

The effect of minimum wage changes on labour supply and income distribution

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Abstract

This paper uses the Melbourne Institute Tax and Transfer Simulator (MITTS) model to estimate the labour supply response that would follow an increase in real terms in the Federal Minimum Wage (FMW). In addition, the effect on income distribution is investigated. In order to put the effect in context, the increase in net household incomes following the FMW increase is returned to households via policy changes to income taxation and/or social security payments at the same total cost. Since all policy changes discussed in this paper imply the same overall increase in net income for households, the effects on labour supply and income distribution arising from these latter policy changes can be compared to the effect of the increase in the FMW.

1. Introduction

The aim of this exploratory study is to provide a first estimate of the labour supply effect arising from an increase in the Federal Minimum Wage (FMW), using the Melbourne Institute Tax and Transfer Simulator (MITTS) model. Specifically, it simulates the change in labour force participation, the change in average hours of labour supply and the resulting effect on inequality that would follow an increase in the FMW. Although microsimulation modelling is not often used in analysing or predicting the effects of a change in the FMW, a recent exception is Müller and Steiner (2008), who examined the effect of introducing a minimum wage in Germany. However, they do not allow for labour supply responses, nor for effects on employment. Their simulation results showed that the minimum wage would be rather ineffective in reducing poverty, even if it led to a substantial increase in hourly wages at the bottom of the wage distribution, and had no negative employment effects. They conclude that the ineffectiveness of a minimum wage in Germany is mainly due to the existing system of means-tested income support.

This analysis is a first step, which at this stage does not incorporate any sensitivity checks; rather, it is meant to provide a first calculation of the expected effect. In order to achieve this, we simulate an increase in wages received by employees currently on, or near, the FMW and an increase in offer wages received by people out of the labour force for those whose imputed wages are close to the FMW. We estimate the labour supply response to this increase in the FMW in terms of their participation rate and average hours of labour supply. We differentiate between the labour supply responses of different demographic groups of FMW earners, that is, partnered males and females, single males and females, and single parents. We estimate the implications for the overall distribution of income (in terms of household equivalised income) in the Australian population as measured by the Gini coefficient, while allowing for the labour supply responses. Finally, to put the effect in context, the increase in net household incomes following the FMW increase is returned to households via two alternative policy changes to income taxation and/or social

security payments at the same total cost. Since the three policy changes imply the same overall increase in net income for households, the effects on labour supply and income distribution arising from the two alternative policy changes can be compared to the effect of the increase in the FMW.

The modelling in this paper only predicts labour supply effects, that is, the amount of hours per week that individuals want to work (desired hours of work). Changes in labour supply do not necessarily equal changes in actual employment. An important assumption in the calculation of changes in government expenditure (arising from an increase in the FMW or one of the alternative policy changes) in this paper is that labour supply is assumed to remain unchanged at the observed hours worked. This means that in our case the reduction in government expenditure due to the FMW increase (assuming unchanged labour supply) may be overestimated if an increase in the FMW would reduce labour demand. Alternatively, it may be underestimated if the increased labour supply following an increase in the FMW is met by sufficient labour demand, for example in a tight labour market.

The report is organised in the following way. In order to understand what a simulation using MITTS involves and to assist in the interpretation of results, a basic understanding of MITTS and some core data issues surrounding the identification of workers at or near the FMW is required. A brief discussion of these and references to more detailed descriptions are provided in Sections 2 and 3. Section 4 discusses the microsimulation results, computing a predicted cost of increasing the FMW, examining labour supply responses and distributional impacts. A brief conclusion is provided in Section 5.

2. MITTS in brief

The purpose of this section is to provide a brief background into the general structure of MITTS in a non-technical basic description. A more detailed description is provided in Appendix A, while certain aspects such as those related to the data used by MITTS are discussed specifically in Section 3.

MITTS is a behavioural tax microsimulation model which allows detailed examination of the potential effects of policy reforms to the tax and transfer system on government direct tax revenue and expenditure.¹ Only policy changes which affect financial incentives for individuals can be studied within MITTS. It consists of a static component that calculates 'day-after' effects of changes to the tax and transfer system assuming no changes in labour supply occur (MITTS-A), and a behavioural component that allows households to adjust their labour supply decisions (MITTS-B). MITTS incorporates nearly all Australian tax and transfer rules and calculates net incomes for individual households based on detailed wage, labour supply, other income, and household composition information.

