abstract from family issues, but a majority of adults in reality live in couples, and so can be assumed to pool income to some extent. We also discuss how the presence of children should be reflected in the optimal tax design. Lastly, we discuss administrative and operational issues concerning benefits.<sup>5</sup> Section 6 describes how the main elements of the current UK personal tax and benefit system affect incentives to work and earn more and, in Section 7, we provide a critique of the UK tax and benefit system, and set out the direction of reform suggested by the insights from optimal tax theory, and the latest evidence on the behavioural response to taxation. To crystallise ideas, we propose specific changes that could be implemented in the short-run. But most optimal tax theory uses simplified models which leave aside a number of important practical issues such as administrative burden for the government and employers, and ease of use for families.<sup>6</sup> Those issues have always been important in practice, and the recent “behavioral economics” literature is starting to incorporate them in the analysis. Therefore, we go further and propose a longer-term reform that builds on the short-run changes to incentives by addressing the main practical issues with the current benefits in the UK. Our plan replaces the piece-meal benefits for low-income families (income support, working and child tax credits, housing benefit and

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<sup>4</sup>To anticipate our discussion in section 5, the WTC can lead to negative PTRs, but not negative METRs, whereas the EITC can lead to negative METRs as well.

<sup>5</sup>Shaw et al, this volume, discusses administrative and operational issues affecting tax design.

<sup>6</sup>A number of those issues are discussed in more detail in the chapter by Shaw et al, this volume.

council tax benefit) into a single *Integrated Family Support* programme which provides stronger and simpler incentives for work at the bottom, reduces compliance costs for families, and is provided “as-you-earn” and administered in the same way as social contributions through the PAYE withholding system. We show how this can be done in a revenue-neutral fashion, and estimate the behavioural responses to such a reform.

### **3 The standard optimal income tax model with intensive responses**

This section presents the standard model of optimal income tax, based on Mirrlees (1971), in which individuals respond to the tax and benefit system by choosing only how much to work. We then give two applications of the model to the UK:

- first, we can derive an expression for the optimal top marginal tax rate (ie, the marginal tax rate facing the highest income individuals), and we go on to calculate this using new, albeit tentative, evidence on the responsiveness of top incomes in the UK to changes in top marginal tax rates over the last 40 years.
- second, we simulate the entire optimal tax system for the UK given some various highly simplifying assumptions in order to show how the optimal tax system is determined by both the social welfare criterion used by the government, and the size of behavioural responses to taxation.

Before that, though, section 3.1 sets out some of the key terms which will occur throughout this chapter.

#### **3.1 Key concepts**

##### **3.1.1 The budget constraint, PTRs and METRs**

A useful tool to investigate the disincentive effects of taxes and transfers is the budget constraint.<sup>7</sup> This shows the relationship between gross earnings (or hours of work) and net income after taxes and transfers, and an example is given in Figure 1A (the example is for a lone parent with 2 children, and we discuss this Figure in more detail and look at other family types in section 6).

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<sup>7</sup>This draws on chapter 2 of Adam et al (2006).

The budget constraint contains all the information we need to know about how taxes and transfers affect financial incentives to work, but in this chapter we frequently refer to some summary measures of work incentives:

- the participation tax rate (PTR) is defined as 1 minus the financial gain to work as a proportion of gross earnings. It measures how the tax and benefit system affect the financial gain to work. If someone who did not work had an income from a benefit programme of £60 a week, and would earn £250 in gross earnings, but pay £40 of that in income tax if they were to work, then the PTR is given by  $1 - (210-60)/250$ , or 40%. The higher the number, the more the tax and benefit system reduces the financial gain to work. A PTR in excess of 1 means the individual would be worse off in work than not working; a PTR equal to 1 means that there is no financial reward to work; a PTR of zero means that the financial reward to work is equal to gross earnings; negative PTRs are possible where benefits are conditional on being in work or having positive earnings.
- the marginal effective tax rate (METR) measures how much of a small rise in gross earnings is lost to payments of tax and reduced entitlements to benefits. It is equal to the slope of the budget constraint at any particular point. The higher the number, the more the tax and benefit system reduces the gain to earning a bit more: a METR in excess of 1 means that an individual would be worse off if they earned a bit more; a METR of 1 means that an individual would be unaffected by any small change in earnings; a METR of zero means that the individual is keeping all of any small rise in earnings; and a negative METR means that an individual's net income increases by more than a small change in earnings (this can arise where benefits act as a proportional subsidy on earnings, such as the phase-in portion of the earned income tax credit in the US).
- It is sometimes more useful to consider the net-of-tax rate, or one minus the METR: this measures how much work pays at the margin.

Figure 1B shows how the schedule of PTRs and METRs for the example budget constraint in Figure 1A; we discuss the particular features of this budget constraint in section 6.

### 3.1.2 Labour supply responses to taxation

Economists think about the disincentive effects of the tax and benefit system using a labour supply model.<sup>8</sup> A basic labour supply model assumes that, when deciding whether and how much to work, people trade off the financial reward to working (plus any intrinsic benefits from working) with the loss of leisure time (by "work" we mean "participate in the labour market", rather than doing unpaid work at home or elsewhere).

As we discussed above, taxes and transfers affect labour supply because they alter the financial reward to working, both by making the net wage lower than the gross wage (most taxes, some transfers) and by reducing the financial gain from working compared to not working (most transfers). Economists usually distinguish between two ways that financial considerations affect labour supply:<sup>9</sup>

1. the impact of the METR on labour supply is called the substitution effect, as increasing the METR (thereby reducing the net-of-tax rate) may lead individuals to work less, or to substitute some leisure for work. Economists often measure this effect using the elasticity of earnings with respect to the net-of-tax rate: this measures the percentage increase in earnings following a one percent increase in the net-of-tax rate (see Box 1).
2. In addition, taxes and transfers may also affect labour supply through income effects: higher taxes or cuts in benefits reduce the income available to individuals, and so may induce individuals to work more in order to increase their standard of living. Equally, lower taxes or more generous benefits increase income, and hence may induce individuals to work less. Because the derivation of optimal income tax models is much simpler when there are no income effects (Diamond, 1998 and Saez, 2001), we will assume no income effects in the analysis below, and discuss later informally how the main results change when there are income effects.

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<sup>8</sup>See Meghir and Phillips, this volume, and references therein, for more detail.

<sup>9</sup>Meghir and Phillips, this volume, shows the different impacts graphically.

**Box 1. The elasticity of earnings**

We denote the marginal effective tax rate by  $\tau$  so that the net-of-tax rate is given by  $1 - \tau$ . The elasticity of earnings  $z$  with respect to the net-of-tax rate  $1 - \tau$  is defined as:

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

This elasticity  $e$  is always positive. The higher is  $e$ , the more responsive are earnings to the net-of-tax rate.

To give an example of its use, if  $e$  is 0.2, and the net of tax rate changes from 20% to 25% (ie the METR falls from 80% to 75%), then earnings will rise by  $0.2 * \frac{5\%}{20\%} = 5\%$ . If the net of tax rate changes from 80% to 75% (ie the METR rise from 20% to 25%), then earnings will fall by  $0.2 * \frac{5\%}{80\%} = 1.25\%$

### 3.2 The Mirrlees model

In the Mirrlees model of optimal taxes, the government is trying to design a tax and benefit system that will maximise social welfare and raise a given amount of revenue. Mirrlees (1971) allowed the tax and benefit system to be non-linear, which means that METRs at a particular point of the earnings distribution can be set to any value without altering METRs at other points. The model assumes that people vary in their earnings potential (or what they would earn if there were no taxes or transfers), and that everyone always works, but chooses how much effort to supply ("effort" can be thought of as hours of work, with a given hourly wage for each individual, but there are other interpretations, as we discuss later).

Before discussing how this model can be used to determine the optimal METR at any point in the income distribution, we first show how it can be used to derive the optimal METR for high-income individuals, a simpler task.

- **The optimal top marginal tax rate**

To determine the optimal top METR, we will consider the different ways in which a small increase in the top METR affects social welfare. Some of these effects will be positive, and others negative, but at the optimum they must be exactly offsetting, so that no small change in the tax rate can better achieve the goals of the government.

We assume that this top METR applies to earnings above a given level, and we will refer

to this level as the top bracket.<sup>10</sup> There are three impacts on social welfare:

1. With no behavioural response, increasing the top METR will increase government revenue. This is the mechanical effect on tax revenue, and this is a benefit to society, as the revenue can be used for government spending or higher transfers.
2. However, increasing the top METR may also induce top bracket taxpayers to reduce their earnings (but not below the top bracket, because the budget constraint has not changed below this point) because of the substitution effect described above. This is known as the behavioural response on tax revenue, and it is a cost to society as tax revenues will fall.
3. Finally, any increase in the top METR will reduce the welfare of top bracket taxpayers. This is the welfare effect, and it is a loss to society. How large is this loss depends on the redistributive tastes of the government: if the government values redistribution, then, for incomes above a certain level, it will consider that the marginal value of income for top-bracket tax-payers is small relative to the average person in the economy. In the limit, the welfare effect will be negligible relative to the mechanical effect on tax revenue.

An optimal top METR is one where the marginal costs and benefits of increasing it further are balanced. If the welfare effect is negligible, then the government should increase the top METR up to the point where the mechanical increase in tax revenue is equal to the loss in tax revenue from the behavioral response. This effectively amounts to setting the top METR so as to maximize the tax revenue collected from top bracket taxpayers; this can therefore be considered as an upper bound to the top METR above which no government should ever go.<sup>11</sup>

A precise formula for this optimum top METR is provided in Box 2. The more responsive are earnings to the net-of-tax rate, and the thinner is the income distribution at the top (we formalise this concept in Box 4), then the lower should be the top METR. Later in this section 3.2, we provide estimates for both these parameters for the UK.

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<sup>10</sup>As already noted, the current top rate of income tax in the UK is 40% and applies to annual earnings greater than £41,435 (in 2008-9). When including National Insurance contributions, the marginal effective tax rate is 47.7% on top earnings.

<sup>11</sup>It is straightforward to extend the theory to the case where the government has less redistributive tastes and hence the welfare effect is not negligible. See e.g. Saez (2001) .

**Box 2. Determining the top rate of income tax**

Here we present the optimal marginal tax rate  $\tau$  for high earners that maximizes tax revenue. We denote by  $z$  the *average* income reported by taxpayers in the top bracket (incomes above  $\bar{z}$ ). By balancing the mechanical and behavioural effects, the optimal rate  $\tau^*$  can be shown to be given by:

$$\tau^* = \frac{1}{1 + a \cdot e}$$

where  $a$  denotes the ratio  $z/(z - \bar{z})$  and is a measure of the thinness of the top of the income distribution. The optimal rate is decreasing in both the elasticity  $e$  and the shape parameter  $a$ . See Appendix for derivation.

**• Optimal marginal tax schedule**

Using a similar technique to how we derived the optimal METR in the top bracket, we can also derive the optimal METR at any point of the income distribution. As before, the optimal METR at any point is set so as to balance the costs and benefits from changing the METR by a very small amount.

As before, an increase in the METR over a very small band of income has three effects on government tax receipts and welfare:

1. First, the reform increases taxes paid by every taxpayer with incomes above the small band (the mechanical effect).
2. Second, the rise in the METR will reduce earnings for taxpayers in the very small band through the substitution effect, and so generates a loss in tax revenue.
3. Third, the extra taxes paid by every taxpayer with incomes above the small band generates a welfare cost whose size will depend upon the extent to which the government values redistribution.

For an optimal METR, these effects must exactly offset, so that no change in the tax schedule can increase social welfare. An exact expression is presented in Box 3.

The key differences with this analysis and that in the previous section that looks at the optimal top rate are:

- changing the METR at any point affects not just those facing that METR, but also all those with higher earnings

- the welfare cost of extra taxes paid is no longer negligible.

**Box 3. Determining the optimal marginal tax schedule**

We assume that the government imposes a tax schedule  $T(z)$  that depends on earnings  $z$ . As shown in Figure 1A and 1B, the slope of this schedule,  $T'(z)$ , gives the METR when earnings are  $z$ . Let  $H(z)$  denote the the fraction of taxpayers with income less than  $z$  (ie cumulative distribution of individuals), and let  $h(z)$  denote the density of taxpayers. The optimal tax system is characterized by a grant to those with no earnings (equal to  $-T(0)$ ) combined with a schedule of marginal tax rates  $T'(z)$  which define first how the grant should be reduced as earnings increase, and then how additional earnings should be taxed once the grant has been fully tapered away. The government's preferences for redistribution are given by  $G(z)$  which measures the social marginal value of consumption for individuals with earnings above  $z$  (this should be decreasing in  $z$  if the government values redistribution). The optimal marginal tax rate  $T'(z)$  is set so as to balance costs and benefits at the margin, and is given by the following formula:

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

The optimal tax rate  $T'(z)$  is decreasing with the elasticity  $e$ , and decreasing in  $G(z)$ , and increasing in the income distribution ratio  $(1 - H(z))/(zh(z))$  which measures the thinness of the earnings distribution. See Appendix for more details.

The formula in Box 3 shows how the optimal METR depends upon the size of the behavioural response to taxation, the government's preferences for redistribution and the underlying shape of the (potential) earnings distribution. In particular, METRs should be higher:

- the less responsive are individuals to the net-of-tax rate
- the more value is placed on redistribution
- at points in the earnings distribution where the number of individuals is small relative to the number of taxpayers with earnings exceeding this amount (this is because the revenue gained from increasing METRs at a given earnings level will be proportional to the number of individuals who have earnings greater than this level; the precise way that we summarise this shape of the income distribution is discussed in Box 4).

**Box 4. Summarising the shape of the income distribution**

The shape of the income distribution is an important determinant of the optimal structure of METRs. We summarise this shape by the income distribution ratio:

$$\frac{1 - H(z)}{zh(z)}$$

which appeared in the optimal taxation formula presented in Box 3 (where we say that is measured the thinness of the income distribution). The optimal formula shows that the government should apply high marginal tax rates at levels where the density of tax payers, measured by  $h(z)$ , is low compared to the number of taxpayers with higher income, measured by  $1 - H(z)$ .

To anticipate the discussion in section 3, it is worth noting that negative METRs are never optimal: if the METR were negative in some range, then increasing it a little bit in that range would raise revenue (and lower the earnings of taxpayers in that range), but the behavioural response (which would be to work less) would also be to raise revenue, because the marginal 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, but income effects discourage work for low-income earners, because transfers increase disposable income. Hence income effects make taxing less costly, but make transfers more costly. Therefore, holding other things constant, income effects lead to higher METRs at the upper end, allowing the government to redistribute more, but make redistribution at the low end more costly, and so the net effect on the level of transfers is ambiguous. If income effects are concentrated at the bottom, then they are likely to reduce the size of the 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 paid for by higher METRs across the distribution.

### 3.3 Empirical evidence on intensive elasticities, and applications to the UK

This section presents two applications of the results shown earlier to the UK tax system. We first derive the optimal top METR, using new, albeit tentative, evidence on the responsiveness of top incomes in the UK to changes in tax rates, based on the response of top incomes

to the large changes in METRs applying to top incomes that have taken place in the UK over the last 40 years. We then derive the entire optimum tax schedule in the standard intensive-responsive Mirrlees model, given assumptions for the labour supply elasticity and the government's preferences for redistribution.

### • Top Incomes and the Optimal Top Tax Rate in the UK

Although there is a large literature analyzing the effects of changes in METRs on reported incomes using tax return data in the US (see e.g., Saez, 2004 for a recent survey; some are cited in Meghir and Phillips, this volume), there has been little study of the British case. This is especially surprising, given that the UK experienced a dramatic drop in top METRs. Up to 1978, the top METR on earnings was 83%<sup>12</sup>. Under the Thatcher administrations, the top rate dropped to 60% in 1979, and then dropped further to 40% in 1988.<sup>13</sup>

In this section, we propose a very preliminary analysis of the link between top METRs and top incomes, using and extending the top income share series constructed by Atkinson (2007). Those series estimate the share of total personal income accruing to various upper income groups such as the top decile (the top 10 percent), or the top percentile (the top 1 percent), and so they measure how top incomes evolve relative to the average.<sup>14</sup> We have computed the average METR faced by various upper income groups from 1962 to present (in fact, there are two METR series, one including income tax and employer and employee national insurance contributions, and one that also includes the impact of consumption taxes, such as VAT and excise duties.<sup>15</sup>

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<sup>12</sup>The top rate on capital income was even higher and reached the extraordinary level of 98% from 1974 to 1978, although, as we remarked earlier about the top rate on earned income of 83%, very few individuals had taxable incomes high enough to face this rate.

<sup>13</sup>Dilnot and Kell (1988) try to analyze this issue, but have only access to a single year of micro-tax returns, and rely on aggregate numbers for their time-series analysis. More recently, Blow and Preston (2002) have used micro tax data for 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. 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 rates and does not focus specifically on the UK case.

<sup>14</sup>The definition of income used by Atkinson (2007) (and therefore by us in this section) is close to the broad income definition used in Gruber and Saez (2002), as it excludes capital gains and certain remuneration in kind. However, there are some inconsistencies over time: the most important is that the data represents families before 1990 and individuals after 1990, and we make an adjustment to the pre-1990 data to correct for that (see online appendix for details). Atkinson (2007, p89) also says that the series omits employees' superannuation contributions before 1985, and before 1975-76, the series is net of retirement annuity premiums, alimony and maintenance payments, and allowable interest payments.

<sup>15</sup>The consumption tax rate is assumed to be uniform, and estimated using total consumption tax receipts.

Figure 2A displays the METRs (excluding and including consumption taxes) on earnings faced by the top 1% (on the left axis), and the top 1% income share (on the right axis) from 1962 to 2003. It shows an increase in the METR from 1962 to 1978 followed by a dramatic decline in the two key income tax 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 exactly when the top METR was reduced in 1979, suggesting that top income shares did respond to the lower METR. From a long-term perspective, the top 1% income share doubled from 6% in 1978 to 12.6% in 2003 while the net-of-tax rate (one minus the METR) doubled from  $1 - .79 = 21\%$  in 1978 to  $1 - .53 = 47\%$  in 2003 (using the rates including consumption taxes). If all the increase in top incomes (relative to the average) can be attributed to the reduction in the METR, this would imply a substantial elasticity almost equal to one.<sup>16</sup>

Figure 2B displays the METR and income share of the next 4% (income earners between the 95th and the 99th percentile). In contrast to the top 1%, the METR in 1978 is virtually identical to the current METR: this illustrates that the Thatcher tax reforms cut the progressivity of the income tax within the top 1%, but had relatively small effects on those with slightly lower incomes. However, the income share of the next 4% also shows a break in 1979: the income share is roughly constant at around 12% before 1979, and then increases steadily from 12% to 15% from 1979 to 2003 despite there being little change in the METR.

Two interpretations of this are possible. First, it could be argued that the change in high incomes was not entirely due to the cuts in the METR, and may have been caused by other reforms enacted by the Thatcher administration that were favourable to high incomes. In that case, our previous estimate of 0.93 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>17</sup> In that case, if a cut in the METR facing the top 1% stimulated incomes

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These and other computations are described in an online appendix. The METR is an average of the METR on earned and unearned income weighted by the share of earned and unearned income in each group. Our METRs are also weighted by income within each group, as larger incomes have a proportionately larger contribution to the total behavioral response of the income group (indeed, in the optimal top tax rate formula (1), one needs to use the elasticity weighted by income).

<sup>16</sup>These elasticities are calculated by computing  $\hat{e} = (\log S_1 - \log S_0) / (\log(1 - \tau_1) - \log(1 - \tau_0))$  where  $S_0$  the top 1% income share before the reform,  $S_1$  the share before the reform,  $\tau_0$  the marginal tax rate of the top 1% before the reform, and  $\tau_1$  the rate after the reform.. In this case, the elasticity is estimated as:  $\log(12.6/6.0) / \log((1 - .79)/(1 - .53)) = .93$ .

<sup>17</sup>Gentry and Hubbard (2004) have tried to estimate such effects in a model of entrepreneurship with US

below the top 1%, our estimate of 0.93 would understate the overall on government revenues.

We show more systematically in Table 1 how this data can be used to estimate the elasticity of broad income with respect to the net-of-tax rate. The first 2 rows of Table 1 focus on the 2 key tax cuts of 1979 and 1988, and compare 1978 with 1981 and 1986 with 1989, respectively<sup>18</sup>. Column (1) estimates the elasticity of top 1% incomes by calculating how the share of income received by the richest 1% of individuals changes relative to the change in the METR that this group was subject to. It shows positive, but not very large, elasticities of 0.34 and 0.26. However, as we discussed above, the longer-run perspective suggests higher elasticities. Indeed, the third and fourth rows compare years 1962 to 1978 (when METRs for the top 1% increased) and years 1978 to 2003 (as we discussed above), and these comparisons imply substantially higher elasticities of 0.61 and 0.93. Finally, the bottom row presents the coefficient of a simple time-series regression of the income share of the top 1% on the METR. Rather than just comparing the changes between two different years, this approach uses data over the entire 1978 to 2003 period, and suggests an elasticity of 0.73 (which is statistically significant). In Column (2) we again calculate the elasticity estimates of top earners, but we exclude consumption taxes from our measure of METR: this hardly changes the elasticity estimates (because average consumption tax rates have changed by much less than the marginal rate of income tax applying to top incomes).

The elasticities reported in columns (1) and (2) are unbiased estimates only if, absent the tax change, the top 1% income share would have remained constant. As we explained above, this assumption seems contradicted by the fact that the top 5-1% income share increased from 1978 to 2003 in spite of no change in METRs. If we assume that, absent the tax change, the top 1% share would have increased as much as the top 5-1% share, we can calculate what is referred to as a *difference-in-differences* estimate, which is presented in column (3) of the table.<sup>19</sup> These difference-in-differences (DiD) estimates are smaller for the long-term 1978-2003 comparison, and for the full time-series regression, although they remain substantial at 0.64 and 0.46 respectively. It is conceivable that, absent the tax change, the top 1% share would still have increased more than the top 5-1% share, perhaps because the Thatcher administration

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data.

<sup>18</sup>We do not use 1990 because of the change from couple to individual tax filing which creates a small discontinuity in the Atkinson series.

<sup>19</sup>Those elasticity estimates are  $\hat{e} = (\log S_1/S_1^c - \log S_0/S_0^c) / (\log(1 - \tau_1)/(1 - \tau_1^c) - \log(1 - \tau_0)/(1 - \tau_0^c))$  where  $S^c$  and  $\tau^c$  are the income share and marginal tax rate for the “control group” Top 5-1%.

implemented other policy changes favorable to top incomes, or because of structural changes in the labour market and changes in the returns to human capital.

