Means-tested benefits, incentives and earnings distributions

John Creedy and Rosanna Scutella
Department of Economics and Melbourne Institute of Applied Economic and Social Research, The University of Melbourne

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Department of Family and Community Services
PO Box 7788
Canberra Mail Centre ACT 2610
Telephone: 1300 653 227
Internet: www.facs.gov.au
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Executive summary

This paper considers the question of whether, in the absence of data on hours worked by individuals, it is possible to identify labour supply incentive effects of a tax and transfer system using information on only the distribution of earnings. An indirect approach is explored in which the major characteristics of the earnings distributions arising from a simple labour supply model are examined. These characteristics include the existence of modes and antimodes caused by kinks where effective marginal tax rates increase and non-convexities in budget constraints arising from means testing. Actual earnings distributions, concentrating on unemployment benefit recipients, are then examined. It is suggested that the use of such an approach must be severely limited, in view of the fact that there is no one-to-one correspondence between the form of the earnings distribution and the parameters of a tax and transfer system.
1 Introduction

This paper considers the question of whether it is possible, using information about only the distribution of earnings, to identify some of the labour supply incentive effects of a tax and transfer system. The mere identification of high marginal tax rates caused by means testing, and the existence of high replacement rates, are not sufficient to demonstrate the importance or magnitude of effects on labour supply. Ideally, it would be required to have sufficient information, for individuals in a large sample, about their precise budget constraint (which in turn requires knowledge of wage rates), along with the actual number of hours worked, so that a fully specified labour supply model could be estimated.

In the absence of such information, it is often suggested that indirect information can be obtained simply by observing the distribution of earnings. In particular, 'spikes' in the distribution are thought to arise from thresholds at which the effective marginal tax rate increases substantially. While this argument appears at first sight to be reasonable, the complexity of the aggregation process resulting in the earnings distribution, particularly allowing for the population heterogeneity involved, suggests that it is far from obvious that labour supply features are clearly reflected in earnings distributions.

This paper explores the use of such an indirect approach. First, the major characteristics of the earnings distributions arising from a model in which individuals select hours of work in order to maximise utility, expressed in terms of leisure and net income, are examined. The approach concentrates entirely on the supply side of the labour market. The earnings distribution characteristics include the existence of modes and antimodes caused by kinks and non-convexities in budget constraints arising from means testing. Empirical earnings distributions are then compared with the types of distribution that can be generated by labour supply models.

Section 2 begins by examining the possible form of the distribution of earnings of benefit claimants in simplified tax and transfer systems. The shape of the distribution depends on the labour supply function of individuals and on the nature and degree of population heterogeneity. Section 3 reports a simulation analysis of the overall distribution of benefit recipients and non-recipients. It is shown that important characteristics of labour supply behaviour in the face of a tax and transfer system may be concealed when examining data for broad population groups. This presents a limitation to the potential value of the indirect approach considered here.

Observed income distributions are examined in section 4. First, data from the Income Distribution Surveys for 1995 and 1996 are presented. These data contain comprehensive information about each income distribution. Second, a special Department of Family and Community Services (FaCS) longitudinal sample of approximately 1 per cent of Centrelink/Department of Social Security clients is used. This data set is drawn from fortnightly extracts of all records over the period June 1995 to June 1999. The survey includes those in receipt of payment for the preceding fortnightly period, along with those who were otherwise eligible but received no payment, perhaps because of their earnings. It does not contain information about hours of work or the wage rate during the benefit period; only earnings over
each fortnightly period are available. Furthermore, no details of earnings or hours worked are known for periods between benefit claims. Emphasis is given to those receiving unemployment benefits, the largest component of which concerns the Newstart Allowance, generally about 17 per cent of total benefit payments. Conclusions are in section 5.
2 Labour supply and earnings

This section considers models of labour supply behaviour within a framework in which individuals maximise utility (specified in terms of net consumption and leisure) subject to a nonlinear budget constraint. The aim is to investigate the possible implications for the distribution of earnings, including the aggregate distribution and that of the restricted group of individuals who claim a means-tested benefit. The simplifying assumption is made that all income is obtained from employment. Furthermore, the model assumes that individuals are able to choose their hours of work continuously. In practice available hours of work may be more limited. The model necessarily concentrates on the supply side of the market. Hence, it cannot be expected that such a model would provide a sufficient explanation for the large number of individuals who do not work, and who are treated as ‘voluntary non-participants’ in the labour supply models. The model is also static. However, additional complications are likely to introduce more ‘noise’ into the relationship between the tax system and the observed earnings distribution, and therefore reinforce the major conclusion of this paper.

2.1 A means-tested benefit

Suppose that a specified level of benefit is obtained if the individual does not work (and therefore has zero income). The benefit is withdrawn at a relatively high ‘taper rate’, $s$, if the individual works. Thus, if the individual’s wage rate is $w$ and the hours of work are $h$, gross earnings are $y = wh$ and the transfer payment received is $s(a - y)$. Eventually, at the earnings threshold, $a$, the benefit falls to zero. Beyond this level, the individual pays income tax of $t(y - a)$ on earnings. The marginal tax rate, $t$, is below the taper rate, $s$, applied to the benefit.