Under MITTS-A, results are calculated by comparing a base system, usually the current tax and transfer system in a policy advice context, to a reform system while assuming individuals work the same amount of (observed) hours under both systems ('day-after' effects). Under MITTS-B, this assumption is relaxed and individuals re-optimize their work and leisure decision under a new set of financial incentives in the reform system. Here, we provide a brief non-technical outline of the labour supply modelling underlying the labour responses. More information on the labour supply modelling is provided in Section 5 and Appendix B.

¹ For further details of the MITTS model see Creedy *et al.* (2002, 2004) or for details on microsimulation modelling more generally, see Creedy and Kalb (2006).

The predicted hours of work decision is based on a labour supply model, which has been estimated separately for couples, single men, single women, and single parents. In this model, individuals (and couples) choose from a fixed number of possible hours of work/leisure. At each hours of work point, the amount of leisure (including home production time) is known by definition, since leisure and labour supply are complements adding up to total time available. Since wages, household composition and other income are known, and MITTS incorporates the full detail of the Australian tax and transfer system, net incomes can be calculated at each hours of work point. Individuals trade off net income and leisure with the goal of maximising their household's utility.

Using historical data on individuals' choices regarding this trade-off, the parameters of this labour supply model are estimated such that they best predict individuals' *actual* labour supply choices, given a set of individual and household characteristics. These characteristics, such as age, account for differences in preferences for net income and leisure between individuals. MITTS-B combines the estimated parameters of this model with net incomes at each hours point, allowing it to predict the probability that a particular point maximises the individual's (or couple's) utility. In other words, MITTS-B assigns each hours point a probability that it will be chosen. Expected labour supply is defined as the sum of the hours of work at the different hours points, weighted by the probabilities that the points will be chosen. With a change in the tax and transfer system, net incomes at each hours point change. As a result, the probability at each point of being chosen changes, and hence expected labour supply changes. Based on the expected labour supply changes, potential savings or additional costs (compared to the 'day-after' results under MITTS-A) are calculated.

Under the pre-reform tax and transfer system, we can predict labour supply by computing expected hours of work as described above, but actual labour supply is observed as well. MITTS-B offers the choice of either predicting and comparing expected labour supply pre- and post-reform, or calibrating pre-reform labour supply to the observed hours. In the latter case, post-reform labour supply is predicted conditional on observed pre-reform labour supply. In the specific case considered in this report it is not a change to the tax and transfer system that is of interest, but an increase in the FMW. However, since an increase in wages affects net incomes at all labour supply points, the process that drives the labour supply response is as described above.

Validating results predicted by the behavioural component of MITTS *ex ante* is complex, since isolating effects of specific policy changes *ex post* can be extremely difficult, given the large number of changes usually occurring at the same time. We have recently undertaken comparisons of the effects for single parents of the Australian New Tax System introduced in July 2000 as predicted by MITTS and the effects predicted by a quasi-experimental evaluation approach (Cai *et al.*, 2008). Only a few other studies have attempted validation of microsimulation results by making this type of comparison using different evaluation approaches (for example, Blundell and Hoynes, 2004; Blundell *et al.*, 2004, Brewer *et al.*, 2006). Overall, they find that the direction and the magnitude of predicted effects are quite similar. Similar conclusions were drawn by Doiron (2004). She compared the results from her evaluation study of the late 1980s changes to payments for single parents to the effects of comparable (but not the same) changes to the tax and transfer system, as published in Duncan and Harris (2002) and Creedy, Kalb and Kew (2003). She found that the quasi-experimental evaluation approach seemed to estimate similar but somewhat larger effects than obtained from behavioural microsimulation for comparable hypothetical policy changes.

The labour supply responses are driven by the underlying labour supply modelling in MITTS. The wage elasticities implied in these models can be compared to other elasticities published in the literature. The implicit labour supply elasticities in MITTS are similar to those generally found within the international literature. The results for single parents and for married and single men and women are well within the range of results usually found, although admittedly this range is quite wide. A detailed comparison of elasticities arising from MITTS with elasticities from other studies is provided in Buddelmeyer, Creedy and Kalb (2007: pp. 21–4).