**Table 1: Elasticity Estimates for Top Income Earners**

	Simple Difference <i>(1)</i>	Simple Difference (excluding consumption tax from MTR) <i>(2)</i>	DD using Top 5-1% as control <i>(3)</i>
1978 vs. 1981	0.34	0.32	0.08
1986 vs. 1989	0.37	0.38	0.41
1978 vs. 1962	0.61	0.63	0.86
2003 vs. 1978	0.93	0.89	0.64
Full time-series regression (s.e. in brackets)	0.73 (0.13)	0.69 (0.12)	0.46 (0.13)

The second parameter in formula (1) is  $a$ , the measure of the thinness of the income distribution at the top (see Box 4). Figure 3 shows how our measure of the shape of the income distribution (discussed in Box 4 above) varies with earnings in the UK: the hazard ratio is very high at the bottom, falls as income increases, and then rises slightly until it becomes flat around 0.6, implying a value of  $a$  of  $1/0.6 = 1.67$ .

What do these estimates mean for the optimal top rate in the UK? We gave an expression for the optimal top rate in Box 2 of  $\tau^* = \frac{1}{1+a-e}$ . With  $a = 1.67$  and an estimate of  $e = 0.46$ , the revenue-maximising top rate is 56.6%, only a little higher than the the actual total top METR in 2008/9 (around 53% including consumption taxes).<sup>20</sup> But we would stress that, as our estimate of the elasticity is tentative, so is the estimated optimal top rate. Taking values of the elasticity 1 standard deviation either side of the central estimate gives a range for the optimal top rate of 50.4% to 64.5%. But our analysis is also consistent with the current top METR being too high: using the value of the elasticity from the simple difference over the period 1978 - 2003 would give an optimal top rate of 40.2%, and using the difference-in-difference estimate of the elasticity from the same period would imply an optimal top rate of 49.4%, slightly lower than the actual top rate. Indeed, both these estimates imply that cuts in

<sup>20</sup>The revenue-maximising top rate is the optimal top rate if the government places no cost on the top 1% having less income as a result of the tax rise.

the METR facing the richest 1% in the UK would actually increase tax revenues (although see Box 5 for a discussion of the difference between taxable income and broad income elasticities).<sup>21</sup>

**Box 5. Taxable income and broad income**

Note that to estimate the revenue implications of raising the METR that applies to the top 1% of earners in the UK given all other aspects of the current UK tax regime, one would want to use a taxable income elasticity (which measures how income that is subject to income tax changes when the net of tax rate changes). But the income measure used in our analysis was close to a broad income measure, rather than taxable income (so it includes some sources of income not subject to income tax). For optimal tax design, the the right concept to use is a broad income elasticity, because the difference between broad income and taxable income is a function of the tax system and enforcement efforts, and therefore depends entirely on the choices made by governments. For the same reason, the taxable income elasticity is unlikely to be constant across income tax regimes. For example, we might expect the taxable income elasticity to be higher in the US, than in the UK, because there are more opportunities to reduce taxable income in the US tax code than in the UK. In the UK, the main ways in which one can reduce taxable income would be through higher contributions to private pensions (which to some extent represent only deferred taxation because eventual pension income is taxable), and through charitable giving (to which there may be externalities).

This first-pass analysis shows that identifying the elasticity of top incomes, a key ingredient in the optimal tax rate formulas derived above, is not simple. The evidence is consistent with significant behavioral responses to top taxpayers to METRs, certainly suggesting that the key elasticity is not zero. As the formula (1) shows that the upper bound on METRs depends critically on the level of this elasticity, it would be very valuable to explore this issue in more detail using the rich UK tax return micro-data (the Survey of Personal Incomes) that have now become available to researchers. Unfortunately, there has been no large change in METRs since 1988; and without such a change it is extremely difficult to estimate this elasticity. It is conceivable that these behavioural responses change over time; see, for example, the discussion of migration effects below.

Note also that these calculations have only derived the optimal rate for the richest 1% of the population. For many years, the highest rate of income tax in the UK has applied to a much greater proportion: in 1991/2, 3.5% of adults paid income tax at the highest rate, and

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<sup>21</sup>In 2004/5, the richest 1% of adults, or 470,000 individuals, had incomes in excess of £100,000, with a mean of £156,000: see Brewer et al (2008).

this has risen to 6.8% in 2004/5, and almost 8% by 2007/8.<sup>22</sup> This means that the conclusions in this section should not be seen as implying that the existing higher-rate of income tax with its existing thresholds should be changed: as the section below shows, the optimal METR that applies to, say, people in the top 6% of income earners but outside the top 1% could be lower or higher than the optimal METR at the top.

• **Simulations of the whole optimal tax system in the UK**

Having estimated the optimal top METR, we below simulate the whole optimal tax structure using the Mirrlees model set out in the previous section, and based on the actual UK earnings distribution, and various assumptions about the intensive labour supply elasticity (full details are in the Appendix). The simulations attempt to show the optimal tax schedule which provides total net tax revenues equal to the current tax system, including revenue from individual income tax, NICs, and consumption taxes, net of spending on existing transfers for families with children or those with disabilities.<sup>23</sup> To focus specifically on income tax, we have computed the optimal income tax schedule when we keep consumption taxes (VAT and excise taxes) at their current level (around 17% on average), which we assume to be constant as income varies. The simulations assume that the tax and benefit system is at an individual level.

Figure 4A shows the optimal income tax schedule, exclusive of consumption tax, assuming a constant elasticity of 0.25 and with the government valuing redistribution (we define this more precisely in Box 6). It shows that for very low levels of earnings, individuals face a METR of around 70%; the METR then decreases relatively quickly with income, reaching 36% as incomes approach £30,000 per year. As incomes increase further, so too does the METR, eventually settling at around 64% for incomes above £200,000.<sup>24</sup>

The U-shape pattern of optimal marginal tax rates is not surprising in light of our theoretical discussion: it is driven by the U-shape of the hazard ratio  $(1 - H)/(zh)$  (see Box 4; this describes the thinness of the income distribution), as well as the decreasing shape for  $1 - G(z)$ , the government's preferences for redistribution, both combined with the assumption that the

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<sup>22</sup>See HMRC (2007c).

<sup>23</sup>We assume total transfers are equal to the amount spent on Job Seekers Allowance, income tax credits and reliefs, child benefit, housing benefit, council tax benefit, and income support.

<sup>24</sup>These marginal rates will increase once we consider the impact of consumption taxation: for example, consumption taxes act to effectively raise the marginal rate of high incomes from 64% to 70%.

elasticity does not vary with earnings.

We now consider how our views regarding the optimal schedule depend on the labour supply elasticity. Meghir and Phillips (this volume) survey the elasticity of hours worked with respect to the wage. For men, they say that “although one can start discussing the relative merits of the approaches taken, existing research will lead to the conclusion that the wage elasticity is zero.” For women, they conclude that the elasticity of weekly hours worked is “in the range of approximately 0.0 to 0.3”. Their preferred estimate is a value of 0.13 for all married women except those with young children (for those with children aged 3-4, the value is 0.37). They also say that “the results of annual labour supply show greater responsiveness to wages”, probably because variations in annual hours worked are a combination of participation responses (whether a woman works at all in a given week), and intensive responses (changes in the hours worked per week).

But hours worked are not the only way in which taxable income can respond to tax changes. For many individuals, the idea that the hourly wage cannot be affected by the amount of effort expended by the individual (as assumed in the theoretical models in Section 3) is too simplistic; earnings could respond to tax changes through changes in the hourly wage (whether through bonuses, tips, job changes or even by workers on piece rates working faster) as well as hours worked. Taxable income reported to the revenue authorities, though, is not the same as gross earnings, and can vary in response to tax changes through changes in the form of compensation, the response of non-labour income, and changes in the amount of income reported to the tax authorities, whether through avoidance or evasion. Saez (2002) argues that “elasticities of earnings with respect to the tax rate [at the bottom end] are ... perhaps around 0.25”, and that: “there is little consensus about the magnitude of intensive elasticities of earnings for middle income earners, although this elasticity is likely to be of modest size for middle income earners and higher for high income earners. Gruber and Saez [2002] summarize this literature and display empirical estimates between 0.25 and 0.5 for middle and high income earners.” (p. 1057, Saez (2002)), although most of this is focused on the US.

Figure 4A also displays an optimal schedule in the case where individual labour supply is more responsive to changes in income (an elasticity of 0.5). The figure demonstrates that this would produce lower METRs across the earnings distribution, falling as low as 20%, with a top rate of 45% (slightly below the existing rate). The intuition for the difference here is

simple: when individuals are more responsive to tax changes, they will react more to a given METRs (reducing their labour supply by more), and this places a limit on how high METRs can go. Correspondingly, and as shown in Table 2, the benefit programme is less generous when the elasticity is higher.

Finally, we consider how the government’s preferences for redistribution affect the optimal schedule (see Box 6 and the online appendix for more detail). An interesting case to consider is known as the Rawlsian case, which seeks to maximise the welfare of the least well-off member of society.<sup>25</sup> As Figure 4B and Table 3 show, under this criteria, we would have a higher lump-sum grant and higher METRs across the entire distribution of earnings. 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 closer to an L than U-shape.

**Box 6. Expressing the preference for redistribution**

In calculating social welfare, we first transform (money metric) utilities so that we allow for the possibility that the government attaches more weight to the welfare gains of individuals whose level of utility is initially low. A convenient and simple way of capturing this concern for inequality is to transform original utilities  $u$  as follows:

$$\begin{aligned} & \frac{u^{1-\gamma}}{1-\gamma} && \text{if } \gamma \neq 1 \\ & \log(u) && \text{if } \gamma = 1 \end{aligned}$$

Social welfare is then obtained by summing these transformed utilities across individuals. Whenever  $\gamma$  is positive, any increase in utility translates into a less than proportional increase in social welfare. When  $\gamma = 1$ , which is the case that we consider here, the government is placing twice as much weight on the utility gains of an individual relative to another individual whose utility is twice as high. If concerns for inequality were even stronger, represented by say  $\gamma = 2$ , then they would be placing four times as much weight on the utility gains of the less well off individual. When  $\gamma = 0$ , there is no concern for inequality; when  $\gamma$  gets very large, only the worst-off individual in society determines social welfare (the Rawlsian case discussed further below).

The form of individuals’ utility function is given in the online appendix, but note that it is quasi-linear in income, and so it does not display diminishing marginal utility of income, which can by itself provide a motive for redistribution even if a government has a strictly utilitarian social welfare function.

<sup>25</sup>The Rawlsian criterion can therefore be seen as a bound on the maximum level of redistribution that the government wishes to do; note that in the optimal tax model, even the Rawlsian government has to raise revenue for some reason, and this places a limit on the size of the transfer to the poorest in society.

**Table 3: Optimal Tax Rates and Lump-sum grants**

Redistribution strength	Elasticity	Average MTR	Lump-sum grant (per year)
$\gamma = 1$	0.25	45%	£5,580
Rawlsian	0.25	73%	£8,150
$\gamma = 1$	0.50	31%	£4,270
Rawlsian	0.50	58%	£6,760

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

The model described in the previous section assumes that individuals respond to the tax and benefit system only by varying their earnings as a function of the net-of-tax rate they face (known as the intensive margin/response). However, changes in whether people participate in the labour market at all (known as participation or extensive responses) are poorly captured within such a framework (see Blundell and MaCurdy, 1999). Indeed, following a small increase in the net gain of work, people tend to enter employment at, say, twenty or forty hours a week, rather than one or two hours. Such extensive labour supply responses are particularly important at the bottom of the income distribution, and can be incorporated into a model of labour supply using fixed costs of work (Heim and Meyer, 2004).

Participation effects are important: accounting for them radically modifies the structure of optimal taxes for low income families from the one obtained above (Diamond (1980), Saez (2002)). In this section, we outline the key theoretical results, and then discuss recent applications using UK data.

### 4.1 Theory

We continue to work with a simple labour supply model, but this time individuals only choose whether or not to work, and this decision depends on the relative rewards to working and not working (including the costs of work). The responsiveness of this decision to the financial rewards can be summarised in the elasticity of participation with respect to the net return to work, similar to the elasticity defined in Box 1. If individuals do work, their earnings are fixed.

If the government implements a tax and benefit schedule that determines the disposable income of individuals both in and out of work, then an individual chooses to work if the net

return to work exceeds her cost of working.<sup>26</sup> Consider the impact of a small rise in the PTR at a given level of earnings. This reform affects only individuals with this earnings potential, because there are no intensive responses. As in section 3.1, this reform has three effects on government tax receipts and welfare:

1. the reform increases the taxes paid by every taxpayer at the given level of earnings who works, increasing government revenues.
2. those extra taxes reduce the welfare of the workers who pay this extra tax, with the value that the government places upon this dependant upon its redistributive preferences.
3. the tax rise induces some of the workers at this earnings level to drop out of work, and this has a cost.

At the optimal, these effects must balance. In the Appendix, we derive formally what this means for the optimal tax schedule, with the result presented in Box 7.

**Box 7. Optimal tax rates with participation responses**

Let  $g(z)$  denote the value the government places on increasing income of individuals with income  $z$ . If the government values redistribution, then  $g(z)$  will be fall as  $z$  rises.

Defining the participation tax rate as  $t(z) = (T(z) - T(0))/z$ , we can derive the optimal tax rate as:

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

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

As Box 7 shows, the optimal average tax rate at any given earnings level will be lower:

1. the more highly the government values income at that earnings level
2. the higher is the participation elasticity (since it is not desirable to tax individuals who adversely respond to reductions in their incomes)

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<sup>26</sup>Since individuals of a given ability level may differ in their costs of working, for any given tax system some of these individuals may choose to work and others not.

A striking implication is that, if the government values redistribution - so that  $1 - g(z)$  is negative - then the participation tax rate should be *negative* for low earnings - in other words, low income workers should receive an earnings subsidy. Hence, in sharp contrast to the intensive model, the extensive model implies that earnings subsidies or work-contingent credits (such as the earned income tax credit or the working tax credit) should be part of an optimal tax system.<sup>27</sup>

The intuition for this result can be understood as follows. Starting from a tax and benefit system with a positive participation tax rate for low skilled workers, and suppose the government contemplates strengthening work incentives for low skilled individuals by reducing the taxes that they would pay when working. This has the following effects:

- the cut in taxes means that tax revenues fall, and this is a cost
- but the associated increase in income of low skilled workers is viewed positively by a government that values redistribution, because it would prefer these individuals to have income more than the average individual. By our assumption that we are considering low income individuals (for whom  $g(z)$  exceeds 1), this benefit effect has to outweigh the costs of reduced revenue.
- the behavioural response from cutting the PTR is to induce some low-skilled individuals to start working, and this increases government revenue (because the individuals who move into work pay positive net taxes).

Hence, this reform is unambiguously desirable, and the implication is that positive PTRs for low-income workers cannot be optimal.

These arguments were true for a model where the only response is along the extensive margin. A more realistic model which allows for both intensive and extensive effects is presented in Saez (2002). To summarise the implications of such a model, consider the situation outlined above, where the government lowers taxes (which are currently greater than zero) for low-skilled workers. If there are both intensive responses and extensive responses, then cutting taxes here would induce some higher skilled workers to reduce their labour supply,

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<sup>27</sup>This result is robust to introducing income effects, as formula (3) remains valid with income effects: see Saez, 2002.

as well as inducing some non-workers to work. Although the latter response is a benefit to society, the former is a cost, and so cutting taxes has ambiguous effects on labour supply and therefore overall social welfare. A government contemplating strengthening incentives by cutting taxes facing low-income workers must therefore weigh precisely the positive participation effect and the negative intensive labour supply effect, and the model in Saez (2002) gives a precise formula for that trade-off.

- **Interpreting the participation response**

The extension of the optimal tax model to allow for non-participation has other applications. Two of those are tax evasion and migration.

To apply the model to tax evasion, our earlier concept of "earnings" could be interpreted as "earnings reported to the government agency administering taxes and transfers". Suppose that low income earners can decide to either work in the formal sector, where we assume full compliance with the tax and benefit rules, or in the informal sector, where we assume full non-compliance. In that case, the decision to work or not work can be replaced by the decision to work and report earnings, or to work informally and not report earnings. In that case, for a given level of tax enforcement efforts, our earlier analysis (and the formula presented in Box 7) remains valid. However, in such a model, the government might recognize that some of all individuals reporting no earnings are in reality working informally, and so might actually be better off than low-income workers in the formal sector. This may lead the government to place a lower value on the consumption of individuals with no reported earnings than they do on workers with low reported earnings (ie,  $g(0) < g(z)$  for some  $z$ ), and this would make subsidies for work even more likely to be optimal.<sup>28</sup>

Second, 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 UK or the US where the burden of tax on high-income individuals may be lower, and generous benefits for lower income individuals in certain countries might encourage migration

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<sup>28</sup>However, subsidies for low income individuals might induce individuals to over-report self-employment income. In the US, Saez (2002b) shows that the self-employed are much more likely than wage earners to report income which makes them entitled to the maximum EITC payments, strongly suggesting that self-employed individuals manipulate their reported earnings to take advantage of the EITC, making use of a flexibility not available to wage earners.

of low skilled workers toward those countries.<sup>29</sup> In the online appendix, we discuss how the migration decision can be incorporated into optimal taxation models.

## 4.2 Evidence on extensive elasticities and empirical applications

Meghir and Phillips (this volume) show that there is a wide range of participation elasticities for women in the literature: “Aaberge et al. (1999), Arrufat and Zabalza (1986) and Pencavel (1986) find results of 0.65, 1.41 and 0.77-0.89 respectively using cross-sectional data-sets from Italy, the UK and the US, and using significantly different modelling and estimation strategies....Devereux (2004), however, finds a lower degree of responsiveness with the elasticity at the median family income equal to 0.17.” There is consensus, though, that participation is more elastic amongst women from poorer families so that “participation is likely to be the key margin of adjustment for poorer women”.

For men, the two studies of static labour supply cited by Meghir and Phillips (this volume) suggest an elasticity close to zero, but they highlight that a separate literature on the effect of unemployment benefits on the duration of unemployment has consistently found that higher benefits lead to a longer period out of work. Even including these effects, though, they suggest the overall participation elasticity for men is very close to zero, at 0.04. A dynamic model for young men in Germany (Adda et al. (2006)) gives a similarly low participation elasticity (0.06). But Meghir and Phillips also provide their own, new empirical evidence. This very clearly shows the heterogeneity of responses: for highly educated men, it is hard to reject the idea that the participation elasticity is zero, but the estimate for men with low educational qualifications is 0.23 for single men, and 0.43 for men in couples.

There are very few empirical studies of optimal tax systems that incorporate intensive and extensive responses: Saez (2002) is an example for the US. Of course, one approach to the second goal of this chapter - where we seek to apply the lessons from optimal tax theory to make recommendations for the UK tax and benefit system - would have been to use an optimal tax model that allowed for intensive and extensive responses to solve for the optimal schedule. We have not taken this approach, though, primarily because we needed to reflect that the current tax system in the UK has different tax schedules for single people and couples, and

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<sup>29</sup>Clearly, governments can use other tools to affect immigration, and such policies are taken here as given. In the EU, emigration and immigration across EU countries is almost completely deregulated, and so our analysis is particularly relevant in this context.

schedules that vary by the number of children, but also because we also consider the impact of the tax and benefit system on family formation and fertility, and administrative issues, and it is to these we turn in the next section.

## 5 How should taxes and benefits treat "the family"?

The models we have considered thus far were based on individuals and so abstracted from family issues. In reality, a majority of adults live in couples, and can be assumed to share income to some extent. In this section, we discuss how the family should be taxed, and how the presence of children should affect taxes and benefits. See Boxes 8 and 9 for a discussion of how these issues are currently treated in the UK.

Under a pure individual-based taxation, tax liability is assessed separately for each family member and is therefore independent of the presence or income of other individuals living in the family or household. At the other extreme, in a system of fully joint taxation of couples, tax liability is assessed at the family level, and depends on total family income (this is how income tax works in the US, for example). 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 (income tax in the UK moved from being family-based to individual-based in April 1990). But tax credits and transfers for low-income families in the UK are based on total family income, as are the equivalent welfare benefits in most other OECD countries, and there has been much less impetus to move to an individually-based system for assessing transfers. Of course, there are many other ways of designing a tax and benefits schedule for individuals that varies with the presence of a partner than a fully joint tax and benefit system, and many EU countries with individual tax systems have some form of recognition of marriage or the presence of a partner (see Di Tommaso et al. 1999).

In general, there are several important points to be considered when designing taxes and benefits for individuals who can live either alone or in a couple:

1. if there is any sharing of resources within a family, a person with a low income living with a high-income spouse is better off than an otherwise-equivalent person living with a low-income spouse. Therefore, if the government values redistribution, two adults earning the

same ought not to be taxed the same if their partners' incomes are very different. This redistributive principle is achieved to a limited extent by having a progressive income tax system based on family income, since it imposes higher average tax rates on adults with high-income spouses than on otherwise-identical people with low-income spouses. By contrast, an individual-based income tax does not meet this redistributive criterion: it imposes the same tax burden on individuals irrespective of their partner's earnings.

2. if there are economies of scale in households, so that two adults living apart could achieve the same standard of living with less income if they lived together, then this arguably provides a reason for the tax system to take account of whether individuals are in a couple or not, presumably by taxing individuals more when they are living as a couple than when they are living alone.
3. family-based income tax and benefit systems are highly likely to create a marriage (or cohabitation) subsidy or penalty, as the net tax liability of the two adults might change if they decide to cohabit or marry. This is well-documented in the US, where the income tax system is family-based for married couples, but not for cohabiting couples. Because the US tax system is progressive - in other words, the tax burden rises as income rises - couples with very unequal incomes (such as single-earner couples) benefit from a marriage subsidy, while couples with similar incomes (such as two earner couples) face a marriage penalty. Although the marriage penalty/subsidy attracts substantial public attention, it becomes relevant for optimal taxation only if the decision to marry is sensitive to those fiscal incentives. Hoynes (this volume) concludes that "overall, the research [mostly using US data] finds tax effects on marriage that are consistent with the theoretical predictions but are small in size" (these studies are cited in Eissa and Hoynes (2004)); a related literature finds that marriage is also sensitive to the financial incentives inherent in welfare systems (almost always anti-marriage incentives), but that the elasticities are small (see Hoynes (1997)). Overall, then, Hoynes concludes that "the estimated elasticities with respect to the tax-induced financial incentives to marry (and divorce) are small". However, even if marriage or partnership decisions are relatively insensitive to fiscal consequences, we might expect that how individuals report their family circumstances to the government authorities would be affected by sufficiently

large cohabitation penalties or subsidies.<sup>30</sup>

4. the empirical literature has shown that the labour supply of secondary earners is more responsive to taxes than that of primary earners (see Meghir and Phillips, this volume, or Blundell and MaCurdy, 1999). Therefore, the earnings of secondary earners should be taxed at a lower rate than the earnings of primary earners for efficiency reasons.<sup>31</sup> This goal is achieved to some extent by a progressive individual-based income tax, since primary earners have higher incomes and hence tend to face higher METRs than secondary earners. By contrast, a family-based tax and benefit system generates identical METRs across members of the same family, and thus does not meet this efficiency principle.
5. Any tax and benefit system other than a fully joint system will give individuals in a couple a tax incentive to equalise their asset holdings or income streams. While this might be a deliberate policy intention, a consequence is that it gives couples an opportunity to reduce their tax burden by transferring assets from an adult with the higher METR to the lower METR.

