Background note to Peter Dawkins' presentation "Welfare to Work: Labour Supply Responses to Work Incentives" at the Conference Sustaining Prosperity, 31 March - 1 April 2005, Melbourne

The MITTS model: a brief description

The Melbourne Institute Tax and Transfer Simulator (MITTS) is a behavioural tax microsimulation model allowing detailed examination of the potential effects on government direct tax revenue and expenditure of policy reforms to the tax and transfer system.[1]

The static component of MITTS

MITTS calculates net incomes for individual households for which we have detailed wage, labour supply, other income and household composition information. The results for individuals can be weighted and aggregated to represent population level results on government revenue and expenditure.

The most recent available sample of households represents the Australian population in 2000/2001. The same sample is used to represent populations from later years, where employment, size, and composition of the population are uprated to the relevant level. A further difference between the different years is that wage rates are updated with the average wage index and other incomes are updated with the consumer price index (CPI). The quarterly indices published by the Australian Bureau of Statistics are used.

The September 2004 social security and tax system of 2004/2005 including the latest budget changes is used as the basis to construct our alternative systems[2]. Detailed descriptions of alternative taxation and social security systems are used to calculate net incomes in a particular year. The outcomes under the different systems can be compared.

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[1] For further details of the MITTS model see Creedy et al. (2002, 2004).

[2] See publications from the Commonwealth Department of Family and Community Services, and the Department of Education, Science and Training (2004) for details on the social security system. For DVA payments see publications by the Department of Veterans' Affairs (2004).

Peter Dawkins has recently taken up the position of Deputy Secretary at the Victorian Department of Treasury and Finance (DTF). Views expressed in this document were written prior to his appointment to DTF and should not be regarded as the views of the Victorian government."

Behavioural simulations

Net incomes can be calculated at all possible hours of labour supply, assuming the gross wage per hour does not change (for example there is no overtime pay in the model). For workers the observed gross wage (earnings divided by the observed hours of work) is used and for non-workers a gross wage is predicted from a wage model based on the individual's characteristics (such as education level and age).[3]

Marginal effective tax rates and a budget constraint (showing net incomes across the possible range of labour supply) can identify potential disincentive effects on labour supply of the tax and social security system. Disincentive effects can occur whenever an additional hour of work is not rewarded by a corresponding increase in net income. MITTS can evaluate incentive effects of alternative policies by predicting whether individuals are expected to change their hours of work as a result. Only *financial* incentives can be studied within MITTS. Individuals who are self-employed, over 65, a full-time student or disabled are left at their observed labour supply. This group is expected to behave differently from the other individuals of working age and to be less responsive to financial incentives.

MITTS calibrates the predicted hours in the base case (the situation in 2000/2001, the year in which our sample was collected) to the observed hours, to use as a starting point for the reform. Estimated parameters from a labour supply model, which indicate a person's preference for time spent in employment in the labour market versus the preference for income, are used to evaluate the different levels of net income at the different levels of labour supply in the alternative tax systems. Several alternative systems can be compared in this way. The labour supply parameters are based on observed behaviour in the past. These parameters have been estimated using the best

[3] See Kalb and Scutella (2002) for a description of the wage models.

available econometric techniques, using the same database that underpins the MITTS model. [4]

An effort is made to account for differences in preferences between individuals, an obvious example is the age of the youngest child for mothers[5], but of course not all individual differences can be captured by a statistical model. This means there is uncertainty associated with the predicted outcomes. Using the model, we can calculate the probability of particular labour supply and net income combinations being the optimal combination an individual can attain given their wage, other income and the tax and social security system. Based on these probabilities, expected labour supply and expected changes in labour supply can be calculated. Based on the expected labour supply changes, potential savings or additional costs (compared to the static situation without behavioural responses to policy changes) can be calculated.

An important assumption in these calculations is that individuals can change their labour supply according to their preferences. In MITTS it is assumed that all additional labour supply is met by a sufficient demand for labour.

Implicit Labour Supply Elasticities

The discrete labour supply model, which is used in the simulation of behavioural responses to policy changes, does not provide straightforward wage elasticities with regard to labour supply.[6] However, elasticities can be calculated by comparing the expected labour supply for an individual after a one-percent wage increase with the expected labour supply under the original wage. The percentage change in labour supply is an approximation of the elasticity. By doing this for each individual in the sample, the

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[4] The labour supply models on which the current behavioural responses in MITTS are based are described in Kalb (2002). Creedy and Kalb (2005) describe in detail how these parameters are estimated and how they are used to calculate labour supply responses in behavioural simulations. They also give a few simplified numerical examples to illustrate the procedures.