The use of MITTS for this paper is somewhat different from how MITTS would usually be used. Instead of comparing a base system of taxes and transfers to a reform system, we aim to simulate what would happen under the current tax and transfer system if changes were to be made to the FMW. An important note to make is that MITTS is a partial equilibrium model predicting changes to labour supply only. In this paper, it means that the FMW change is assumed to have no effect on the demand for labour. In fact, it is assumed that there will be enough demand to meet any additional supply of labour due to the FMW increase.

3. Data issues

3.1 The data of analysis

The input for the MITTS model is based on the Australian Bureau of Statistics' (ABS) Survey of Income and Housing Costs (SIHC). The most recent available sample of households in MITTS represents the Australian population in 2003/2004.² Financial information for this population can be updated to a more current date, as can the tax and transfer system. However, the characteristics in the sample remain representative of the population in 2003/2004. Wages are updated with the gender-specific Average Weekly Earnings (AWE) index, and other incomes are updated with the Consumer Price Index (CPI). Both the gender-specific AWE and the CPI are published in ABS publications (ABS, 2008a, b).

MITTS-A and MITTS-B results are based on all individuals in the SIHC, but under MITTS-B some individuals are assumed not to change their labour supply decision, i.e. they are fixed at their observed labour supply levels. This group consists of:

- individuals who are self-employed;
- individuals over 65 years of age;
- full-time students; and
- individuals who are disabled (as reflected by receipt of a disability pension or because they report that they are temporarily or permanently unable to work).

These four groups are assumed to remain at their observed labour supply, because they are expected to behave differently from other individuals of working age, and to be less responsive to financial incentives. This is discussed in more detail in Section 5.

3.2 Definition of wages

The hourly wage variable used in MITTS is total employee income divided by usual total hours. More specifically, hourly wages are calculated as 'total current weekly employee

² We plan to update MITTS with the SIHC 2005/2006 data.

income' (the variable IWSUCP) divided by 'number of hours usually worked per week in main and second jobs' (the variable IHRSWKACP). Predicted wages are calculated for each individual using a wage model as described in Kalb and Scutella (2002). When hourly wage information cannot be derived directly from the SIHC data, predicted wages instead of observed wages are used to predict labour supply. This is always the case for individuals not working, but it also occurs for employed individuals when IWSUCP or IHRSWKACP are not available.

As described above, wages are predicted in order to obtain wages for those currently not in work. This is described in detail in Kalb and Scutella (2002), and has recently been updated in Kalb and Lee (2008). In short, the SIHC data from 1999/00, 2000/01, 2002/03 and 2003/04 are pooled and used to estimate a wage equation, corrected for selection into work using a Heckman correction. This wage equation is estimated separately for five groups: married women, married men, single women, single men and single parents. Explanatory variables are age, work experience, occupation, industry, qualifications, state, a capital city identifier, country of birth, and some interaction terms. Wages can then be predicted by combining an individual's values of the explanatory variables with the appropriate coefficient estimates. To overcome the problem of missing information on occupation and industry for non-workers, each non-working individual is assumed to be working for a proportion in each occupation and industry. That is, the dummy variables for occupation and industry are replaced by the sample proportions in the different occupations and industries. Since it is likely that the distribution across occupation differs between employed and unemployed individuals, ABS information on the distribution of unemployed individuals over the various occupation and industry groups is used to assign proportions within occupation and industry groups to the non-workers (ABS, 2003; 2006). See Table 1, which is an updated version of Table A.4 in Kalb and Scutella (2002), taken from Kalb and Lee (2008). For a complete discussion of this approach, see Creedy *et al.* (2001).