Deriving general optimal tax results for couples is, in general, extremely complicated. Kleven et al (2006) consider a simple optimal tax model for couples where the primary earner chooses only how much to work (as in the models outlined in Section 2) and the secondary earner chooses only whether or not to work (as in the models outlined in Section 3). In contrast to the separable and linear tax system in Boskin and Sheshinski, 1983, they consider a fully general joint taxation system. Naive intuition based suggests that, for redistributive reasons, the participation tax rate on the secondary earner should be higher when the earnings of the primary earner are larger, as the contribution of the secondary earner's income to the family's well-being is minimal. However, the authors show that the reverse is true: the participation

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<sup>30</sup>In the UK, Her Majesty's Revenue and Customs and the Department for Work and Pensions both estimate the extent of money lost to such fraud or error relating to the presence of a partner: these estimate that £67m was overpaid in income support, jobseekers allowance and the pension credit, £30m in housing benefit (both in in 2005/6) and £320m overpaid in tax credits (in 2004/5) (DWP, 2007a and HMRC, 2007b). Powerful circumstantial evidence that such fraud exists comes from the fact that the UK government is paying child-contingent support to between 5 and 10 per cent more lone parent families than are thought to live in the UK (Brewer et al, forthcoming; Brewer and Shaw, 2006).

<sup>31</sup>This is in line with the traditional Ramsey principle of optimal taxation that commodities with relatively more elastic demands should have relatively lower tax rates. See also Boskin and Sheshinski, 1983, Alesina and Ichino, 2007.

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 METR 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 optimal schedule for one-earner couples is obtained from that base schedule by introducing a tax allowance for non-working spouses that is larger for couples with low primary earnings than for couples with high primary earnings. This shrinking tax allowance generates an implicit tax on secondary earners which decreases with primary earnings.

This result suggest that a progressive joint income tax system goes in the wrong direction, and that neutral individual taxation is closer to the optimum. However, it is important to note that, in practice, benefits for low-income families are almost always based on joint family income, and the phasing-out of those programmes creates implicit taxes on secondary earners which are decreasing with primary earnings. For example, a secondary earner in the UK with modest earnings would face a relatively high (average and marginal) tax rate when her partner's earnings are low, because the second adult's earnings reduce the family's tax credit entitlement as well as being subject to income tax and national insurance contributions, and would face a relatively low (average and marginal) tax if her partner's earnings are high, because the secondary earnings are subject only to the individual income tax and NICs. Hence, the results in Kleven et al. suggest that the broad way in which tax and benefit systems of many OECD countries treat the incomes of a couple, including that of the UK, are consistent with optimal tax results.

**Box 8. Marriage and cohabitation penalties in the UK tax and transfer system.**

As we discuss in chapter 6, the UK has individual assessment for income tax, but welfare programmes and the child and working tax credit are assessed against the joint income of co-resident couples, where legally married or not. There are currently very few tax-induced marriage penalties or subsidies in the UK.<sup>a</sup> However, there are substantial so-called cohabitation or couple penalties or subsidies in the UK: these arise because welfare benefits and tax credits are assessed against the joint income of cohabiting couples, whether legally married or not.<sup>b</sup> The same structural features that lead to such cohabitation penalties also give differences between the incentives to work facing the first and second earner in a couple. Typically, the PTR of the second earner will be considerably lower than that of the first earner (see also Figure 6A), but the direction of recent reforms has tended to increase PTRs of second earners as entitlement to tax credits has risen in real terms (see Brewer, 2007).

<sup>a</sup>See Bowler (2007); some groups have argued that there should be more subsidies: see Social Justice Policy Group (2007).

<sup>b</sup>Such couple penalties or subsidies are usually shown either by calculating the change in net transfers from the state that two adults would experience if they were to cohabit - a complicated calculation that requires assumptions on how housing costs and labour supply would change upon cohabitation - or by calculating the change in net transfers that a cohabiting couple would experience if they (fraudently) claimed to be living apart. See Anderberg et al. (2007); see also Kirby (2005) and Draper (2007)

• **Collective labour supply model**

How disposable income is allocated among family members raises interesting issues. Empirical findings by Lundberg et al. (1997) show that giving an allowance for children directly to the mother instead of giving it to the main earner through a reduction in taxes increased spending on children significantly. This shows that families do not fit what is called the "unitary model", whereby a family acts as if all the adults in it care about the same things. Many other models of behaviour of couples are possible, and Chiappori (1988, 1992) developed a model where consumption is allocated within family members in an efficient way (so that it is not possible to make one member in the family better off without making another worse off), but that the power each family member has in the decision-making process depend on their relative incomes or on whom is entitled to the government transfers (this is known as a collective labour supply model).

How does this affect our analysis? Suppose, for example, that husbands have too much power within a couple, and get too much control over how income is used than their spouses,

and suppose that the government would like to achieve a fairer distribution of consumption within families. If the government wants to increase parents' spending on children, Blundell, Chiappori, and Meghir (2005) show that what matters is how the *marginal* willingness to spend on children differs across parents. If mothers have a higher *marginal* willingness to spend, then it is valuable to transfer resources from husband to wife. The empirical analysis of Lundberg et al. (1997) suggests that this can be done at no fiscal cost simply by switching who is the nominal recipient of the benefit in the family (and without altering the total disposable income of the family). Therefore, in sharp contrast to the previous models we have considered so far, this within-family redistribution does not create any efficiency costs (as long as the within-family bargaining is efficient, as assumed in Chiappori (1988, 1992).

These results suggest that within-family distributional issues could be addressed by transfers from wallet to purse, but leaving unchanged the total level of transfers going to low income families. The issue of transferring between high and low income families is not fundamentally affected by bargaining issues within the family.

- The treatment of children

In Box 9 we briefly discuss actual child-contingent transfers in the UK. There are various arguments why the optimal tax schedule should depend upon the presence of children:<sup>32</sup>

1. the presence of children could be used as a tag (Akerlof, 1978), if the presence of children in a family is correlated with the parents' ability to pay taxes, or because it is correlated with the labour supply elasticity (we cited evidence in support of the latter in section 3)<sup>33</sup>.
2. to the extent that children represent a cost to their families, so that a family with children needs more disposable income than one without to reach a given standard of well-being, then there is an argument that this should be reflected in the optimal tax schedule, so that for a given family income level, the presence of children should reduce the family's tax liability or increase the transfers received. But this is not a universally-held viewpoint:

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<sup>32</sup>Similar arguments can be made for matters such as old age, or long-term sickness or disabilities, but we do not explore these here.

<sup>33</sup>Note that this argument does not say whether, for a given level of income, a family with children should face a lower average tax burden or METR than a family without in an optimal tax system, merely that they could be different.

certainly children do cost money, but given that there is a degree of choice in having children, there must be some benefits to families too, it can be questioned why society should compensate families for a particular lifestyle choice;<sup>34</sup> given the benefits that arise from having children, compensating families for the extra cost of having children cannot be justified as easily as compensating families for the extra costs imposed by long-term sickness or disability, for example.

3. a society may feel a responsibility for children's well-being directly because they are unable to affect their parents' income, and there is therefore an argument for an optimal tax system to provide a means of insuring children against growing up in a household with a low income (this argument is strengthened if there are costs to society as a whole from having children grow up in a household with low income).

However, it is also possible that decisions on whether to have children (and if so, how many) are affected by the generosity of child-contingent transfers. If so, this introduces another aspect of behaviour which can be distorted by the design of the tax system, potentially leading to efficiency costs.<sup>35</sup> Surveying recent evidence, Brewer, Ratcliffe and Smith (2007) conclude that fertility can be responsive to financial considerations, but the implied elasticity is low.<sup>36</sup> If fertility does respond to financial incentives, then this introduces another dimension to the optimal tax problem.

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<sup>34</sup>This argument was made forcibly by Dilnot, Kay and Morris (1984).

<sup>35</sup>Clearly if there are benefits (or costs) to society as a whole from the presence of children which parents do not take account of when making fertility decisions, and if fertility decisions are affected by the generosity of the tax and transfer system, then this may provide a rationale for using the tax system to subsidise (or tax) children (this is a standard argument for using the tax system to correct for externalities: see Fullerton et al., this volume]).

<sup>36</sup>In the US, there is little conclusive evidence that welfare benefits or the EITC have any effect on fertility (see Hoynes, 1997 and Baughman and Dickert-Conlin, 2007) but studies of specific programmes in other countries have shown there to be small responses of fertility to child-contingent transfers (see Laroque and Salanié (2005) and Milligan (2005)).

### **Box 9. Child-contingent transfers in the UK**

The UK tax and benefit system varies markedly with the presence of and number of children. At the time of the Meade report, the UK government was replacing child tax allowances and a programme known as family allowances with child benefit: a non-means-tested cash payment for all children almost always paid direct to the child's mother. But child benefit is no longer the single most expensive programme for supporting children thanks to the growth, since 1997, of means-tested tax credits conditional on the presence of children.<sup>a</sup> Overall, then, child-contingent transfers in the UK are now more means-tested than universal, and are higher for the first child than subsequent children (both these features have been accentuated since 1997).

Because there have been large increase in entitlements to welfare benefits and tax credits for families with dependent children but none for those without, the size of net transfers that is conditional on having children has risen substantially since 1997: the real value of child-contingent transfers per child grew by around 50% between 1997 and 2003, more than it had risen by in the previous 22 years, and Brewer, Smith and Ratcliffe (2007) provides new evidence suggesting this increase has led to a rise in fertility amongst couples likely to be eligible for such programmes.

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<sup>a</sup>See Adam and Brewer (2004) and Adam et al (2007). These changes have come about because the current UK government is particularly concerned about the high (by international and historical) levels of relative child poverty, and this concern - and the tough quantified targets that accompanied it - has led to very large real increases in entitlements to welfare benefits and tax credits for families with dependent children since 1998 (see Brewer et al, 2008).

## **6 Administrative and operational concerns in optimal tax design**

In this section, we discuss whether and how a benefit system for low-income individuals should be complemented by requirements (backed up with sanctions) for failing to accept suitable jobs and/or work sufficient number of hours, and other administrative and operational issues concerning benefits or in-work credits.

### **6.1 The role of conditionality and active labour market policies**

A general trend throughout many OECD countries in the 1990s was the adoption of active labour market policies in order to encourage work among welfare recipients and the unemployed. Such policies range from training programmes, assistance in finding jobs, or requirements, backed up with sanctions, for welfare recipients to look for work and to accept

reasonable job offers.<sup>37</sup>

If participation tax rates for low-skilled workers are high, then the tax and benefit system discourages low-skilled work. In that context, it would be socially desirable to induce those who are just indifferent between working and not working to start working, since doing so would raise revenue (a gain to society), and the cost to the individuals of having to work is negligible. Obviously, strengthening financial incentives is one way to achieve this goal, as we discussed in Section 3. However, conditionality or active labour market policies can provide alternative tools that the government can use to induce work. If the direct cost of providing ALMPs or enforcing job-search requirements plus the welfare cost of forcing individuals to do things they would not have chosen otherwise is smaller than the fiscal savings obtained from having more people work, then such policies are socially desirable.<sup>38</sup> The general principle follows the theory of quotas and rationing developed by Guesnerie and Roberts (1984): goods that are subsidized by the optimal tax system should be rationed. In a system where participation tax rates for low-skilled workers are high, then being out of work is effectively subsidized, and should be rationed.

Two points should be noted. First, in reality, the welfare costs of forcing some individuals to work is higher than it is for others, and it might be difficult for the government to target precisely the individuals who do face low costs of working (and therefore for whom requirements to seek and accept job offers are most likely to be welfare-improving for society), and those active labour market policies might generate substantial welfare costs if, for example, they require beneficiaries with very high costs of working to start working. A crude but common way to achieve such targeting is to use family and disability status.<sup>39</sup>

Second, if the optimal tax system is such that the participation tax rate among low skilled individuals is low (and even more so if it is negative as our previous analysis suggested), then

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<sup>37</sup>A very large empirical literature analyzes such programmes, and Kluge et al. 2007 provides a comprehensive survey of this literature and meta-analysis for policies in European countries.

<sup>38</sup>NAO (2007) [or HC 609 Session 2006-7 not sure how to reference?] compares the direct cost of providing different New Deal programmes in the UK in 2005/6 with the net tax savings from getting participants into work, and finds that most of the UK's active labour market programmes are not worthwhile (the calculation takes only a short-run view of the fiscal savings, but on the other hand, it does value the costs of making individuals work when they would have preferred not to).

<sup>39</sup>For example, after the 1996 welfare reform in the US, welfare recipients were required to enroll in training programs or work part-time unless they had very young children. In the UK, the conditions that apply to claimants of out-of-work benefits are different for lone parents, those who have a long-term sickness or a disability, and other individuals (although the current Government has proposed changes to reduce these differences). See Section 5 for more information or Cm 7290 (2006-7) for the UK government's current strategy.

the desirability of using such active labor market policies is weakened as the tax savings from inducing people to work are small (or even negative, if the PTR is negative). In the optimal tax model developed in Section 3.2, it is desirable to induce out-of-work high skilled individuals to start working, but in reality, active labour market policies rarely target high-skilled individuals.

This discussion (like previous sections) assumes the government maximizes a social welfare function that depends only on individual utilities; the approach to optimal taxation pioneered by Mirrlees is considered “welfarist” in the sense that it disregards any information not related to individuals’ well-being or welfare. In such a model, if individuals make a well-informed decision not to work given the tax schedule facing them, then that decision should be respected by the government. In contrast, a non-welfarist approach to optimal taxation allows for the government to use a criterion for evaluating social welfare that is different from the preferences of the individuals. Clearly, departures from the welfarist approach to optimal non-linear income taxation may lead to very different implications for taxation design. For example, Kanbur, Keen and Tuomala (1994) consider a optimal tax problem where the objective of the government is to reduce poverty defined using a standard income-based poverty index.<sup>40</sup> Moffitt (2006) argues that the history of redistributive policy in the US suggests that the government values work per se and given this, considers a optimal taxation problem where having a government has a direct objective to maximise the number of individuals in work (the same conclusion would almost certainly be drawn about recent UK governments). In this setting, earnings subsidies are often optimal, and work requirements emerge as an instrument for improving the government’s view of social welfare (see Moffitt, this volume).

Box 10 discusses the extent to which transfers in the UK can be viewed as conditional, rather than unconditional, transfers.

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<sup>40</sup>By contrast, a welfarist government might be deeply concerned about, for example, poverty measured by a standard income-based poverty index, but only as an intermediate objective.

**Box 10. Conditionality in the main transfer programmes.**

The shape of the budget constraint for those with no or very low earnings (and hence PTRs for all workers) in practice depends on the whether benefits are conditional or unconditional.

Of the benefits mentioned above, HB/CTB and CTC are paid to all who are income-eligible, and the WTC is paid to all who are income-eligible and where one person in the family works some minimum number of hours a week: for these programmes, claimants are not required to do any other activities as a condition of receiving benefit. However, conditions do apply to those claiming IS or JSA (which are two identically-structured programmes for people who are out of work and on a low income). Claimants of JSA have to be available for work, actively seeking work, and have agreed a jobseeker's agreement with Jobcentre Plus; furthermore, people may be unable to claim JSA if they left their previous job voluntarily, or were sacked for misconduct. In principle, this means that people who do not make sufficient effort to look for work, or who turn down reasonable offers of work, can lose their entitlement to benefit for between 1 and 26 weeks (with exceptions made for vulnerable groups). Claimants of IS may have to attend periodic meetings at a Jobcentre Plus office, but do not have to look for work as a condition of receiving benefit; however, only some groups are allowed to claim IS, the main ones being people who are sick or disabled, people who are caring for a sick or disabled individual, and lone parents whose children are all aged under 7.<sup>a</sup>

Adults who are incapable of work through sickness or disability can usually claim incapacity benefits (incapacity benefit and income support on the grounds of disability), continued receipt of which is conditional only on attending periodic meetings at a Jobcentre Plus office. New claimants from April 2008 will instead claim the Employment and Support Allowance, which will have greater requirements on claimants, backed up with sanctions for non-compliance.

<sup>a</sup>At the time of writing, lone parents could claim IS until their youngest child reached 16, but this will fall to age 7 by October 2010. See Cm 7290 (2006-7).

## 6.2 The assessment period and timing of taxes and transfers

In most countries, individual income taxes are assessed on annual income, and transfers often assessed on a monthly basis (in the UK, weekly). Standard economic models predict that families should budget over long time periods, by borrowing (or using credit) and saving. If families have fluctuating incomes but are able to smooth consumption over time by borrowing and saving, then income assessed over a longer period of time is a better measure of economic welfare or well-being than income assessed over a short period of time.

In reality, costs of using financial services and other credit market failures, low levels of literacy, numeracy and financial education, and self-control problems with savings all create

significant departures from the standard model. These departures are likely to be more prevalent amongst low-income families, and tend to lead to such families budgeting consumption over short periods of time, such as a month or a fortnight. It therefore seems desirable to operate transfers for low-income families on a high-frequency basis, and operate taxes on higher incomes on a lower frequency, such as annual.

Another important aspect is the timing of tax payment or benefit receipt relative to the period of earnings assessment. Because of imperfect credit markets and some families' imperfect ability to budget (as described above), many families would be unable to pay a significant level of tax if it is not withheld at the time they receive the earnings: this is why setting up tax withholding systems operated by employers is key to implementing broad-based taxes (or social insurance contributions) on earnings.<sup>41</sup> In this way, income tax can be withheld throughout the year at levels which are approximately correct, and a small adjustment made once a year if the amount withheld does not correspond to the actual tax liability. A similar argument applies to the design of benefits: the closer is the timing of payment to the period of assessment, the better targeted is the benefit ; paying credits through a single annual payment (as almost always happens with the EITC) can be very inefficient if families are credit constrained.<sup>42</sup>

One way of aligning the timing of payment to the timing of assessment is to administer benefits for workers through income tax system; such a scheme can also have lower administrative and compliance costs relative to traditional welfare programmes and relative to the child and working tax credits in the UK, discussed further below. For example, a (refundable) tax credit could be administered through a system of "negative withholding", where the revenue authorities fund employers to top up earnings instead of withholding taxes. Having an automatic system of benefit payments may also reduce stigma costs for recipients.<sup>43</sup>

However, the experience of the first two years of the working and child tax credits in the

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<sup>41</sup>We use "withholding" in the same sense as Shaw et al, this volume.

<sup>42</sup>It is possible that the prospect of a large annual lumpsum tax refund induces families to borrow against the forthcoming tax refund with high interest costs. Indeed, surveys show that US tax refunds received by low and moderate income families are used primarily for paying down debts. Alternatively, one-off tax refunds can be seen as forced savings devices which allow low income families with self-control problems to save for purchasing consumer durables or investing in human capital. Empirical work has not yet been able to distinguish those two scenarios. It is striking to note, however, that there is little demand for such forced savings devices in the UK where transfers are paid monthly or fortnightly.

<sup>43</sup>Exactly as taxpayers disliked interactions with the tax collector in past centuries, welfare recipients today dislike the close scrutiny required to qualify for such transfers.

UK (see Box 11), the Advance EITC in the US, or Prime à l'Emploi in France, all show that such a system will cause difficulties if there is a significant risk that families incur an overpayment which they have to repay to the government. This fear leads the vast majority of EITC recipients in US to opt to receive it annually in arrears, and the UK government changed the way tax credits depend on income in 2005 so that they are predominantly based on the previous tax year's income (except where income falls), meaning that most rises in income should not lead to over-payments (although this change was predicted to reduce the number of over-payments by just a third). But such a design makes tax credits rather like a retrospective benefit scheme based on annual income, and this means the credits are then not as well targeted as they could be.<sup>44</sup>

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<sup>44</sup>Many of these issues were discussed in detail when the UK government proposed merging working families' tax credit (a 6-monthly retrospective transfer programme) and the children's tax credit (an annual transfer implemented through PAYE) to form the child and working tax credit: see Brewer et al (2001) and Whiteford et al (2003) for more discussion. See also Brewer (2006).

**Box 11. The administration and operation of tax credits in the UK.**

In-work programmes increased in importance during the early to mid 1990s, partly as a response to the growing prevalence of lone parent families. But their importance changed beyond recognition between 1999 and 2003. The working tax credit now supports working families with or without children with a low income, and the child tax credit is now received by around 90% of all families with children. These tax credits are administered by Her Majesty's Revenue and Customs (HMRC), but they have many elements which feel much more like traditional welfare programmes: they are jointly assessed, paid regularly directly to recipients' bank accounts, and do not reduce formal income tax liabilities.

The administration of tax credits has been extensively criticised, with a cross-party group of Members of Parliament concluding in early 2008 that "there is little evidence that [HMRC] has the scheme under control. Many claimants continue to struggle to understand tax credits and why they are overpaid. There have been many complaints about the process of recovering overpayments and the Ombudsman continues to receive and uphold a large number of complaints".

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These administrative problems mostly derive from policy choices, so it is worth discussing these briefly. One of the predecessors of the child and working tax credit was Working Families' Tax Credit (WFTC). WFTC awards were retrospective, and having determined entitlement to WFTC, this amount was paid for 6 months, regardless of any changes in the family's circumstances; any changes in circumstances were reflected in the next award if the family re-applied after 6 months. Because awards were based on verified information, there was no need to re-assess awards.

But the retrospective nature, combined with the 6 month gap between assessments, meant that payments need not have reflected current circumstances, and these, plus the perceived compliance costs to families of providing verified earnings details twice a year, were the main motivations behind the introduction of the child and working tax credits. Their design reflects an attempt to reconcile these tensions. The principle of the child and working tax credits is that they should depend on current family circumstances, and income in the current year. But the tax authorities do not know the details on which tax credit entitlements depend (the earnings of all adults in the family, the number of children, whether any adult is working for 16 or 30 or more hours a week, and how much is being spent on childcare) so tax credits rely on two things: first, there is a 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 – within a month of it happening. Second, tax credits are likely to be based on the claimant's previous year's annual income: claimants whose income is lower than last year can have tax credits assessed on their best estimate of their current income, but claimants whose income is higher than the previous year can have tax credits assessed on the previous year's income, provided that is within £25,000 of their current annual income. [So why over-payments?]

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<sup>a</sup>For example, see HC 300 2006-7, CAB (2007) and Brewer (2006) and references therein.