This system gives rise to the piecewise linear budget constraint shown as ABC in Figure 1(a), in which net income is measured on the vertical axis and hours of leisure are measured on the horizontal axis. The price index is normalised to unity, and savings are ignored in this static framework, so that net income measures real consumption.\(^5\) Despite the simplicity of this constraint, it provides a good approximation to the overall shape produced by many means-tested systems found in practice, including that in Australia, which contain many (often overlapping) benefits and means tests.

The slope of the section BC is equal to the net wage, $w(1 - s)$. The slope of the section AB is $w(1 - t)$, so that as $s > t$, BC is flatter than AB and the budget set is non-convex. The point C is associated with a benefit equal to $sa$. The point B corresponds to the hours of work for which earnings are such that the individual neither receives a benefit nor pays any income tax.

Consider the individual’s labour supply function showing the variation in the number of hours worked as the wage rate increases.\(^6\) The optimal position is given by the highest indifference curve that can be reached subject to the budget constraint. There are several possibilities. First, for a low value of the wage rate, $w$, combined with a high taper rate, $s$, there could be a corner solution at C where the individual does not work, and receives the maximum value of the transfer payment; this is shown in Figure 1(a). Given a specific form for the individual’s utility
function, it would be possible to determine the threshold value of the wage rate, $w_L$, such that lower values would place the individual at this corner. This threshold would obviously be higher, the higher is the taper rate applied to the benefit. As the wage rate rises above $w_L$, the section BC (which becomes steeper) may provide a tangency solution where the individual works and continues to receive some benefit income, as shown in Figure 1(b).

Consider how hours worked and earnings are expected to vary as the wage rate continues to increase beyond $w_L$. Figure 1(c) shows a situation in which, at the wage rate, say $w_S$, the individual is indifferent between working and paying tax, at point D, and working and receiving partial benefits, at E. Where this type of double tangency arises, the individual would not work over the range of hours between D and E; there is a discontinuity in the individual’s labour supply function relating hours worked to the wage rate. The rate $w_S$ is a ‘switching’ wage, since

**Figure 1:** A means-tested benefit

(a) Non-participation in the labour force  
(b) Tangency solution: Working benefit-recipient  
(c) Two tangency solutions  
(d) No working benefit-recipients
the individual would make a discrete jump or switch from one section of the budget constraint to another.

An alternative labour supply response is shown in Figure 1(d), where an indifference curve is tangential to section AB, at D, and simultaneously touches the point C. In this case, the individual would never be observed both working and receiving benefits. The person would either be at point C or at some point beyond D on the section of the budget constraint where income tax is paid and no benefit is received. Again, there is a ‘switching’ wage rate at which a discrete jump in labour supply takes place. In both cases, the earnings level jumps across the income threshold, $a$.

### 2.2 The earnings distribution

In this type of system, all individuals would face common values of the three tax parameters, $t$ and $s$, and the income threshold, $a$, above which income tax is paid. However, in any population, there is a distribution of wage rates and, in addition, there are differences between individuals in their preferences. The question arises of how a joint distribution of wages and preferences would be expected to generate distributions of earnings and hours worked.

Suppose that the preferences of individuals can be distinguished by a single parameter, $\alpha$. For any individual, the number of hours worked, $h$, can be expressed as a function of $w$ and $\alpha$, that is, by $b(w, \alpha)$. The associated earnings are therefore given by $y = wb(w, \alpha)$. Suppose furthermore that there is a joint distribution of $w$ and $\alpha$, expressed in general as $f(w, \alpha)$. The form of the distribution of earnings, $f(y)$, is therefore given by the expression:

$$f(y) = \left\{ \left\{ wb(w, \alpha) f(w, \alpha) \right\} f(\alpha) \right\} d\alpha$$

where $f(w|\alpha)$ and $f(\alpha)$ respectively denote the conditional distribution of $w$, given $\alpha$, and the marginal distribution of $\alpha$. Integration is over the relevant ranges. However, it has already been seen that the function $b(w, \alpha)$ has discontinuities, where the relevant wage thresholds (such as $w_L$ and $w_S$) are themselves functions of preferences (and the tax parameters). For this reason, the expression in (1) is unlikely to be tractable, even for very simple tax systems. The present subsection therefore discusses the form of the distribution in general terms, while simulation results are reported in the next section.

Some individuals would be observed at a point such as C on the respective budget constraint, depending on their wage rates. However, the threshold value, $w_L$, varies among individuals depending on both the wage rate and preferences (in particular the relative strength of the taste for leisure). Of those who have labour supply functions associated with Figures 1(b) and 1(c), a proportion (depending on their wage rates) are among the ‘working poor’ (earning and receiving partial benefits), while others pay income tax only. With some heterogeneity in preferences, there is likely to be an antimode in the distribution of earnings, at the earnings threshold, $a$, instead of a complete gap. A complete gap would only arise if all individuals were to have the same preferences, but face different wage rates.
A lower mode would be expected among benefit claimants, but the position of the mode depends on the precise joint distribution and in some cases it could be at zero earnings. This is unlikely and is certainly not a necessary implication. In practice, demand-side considerations are likely to produce a mode at zero.