Table 1: Occupation and industry percentages: unemployed August 2003 and 2006

Category	Males		Females	
	2003	2006	2003	2006
Industry division				
Agriculture, forestry and fishing	8.75	4.83	4.90	3.05
Mining	0.93	1.75	0.58	0.32
Manufacturing	18.90	17.73	6.05	4.41
Electricity, gas and water supply	0.52	0.97	0.07	0.16
Construction	14.71	17.67	0.94	2.01
Wholesale trade	6.16	7.30	2.59	3.45
Retail trade	13.67	15.38	22.84	26.97
Accommodation, cafés and restaurants	6.21	6.03	12.10	15.01
Transport and storage	6.16	4.52	2.88	2.17
Communication services	1.14	1.99	2.74	0.88
Finance and insurance	1.97	1.57	3.17	3.69
Property and business services	9.89	10.31	12.68	11.72
Government administration and defence	3.37	2.29	2.88	1.85
Education	0.98	1.63	5.55	5.30
Health and community services	2.23	2.17	12.68	11.64
Cultural and recreational services	2.18	1.57	3.03	2.09
Personal and other services	2.18	2.29	4.25	5.22
Occupational group				
Managers and administrators	3.88	5.79	2.09	1.61
Professionals	7.51	5.43	10.16	9.87
Associate professionals	5.85	9.35	6.84	10.91
Tradespersons	15.12	15.80	3.60	3.61
Advanced clerical and service workers	1.24	0.48	3.10	3.69
Intermediate clerical, sales and service workers	7.66	6.94	33.57	28.01
Intermediate production and transport workers	16.83	15.44	2.31	4.09
Elementary clerical, sales and service workers	9.01	9.53	21.83	23.03
Labourers and related workers	32.94	31.24	16.50	15.09

3.3 The wage distribution

Due to the underlying data being the 2003/2004 SIHC, the wage distribution is compared to the FMW value current between May 2003 and May 2004, i.e. at \$448.40 per week. With a standard week of 38 hours this equates to an hourly wage of \$11.80, or a log hourly wage of \$2.47. Figures 1 to 3 present graphs of the log hourly wage distribution, based on SIHC 2003/04 with hourly wages calculated as total employee earnings divided by the number of usual hours in all jobs.³ The graphs are presented separately for employed persons, unemployed persons and persons not in the labour force. For the two latter groups, hourly wages are predicted as described in Section 3.2. Individuals reporting (or with predicted) wages lower than \$4 an hour or greater than \$125 an hour are considered outliers and are omitted. Self-employed individuals are omitted as well.

As can be seen, even for recorded hourly wages, it is not uncommon to register an hourly wage below the FMW. Since predicted wages are informed by actual observed wages

³ The relevant distribution would be the same if we had inflated the 2003/2004 wage rates with the male and female wage indices, except for a shift to the right due to the same percentage increase for all individuals.

these, too, will exhibit this phenomenon. However, for predicted wages the issue is less pronounced. The graphs show that predicted wages are always in excess of at least a log wage of 2, which translates into a wage of about \$7.40 per hour.