## 7 The current household tax and benefit system in the UK

This section describe the inherent work incentives for working-age adults in the UK tax and benefit system that arise from income tax, employer and employee national insurance contributions (the payroll tax), the working and child tax credits, and other benefits.<sup>45</sup> Box 12 summarises the key changes since Meade (see also Adam et al, this volume and references therein).<sup>46</sup>

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<sup>45</sup>There is more detail on individual taxes in Adam and Browne (2007) and on individual transfer programmes in O’Dea et al. (2007). We do not show the schedule affecting those over the state pension age, nor do we discuss health- or disability-related transfers: the main differences for those above state pension age are: there is no payroll tax on earned income, there are higher personal allowances for income tax, welfare programmes are more generous, and health-related transfers are more important.

<sup>46</sup>Adam et al (2006) shows the distribution of key work incentive measures has changed over time; their measures of work incentives exclude employer NI, however. Adam et al, this volume shows how tax and transfer changes have affected key work incentive measures.

**Box 12. The main changes to the UK tax and transfer system since the Meade report**

Much has changed to the personal tax and benefit system in the UK since the first Meade report in 1978, but we would highlight three particularly important developments:

First, statutory rates of tax have fallen at the top, but marginal effective tax rates (METRs) have not necessarily fallen. In 1978, the highest marginal income tax rate on earned income was 83%; a decade later, it had fallen to 40% (with extensions of national insurance contributions over this period, the overall marginal tax rate on top earnings, before considering the impact of consumption taxes, is now 47.6%). But this tells us only about the change in the marginal tax rate facing the very richest in the UK (Between 1974 and 1978, the mean income of the richest 1% of adults in the UK was not high enough for the highest marginal rate to be applicable, but the mean income in the top 0.1% was). In fact, across the whole population, statutory income tax rates are generally lower than in 1978, but METRs across the whole distribution are not necessarily lower now than in 1978, partly because of the expansion of income-related in-work programmes, and partly because tax allowances have not kept pace with growth in earnings (a phenomenon known as fiscal drag) (see Adam et al, this volume, and Adam et al (2006)).

Second, income tax is assessed at the individual level, rather than jointly, but many married or cohabiting couples in the UK still face some form of joint assessment of their incomes, thanks to the expansion of income-related in-work programmes, and of means-tested benefits for those aged 60 or more. 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 that depend upon the joint income of a co-resident couple, whether legally married or not (see Hoynes, this volume, for further discussion).

There has been an expansion of in-work programmes or refundable tax credits conditional on work. In fact, the UK has had a programme to support low-income working families since 1972, but the importance of benefits to families who are working is much greater now than at the time of the Meade report.

Figure 5A-1 shows how the annual net income of a lone parent with two children varies with the annual employer cost (ie annual earnings plus employer NICs).<sup>47</sup> While this is not intended to be a typical family, it does illustrate some of the key features of the UK tax and benefit system (Box 13 discusses how the tax and benefit system varies across different family types).

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<sup>47</sup>Throughout this section we assume that there are no childcare 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 (as of October 2007) of £5.52 per hour. The benefits system works on a weekly basis, and the tax system on an annual basis, but the Figures have assumed both work on an annual basis.

Figure 5B-1 and 5C-1 show how the associated participation tax rate (PTR) and METR vary with earnings for the same specimen family type. They also show the empirical relationship between PTRs and METRs and the employer cost for all working lone parents, given the underlying demographic structure, employment patterns, and distribution of earnings in the UK (the main reason why the empirical distribution differs from the hypothetical relationship is that, on average, lone parent families have fewer than 2 children, and children serve to raise PTRs and extend the range of income over which a high METR applies).

**Box 13. Generalising to other family types**

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 (see also Figures 5A-2, 5B-2, 5C-2 and 6A and 6B):

The schedule of METRs would be identical to that shown for a primary earner in a couple with children, but PTRs would be higher, because such families are entitled to more JSA/IS than lone parents when they do not work but no more WTC when they do work.

The presence and number of children has a large impact on the METR schedule (and a smaller impact on PTRs) for low to middle earners: each additional (fewer) child would increase (decrease) the point at which the METR falls from 73.4% to 38.8% by £5,346 a year (personal earnings).

Families without dependent children are not entitled to tax credits until they work 30 hours a week, and so METRs would be lower (and PTRs a lot higher) than those for otherwise-equivalent families with children working between 16 and 29 hours a week.

Because of the various hours rules in the UK tax and benefit system, assuming higher hourly wages given a value of employer cost measured weekly would change the pattern of METRs and PTRs at the bottom of the earnings distribution, but not at the top, where income tax, national insurance contributions and tax credits depend only on weekly or annual earnings.

Generalising across other forms of income is harder: unearned income is treated differently from earned income in IS/JSA, and by national insurance contributions, but treated similarly to earned income by income tax and tax credits; self-employment profits are treated differently from earnings from employment by national insurance contributions, but not by income tax or benefits.

They illustrate the following features of the UK tax and benefit system:

1. The PTR is 0% for very low earnings and then increases rapidly. This reflects the structure of the main means-tested benefits for families with no earnings and who work no more than 15 hours a week (Jobseekers' Allowance (JSA) and/or Income Support

(IS)<sup>48</sup>). For families on JSA/IS, a 100% METR applies after a small earnings disregard (£5 a week for single adults, £10 a week for couples, £20 a week for lone parents): families therefore face no direct financial incentive to increase their earnings above the very low disregard unless they earn enough to exhaust fully entitlement to IS/JSA, or they work sufficiently high number of hours to qualify for the working tax credit. In April 2008, a single adult aged 25 or over would receive £60.50 a week in JSA. Receipt of these benefits also confers entitlement to various benefit-in-kind programmes, the most important of which is entitlement to free school meals.<sup>49</sup>

2. Hours rules are an extremely important part of the benefit system in the UK<sup>50</sup>: the most important ones are that individuals working 16 or more hours may not claim JSA/IS, and individuals with (without) children working 16 (30) or more hours may instead claim working tax credit.<sup>51</sup> Figure 5B-1 and 5B-3 show that these hours rules lead to a striking discontinuity in the PTR schedule: after reaching a maximum at the point just before entitlement to JSA/IS is exhausted, the PTR falls substantially at 16 hours work a week (there is a further discontinuity at 30 hours a week - annual earnings of £8,611 for a minimum wage worker - when an additional credit in the WTC is payable).
3. Families with dependent children receive child-contingent support through a non-means-tested child benefit, and most receive more through a means-tested fully-refundable child tax credit<sup>52</sup>. In 2008-09, a lone parent and two children with no private income would receive £183 a week from income support, child benefit and child tax credit combined (so three times as much as the single adult with no children).

4. The shape of the budget constraint for low to middle earners varies considerably by

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<sup>48</sup>There is also a short-term non-means-tested jobseekers' allowance for those who have paid sufficient national insurance contributions, but only a minority of JSA recipients qualify for this.

<sup>49</sup>The loss of these benefits-in-kind can substantially increase PTRs; the difficulty is modelling their value to individual families. For a qualitative study, see Community Links et al (2007).

<sup>50</sup>In principle, making the working tax credit means-tested against weekly earnings and conditional on working 16 or more hours a week means it is more closely focused on low-wage workers than would be the case if it were conditional solely on having positive earnings. In practice, there may be very few high wage workers who would wish to work small numbers of hours if there were an earnings-based in-work credit, and so there may be little efficiency gain from having an hours rule. Furthermore, under the current rules for the WTC, hours of work are self-reported (although potentially verifiable if the revenue agency consults with employers).

<sup>51</sup>The take-up rate for the WTC for those without children is extremely low, at 20 per cent (25 per cent by value; see HMRC, 2007a).

<sup>52</sup>In the rest of this section, we use children to mean dependent children, which is currently defined as children under 16, or aged 19 or under in full-time education or approved training schemes.

whether a family is entitled to the means-tested benefits known as housing benefit and council tax benefit (together, HB/CTB) (see Box 14). Families who are receiving JSA/IS are automatically entitled to the full amount of HB/CTB, but once JSA/IS has been exhausted, HB/CTB are withdrawn at a rapid rate. This can dramatically reduce the gain to work: in Figure 5A-1, for example, net income increases by over £50.50/wk when the earner works 16 hours a week, but with housing costs of £80 per week, this is reduced to £6/wk.<sup>53</sup>

5. For most people, METRs are determined by the rates of income tax and National Insurance contributions. Income tax (20%) and employee NICs (11%) are both liable when annual earnings reach £5,435 a year (£104.52 a week) to give a METR of 31% (plus 12.8% on the employer, or 38.3% overall).<sup>54</sup> This increases to 47.7% (41% plus 12.8% on the employer) when earnings are sufficiently high for the higher-rate of income tax to be liable (from April 2008, this will be £41,435 a year, but the Government has already announced a real rise in this threshold from April 2009 which we allow for in our reform proposals in section 6).<sup>55</sup>
6. But METRs are considerably higher for families entitled to tax credits or HB/CTB. Once annual earnings have reached £6,420, entitlement to tax credits begins to fall, and this increases the METR by 39 ppts to 70% (with the 12.8% on the employer, this reaches 73.4% overall). For a family with 2 children and a full-time earner, the 70% (or 73.4%) METR falls back to 31% (or 38.3%) once gross annual earnings reaches £28,150. But what complicates - and raises - METRs even further is the way this combined income tax-NI-tax credit METR interacts with HB/CTB: to give an example, someone facing a combined income tax-NI-tax credit METR of 70% and entitled to HB/CTB would face a METR of 95.5% (plus 12.8% on the employer side, or 96% overall): see Box 14.

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<sup>53</sup>The 2008 Budget - which took place as this chapter was being finalised - announced that earnings disregards in housing benefit and council tax benefit would effectively be increased substantially for families with children from October 2009.

<sup>54</sup>If an employer pays £1 in notional gross earnings, then the employer actually pays out 112.8p, and the individual actually receives 69p, with the Government receiving 43.8p. The overall METR is therefore 43.8/112.8 or 38.3%.

<sup>55</sup>When joint family earnings are between £50,000 and £57,783, the family element of the child tax credit is withdrawn at a rate of 6.7%, giving a slightly higher METR of 47.7% plus 12.8% on employer, or 53.6% over this range.

**Box 14. Housing benefit and council tax benefit**

Housing benefit is a rental subsidy programme which can potentially cover the full cost of renting (subject to locally-determined rent ceilings), but where actual entitlement depends upon family income and household composition.<sup>a</sup> Council tax benefit is a very similarly structured programme that provides a (potentially 100%) rebate on council tax payments. Hereafter we refer to these programmes together as HB/CTB.

The withdrawal rates in HB is 65%, and in CTB, 20%; these are cumulative, but they apply to net income, not gross income, and so the 20%/65%/85% withdrawal rate of CTB/HB/both combined is not added to the combined income tax-NI-tax credit METR, but instead applied to whatever earnings are left. For example, someone facing a combined income tax-employee NICs-tax credit METR of 70% and on the taper of both HB and CTB would lose 85% of the remaining 30%, giving a total MTR of 95.5% (plus 12.8% on the employer side, or 96% overall). Someone with a combined income tax-employee NICs METR of 31% and on the taper of CTB would lose 20% of the remaining 69%, giving a total MTR of 44.8% (51% with employer NI).

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<sup>a</sup>In the private rental sector, the rules for HB changed in April 2008 so that the maximum entitlement depends on household size and composition (and locality), and not on the actual rent paid.

Table 4 shows the distribution of work incentives measures for various family types (and see also Figures 5B-1, 5C-1, 5B-2, 5C-3 and 6A and 6B). It shows that:

- METRs and PTRs are generally higher for families with children than those without with identical incomes.<sup>56</sup>
- PTRs are generally lower for adults whose partner is in work than for the sole earner in a couple.

**Table 4. Distribution of participation tax rates amongst workers, 2008/9 tax and benefit system**

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<sup>56</sup>One slight exception is that low-earning lone parents can face lower PTRs than low-earning single adults without children: this is because WTC requires fewer hours of work for lone parents than low-earning single adults without children, and because the interaction of child maintenance payments with IS/JSA and WTC means that lone parents receiving child maintenance payments can face very low or negative PTRs.

	Centile of distribution of PTRs					
	10th	25th	50th	75th	90th	Mean
Single, no kids	.31	.40	.42	.47	.63	.44
Couple, no kids						
Partner not working	.28	.35	.45	.55	.67	.45
Partner working	.18	.25	.30	.35	.41	.29
Lone Parent	.01	.25	.44	.55	.66	.36
Couple with kids						
Partner not working	.40	.48	.56	.64	.78	.55
Partner working	.15	.29	.39	.50	.57	.37

Notes and sources: Authors' calculations based on FRS 2004/5 with net incomes calculated using TAXBEN. Assumes the April 2008 tax and benefit system. Sample is all workers. Adults in families with anyone aged 60+ are excluded.

## 8 A plan for reforming taxes and transfers in the UK

In this final section, we first suggest a set of changes to the existing tax and benefit structure that could be made immediately and that address problems we identify with the work incentives inherent in the current system. We then set out a more radical and comprehensive set of structural changes to the tax and benefit system that attempt to deal not only with the work incentive issues, but also with the administrative failings that we identify. None of the reforms described below would apply to those aged 60 or over, nor do we propose specific changes for those with long-term sickness or disabilities, nor do we address how conditionality should be applied to out-of-work benefits nor how welfare to work policies should be designed.

As we discussed earlier, one direct way to arrive at an optimal tax and benefit schedule for the UK would be to use an optimal tax model for the UK that reflected extensive and intensive responses. But such a model would most likely miss out on some of the considerable heterogeneity between different sorts of families in the tax and benefit schedules (as the schedule differs by the number of adults and the number of children), and it would be even more complicated to allow for responses other than to taxable income (for example, to reflect that household formation may be sensitive to tax incentives) and to allow for concerns over administrative and compliance costs. Instead, we have sought in this section to apply the lessons from optimal tax theory combined with the best available evidence on the scale of behavioural responses, and our knowledge of the incentives inherent in the existing UK tax

and benefit system.

In formulating these suggested reforms, we have been guided by the following points or principles, discussed earlier in this paper:

- For certain groups, such as second earners and individuals with low levels of education, extensive responses are likely to be more important than intensive responses (see Section 3.2).
- The responsiveness of hours worked to the tax system is very low for most groups, and perhaps zero. The responsiveness of taxable earnings is greater, with an elasticity of perhaps 0.25 for low and middle income earners, rising for high income earners (see Section 2.2).
- There may be little or no scope for raising METRs applying to top earners in the UK. The current tax system in the UK has METRs from income and NICs that rise modestly: the combined tax rate on earned income rises from 31% to 41% (from 40.6% to 47.7% including employer NI) when earnings reach £41,435 (April 2008). Section 2 showed that, with reasonable preferences for redistribution, METRs should rise in the upper part of the earnings distribution if the elasticity of taxable income with respect to tax rates is constant across income groups. Our numerical simulations (Figures 4A and 4B) showed that, if elasticities were constant and modest in size - our numerical example used an elasticity of 0.25 - then increasing tax progressivity of the current UK tax system by adding yet an additional higher tax rate for the richest 1% would be desirable. However, our empirical analysis in section 2 suggests that the relevant elasticity of the richest 1% might well exceed 0.25, in which case it is undesirable to increase top METRs because doing so would reduce government revenues. We therefore do not propose changes to the METR affecting top incomes.
- We take it for granted that the income tax system will remain individual, reflecting the extremely strong current political consensus in support of individualised income tax, and we conclude that the redistributive benefit of jointly-assessed transfers for lower-income families outweigh any efficiency losses (see Section 4).

We present UK tax and benefit system described in section 5 suffers from four important defects:

- Participation tax rates for low levels of earnings are high: for most groups, they are close to 100% before individuals are entitled to the working tax credit, and they remain high even with the working tax credit. These PTRs appear much too high in a context where optimal tax theory suggests that the participation tax rate should be low, possibly even negative, at low levels of earnings, so as to encourage people to move into work. And PTRs for families potentially entitled to HB/CTB remain extremely high (over 70%) even at medium and high incomes.
- The phasing-out of the working and child tax credit, which operates on top of income tax and NICs, generates METRs of 73.4% including employer NICs (higher if also entitled to HB/CTB) for a large number of low to moderate earners; such a high METR is highly likely to be above the optimum rate even with modest behavioral responses.
- The main means-tested programme to help with housing (housing benefit) has an extremely high withdrawal rate, administrative difficulties and problems of mis-perception which deter low-income working families from claiming it (Turley and Thomas, 2006), and, by its design, predominately affects a minority group in society - tenants of social housing - who we might expect to have low earnings capabilities, a weak labour market attachment, and therefore relatively high labour supply elasticities.
- While the system for administering income tax and NICs in the UK is simple and efficient, the systems for administering child and working tax credits, and those for housing benefit and council tax benefit, are administratively burdensome for claimants, relatively expensive for the government, and prone to large amounts of fraud and error: all mean that neither is as well-targeted on the economic situation of beneficiaries as they could be.<sup>57</sup>

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<sup>57</sup>Tax credits are proving expensive to administer (HMRC spent £587m in 2006/7 to administer net spending of £18.7bn, a ratio of 3.13%, compared to a ratio of 2.12% to administer WFTC, its much smaller predecessor (see Cm 6983 2006-7 [HMRC's Annual report 2005/6] and HC 626 2006-7 [HMRC's Accounts for 2006/7]), tax credits have the highest rates of fraud and error in central government (£1bn to £1.3bn in 2004/5 out of total spending of around £16bn; HMRC, 2007b), they can often serve to increase (rather than cut) volatility of income (Hills et al, 2006 [Case report]), and there remain concerns about their impact on recipients (see HC 1010 (2006-7) [ombudsman report] and CAB, 2007).

We set out reforms that could address these shortcomings in the following two sections.

## 8.1 Immediate changes to household taxes and transfers

There are a number of straightforward steps that could be taken within the current system in order to address the key work dis-incentives.<sup>58</sup>

- Increase the level of earnings disregards (the amount of earnings a person is allowed to earn before benefits are withdrawn) in all of the means-tested benefits (in order of priority, HB/CTB then JSA/IS) to reduce PTRs on earnings of less than £90 a week for all, and on higher earnings for individuals receiving HB/CTB: these groups currently face very weak incentives to work at all.<sup>59</sup> An increase of HB/CTB disregards to £50/wk would cost £1.7bn a year, to the value of 16 times the minimum wage would cost £4.3bn. Duplicating this in JSA/IS would cost an extra £0.3bn or £0.6bn respectively. This policy should lead to an increase in employment, but it would also extend eligibility to HB/CTB to many more working families, and so this measure should be considered only alongside measures to speed up dramatically processing times for HB/CTB claims, or a move to fixed or retrospective HB/CTB awards (to eliminate the problem of overpayments); hopefully such measures, plus the clear signal sent by a large disregard, would themselves do much to increase the take-up rate of HB/CTB amongst eligible working families. Higher disregards in IS/JSA would also increase the number of people eligible to such benefits both through its immediate effects (because it extends eligibility up the income distribution), and after considering the behavioural response (because it makes working fewer than 16 hours and claiming IS/JSA relatively more appealing than working 16 or more hours and not claiming IS/JSA). Higher disregards in IS/JSA might be less appealing, then, if a government had a direct objective to get people off IS/JSA, which it might do if it had a non-welfarist objective function (see earlier section), or if the cost of administering IS/JSA were much higher than the cost of administering transfers

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<sup>58</sup>These are not all novel proposals: Bell et al. (2007) analyse large increases in the earnings disregards in transfer programmes affecting lone parents, and HC 42-I (2007-08) recommends them for all family types; Adam et al. (2007) analyse increases in the working tax credit; Brewer (2007) analyses an extra credit for second earners in the working tax credit, as proposed by Harker (2006) and Cooke and Stanley (2008).

<sup>59</sup>As this chapter was being finalised, Budget 2008 announced an effective rise in the earnings disregard for families with children of £20 a week for those with 1 child, and more for larger families. This clearly reduces the cost (and impact) of our proposal.

for low-income families in work.

- Introduce an additional earnings disregard in tax credits for second earners (or an additional credit in the working tax credit for families with two earners). This would reduce PTRs for secondary earners, particularly those with children. Giving each individual their own earnings disregard of £6,200 in tax credits would cost £1.3bn before any behavioural change. The downside of this policy would be that it merely shifts upwards the range of income over which second earners can expect to face a very high METR through the withdrawal of tax credits alongside payment of income tax and national insurance. However, this seems justifiable given the strong evidence that participation elasticities are relatively high for second earners in couples with children, and that the extensive response is more important than the intensive response.
- Reduce the withdrawal rate in child and working tax credits. This would reduce METRs and PTRs for individuals receiving the working or child tax credits, most of whom will be earning more than £90 a week. A cut from 39% to 34% would cost £1.4bn before any behavioural response. It would increase the number of individuals who face high METRs through a withdrawal of tax credits on top of income tax and NICs, but our assessment is this is acceptable if it permits the combined tax credit-income tax-NICs withdrawal rate to fall from its current high level of 73.4% (including employer NI), and it if acts to lower PTRs for low-earning families.<sup>60</sup>
- Increase the working tax credit for groups other than lone parents (the level of the working tax credit for low-earning lone parents currently exceeds entitlement to IS/JSA if they did not work, leading to low or negative PTRs at low earnings; no increase is needed here on efficiency grounds). This would lower PTRs for low-earning individuals eligible for WTC. Equalising WTC rates with JSA/IS rates would cost £3.2bn; halving the gap would cost £1.6bn. Two downsides of this policy are that it would increase the

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<sup>60</sup>In the UK, most high METRs occur when income tax and NICs are liable at the same time as tax credits are withdrawn. One way of solving this problem is to introduce large tax allowances, so that income tax is not deducted until tax credits are fully withdrawn; this change could be accompanied by a rise in the tax credit withdrawal rate. This reform is appealing because it allows well-off families to receive support through tax cuts administered automatically through PAYE, whilst focusing the part of the programme that pays out cash on the families with the lowest incomes. Compared to the current system, though, such a change is expensive, because it effectively grants tax allowances to families previously too rich to receive much or any tax credits, and it would only be possible if the system of tax allowances were based on family, not individual, circumstances.

number of individuals who face a withdrawal of tax credits on top of income tax and NICs, and that it would reduce the gain to work for some second earners in couples (so directly offsetting the impact of the additional earnings disregard in tax credits proposed above). However, the rationale for recommending this policy is that these downsides would be outweighed by the increase in the number of adults working, as participation tax rates are cut for eligible families.