Of those who have labour supply functions associated with Figure 1(d), there would never be any ‘working poor’. All claimants would have zero incomes and receive the full benefit. The situation shown in Figure 1(d) is more likely, the higher is the level of the taper rate at which benefits are withdrawn. The range of wage rates over which earnings are positive nevertheless varies, depending on the precise distribution of preferences. Among such a group, the distribution of earnings would be expected to be bimodal, with the lower mode at zero. The extent of the antimode again is likely to depend on the precise form of the joint distribution of wage rates and preferences, though its location is, as before, affected by the income threshold, $a$.

There are therefore two possibilities for the form of the overall distribution of earnings. First, it could be bimodal, particularly if there is a relatively small proportion of people for whom Figure 1(d) is relevant, with a lower mode at positive earnings. For a considerable degree of population heterogeneity, it would be possible for the overall distribution of earnings to look as if it were unimodal, especially if a histogram is produced using quite large class widths. The second alternative is that the overall distribution of earnings is trimodal. The lowest mode would be at zero, while the second mode would refer to the working poor; and the upper mode would apply to workers paying income tax. Again, the distance between the modes depends crucially on the degree of population heterogeneity.

Under this type of nonlinear tax and transfer system, the income distribution among claimants only could therefore have two modes, with a large number of individuals bunched at zero income and a second mode for the working poor. Alternatively, the distribution may have one mode, with no mode at zero earnings.

A policy change, such as a reduction in the taper rate, could introduce a substantial change in the form of the earnings distribution, perhaps eliminating the lowest mode in a trimodal case. In the case of a bimodal distribution, it is quite possible for such a policy change to lead to a partial filling of the density mass between the two modes. These aspects are investigated further in section 3.

2.3 A cost of claiming benefits

The nonlinear budget constraint examined in the previous subsection needs to be modified if claiming benefits imposes a non-recoverable cost on claimants. The effect of this is to shift section BC of the budget constraint in Figure 1 downwards by the amount of the cost. The resulting budget constraint is shown as ABCD in Figure 2(a), where the section BC corresponds in this case to the situation in which the individual neither earns enough to pay income tax, nor
finds it worthwhile to claim the means-tested benefit; hence the slope of the segment BC is the gross wage rate, $w$. The amount of benefit that would be received is less than the cost of claiming.\textsuperscript{8}

Consider the labour supply function. For low wage rates (or high taper rates) the highest indifference curve produces a corner solution at point D in Figure 2(a). As the wage rate increases, several possibilities arise. The individual may be induced to work and simultaneously claim benefits, but for further increases in $w$ there may be a discrete jump to a point along the range BC, caused by the situation, also shown in Figure 2(a), where an indifference curve is tangential to points on sections BC and CD. Further increases in the wage rate would push the individual to the corner. The individual would remain at the corner, B, over a range of further wage increases, until the wage becomes sufficiently high to move the individual to a point on the segment AB, where income tax is paid.

Alternatively, an increase in the wage rate from a low level may lead to a discrete jump from the corner at D to the corner at B; this corresponds to the situation in Figure 2(b). A further possibility is that the individual could jump to a tangency position along BC, as shown in Figure 2(c). Both of these alternatives are situations in which the individual would never simultaneously work and claim benefits. In Figure 2(c), it is possible, but not worthwhile, to claim the means-tested benefit because the entitlement is less than the cost of claiming.

Yet another possibility is shown in Figure 2(d). As the wage rate increases, the individual jumps from a tangency along CD to the corner at B where earnings are equal to the income threshold, $a$. There are no relevant wage rates for which such an individual would not claim benefits, if entitled to them.

The shape of the distribution of earnings within a heterogeneous population, where individuals face different wage rates and have different preferences, can take several forms, depending on the precise form of the joint distribution as well as the tax parameters. From the earlier argument, there is likely to be an antimode caused by the range BCD, though there may be a mode at the corner, D, as well as a mode corresponding to earnings of benefit claimants along the range CD. There is likely (but not certain) to be another mode corresponding to the kink, B, since each individual remains at this type of corner for a range of wage rates. In addition, it is possible to have another mode corresponding to tangency solutions along the range AB.

It is therefore possible to have a distribution with four modes, though only the mode corresponding to the income threshold, $a$, can be directly linked to a parameter of the tax and transfer system. Although the number of hours worked, $h$, associated with the point, B, differs among individuals, this point involves the same value of gross earnings for each person.