Figure 1: Log hourly wages of all employed persons 21–59 yrs

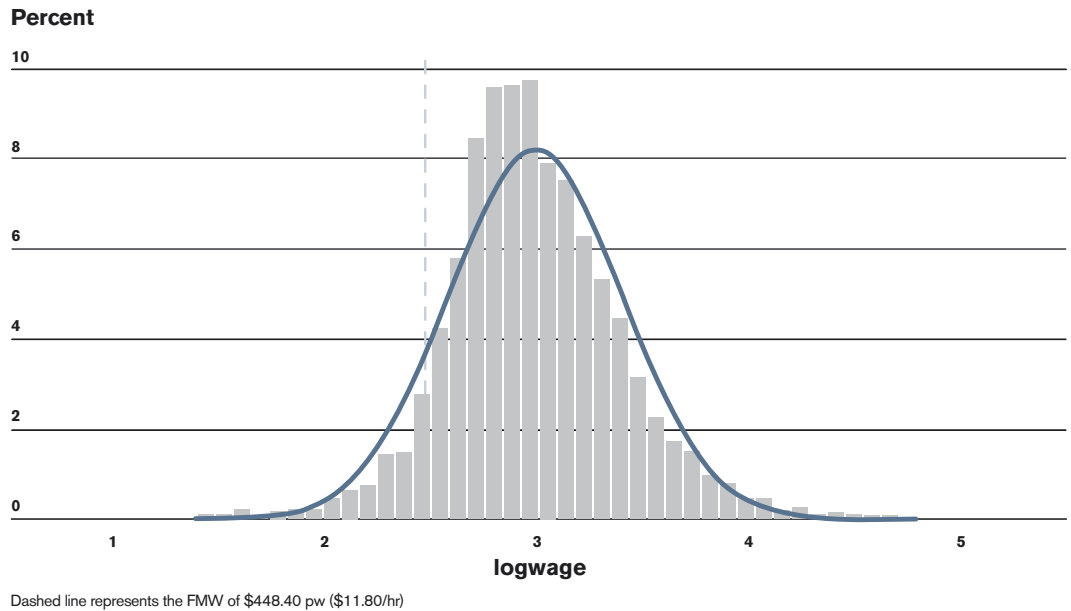


Figure 2: Log hourly wages of all unemployed persons 21–59 yrs

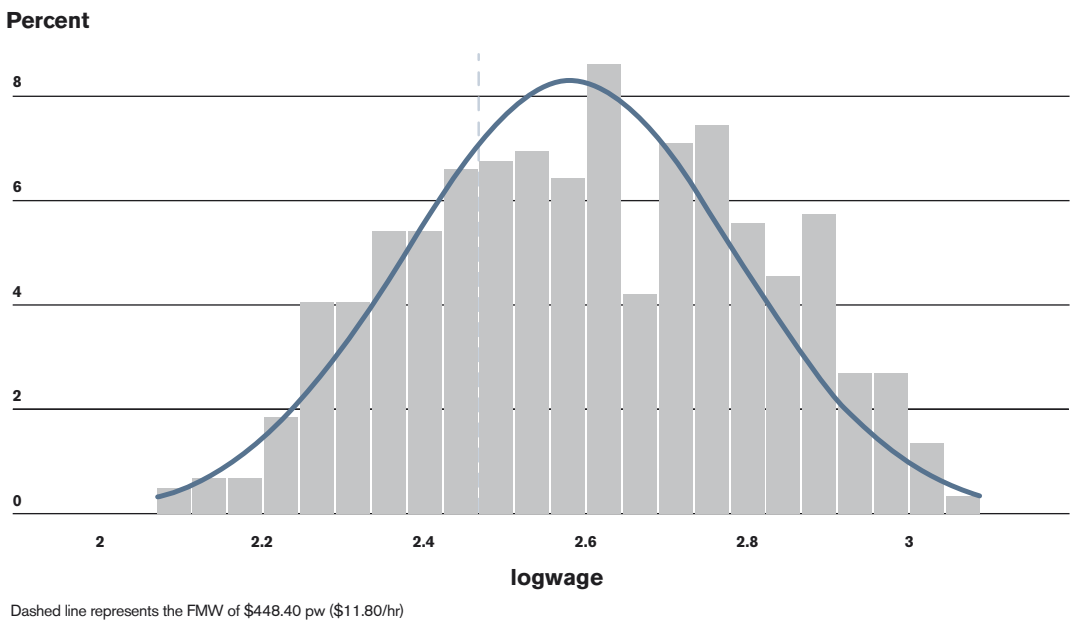
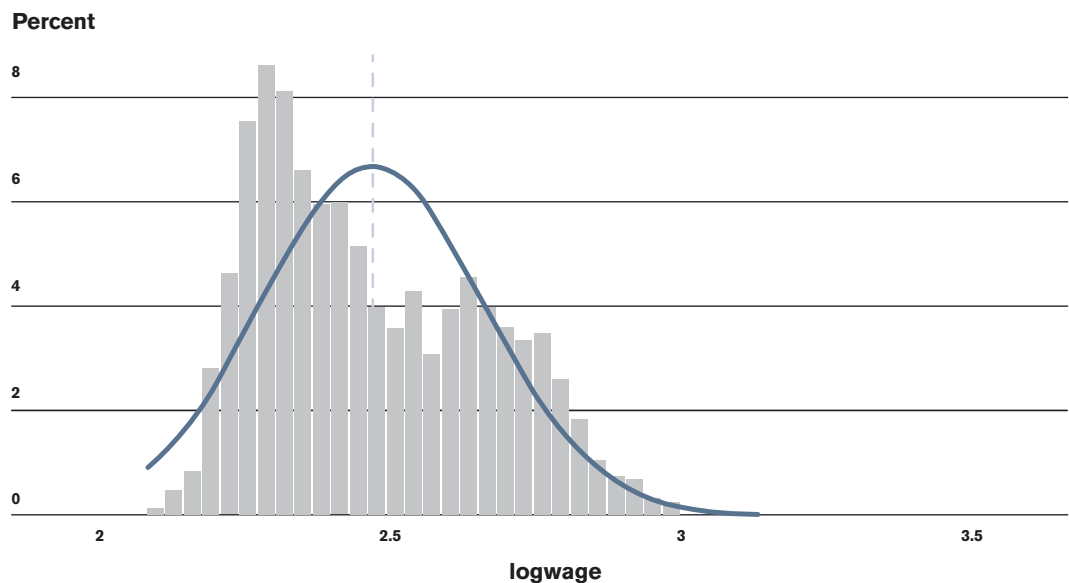