Of course, all of these changes would mean the government paying out considerably more in transfers or tax credits.<sup>61</sup> We do not at this stage propose off-setting changes to increase tax revenue or reduce spending on transfers elsewhere. However, we have suggested these reforms on efficiency (rather than equity) grounds, and so it follows that any widespread tax rise (such as a rise in VAT, income tax or national insurance) to fund these tax cuts should still lead to a reform package that is desirable on efficiency grounds (in other words, it should be possible to find a revenue neutral set of tax and benefit changes that leads to a overall increase in aggregate earnings).<sup>62</sup>

These reforms have suggested themselves on efficiency ground, not because we are seeking to redistribute to particular groups. But whether these proposals seem sensible to the government will obviously depend on their own priorities for redistribution, so Table 5a & b shows the distributional impact of these policies, and the average gain for different family types, assuming no change in behaviour, and ignoring the impact of any revenue-raising measures to pay for them (which could be chosen to have any desired distributional effect).

**Table 5a: Distributional impact of reforms by decile group (% gain in net income)**

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<sup>61</sup>Note that all the costs have been estimated assuming no behavioural change, and that only 1 reform at a time is implemented. However, the reforms, and therefore their costs, interact: a £50 disregard in all means-tested benefits plus the three tax credit changes would cost just over £8.8bn).

<sup>62</sup>Furthermore, it might be appropriate to reduce spending on child benefit (or the family element of the child tax credit) in order to pay for at least some of these reforms, given that families with children tend to benefit more than families without, and given that these reforms suggested themselves on efficiency grounds, and not from a desire to redistribute more to particular groups.

Decile Group	Reform				
	Increase earnings disregards	Raise WTC entitlements	Cut tax credits taper	2nd adult disregard in tax credits	All reforms
1	2.88%	0.26%	0.00%	0.00%	3.13%
2	2.90%	1.69%	0.24%	0.10%	4.55%
3	2.08%	3.41%	1.27%	1.05%	7.01%
4	0.85%	3.39%	1.61%	1.65%	7.84%
5	0.36%	1.13%	0.58%	0.69%	4.46%
6	0.15%	0.19%	0.19%	0.09%	1.70%
7	0.10%	0.07%	0.06%	0.01%	0.36%
8	0.06%	0.03%	0.02%	0.00%	0.12%
9	0.02%	0.01%	0.01%	0.00%	0.04%
10	0.00%	0.00%	0.00%	0.00%	0.00%

**Table 5b: Distributional impact of reforms by family type (% gain in net income)**

Family Type	Reform				
	Increase earnings disregards	Raise WTC entitlements	Cut tax credits taper	2nd adult disregard in tax credits	All reforms
Singles, no kids	0.45%	0.66%	0.08%	0.00%	1.32%
Couples, no kids	0.17%	0.20%	0.05%	0.00%	0.45%
Couples, with kids	0.51%	1.06%	0.52%	0.67%	3.21%
Singles, with kids	0.58%	0.00%	0.69%	0.00%	1.26%

Notes: authors calculations based on FRS data and the TAXBEN micro-simulation model.

## 8.2 Radical reform: the Integrated Family Support

The radical reform plan we propose goes one step further. It is designed not only to by targeting net tax cuts where incentives to work are currently at their weakest but also to simplify administration and enforcement for the government, and to reduce the compliance costs of employers and claimants.

The centre-piece of our new tax and benefit system is a new programme, called the Integrated Family Support (IFS), which acts as a replacement for child and working tax credit, income support/JSA, child benefit, housing benefit and council tax benefit.

The key features are as follows (there are more details on how it would work in the online Appendix, but at this stage, we do not claim that we have identified or resolved the operational and administrative difficulties):

- Integrating most of the current benefits means that claimants can feel more secure about continuing to receive transfers when their circumstances change, and also removes the

problems that can occur when the benefits interact (this particular applies to the current interaction between tax credits and HB/CTB); these should reduce the compliance costs of claimants. It should also mean reduced opportunities for fraud and simplify administration and enforcement for the government.

- The maximum entitlement to the IFS would be *family* based, and would be the sum of a family component (different for single adults and couples), a child component (depending on the presence and number of dependent children), and a housing component (depending on whether the family rents or owns, and on the local rental and council tax levels). This structure broadly reflects the current set of maximum entitlements provided through transfers and tax credits.
- The IFS allowance would be means-tested based on *family* income, but there would be an *individual* earnings disregard of £90, or just over 16 hours work at the current minimum wage<sup>63</sup>. This disregard would apply to each adult in the family, so each of the two adults in a couple could earn up to £90 and still keep the maximum IFS allowance. The aim of this, which echoes our suggested immediate reforms, is to lower PTRs, potentially to zero for low-earnings work, in order to encourage labour market participation amongst those currently not working.
- The IFS would be paid directly by the government to eligible low and moderate income families, but the withdrawing of the IFS would be achieved, for the vast majority of families, through the existing (and augmented) system of income tax and NI withholding.<sup>64</sup> The IFS would not be an annual system, but instead be operated on a non-cumulative basis, with a weekly or monthly periodicity, so maximum entitlements would be determined weekly or monthly, and the withdrawal would depend on the earnings in each pay period. The aim is to ensure that the IFS is more transparent and provides more certainty than child and working tax credits.<sup>65</sup>

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<sup>63</sup>We describe the reform in 2008/9 prices (ie, as if it were an alternative to the April 2008 tax and transfer system), although we include in the base system for costing the reform the small change to the Upper Earnings Limit for employee NICs and the income tax higher-rate threshold due in April 2009.

<sup>64</sup>We use the word "withholding" in the same sense as in Shaw et al, this volume.

<sup>65</sup>It would clearly be much simpler if the IFS was an annual, retrospective scheme, because then it could be aligned fully with income tax. But doing this would mean that IFS payments could be weakly related to families' circumstances, and this is significantly at odds with the principles of transfer programmes in the UK.

- There will be two taper rates for the IFS: 30%, if the family is receiving only the child and family elements, or 45% if the family is receiving the housing element. These imply a lower overall METR than currently applies to families entitled to tax credits and/or HB/CTB. This is in line with our earlier conclusion that METRs for low to middle earners are far too high, even if behavioural responses are modest.
- This system does not do away with under- or over-payments, but their incidence should be much reduced compared to the current systems. Similarly, end-of-year reconciliations will still be needed, although these ought to be combined with the self-assessment process for income tax (as they would only be needed for relatively well-off families receiving the IFS). If, for various reasons, a family is under-withheld, the government would not ask for an immediate repayment, but could gradually reduce the balance over time through reasonable reductions in future IFS payments.

- **Financing the IFS, and its effect on household incomes**

The substantial increase in the earnings disregard of the IFS relative to the current system for IS/JSA, HB/CTB and in the working tax credit for second earners, the effective cut in the withdrawal rates of HB/CTB and tax credits, and the extension of the IFS to groups currently eligible for neither IS/JSA nor tax credits all cost a significant amount.

For the reform to be revenue neutral before behavioral responses, there need to be net tax rises elsewhere. In this proposal, this has been achieved by:

1. subsuming child benefit and the family element of the child tax credit within the IFS, and thereby removing both from better-off families through a means-test<sup>66</sup>;
2. lowering the income tax personal allowance and the point at which NICs start to be due from £104.50 a week so that they are aligned with the IFS disregard of £90 a week;
3. increasing the basic rate of income tax by 1 ppt;

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<sup>66</sup>There would then be no difference in the net taxes paid by well-off families with children and those without children, which makes sense if children are not seen as imposing extra costs: see the discussion in Section 4. A version that retains child benefit would cost an extra £3.3bn, and therefore it would be necessary to increase the basic rate of income tax by around 1 ppts to be revenue-neutral.

4. setting family and child entitlements to the IFS that are below the current rates of JSA/IS and child tax credit, but higher than the current rates of working tax credit. <sup>67</sup>

The key parameters are shown in Table 6.<sup>68</sup>

**Table 6: Parameters of the IFS reform<sup>§</sup>**

Single adult	£50
Couple	£80
Amount per child	£50
Supplement for first child	
Lone parent family	£30
Couple family	£20
Earnings disregard (for each adult)	£90
Withdrawal rates <sup>†</sup>	
IFS	30%
HB/CTB	15%
Income tax and National insurance thresholds	
Personal allowance/primary threshold	£4,680/yr (£90/wk)

<sup>§</sup>Weekly values unless stated otherwise.

<sup>†</sup>Rates applied to gross income in excess of disregard.

#### • The effect of the IFS on household incomes

Figures 7A-7D show how the budget constraint would change for some specimen families would change under the IFS. The main implication of the IFS is that it starts withdrawing means-tested support at higher income levels than the present system, and then withdraws this more slowly. This strengthens the very weak work incentives currently created by aggressive means-testing, but it does bring many more people into the scope of means-testing on top of income tax and NICs.

Given the focus on strengthening the very weak work incentives for those on HB and CTB, there is a substantial shift in resources between those not entitled to HB and CTB to those who are (in practice, the vast majority of households are liable to CT and therefore entitled to

<sup>67</sup>The last of these changes leads to losses for some low-income families with no private income. A version of the IFS where the the family and child elements of the IFS are set at the existing rates of IS/JSA and child tax credits (so as to produce no change in net transfers to families with no private income) would cost an extra £6 billion a year, and would imply considerable gains for low-earning adults without children, and all but the richest couples with children. To make this revenue neutral would require increasing the basic rate of income tax by nearly 2 ppts (after considering the behavioural responses).

<sup>68</sup>Estimates of the cost of the IFS have been made assuming no behavioural change, and that all benefits and tax credits are taken up. The second of these assumptions may understate the cost of the IFS; if the IFS succeeds in having lower compliance burden for families, then some currently not claiming tax credits or HB/CTB when in work may be induced to do so.

CTB, but only renters are eligible for HB). Whether the IFS reform implies an unacceptable distortion to the housing market - by increasing rent subsidies, and doing nothing for home-owners - takes us outside the scope of optimal tax theory and into issues related to housing policy in the UK, but addressing this (perceived or actual) distortion would require either reducing the generosity of housing benefit, or extending it to home-owners so that it is tenure-neutral (with an accompanying general rise in tax to pay for this). Similarly, it is beyond the scope of this chapter to consider whether council tax itself should be reformed; if it were made less regressive, then it might be possible to do without council tax benefit.

Table 7 shows the impact of the IFS on net incomes of working-age adults, by family type, and by decile group of equivalised income of working-age adults before any consideration of behavioural effects. The main impacts of the IFS reform on net incomes are as follows.

- The maximum entitlements to the IFS are a little higher than current tax credit entitlements but lower than current IS/JSA rates (except for lone parents), and this leads to losses for IS/JSA recipients with no other sources of income. However, the fact that the IFS is made available without any hours rules means that some low-income individuals (particularly single adults with no children aged 25 or over working under 30 hours a week) currently entitled to neither IS/JSA nor tax credits gain substantially.
- Low-income families entitled to HB/CTB tend to gain because the equivalent support is withdrawn more slowly under the IFS.
- Better-off families with children tend to lose as support currently provided through the non-means-tested child benefit is now tapered away as part of the IFS.
- All taxpayers lose slightly as the income tax personal allowance and the NICs primary threshold has been cut slightly.
- All taxpayers lose as the main rate of income tax is increased.

Across the whole population, the bottom half of the income distribution tend to be better off, and the top half to be worse off, but the changes are not entirely progressive: the largest gains are in the middle of the bottom half of the distribution, and the largest losses are in the

middle of the top half.<sup>69</sup>

**Table 7: Distributional impact of IFS: percentage income gain**

Decile group	overall population	singles no children	couples no children	couples with children	lone parents
1	4.6%	4.1%	11.8%	1.4%	3.7%
2	4.3%	6.2%	6.7%	3.6%	2.4%
3	4.8%	2.4%	5.4%	6.1%	4.1%
4	4.0%	3.0%	3.8%	5.1%	2.7%
5	0.9%	2.1%	0.9%	0.1%	1.2%
6	-1.7%	1.3%	-0.1%	-4.6%	0.3%
7	-2.4%	0.5%	-0.4%	-6.2%	-0.2%
8	-2.2%	1.4%	-1.2%	-5.4%	-2.5%
9	-1.6%	0.9%	-1.2%	-3.9%	-3.2%
10	-1.2%	-0.4%	-1.1%	-2.1%	-1.5%

Note: based on uprated data from the Family Resources Survey 2004/5 and the Institute for Fiscal Studies' tax and benefit micro-simulation model, TAXBEN.

Figures 8A to 8H show the impact of the IFS on (mean) PTRs and METRs by earnings for the same four family types.<sup>70</sup> In general, PTRs are lowered for all adults with low earnings, reflecting the universal £90 earnings disregard, and the lower out-of-work safety net for some. For some adults in families with children, the IFS increases PTRs on higher earnings, reflecting that support currently provided through the non-means-tested child benefit would be withdrawn as part of the IFS.

The impact on METRs is more complex. All family types see a fall in METRs on earnings below £90, reflecting that the £90 earnings disregard in the IFS is much higher than in current means-tested benefits. Above this, there are different patterns for the different family types. Lone parents and primary earners in couples with children tend to see METRs fall slightly at low earnings (that are above £90) but rise at higher earnings: this directly reflects that the IFS taper is lower than the current tax credit taper, and that the IFS taper extends further up the earnings distribution than the tax credit taper does currently. However, the other family

<sup>69</sup> Another statistic summarising the impact on the income distribution is the impact on relative poverty rates. Calibrating the poverty line so that 21% of children are in relative poverty (the rate in 2004/5, where poverty is defined as living in a household with less than 60% of median equivalised income), child poverty falls by 1.4 ppts, or just under 200,000 children before allowing for behavioural responses (but allowing the IFS reform to shift the median).

<sup>70</sup> These Figures are based on estimates of the METR and PTR of each working adult in the 2004/5 FRS made using TAXBEN. All Figures plot individual earnings on the horizontal axis.

types tend to see rises in METRs because more of these adults are affected by the withdrawal of the IFS than are currently affected by a withdrawal of tax credits (for single adults without children, this is predominantly because many more are entitled to the IFS as it has no hours of work limits; for second earners in couples with children, it is predominantly because the lower IFS withdrawal rate means that its withdrawal extends further up the (family) earnings distribution).

The online appendix explains how simple estimates of the behavioural response to the IFS affect the cost to the Exchequer, employment and total hours worked (or total earnings). These show that, given reasonable assumptions on the size of behavioural responses, the impact of the IFS reform on the Exchequer is small but negative. The IFS reform would be expected to lead to more people participating in the labour market, but average earnings conditional on participation falls, with the overall effect on total earnings being negative.<sup>71</sup>

Part of the reason for this negative behavioural response is that we have tried to reduce the generosity of the system for those with no private income by relatively small amounts, and we have made no cuts at all in the generosity of HB/CTB. If those programmes were made less generous to those with no private income, then income tax rates could be lowered, and the overall impact of the IFS would be to increase total earnings. However, with the rates proposed here, the achievement of the IFS is that it manages to redistribute more income with minimal impact on total earnings and total net tax revenue, by targeting net tax cuts where incentives to work are currently at their weakest.

### 8.3 Conclusion

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<sup>71</sup>It is not possible to estimate the impact of the behavioural responses on relative poverty rates, because the behavioural responses are modelled at an individual level. But it is possible to say something for single adult families. For lone parents, using a calibrated poverty line so that 21% of children were in relative poverty in the base system, 41% of children in lone parents were in poverty. Before behavioural responses, this falls to 40% (70% for children with a workless lone parent, 7% for children with a working lone parent, with 48% of children having a working lone parent). The estimated impact of behavioural responses is to increase the number of children with a working lone parent by 3.4 ppts, and to cut the poverty rate of children with working lone parents to 5%. Together, this makes the poverty rate for all children in lone parent families equal to 38%.

This paper has provided 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 benefits, and an application to the United Kingdom. We derived formulae for the optimal tax rates using the simple Mirrlees model, and showed the result of simulations of the whole tax system based on the UK earnings distribution and empirically-estimated labor supply elasticities. We investigated the link between top incomes and top marginal income tax rates since the 1960s. We discussed how the optimal tax system is affected by allowing for participation responses, migration, and how families and children should be treated.

These insights from optimal tax theory were contrasted with the work incentives inherent in the current UK tax and benefit system, and it is worth repeating our conclusions.

First, participation tax rates at low earnings are high: for most groups, they are close to 100% for jobs of too few hours to grant individuals entitlement to the working tax credit, and they remain high even with it. Secondly, the phasing-out of the working and child tax credits, which operates on top of national insurance and income tax, generates METRs of 73.4% (including employer NICs) for a large number of low to moderate earners which is likely to be above the optimum rate even with modest behavioral responses. Third, the main means-tested programme to help with housing (housing benefit) has an extremely high withdrawal rate (further increasing METRs), administrative difficulties and problems of mis-perception which deter low-income working families from claiming it. Finally, while the system for administering income tax and NICs in the UK is simple and efficient, the systems for administering child and working tax credits, and for housing benefit and council tax benefit, are administratively burdensome for claimants, relatively expensive for the government, and prone to large amounts of fraud and error: all mean that neither are as well-targeted on the economic situation of beneficiaries as they could be.

Given this, we suggest a set of changes to the existing tax and benefit structure that could be made immediately based on the lessons from our analysis. Our package of “immediate reforms” is costly, and involves increasing the level of earnings disregard in all of the means-tested benefits to reduce PTRs on low earnings and introducing an additional earnings disregard in tax credits for second earners to reduce PTRs for secondary earners, particularly those with children. Work incentives can be further improved by reductions in the withdrawal rate in child and working tax credits, and by targeting increases in the working tax credit on

groups other than lone parents.

We also provide a more radical and comprehensive plan for reforming the UK household tax and benefit system that attempts to deal not only with these work incentive issues, but also the administrative failings that we identify. Our plan replaces the piece-meal benefits for low-income families (income support, working and child tax credits, housing benefit and council tax benefit) into a single *Integrated Family Support* programme which provides stronger and simpler incentives for work at the bottom, reduces compliance costs for families, and is provided “as-you-earn” and administered in the same way as NICs through the PAYE withholding system. We show how this can be done in a revenue-neutral fashion, including an assessment of the behavioural responses. The key achievement of the IFS is that it manages to redistribute income with minimal impact on total earnings and total net tax revenue, by targeting net tax cuts which work with the grain, rather than against the grain, of individuals’ work incentives.

We have used the framework of optimal tax theory to guide our discussion throughout this chapter. We argued that one attractive feature of this theory is that it makes explicit that one cannot hope to say how best to design taxes and transfers without specifying what one is trying to achieve overall. This, of course, may prove to be our ultimate downfall. Without knowing the government’s preferences for redistribution or other objectives, we cannot hope to predict whether our reform will appeal.

## Appendix

This section provides a more formal discussion of the derivation of optimal income tax rates. We will first show how to determine the optimal marginal tax rate for high earners, and then how to derive optimal tax rates for tax payers more generally.

### • Determining the top rate of income tax

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 the top bracket  $\bar{z}$ ). Here, let us denote by  $z$  the *average* income reported by taxpayers in the top bracket and let us assume that there are  $N$  taxpayers in the top bracket. As mentioned in the main text, this small tax reform has the following effects on tax revenue:

1. There is a mechanical increase in tax revenue because taxpayers face a higher MTR on 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 if there were no behavioral response.
2. 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 (by definition of the elasticity  $e$  - see Box 1 in Section 3) and hence produces a loss in tax revenue equal to  $dB = -N \cdot e \cdot z \cdot d\tau \cdot \tau / (1 - \tau) < 0$ .

Rather than necessarily assuming that the marginal value of consumption for top taxpayers is negligible relative to the average person in the economy, let us assume that the government values at  $g$ , giving 1 additional £ to the 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 (the case considered in the main text). 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. As before, let us denote by  $a$  the ratio  $z/(z - \bar{z})$ , which measures the thinness of the top of the income distribution. Note that  $a \geq 1$ . The optimum  $\tau$  can then be expressed as:

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

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. Note that this expression is identical to that presented in Box 2 when  $g = 0$ . This important case 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. Finally, we note that it is well known that top tails of income distributions

are closely approximated by Pareto distributions,<sup>72</sup> in which case the parameter  $a$  does not vary with  $\bar{z}$  and is exactly equal to the Pareto parameter.<sup>73</sup>

• **Determining the optimal marginal tax schedules**

We can extend the above analysis to consider how the optimal tax rate varies more generally across the income distribution. Here, we let  $T(z)$  denote the (possibly non-linear) tax schedule that the government imposes, where  $z$  denotes a given level of earnings. 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. The optimal tax system is characterized by a lumpsum grant received by those with no earnings (equal to  $-T(0)$ ) combined with a schedule of marginal tax rates  $T'(z)$  which define how the lumpsum grant should be reduced at earnings increase and how additional earnings should be taxed once the lumpsum grant is fully tapered out. Again, the optimal marginal tax rate  $T'(z)$  is set so as to balance costs and benefits at the margin.

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:

1. The reform increases taxes by  $d\tau dz$  for every taxpayer above the small band, and hence collects extra taxes  $dM = (1 - H(z))d\tau dz$ .
2. Those extra taxes generate a welfare cost to taxpayers. 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  $dW = dM \cdot G(z)$ .<sup>74</sup> If the government values redistribution,  $G(z)$  will be decreasing in  $z$ . As we have assumed away income effects,  $G(0) = 1$ .<sup>75</sup>, and we assumed above that  $G(z)$  goes to zero when  $z$  is large (i.e. in the top

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<sup>72</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>73</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 for the very highest income earner.

<sup>74</sup>This is a consequence of the envelope theorem as each individual maximizes utility.

<sup>75</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.

tax bracket). The more redistributive the tastes of the government, the smaller  $G(z)$ .

3. 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 due to the substitution effect. There are  $h(z)dz$  such taxpayers in the small band, and so this produces a loss in tax revenue equal to  $dB = -e \cdot z \cdot [T'(z)/(1 - T'(z))]d\tau \cdot h(z)dz$ .

At the optimum,  $dM + dW + dB = 0$ , which generates the following optimal tax rate formula:<sup>76</sup>

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

The optimal tax rate  $T'(z)$  is decreasing with the elasticity  $e$ . It is also decreasing in  $G(z)$  which measures the social marginal value of consumption for individuals with earnings above  $z$ , and decreasing in the hazard ratio  $(1 - H(z))/(zh(z))$  which measures the thinness of the distribution.

#### • Optimal tax rates with participation responses

Here, 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  $z - T(z) + T(0)$  exceeds her costs of working which we denote by  $q$ . 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:

$$\eta_{(z)} = \frac{z - T(z) + T(0)}{P} \cdot \frac{\partial P}{\partial q}. \quad (2)$$

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

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<sup>76</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 details.

skill  $z$ . As above, this reform has three effects on government tax receipts and welfare:

1. The reform increases taxes by  $dT$  for every taxpayer with skill  $z$  who works and hence collects extra taxes  $dM = P(q|z)dT$ .
2. The extra taxes that are now collected 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.. The  $g(z)$  of this section and the  $G(z)$  of previous section are related by the formula  $G(z)(1 - H(z)) = \int_z^\infty g(z)h(z)dz$ .
3. 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  $dB = [(T(z) - T(0)) / (z - T(z) + T(0))] \cdot \eta \cdot P(q|z)dT$ .<sup>77</sup>

To proceed, define the participation tax rate, a measure of the extent to which the tax and benefit system weakens the reward from working  $t(z) = (T(z) - T(0)) / z$ . As discussed above,  $1 - t(z)$  measures the increase in disposable income (relative to earnings) when an individual decides to work. Using this definition, and noting that at the optimum we again must have  $dM + dW + dB = 0$ , we generate the following optimal tax rate formula:

$$\frac{t(z)}{1 - t(z)} = \frac{1}{\eta} \cdot (1 - g(z)) \quad (3)$$

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  $z$ .