The existence of a cost of claiming benefits may be an important factor in the labour supply and benefit take-up behaviour of a significant number of individuals. Depending on the degree of wage and preference heterogeneity, this may be associated with an earnings distribution that is hard to distinguish from a distribution associated with the first system considered above, of Figure 1, where there is always a complete take-up of benefits.
2.4 Further complication

In practice, there may be a ‘free’ area whereby earnings do not give rise to a reduction in benefits. This creates a further kink in budget constraints and, from the point of view of the earnings distribution, the potential for another mode. In cases where there is a threshold at which a benefit taper is introduced, or where it involves an increase in the taper rate, there is a discrete increase in the effective marginal tax rate facing individuals. The budget constraint has a kink or corner where it becomes flatter as the threshold is crossed.
Each of these corners is associated with a certain amount of stability, in the sense that earnings are unchanged over a range of wage rates. The existence of such a range of wage rates (though the precise values may differ among individuals) means that there may be a mode in the earnings distribution at each corner. Here the modes are clearly associated with tax and transfer policy variables. Their relative importance again depends on the extent of population heterogeneity, along with the size of the change in the marginal tax rate involved. However, it is not certain to produce a mode at the kink.

Another situation, in which a mode at zero earnings is likely to exist, could arise from the existence of fixed costs of employment. These may include costs of travel to work, clothing, and child care costs. They are likely to differ among individuals. Fixed costs of working imply that non-wage income drops sharply as the number of hours worked becomes positive. In terms of the constraint of the previous subsection, it is possible for an indifference curve to touch the tip of the spike at zero hours and be tangential to the constraint along the range BC.

A group of individuals with heterogeneous preferences would produce an earnings distribution of benefit claimants having an antimode corresponding to hours of work to the right of the tangency solution, with a mode at zero hours. In the case where there is also a ‘free area’, which may be expected to give rise to a mode where a taper begins to operate, the existence of fixed costs of employment could eliminate such a mode. The resulting earnings distribution would be hard to distinguish from some of those arising in the simpler case discussed at the start of this section.

An important implication of the above discussion is that there is no clear ‘one-to-one’ relationship between possible earnings distributions and the tax and transfer system. The transformation from various forms of labour supply function to the earnings distribution involves the joint distribution of wage rates and preferences in the population. Population heterogeneity could almost entirely mask crucial features of incentive effects and labour supply functions, or lead to quite different tax models giving rise to similar distributions. Some forms of mode that may be expected are associated with discrete increases in marginal tax rates at specified income thresholds, though they may not always appear, depending on the nature of the relevant wage and preference distributions.
3 A simulation analysis

3.1 Simulated distributions

Explicit solutions of the expression for the earnings distribution in (3.1) cannot be obtained. However, the distributional properties discussed in the previous section can usefully be investigated further using a simulation approach. Suppose that all individuals have a Cobb-Douglas utility function, \( U = c^\alpha l^{1-\alpha} \), where \( c \) and \( l \) are consumption (net income) and the proportion of time spent in leisure. The Cobb-Douglas is convenient as it requires only one parameter. Population heterogeneity can therefore be modelled by specifying a joint distribution for the wage rate, \( w \), and the preference parameter, \( \alpha \). The following examples assume that they are jointly lognormally distributed. It is therefore possible to select a large number of individuals at random from the specified distribution and then to examine the labour supply behaviour of each individual under alternative tax structures.10

Consider the basic tax and transfer scheme of Figure 1, in which there is a single means-tested benefit with a taper of \( s \) for those with earnings below a threshold, \( a \), and a single marginal income tax rate of \( t \) applied to earnings above \( a \). The government cannot set these three parameters independently because a degree of freedom is lost as a result of the government’s own budget constraint. For given values of \( t \) and \( s \), the value of the tax threshold, \( a \), required for revenue neutrality, can be calculated using an iterative search procedure. This ensures that each individual selects the value of \( l \) (and therefore labour supply) by maximising \( U \) subject to the nonlinear budget constraint, and maximisation by each individual is consistent with the government raising sufficient revenue from income tax in order to finance non-transfer expenditure as well as the cost of the means-tested transfer payment.

Simulated distributions were based on 3 000 individuals and were obtained for alternative values of \( s \), \( t \), the non-transfer revenue per capita, \( R \), and the variance of logarithms, \( V(\alpha) \), of the preference coefficient, \( \alpha \). Examples are shown in Figure 3. In all cases a negative correlation between (the logarithms of) wages and preferences of \(-0.75\) was assumed. This implies that the high-wage individuals have, on average, a stronger preference for consumption (net income) compared with leisure. The arithmetic mean of \( \alpha \) was set equal to 0.75, and the variance of logarithms of the wage rate was 0.5. The absolute value of the mean of logarithms of \( w \) is unimportant, since thresholds can be expressed in terms of ratios of the median wage rate.11

Figure 3(a) shows the bimodal earnings distribution for \( s = 0.5 \) and \( t = 0.2 \), and with \( a \) determined endogenously (using the iterative process mentioned above) in order to finance the ‘pure transfer’ system. There is no mode at zero earnings, and the preference heterogeneity leaves a relatively small gap between the two modes (one that would virtually disappear if a larger class width were chosen for the histogram). The need to raise non-transfer revenue (of 11 per cent of the median wage per person12) means that, with the same tax rates, the revenue-neutral value of the threshold, \( a \), must be lower. This in turn reduces the size of the transfer payment available; for those not working it is equal to \( as \). The effect of this change is shown in Figure 3(b), where the lower mode is substantially reduced, and only a small change in the class
Figure 3: Simulated earnings distributions