Figure 3: Log hourly wages of all NILF persons 21–59 yrs



Dashed line represents the FMW of \$448.40 pw (\$11.80/hr)

3.4 Identification of low-paid and/or FMW employees

Several individuals are known to have special wage provisions. These include casual workers who receive a loading to compensate for the lack of paid leave, juniors who may be on junior wages, and trainees and apprentices who may be on trainee wages. Furthermore, it can be argued that the calculated wages for self-employed individuals are very noisy, statistically speaking. Unfortunately, the SIHC does not collect identifiers to indicate if people are trainees, apprentices or casuals. Therefore, to avoid allowing for junior wages we limit the sample to individuals 21 years and over. Self-employed individuals can be identified and are omitted from the analysis. As a point of clarification, the wages of individuals with disability and full-time students are treated as normal wages.

To clarify what proportion of people would be considered 'a FMW worker', Table 2 summarises the raw and weighted sample sizes under alternative definitions. As junior wages cannot be properly identified in the SIHC we have excluded all individuals under 21. Furthermore, to maintain a prime labour market focus we have set the maximum age at 59, which mainly affects the number of non-participants due to many individuals in the SIHC who are already retired between ages 60 and 64. Finally, we have dropped individuals with a reported or predicted wage of less than \$4 or more than \$125 per hour. Table 2 shows how these various restrictions reduce the sample size. Subsequently, Table 3 then summarises the sample sizes of the FMW workers under various definitions of the FMW.

Table 2: Impact of restrictions on the sample size

	All	Age <= 59	21 <= Age <= 59	\$4 / \$125 trim
Employed				
Sole parent	449	446	446	443
Single female	1,823	1,775	1,209	1,194
Single male	2,058	2,004	1,416	1,389
Partnered female	3,573	3,444	3,395	3,357
Partnered male	4,258	3,941	3,919	3,879
Total A	12,161	11,610	10,385	10,262
<i>Weighted</i>	8,410,515	8,072,589	7,165,587	7,076,228
Not participating (NILF)				
Sole parent	350	344	329	329
Single female	1,633	604	278	278
Single male	1,095	706	325	325
Partnered female	2,795	1,566	1,546	1,546
Partnered male	1,734	414	412	412
Total B	7,607	3,634	2,890	2,890
<i>Weighted</i>	5,531,870	2,729,273	2,130,615	2,130,615
Unemployed				
Sole parent	65	65	63	63
Single female	193	192	97	97
Single male	296	291	178	178
Partnered female	135	134	126	126
Partnered male	142	129	126	126
Total C	831	811	590	590
<i>Weighted</i>	581,890	569,735	415,491	415,491
Total A+B+C	20,599	16,055	13,865	13,742
<i>Weighted</i>	14,524,275	11,371,597	9,711,693	9,622,334