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<sup>77</sup>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. This is directly equivalent to the situation from Section 2 where behavioral responses do not create a first order welfare effect.

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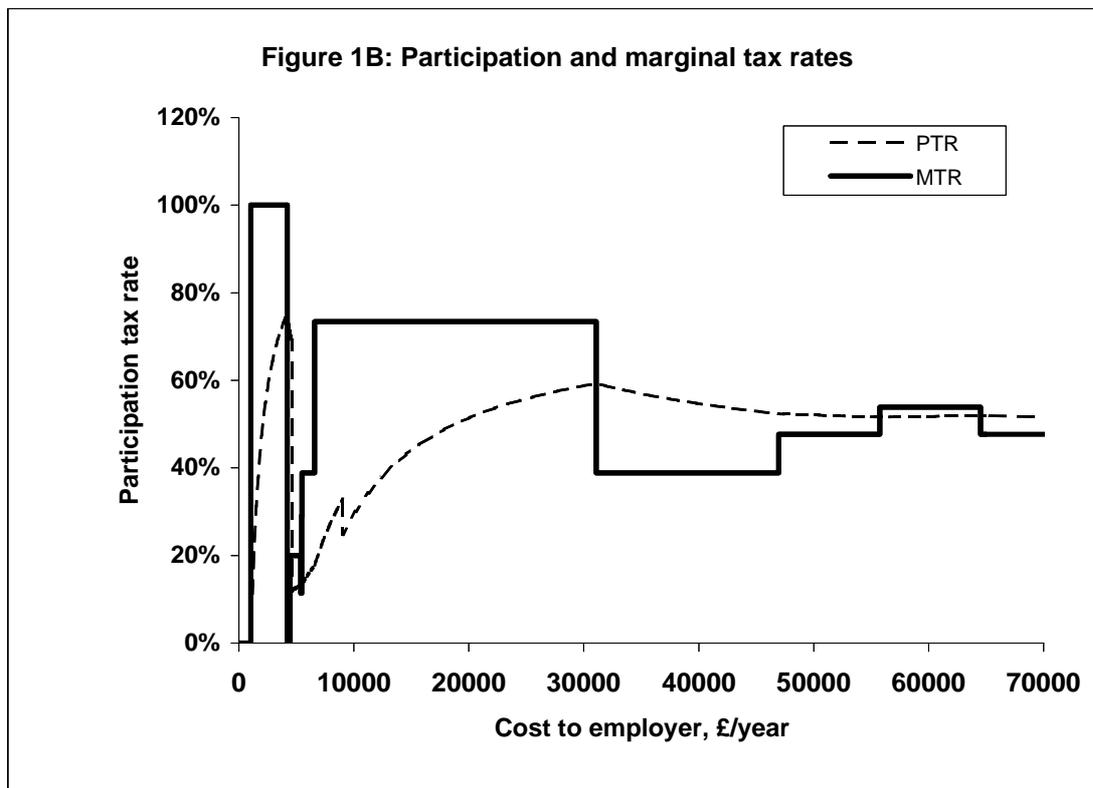
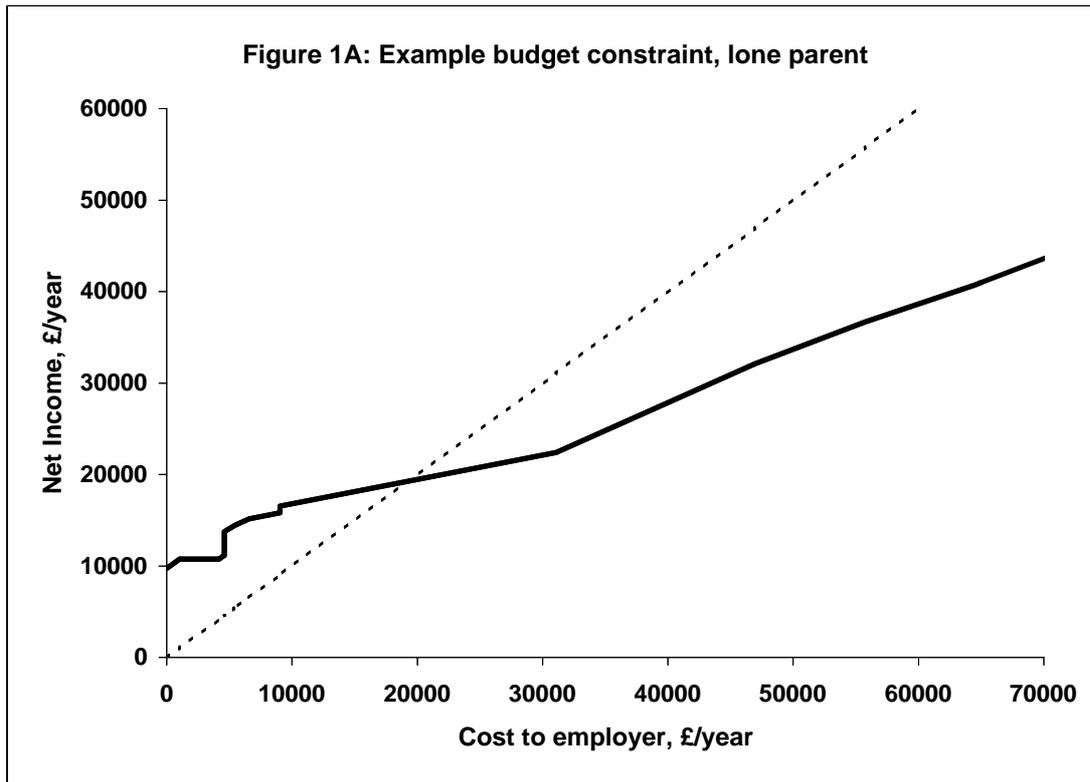
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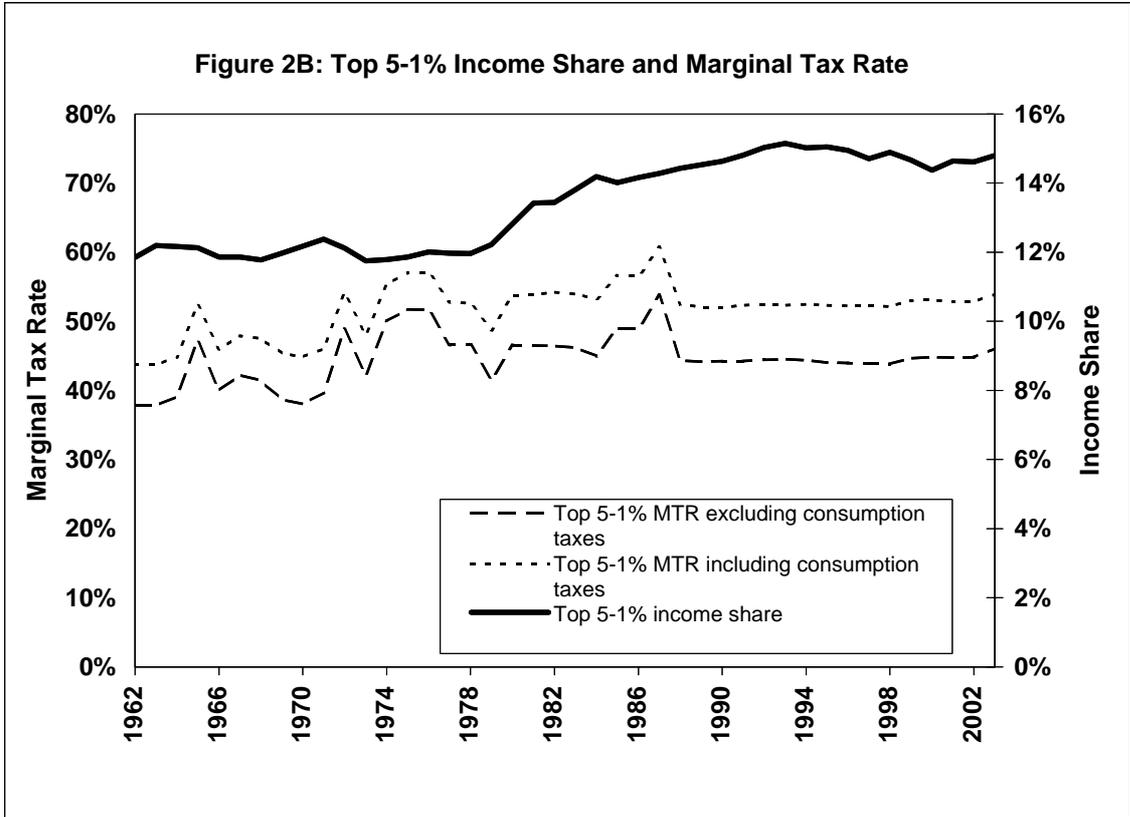
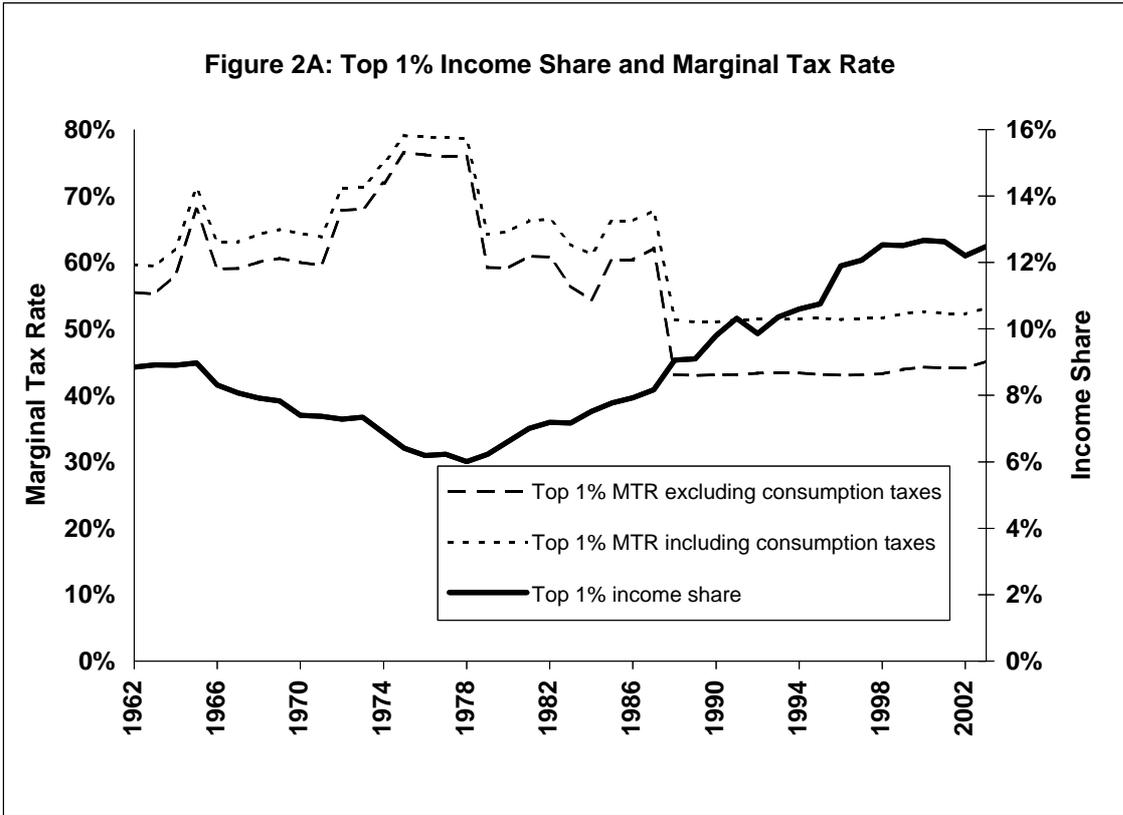
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Notes:

Assumes a lone parent with two children, paying £80 per week in rent, no childcare costs, average Band C council tax, and with a wage of £5.52 per hour. Incomes are calculated under the April 2008 tax and benefit system with announced changes to the higher-rate threshold and UEL.



Note: Income shares from Atkinson but 1962-1989 are adjusted up by 5% (factor 1.05) so that continuity from 1989 to 1990 when filing shifts from couples to individual

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

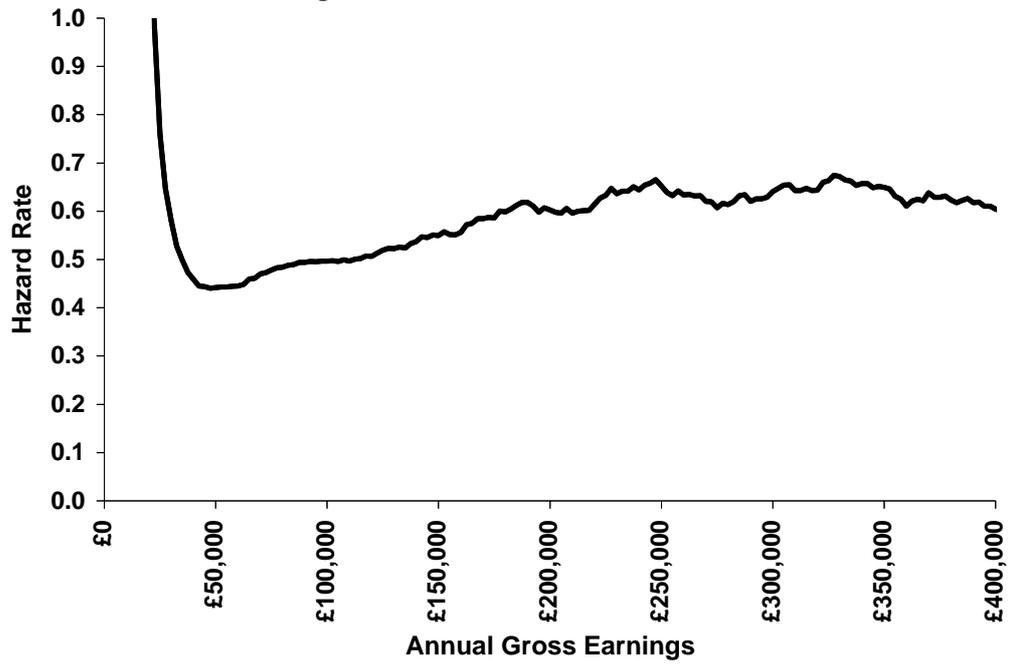


Figure 4A: Optimal tax sensitivity, labor elasticity

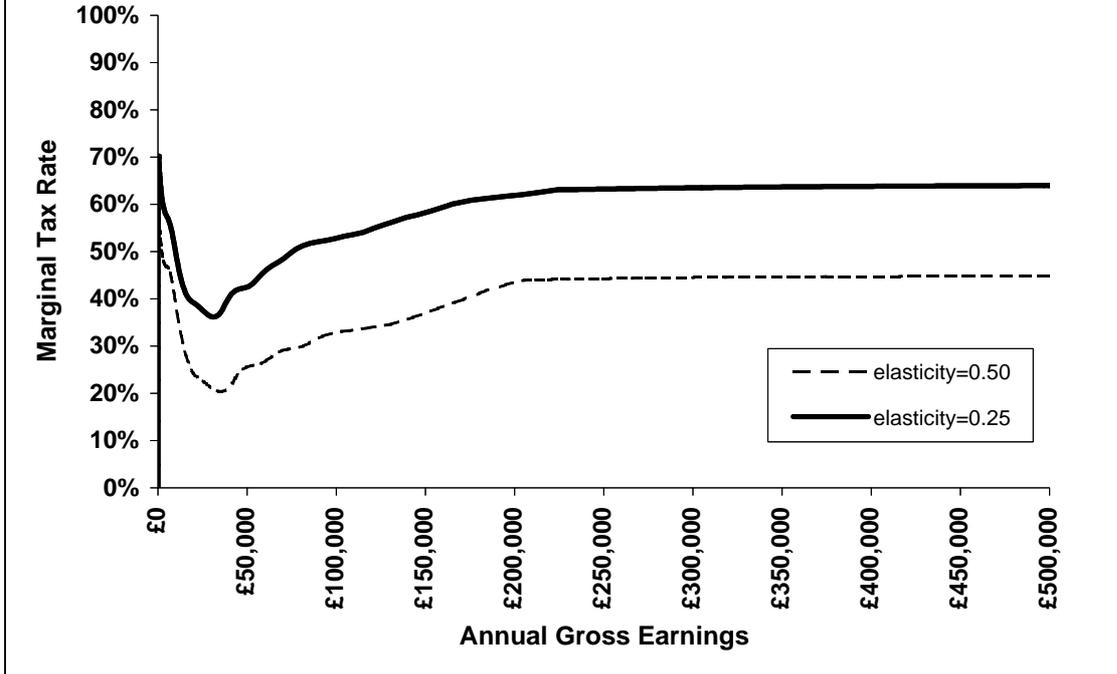
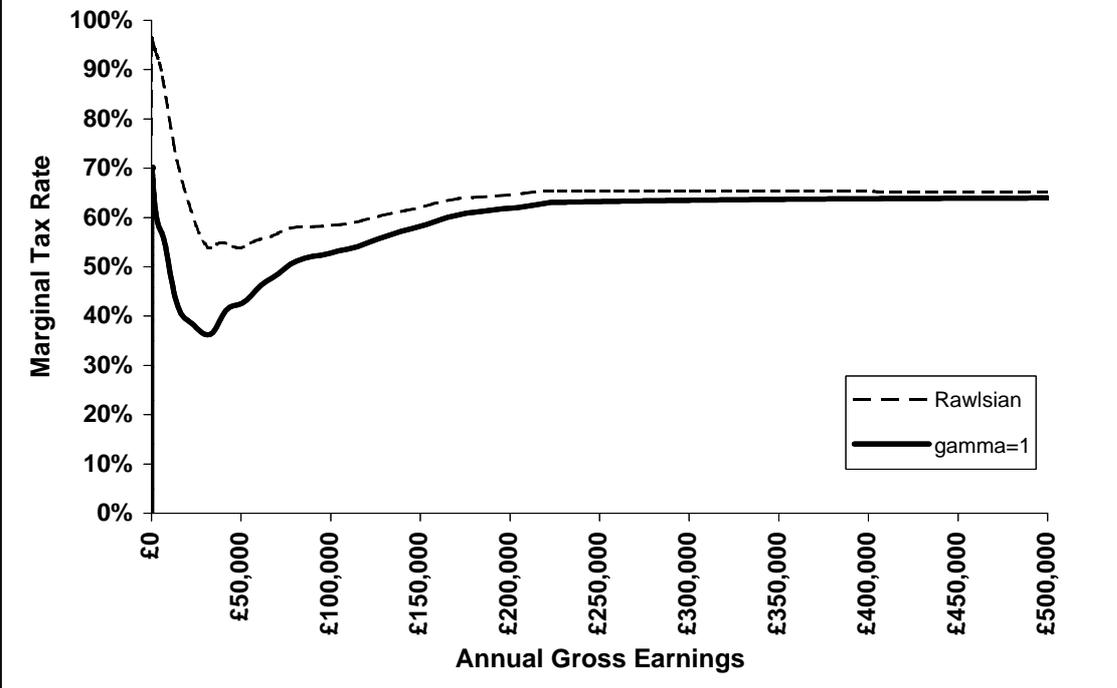
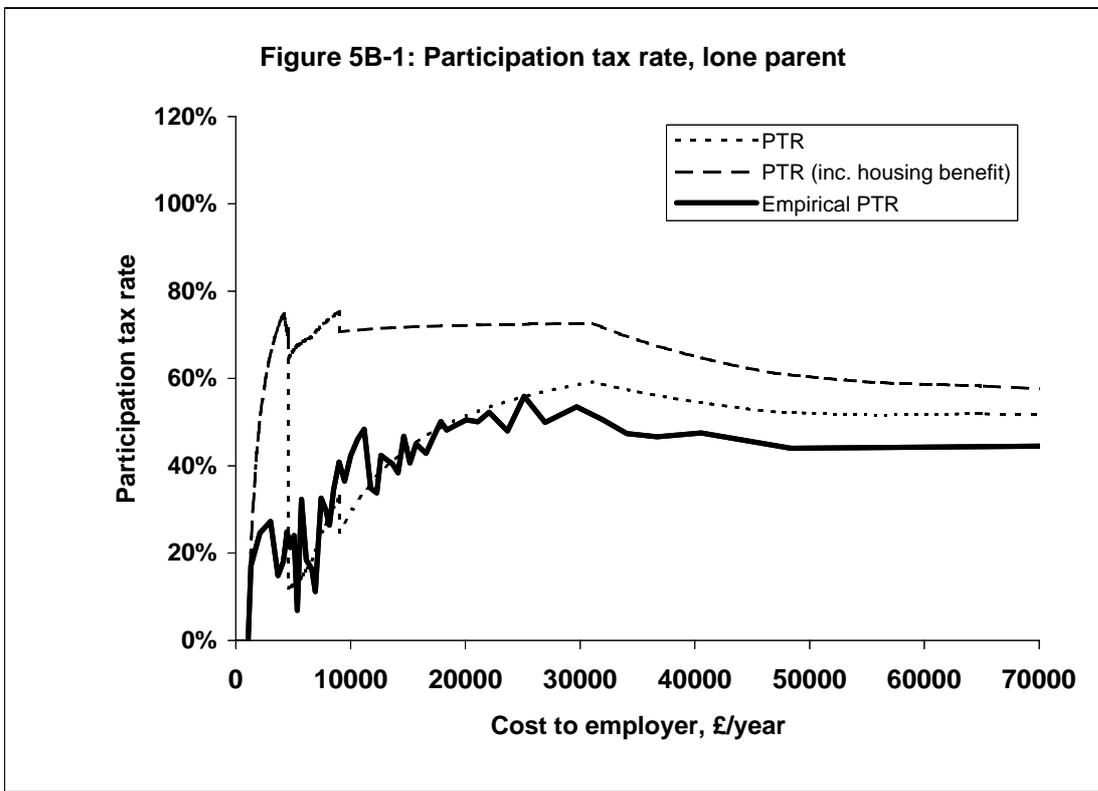
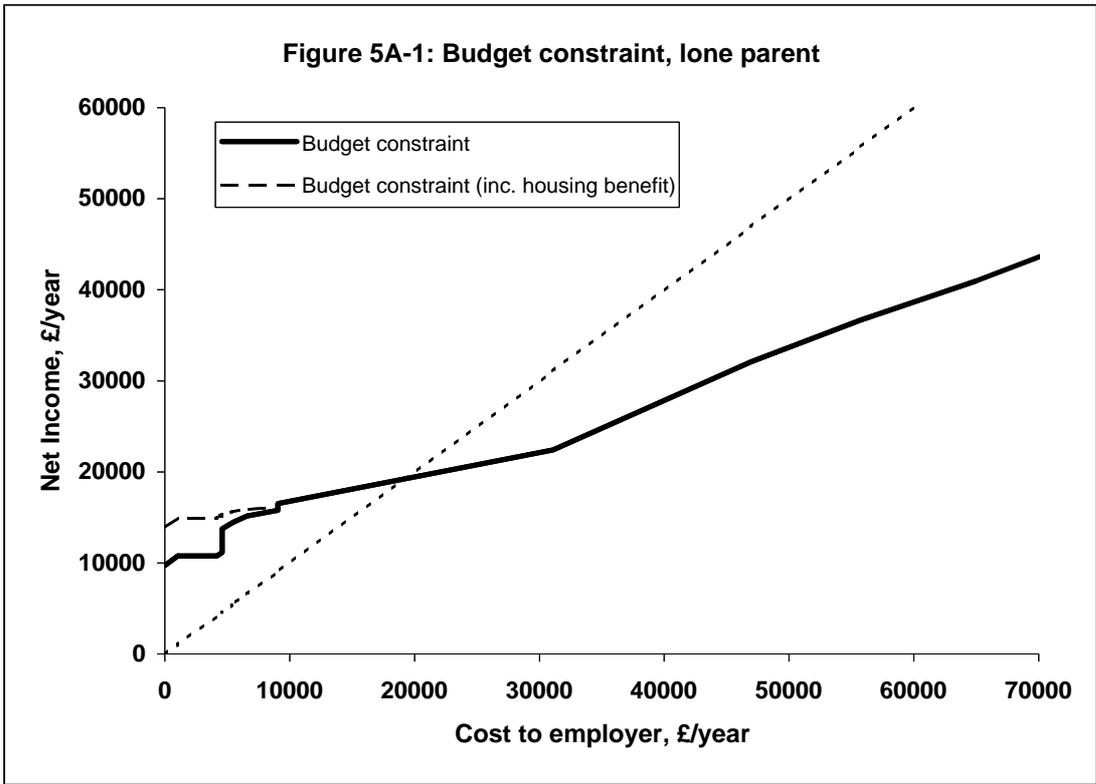
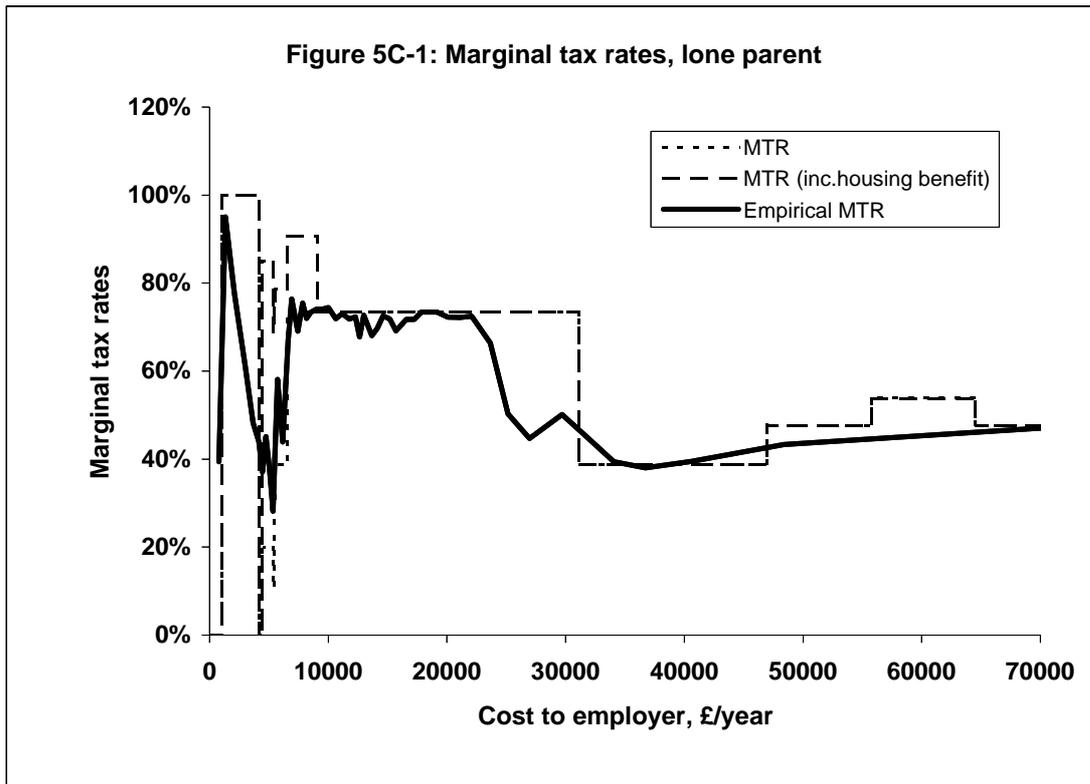