(a) $s = 0.5; t = 0.2; V(\alpha) = 0.1; R = 0$

(b) $s = 0.5; t = 0.2; V(\alpha) = 0.1; R = 6$

(c) $s = 0.7; t = 3; V(\alpha) = 0.1; R = 0$

(d) $s = 0.7; t = 3; V(\alpha) = 0.1; R = 10$

(e) $s = 0.5; t = 0.3; V(\alpha) = 0.1; R = 0$

(f) $s = 0.5; t = 0.3; V(\alpha) = 0.0001; R = 0$
width chosen for the histogram would conceal its existence. This example is more realistic than the pure transfer system. Despite the crucial role of endogenous labour supply choices in a utility-maximising framework, in which individuals can select the preferred number of hours of work, the resulting earnings distribution reveals little about the complex range of incentive effects of the taper rate.

Figure 3(c) shows the effect of increasing both the taper rate (to $s = 0.7$) and the tax rate (to $t = 0.3$), for a pure transfer system. The higher level of the transfer available (financed by the higher tax rate, combined with the fact that the maximum benefit is $\alpha$) discourages participation in employment and creates a third mode at zero earnings. Again, the introduction of additional revenue per person (in this case about 18 per cent of the median wage rate) changes the earnings distribution considerably, as shown in Figure 3(d). This difference is brought about by the need to raise the additional revenue, and therefore a reduction in the tax threshold and the size of transfers, rather than any changes in the taper and tax rates. As before, Figure 3(d) largely conceals the complexity of the labour supply functions of different individuals.

The assumptions underlying Figure 3(c) are similar to those of Figure 3(a), except that the income tax rate is higher, at $t = 0.3$. This allows a higher tax threshold, $\alpha$, to be financed, thereby shifting much more of the distribution to the range where individuals simultaneously work and receive reduced means-tested transfer payments. Finally, Figure 3(f) shows how the distribution in Figure 3(e) is affected by a reduction in the degree of preference heterogeneity; there is a complete gap in the distribution between the two modes.

### 3.2 Some general properties

These histograms suggest the following results which reinforce the general arguments made above. A trimodal earnings distribution is likely to be produced by the following characteristics: a relatively high dispersion in the value of $\alpha$ (associated with high values of the variance of logarithms); a high value of the taper rate, $s$; and a relatively large difference between the income tax rate, $t$, and the taper rate, $s$.

In cases where three modes exist, an increase in the revenue needed for non-transfer purposes reduces the value of the income threshold, $\alpha$, that can be financed with any given tax rate. This in turn reduces the number of modes to two, so that there is no longer a mode at zero earnings. Furthermore the lower mode, applying to those who are described as ‘working poor’, is substantially reduced.

Where two modes exist, a large degree of preference heterogeneity produces a relatively small gap between the modes. Indeed, small increases in the class widths used to generate the earnings distribution histograms are capable of producing distributions that look like conventional unimodal positively skewed earnings distributions. Hence, such histograms may conceal the distributional implications of the incentive effects of the tax and transfer system.
This suggests that it would be unwise to be optimistic about the possibility of observing clear effects on incentives of nonlinear tax structures simply by examining earnings distributions, especially where broad population groups are considered.

There are further simplifying assumptions made by the static labour supply model considered here. Some individuals may work a number of hours that are not optimal, at the relevant wage rate, from the point of view of a single period. From a longer-term point of view it may be worthwhile being in the labour market in that particular job, which may offer future prospects, including on-the-job training, experience, contacts (social and professional) and other in-work benefits. Furthermore, some individuals may in practice be constrained, in the sense that there may not be the opportunity to select the optimal number of hours; the model is entirely a supply-side analysis.

The simulations discussed above imply strongly negatively-skewed and bimodal distributions of hours worked, with a large dispersion. The exception is associated with Figure 3(c), where there is a lower mode at zero hours. Furthermore, only broad demographic groups can be identified in observed earnings distributions. In addition, the model assumes that all income is derived from earnings from employment, whereas in practice income is obtained from other sources, and there are various allowances in the income tax system, introducing further heterogeneity by making the threshold, \( a \), individual-specific. All these factors introduce a further substantial amount of ‘noise’ into the observed distributions, in addition to the type of preference heterogeneity discussed earlier.
4 Empirical distributions

4.1 Income distribution survey data

The simulated distributions may be compared with those obtained using the main source of Australian income distribution data, the Income Distribution Survey (IDS). In view of the fact that means tests are based on income from all sources, rather than simply earnings from employment, distributions of income from all sources (excluding transfer payments and partner’s income, where relevant) are shown in Figure 4, for several demographic groups. These histograms exclude those with zero incomes, although there is a large mode at zero which is mainly associated with demand-side factors. The diagrams are based on pooled data from the 1995 and 1996 surveys, in order to increase the sample size. The very low incomes in each of the cases of Figures 4(c) to 4(f) relate to small amounts of interest income.