[5] Having a preschool child decreases the predicted preference for employment in the labour market for mothers.

[6] This wage elasticity is defined as follows: $\frac{\text{percentage change in labour supply}}{\text{percentage change in wage rate}}$

average elasticity across the sample (or population when making use of the weights) can be computed.

Table 1 presents these uncompensated wage elasticities for those in the population that are allowed to change labour supply in MITTS. For self employed, full-time students, disabled individuals and people over 65 it is assumed this elasticity is zero. In addition to using predicted labour supply alone, we can use calibration and calculate the elasticity starting from the observed labour supply for those already in work. For non-workers, the elasticity cannot be computed because a percentage change starting from zero hours is not defined. The two final columns in Table 1 present the predicted participation rate changes resulting from a one-percent wage increase.

Table 1 Implied average uncompensated wage elasticities across the population for which labour supply is simulated[7]

	Elasticity derived from expected labour supply	**Elasticity using calibrated labour supply (for positive hours only)**	**Change in participation derived from expected labour supply (in percentage points)**	**Change in participation derived from calibrated labour supply (in percentage points)**
Married men	0.25	0.02	0.14	0.30
Married women	0.54	0.68	0.19	0.25
Single men	0.28	0.03	0.18	0.45
Single women	0.34	0.11	0.18	0.48
Lone parents	1.58	1.38	0.42	0.47

These implicit labour supply elasticities are similar to what is generally found within the international literature on such elasticities. The results for married and single men and women are well within the range of results usually found. The range of elasticities published in the literature is fairly wide, with large differences between studies using different data and/or approaches.[8]

[7] This excludes the people over 65, disabled individuals, full-time students and the self employed.
[8] See for example, overviews given by Killingsworth (1983), Killingsworth and Heckman (1986), Pencavel (1986) or more recently by Blundell and MaCurdy (1999) or Hotz and Scholz (2003).

The effect for lone parents is often found to be larger than for other groups and this is what we find in MITTS. The elasticity implicit in MITTS is on the higher end of this range internationally, although we will see evidence below that a high labour supply responsiveness for lone parents in Australia has been found before by Murray (1996), Duncan and Harris (2002), and Doiron (2004). Relatively few labour supply studies have been done for Australia, but two relatively recent exceptions for lone parents are two of the above mentioned papers: Murray (1996) and Duncan and Harris (2002).

Murray (1996) found values between 0.13 and 1.64, depending on the exact specification, for part-time working lone mothers. The elasticities she finds, for full-time workers and lone parents out of the labour force, are much smaller (at most 0.30). Murray used 1986 data, where only 13 per cent of all lone mothers worked part time and about 23 per cent worked full time. In the 2001 data used here, around 50 per cent of lone parents work, and about half of the workers work in between 1 and 35 hours per week.

Duncan and Harris (2002) analysed the effect of four hypothetical reforms, using a previous version of the labour supply models underlying the behavioural responses in MITTS. Two of these reforms are close to being a 10 per cent increase and 10 per cent decrease in lone parents' wage rates. The first one is to decrease the withdrawal rate for lone parents by 10 per cent, which increases their marginal wage rate while they are on lower levels of income. Duncan and Harris report that this is expected to increase labour force participation by 2.5 percentage points and increase average hours by 0.55 hour. The second reform increases the lowest income tax rate from 20 to 30 per cent. This is expected to decrease participation by 2.8 percentage points and decrease average hours by 1.2 hours. Comparing this to the effect of a 10 per cent wage increase using our latest labour supply parameters, effects of a similar magnitude are found. That is, participation is expected to increase by 3.0 percentage points and the average hours are expected to increase by 1.3 hours.

Finally, Doiron (2004) evaluates a policy reform, which affected lone parents in the late 1980s, to find large labour supply effects that are likely to be due to this reform. In her

conclusion, she compares the effect she finds through her natural experiment approach with predicted effects of policy changes from the MITTS model (as can be found in Duncan and Harris (2002) or Creedy et al. (2003)). Based on the results from her evaluation, she argues that observed shifts in labour supply of lone parents can equal or even surpass the predictions based on behavioural microsimulation.

The above suggests that lone parents' labour supply elasticities may be substantial. This is not so surprising, given the low participation rate of lone parents and the tendency to work low part-time hours, an increase in labour supply by one hour is going to be a larger increase, percentage wise, than the same increase for a married man. For the other demographic groups, elasticities amongst those working few hours are generally higher than for those (in the same group) working more hours as well.

It should also be borne in mind that the lone parent group is the smallest demographic group in our population. Thus, a change in their labour supply responsiveness would have a relatively small effect on the overall result.

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