Figure 4B: Optimal tax sensitivity, redistribution preference







Notes:

Assumes a lone parent with two children, paying £80 per week in rent, no childcare costs, average Band C council tax, and with a wage of £5.52 per hour. Incomes are calculated under the April 2008 tax and benefit system with announced changes to the higher-rate threshold and UEL.

Figure 5A-2: Budget constraint, single no children

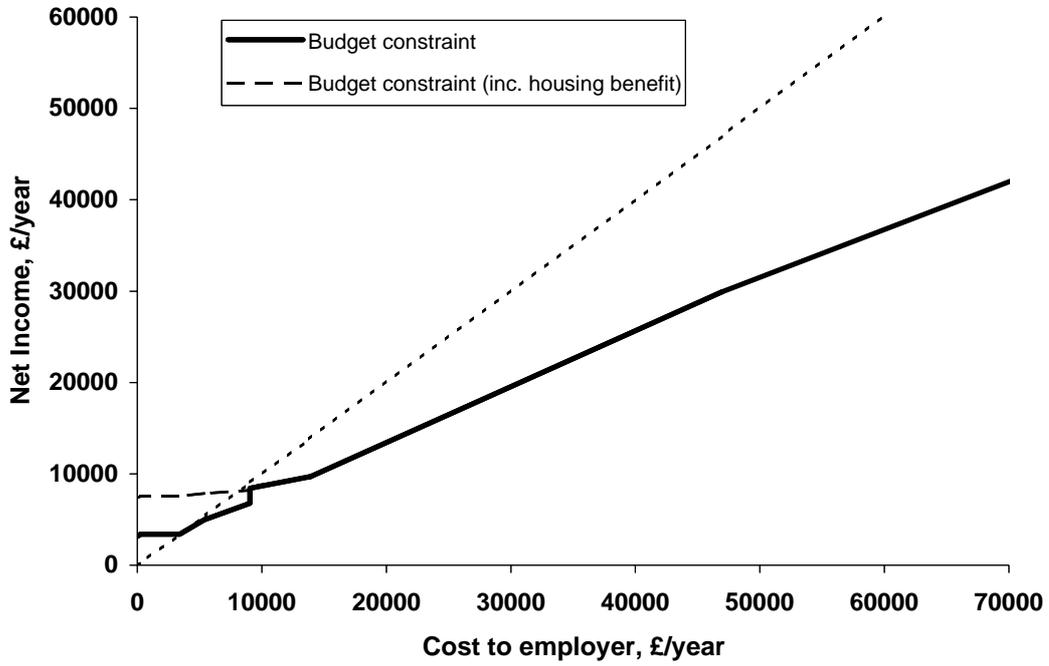
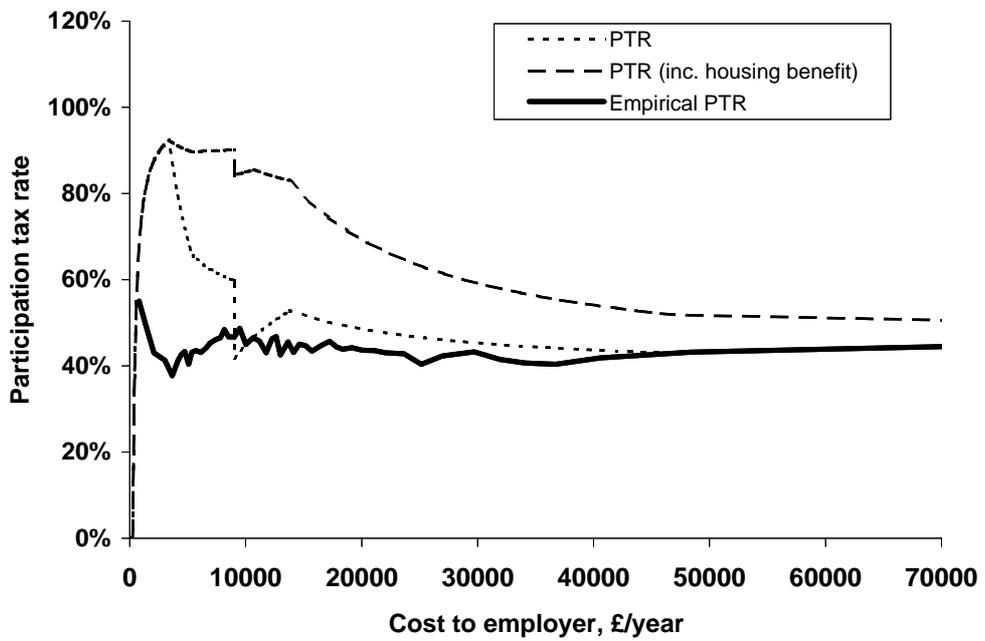
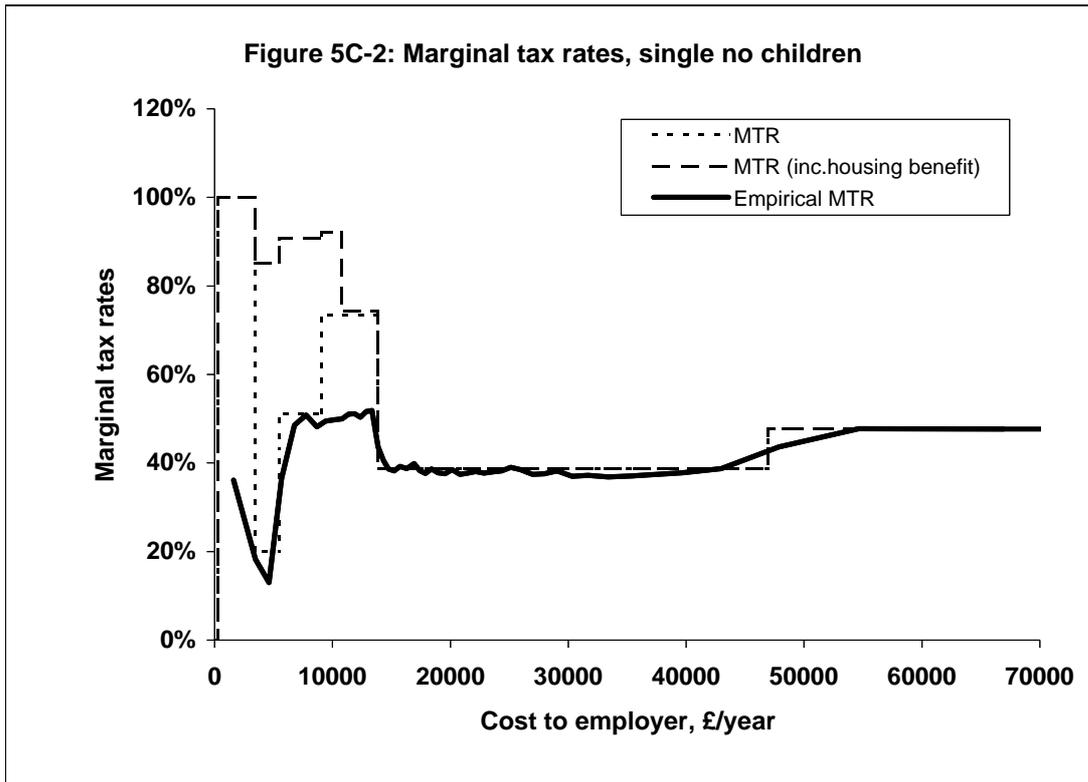


Figure 5B-2: Participation tax rate, single no children

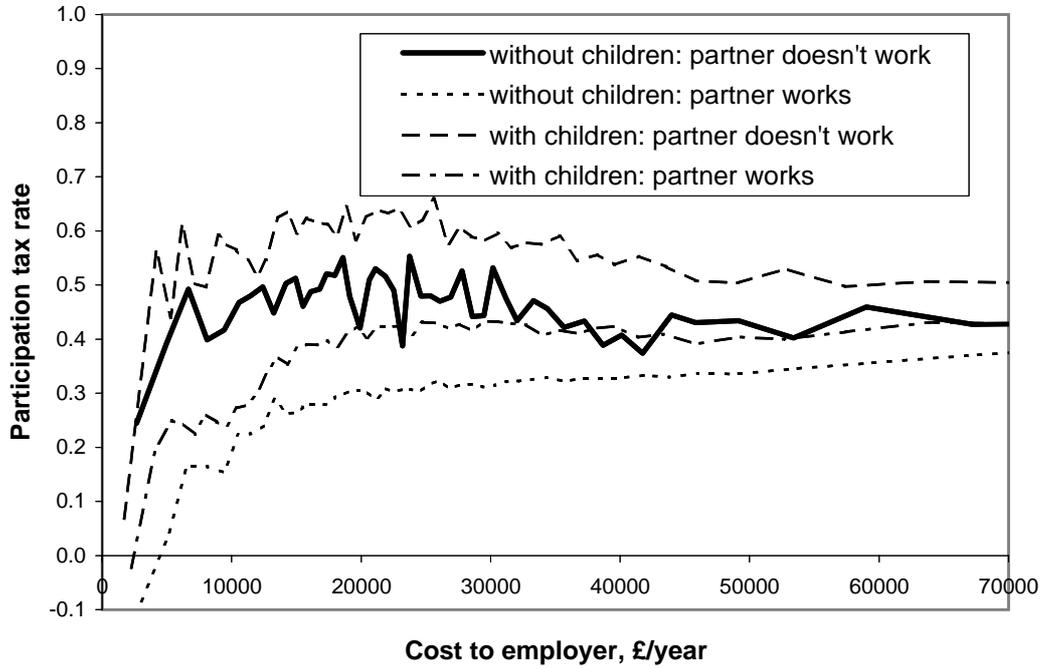




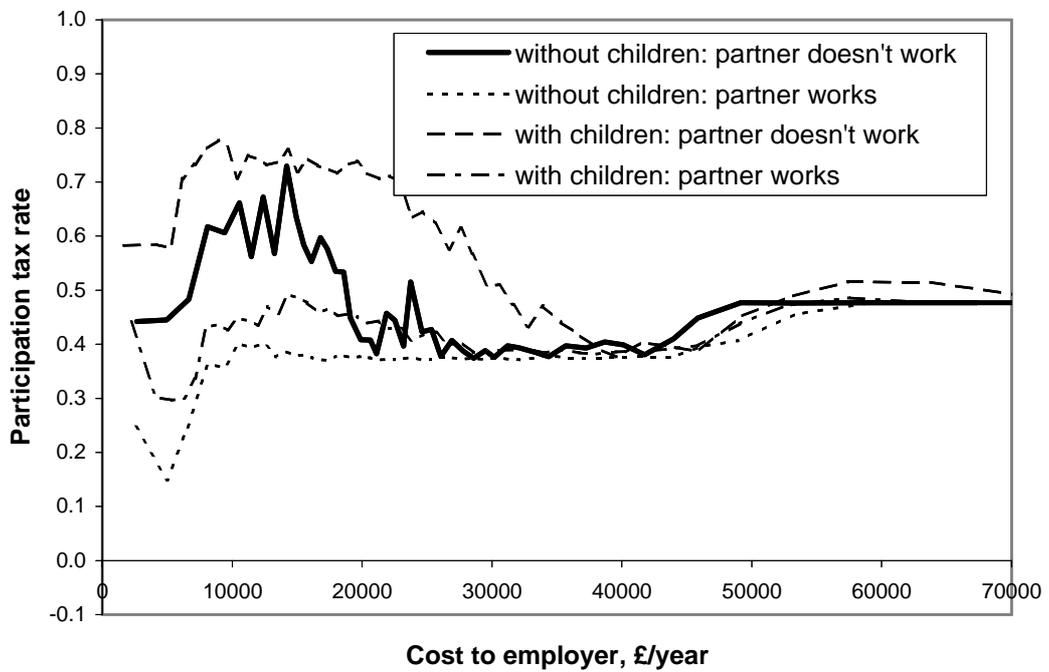
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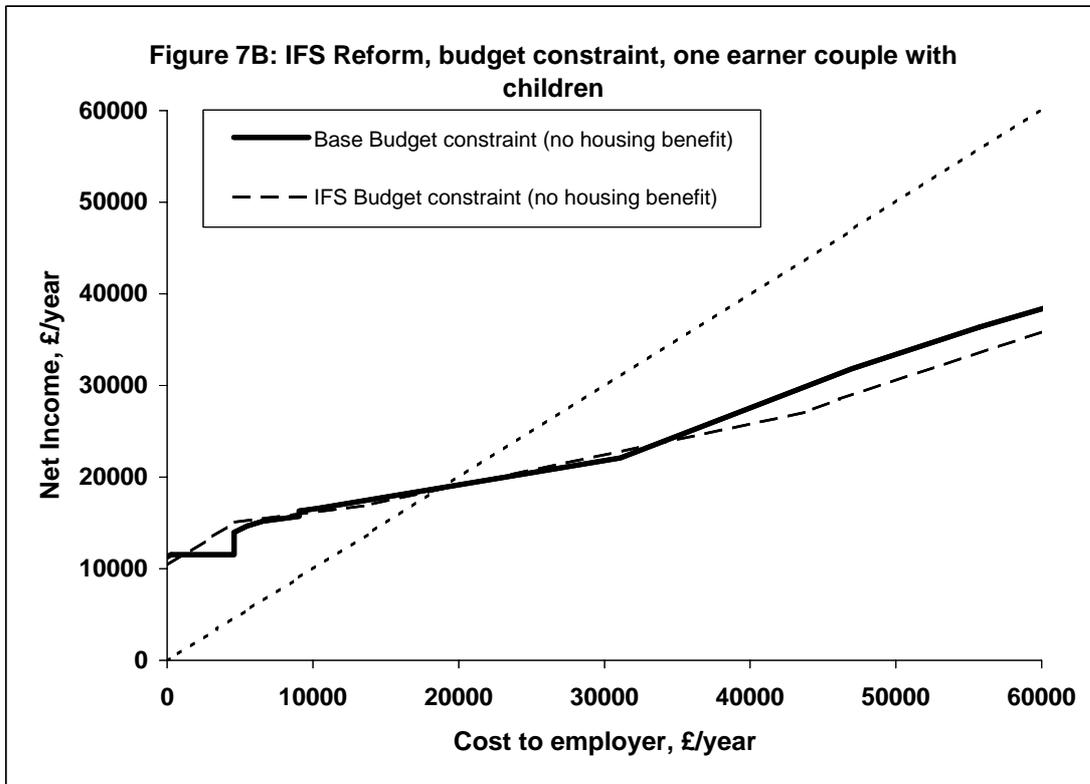
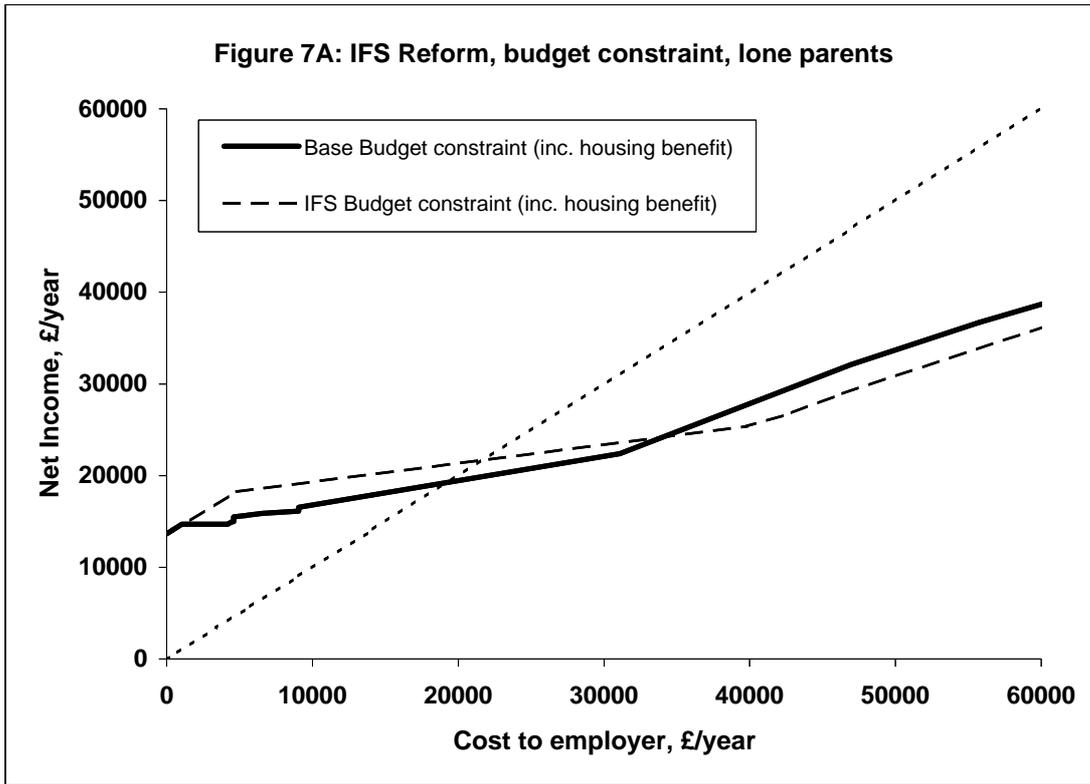
Assumes a single adult without children, paying £80 per week in rent, average Band C council tax and with a wage of £5.52 per hour. Incomes are calculated under the April 2008 tax and benefit system with announced changes to the higher-rate threshold and UEL.