These distributions reveal that, within each demographic group, there is much heterogeneity; the distributions are far from smooth. The levels of means-tested benefits, in relation to tax rates, are influenced by the need to raise substantial non-transfer revenue, so that the simulated distributions of the form of Figures 3(b) and 3(d) are most relevant here. Except for the figure for lone parents, which reflects a considerable degree of variability, the figures show that the distributions conform approximately to the bimodal form expected from a means-tested system. Nevertheless, they conceal a large amount of detail concerning the complex nature of the incentive effects generated by the tax and transfer system.

It was mentioned above that individuals may be to some extent constrained in the extent to which hours of work can be varied. Examination of the associated distributions of hours worked (not shown here) revealed that, while the distributions were generally of the negatively skewed form expected, and covered the entire range of hours, they typically had more peaked modes (especially for males), less density in the lower hours and, not surprisingly, much more variability than the corresponding types of hours distribution generated in the simulations.

4.2 Unemployment benefit claimants

This subsection examines the earnings distributions of unemployment benefit recipients using the FaCS data described in the introduction. Newstart Allowance is the main unemployment benefit in Australia, and for the period between September 1996 and July 1998 was the only unemployment benefit for those aged between 18 to 21 years. Since July 1998 unemployed persons under the age of 21 were no longer eligible for Newstart Allowance but could claim the Youth Allowance (which also replaced Youth Training Allowance, Sickness Allowance for those aged under 21 years and AUSTUDY for students up to 25 years old).

Individuals can receive Newstart Allowance and undertake suitable paid work or engage in an activity that improves their prospects of finding suitable paid work. An income test is applied, the main characteristics of which are that (before the cut-out point is reached) there are two taper rates. Fortnightly earnings between $60 and $140 dollars per fortnight reduce the
Figure 4: Non-benefit weekly income ($): IDS data

- Married men, 1 dependent child
- Married men, 2 dependent children
- Married women, 1 dependent child
- Married women, 2 dependent children
- Single men, no children
- Sole parents
fortnightly allowance by 50 cents in the dollar. For earnings above $140 per fortnight, the allowance is reduced by 70 cents in the dollar. For further details, see the appendix to this paper.

The budget constraint facing each individual depends on the precise wage rate and a range of demographic characteristics. These constraints are typically extremely complicated, having many kinks and, in some cases, discontinuities. Many important labour supply effects are unlikely to be evident from overall earnings distributions. Nevertheless, it is worthwhile investigating the earnings distributions of unemployment benefit recipients to see if any of the characteristics discussed earlier are revealed. In particular, the question arises of whether modes appear at the $60 and $140 thresholds.

The FaCS data contain information only about DSS/Centrelink clients during the benefit period. Hence the distributions provide limited information about the overall earnings distribution. This may be considered to be made up of a mixture of two separate distributions of beneficiaries and other workers. It is likely that there is a substantial overlap in the relevant ranges of the components that form this ‘mixture distribution’. Hence it is not possible to evaluate the extent and nature of the expected antimode produced by the typical non-convexity of budget sets.16

Histograms of fortnightly earnings for single males in a range of age groups, using all observations over the period June 1995 to June 1999, are shown in Figure 5. As mentioned above, these histograms omit frequencies for zero earnings, as a substantial mode otherwise appears that would reduce the detail shown in the remainder of the distribution. Hence in what follows it should be remembered that there is another dominant mode at zero earnings. This (unshown) mode is consistent with the existence of a non-participation corner solution in labour supply behaviour. However, it is most unlikely that it can be explained entirely by supply-side considerations.

These figures show a lower mode in what could be a trimodal overall earnings distribution. The distribution for single males aged 55 and over shows some evidence of modes associated with the $60 and $140 thresholds in the Newstart Allowance income test, though these are not pronounced. Similar modes are not revealed for other age groups, though the mode in each case appears within the range where the 50 per cent taper rate, rather than the 70 per cent rate, applies. The absence of a mode at these thresholds is nevertheless consistent with the existence of a significant role in labour supply determination. As stressed earlier, the earnings distribution depends on the precise form of the wage rate distribution and the nature and heterogeneity of preferences of the sample groups (as shown by the above simulations). The lack of prominence of the thresholds may also partially result from the operation of an Earnings Credit, which effectively provided a certain amount of income averaging in calculating benefit entitlement; this is discussed in the following subsection.17

Histograms for single females in a number of age groups over the same period are shown in Figure 6. Again, at this level of aggregation, no modes are revealed at the threshold income levels, though the mode does lie within the 50 per cent taper range. These distributions, as for the males, reveal considerable variation in fortnightly earnings.
Figure 5: Earned fortnightly income for unemployment benefit recipients (single males)
Figure 6: Earned fortnightly income for recipients of unemployment benefit (single females)
Some selected examples for married/partnered individuals, with further disaggregations according to the number of dependent children, are shown in Figure 7. Like the previous examples, the figures for males reveal considerable variation in earnings with, in most cases, a mode covering (in addition to the zero mode not shown) the range of earnings where the 50 per cent taper applies. In some cases where there are more children, a further mode appears in the higher earnings range. There are also examples where the $60 threshold is associated with a relatively stronger mode. The histograms for women reveal more variability, though in most cases the dominant mode (other than at zero) is within the 50 per cent taper range.