**Figure 6A: PTR, Couples with and without children**



**Figure 6B: MTR, Couples with and without children**





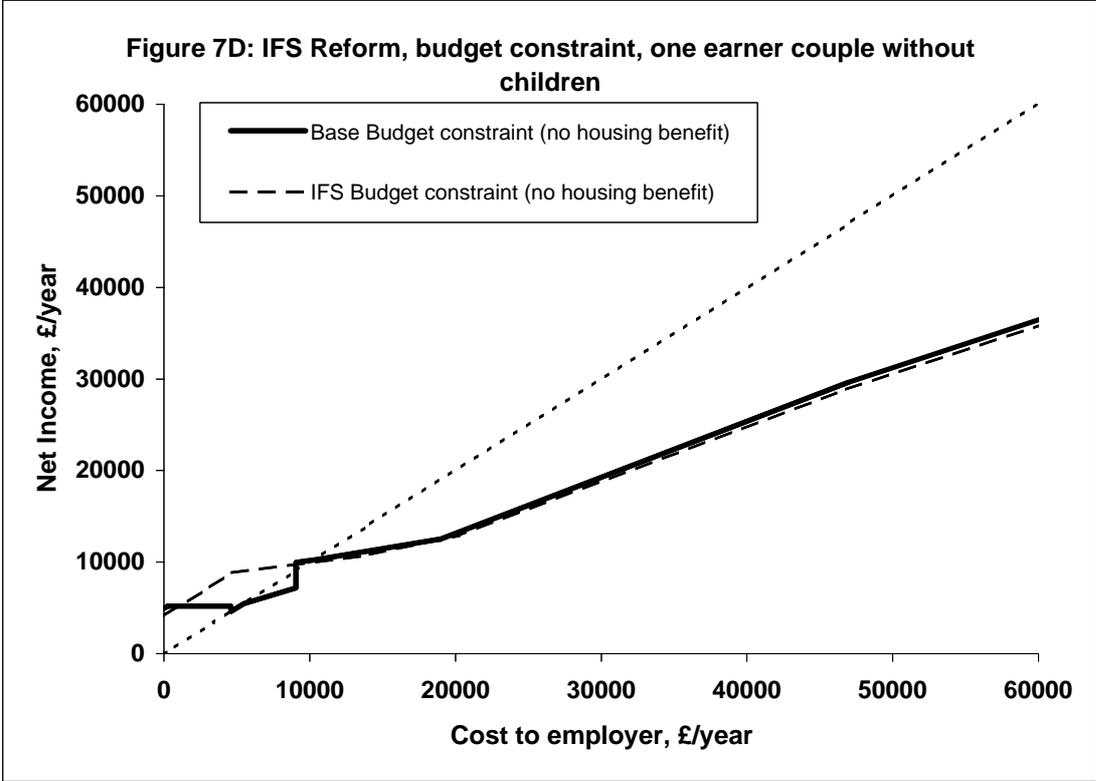
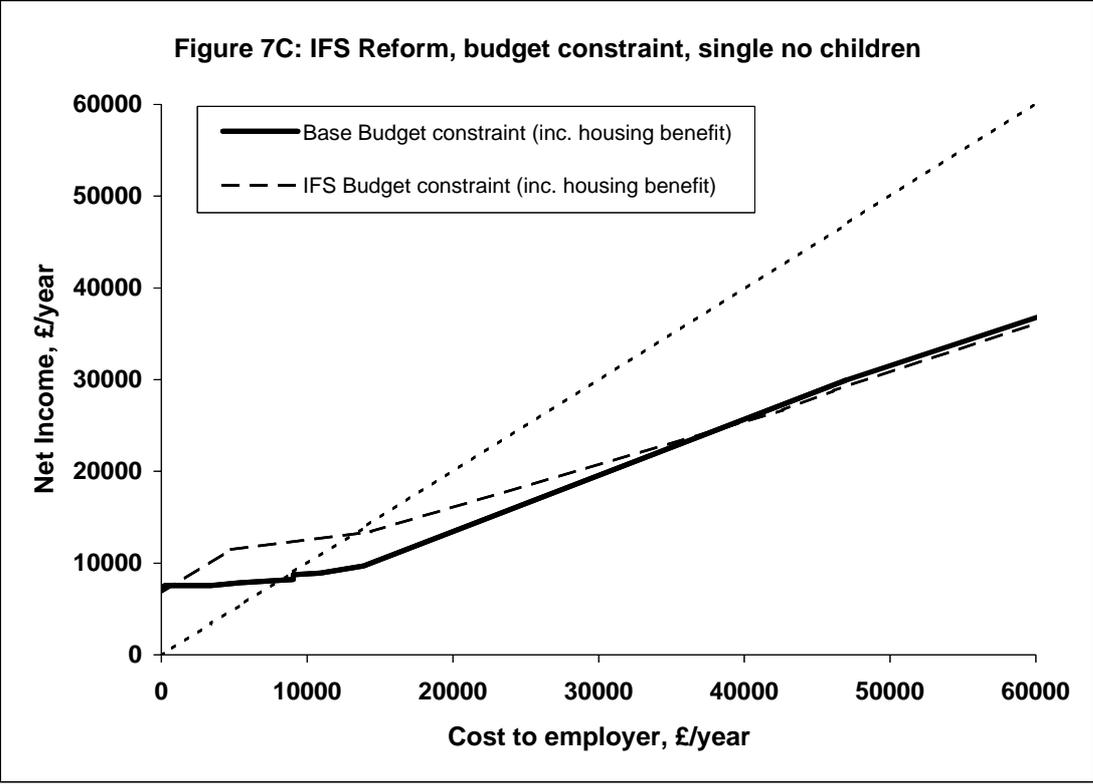


Figure 8A: PTR - Singles no children, impact of reform

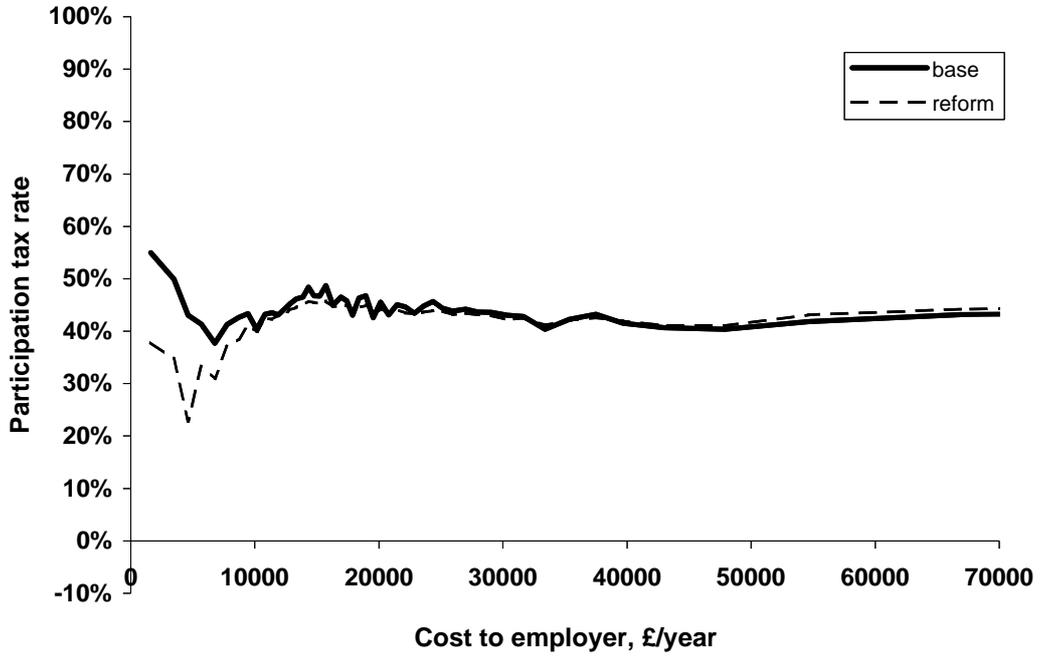
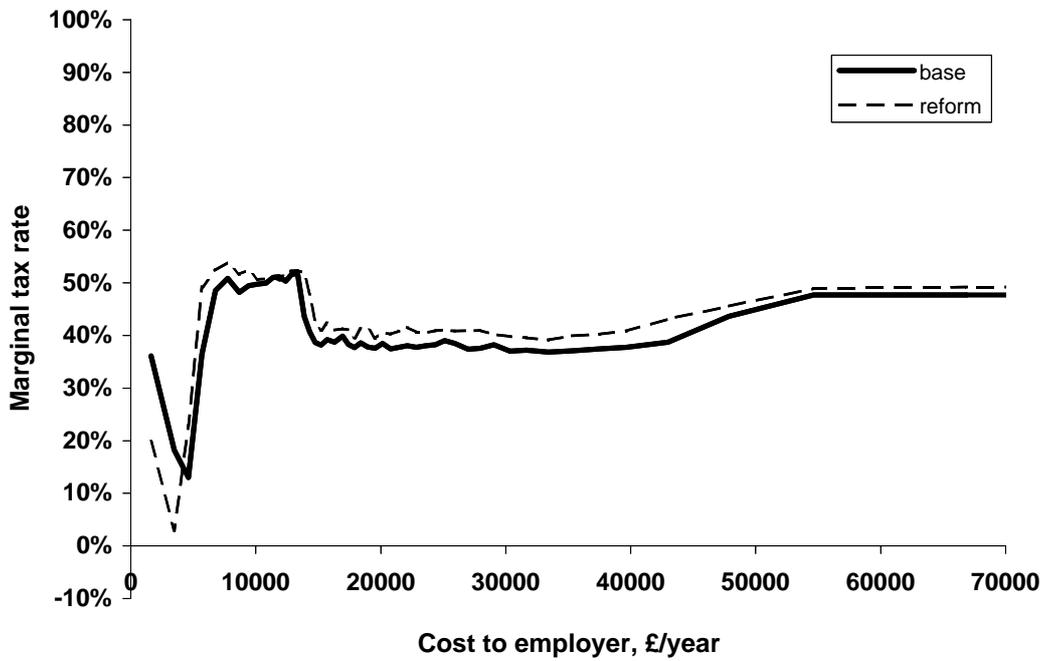


Figure 8B: MTR - Singles no children, impact of reform



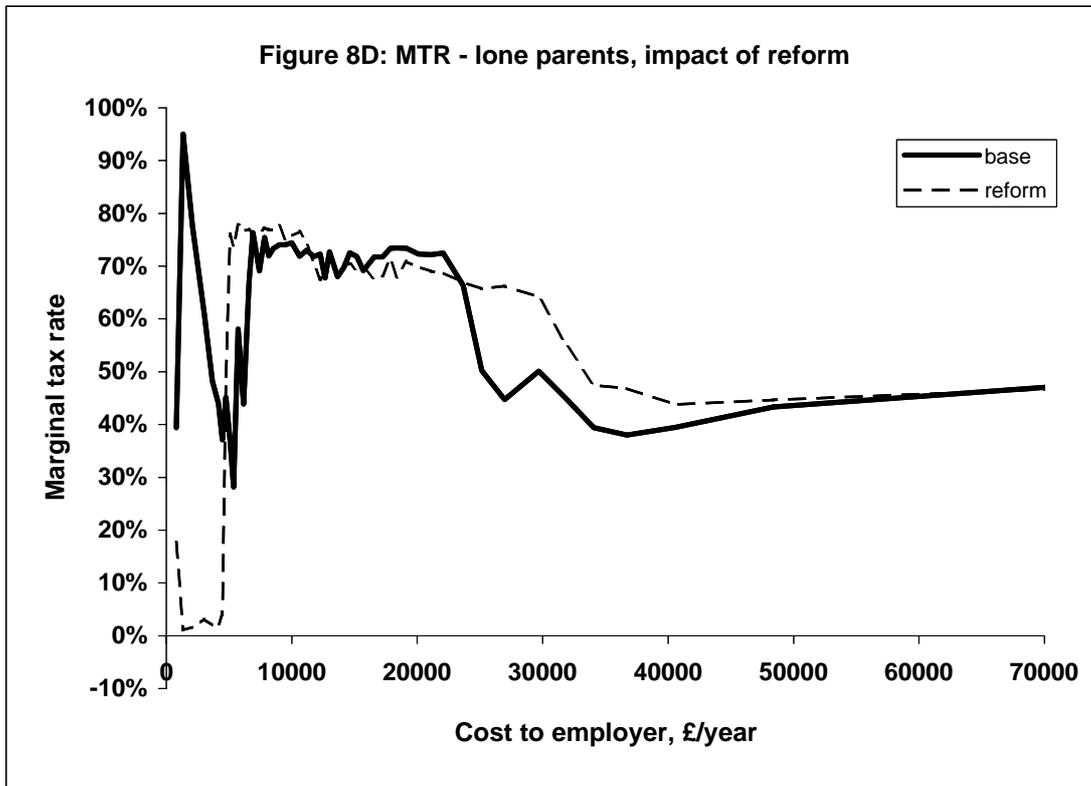
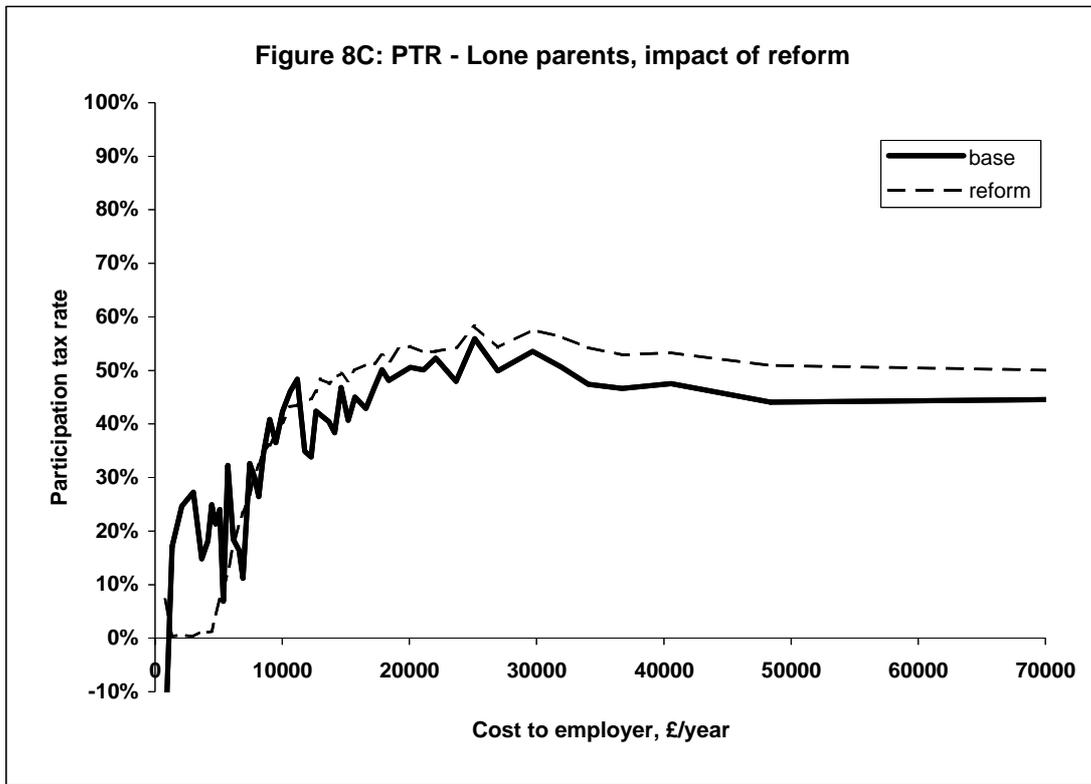


Figure 8E: PTR - Couples no children, impact of reform

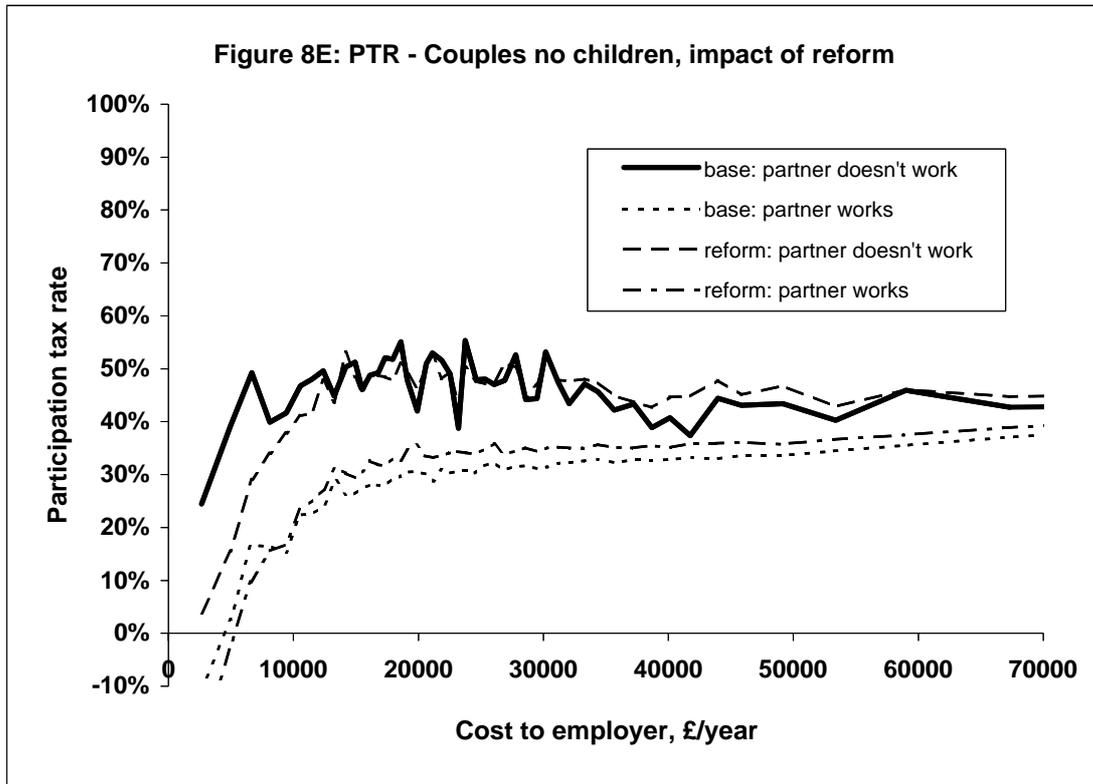


Figure 8F: MTR - Couples no children, impact of reform

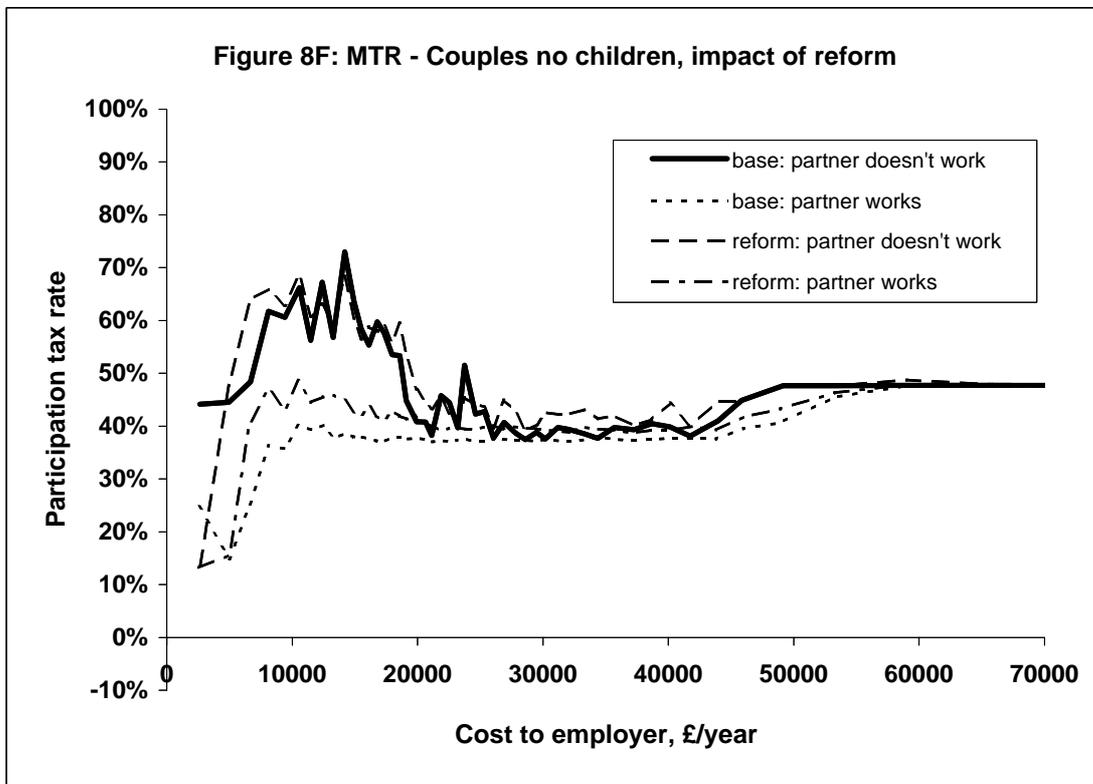


Figure 8G: PTR - Couples with children, impact of reform

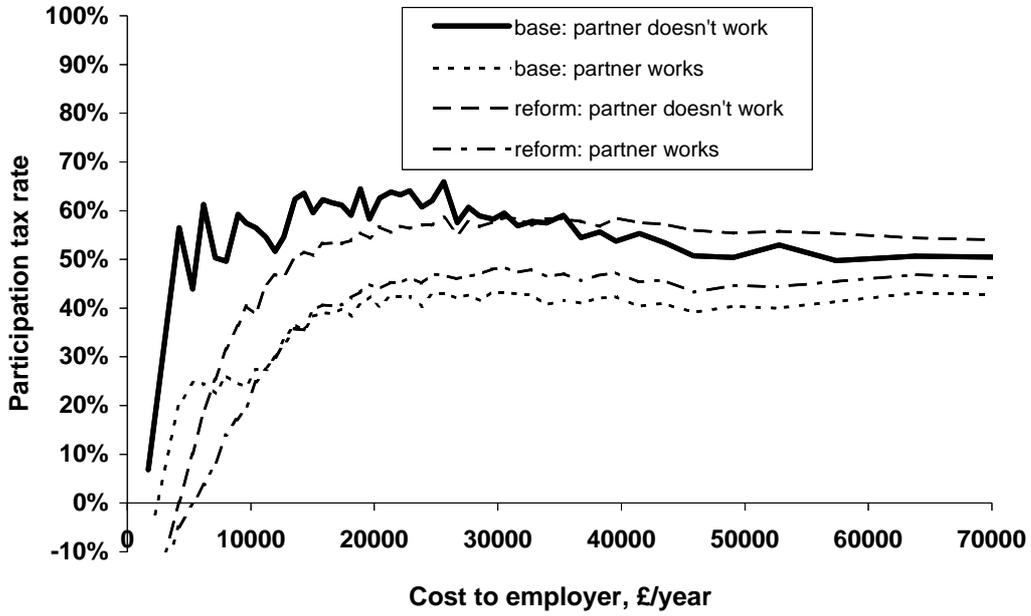


Figure 8H: MTR - Couples with children, impact of reform