A feature of the Newstart Allowance for part of the period was the Earnings Credit. This credit, introduced in 1994, was accruable up to a maximum amount of $500 dollars. It could be used to offset income if the recipient’s income was below the income test cut-out for that fortnight. The credit was accrued at a rate equal to the ‘free area’ of a particular allowance or pension. Hence it provided a type of income averaging provision. However, the condition regarding the cut-out level means that recipients could only use the credit if they would have been entitled to some level of payment in that fortnight without the use of the credit. However, it means that the threshold income levels were effectively to some extent ‘variable’, depending on the degree of variability in fortnightly earnings. The existence of the credit may perhaps be thought partially to explain why, in the majority of demographic groups identified, there were no modes at the $60 and $140 earnings levels.

From March 1996 the Earnings Credit could be accrued at a lower rate, equal to the unused portion of the free area. Furthermore, the maximum usable credit in any fortnight was limited to $100. Once the maximum credit was used, the recipient could not access any more credits for 12 months. The Earnings Credit was abolished in March 1997.

For comparison purposes, the sample was therefore divided into two periods, before March 1996 and after March 1997. In some cases, after the abolition of the Earnings Credit, stronger modes appear at the one or more of the threshold levels and often the distributions become more highly (positively) skewed. It would be valuable to be able to identify a control group with similar characteristics to the demographic group potentially affected by the policy change. However, in the present context it is not possible to identify such control groups. All pensioners and allowees had access to the Earnings Credit and all were in principle affected by its abolition in 1997. Hence, caution must be used in interpreting the earnings distribution.
Figure 7: Earned fortnightly income for recipients of unemployment benefit

- Married men, < 25 years, 2 dependent children
- Married men, 45 to 54 years, 1 dependent child
- Married men, 45 to 54 years, 3 dependent children
- Married women, 35 to 44 years, 1 dependent child
- Married women, 35 to 44 years, 2 dependent children
- Married women, 35 to 44 years, 3 dependent children
5 Conclusions

This paper has considered the question of whether, in the absence of data on the actual number of hours worked of each individual, it is possible to identify any labour supply incentive effects of a tax and transfer system using information on only the distribution of earnings. An indirect approach was explored in which the major characteristics of the earnings distributions arising from a simple labour supply model were first examined, and illustrated using simulation methods. These characteristics include the existence of modes and antimodes caused by kinks where effective marginal tax rates increase, and non-convexities in budget constraints arising from means-testing. Actual earnings distributions, concentrating on unemployment benefit recipients, were then compared with the types of distribution that can be generated by labour supply models.

It was suggested that the use of such an approach must be severely limited, in view of the fact that there is no one-to-one correspondence between the form of the earnings distribution and the parameters of a tax and transfer system. The form of the joint distribution of wage rates and preferences plays a substantial role in combining with a variety of types of labour supply response to generate the earnings distribution. Furthermore, in practice only broad demographic groups can be identified, so that any sample must contain considerable heterogeneity.

Despite these limitations, the examination of a wide range of distributions revealed, for a number of demographic groups, some of the expected characteristics associated with the Newstart Allowance means test. In addition, the abolition of the Earnings Credit (which, in view of its averaging provisions, would have ‘blurred’ the income thresholds, depending on the degree of variability of earnings over time) was found in some cases to be associated with changes in earnings distributions that are consistent with incentive effects. No such conclusions could be reached for a large number of other demographic groups examined. Caution is required in view of the impossibility of identifying a control group.

The paper therefore has the negative conclusion that the identification of labour supply incentive effects of tax structures by the examination of earnings distributions is limited. In order to examine the labour supply effects of tax and transfer systems, there is no real alternative to a full-scale econometric study. However, there is some evidence, however indirect, that incentives matter. Of course, economists have known for a long time that, in designing tax and transfer systems, and reforms to them, such incentive effects need to be taken seriously.
Appendix: The Newstart Allowance

The Newstart Allowance is the main unemployment benefit in Australia. For the period between September 1996 and June 1998, in order to qualify for the allowance a person must: be aged 18 or over and under Age Pension age or aged under 18 and in receipt of Job Search Allowance as at 1/1/95; be unemployed; be registered with Centrelink; be prepared to enter into, comply with or vary an existing activity agreement; and satisfy the activity test.20 Individuals satisfy the activity test if they are: 1) actively seeking and willing to undertake suitable paid work; or 2) complying with a requirement (if any) from Centrelink to undertake suitable paid work or engage in an activity (approved by Centrelink) that improves their prospects of finding work or assists them in seeking suitable paid work. Approved activities must help the prospect of finding work or assist in seeking suitable paid work. The types of activity that may be undertaken include: training, vocational, personal development, literacy and migrant language courses; self-employment development and group-community cooperative enterprise development; voluntary work; vocational rehabilitation; and an activity nominated by a client living in a remote area. Clients receiving Newstart Allowance must apply to Centrelink for approval to undertake specified activities.

Rates of payment (at March 1998) are:

- Single
  - 18–20 at home, $174.80
  - 18–20, away from home, no children $265.50
  - 21 or over, no children $321.50
  - 18 or over, with children $347.80
  - 60 or over, after 9 months, $347.80

- Couple
  - both over 21, or over 18 with children (each) $290.10
  - no children, one partner over 21, $290.10
  - for partner aged 21 and over, $290.10
  - for partner aged 18–20, $265.50
  - for partner under 18, $240.00

In addition, a Pharmaceutical Allowance of $5.40 is paid (single or couple combined).

The income test relating to Newstart Allowance may be expressed as follows. Let the unemployed person’s fortnightly income be $y_u$ and the income of the spouse, where relevant, be $y_s$. The basic rate, $NSA_B$, is given if $y_u \leq 60$ and $y_s \leq y_c$, where $y_c$ is referred to as the ‘cut-out’ income, which also depends on demographic characteristics. The Newstart Allowance, $NSA$, is reduced by 50 cents for each dollar earned in excess of $60 per fortnight, and by a further 20 cents for each dollar earned in excess of $140 per fortnight. Similarly, $NSA$ is reduced by 70 cents for each dollar that the spouse of an unemployed person earns in excess of $497.27 per fortnight.
The Newstart Allowance can be calculated by:

$$ NSA = \max [0, NSA_I] $$

where

$$ NSA_I = NSA_B - \max[0,0.5(y_u - 60)] - \max[0,0.2(y_u - 140)] - \max[0,0.7(y_s - y_c)] $$

The Newstart Allowance is taxable.
Endnotes

1. The Department of Family and Community Services was created in 1998 out of elements of four different agencies, one of which was the Department of Social Security.

2. It also includes those not in receipt of a payment but who are partners of recipients, along with those in receipt of a payment not classed as an income security payment, but who are partners of customers receiving an income security payment.

3. Furthermore, there is insufficient information about individuals’ characteristics to be able to assign wage rates to individuals, using, for example, estimated wage equations based on other data (such as the Income Distribution Survey).

4. This is the largest proportion after the Age Pension, which makes up about 36 per cent of claims.

5. The two-rate model was first examined in detail by Lambert (1985) using Cobb-Douglas preferences. For the extension to the CES case, see Creedy (1994, 1996).

6. The nature of the budget constraint means that simple continuous functions, such as those examined in Stern (1986) in which hours worked are expressed in terms of the net wage, are inappropriate. On the econometrics on piecewise-linear budget constraints, see Moffitt (1986).

7. The government could not set these three policy instruments independently, as a degree of freedom is lost by the need to satisfy a government budget constraint. In some cases the threshold, $a$, may depend on individuals’ characteristics.

8. This situation is examined in detail in Creedy (1999).

9. However, labour supply falls, since the labour supply function, over the range of wage rates for which the kink is relevant, is a rectangular hyperbola in view of the fact that $wb = y$ is constant.

10. For further discussion of the simulation procedure in the context of a joint distribution of $w$ and $a$, see Creedy (1996).

11. In the simulations, it was arbitrarily set at 4. This may be kept in mind when considering the values of revenue per capita, in the two cases that are not of ‘pure transfer’ systems, and the earnings levels shown in the figures.

12. It was set at 6, so that with a mean of log $w$ of 4, the revenue requirement is $6/\exp 4 = 0.11$.

13. It was set at 10 units in the simulations.

14. As expected, the lower mode is in most cases reduced somewhat if only earnings are considered.

15. 18–20 year olds who were in receipt of Newstart Allowance at 17 June 1997 and still on payment on 1 July 1998, remain on Newstart Allowance.

16. For a treatment of bimodal distributions using mixture distributions, see Bakker and Creedy (1999).

17. A further complication arises from the existence of a partner income test; see the appendix.

18. For further discussion of the Earnings Credit, concentrating on the possible impact of its removal on the number of earners, see FaCS (1999). This argues, using time series information, that the reduction in the number of earners was related to the abolition of the Earnings Credit. However, no ‘control group’ was used.

19. The identification of a control group is problematic in other contexts. For example, during the relevant period, in 1997, there was a 25 per cent reduction in the maximum rate of Rent Assistance for sharers. This may be thought to encourage higher labour supply. However, sharers (single non-home owners in rental accommodation who are sharing)
cannot be precisely identified in the data. One approach may be to take those single individuals aged less than 30 who are renters. Those in the same age group who are non-renters might be a control group, but an analysis using this classification proved to be inconclusive. Average earnings of the ‘treatment’ group actually fell by about 15 per cent, compared with about 6 per cent for the control group, while the median increased for the former group and was constant for the latter group.

From July 1998 18 to 24 year old Newstart and Youth Allowance customers, in receipt of payments for six months, are required to undertake one or a combination of a range of approved activities (part time work, part time study, voluntary work and Work for the Dole) in return for income support. This is in addition to job search activity.
References


Department of Family and Community Services (FaCS), Labour Market Analysis Section, Labour Market Branch 1999, ‘The impact on unemployment allowances of abolishing the Earnings Credit Scheme’.