As can be seen in Table 2, there are approximately 14,000 individuals aged between 21 and 59 with a calculated or predicted wage between \$4 and \$125 per hour. This represents about 9.6 million Australians. About 7.1 million persons are employed, 2.1 million persons are not in the labour force and 400,000 persons are unemployed. Based on this sample of 14,000 individuals, we present the distribution of wages in Table 3. The lower bound for the wage is \$4 due to earlier exclusions. We group wages in the following categories: between \$4 and \$6, \$6 and \$9, \$9 and \$11.30, \$11.30 and \$12.30, \$12.30 and \$14.60, and \$14.60 to \$125 (the imposed upper bound). The category between \$11.30 and \$12.30 captures individuals within a 50 cent margin of the FMW. We call this group the core FMW group. The sample size of this core group consists of about 700 people, with slightly fewer than half of this group being employed. The core group can be extended to include, for instance, all individuals with a wage between \$9 and \$11.30. This would expand the group of 'FMW workers' to just over 2,500 persons, with nearly 30 per cent of this group being employed.⁴

4 We can do a sensitivity analysis to a number of cut-off points for the FMW and compare the results to McGuinness, Freebairn and Mavromaras (2007).

Table 3: Sample sizes of individuals between 21 and 59 years of age by family type and employment status

Lower bound for hourly wage	\$4.00	\$6.00	\$9.00	\$11.30	\$12.30	\$14.60	
Upper bound for hourly wage	\$6.00	\$9.00	\$11.30	\$12.30	\$14.60	\$125.00	
Employed							Total
Sole parent	3	8	21	6	59	346	443
Single female	7	22	60	49	152	904	1,194
Single male	14	28	47	62	191	1,047	1,389
Partnered female	14	71	137	105	396	2,634	3,357
Partnered male	27	68	113	92	282	3,297	3,879
Total A	65	197	378	314	1,080	8,228	10,262
<i>Weighted</i>	48,389	143,294	261,660	215,279	743,533	5,664,073	7,076,228
Not participating (NILF)							
Sole parent	0	0	0	1	219	109	329
Single female	0	0	4	14	101	159	278
Single male	0	0	4	17	84	220	325
Partnered female	0	97	1,199	142	101	7	1,546
Partnered male	0	0	153	155	91	13	412
Total B	0	97	1,360	329	596	508	2,890
<i>Weighted</i>	0	62,113	989,330	255,618	429,401	394,153	2,130,615
Unemployed							
Sole parent	0	0	0	0	30	33	63
Single female	0	0	1	8	31	57	97
Single male	0	0	0	11	62	105	178
Partnered female	0	11	88	18	9	0	126
Partnered male	0	1	50	39	33	3	126
Total C	0	12	139	76	165	198	590
<i>Weighted</i>	0	8,062	92,723	54,374	114,814	145,519	415,491
Total A+B+C	65	306	1,877	719	1,841	8,934	13,742
<i>Weighted</i>	48,389	213,469	1,343,713	525,271	1,287,748	6,203,745	9,622,334

4. Results from microsimulation

The wages in the input data are changed *before* the data are used by MITTS. This is relatively straightforward. After the FMW group has been identified as described in Section 3, the wages for this group can be set at any arbitrary level. Running MITTS, using this amended dataset, a predicted expected labour supply measured in hours can be produced. Repeating this process for two different chosen wage levels (for example, the minimum wage before and after the increase), we can compare the difference in expected hours of labour supply. Since wages are modified manually, we maintain full flexibility in deciding which individual wages are changed and to what level.

This method can be used to simulate an increase in the wage. Since the variable 'wage' is available for every individual (if the individual is not employed 'wage' is the predicted wage) these methods can be used to simulate an increase in the wage of FMW employees (that is, persons who are currently working) and in the wage of those currently not employed.

The latter case would be simulating an increase in offer wages received by people currently out of the labour force, but who have been identified as 'FMW workers' if they were to work.

4.1 Estimated cost to employers of an increase in the FMW

We use the non-behavioural MITTS results to predict the aggregate increase in wage income of minimum wage workers when in 2008 minimum wage levels are increased from \$13.74 to \$14.31 per hour. It is assumed that this is a real wage increase, and does not account for the effect of inflation over time.

Minimum wage workers are identified in the 2003/2004 SIHC data using the relevant minimum wage valid in the first quarter of 2004. FMW workers are defined as those who are within 50 cents of the FMW of that time of \$11.80 per hour. The information in the 2003/2004 data is updated to 2008 through the use of the CPI and wage indices before applying the tax and social security system of 2008. Those who are identified as minimum wage workers have their wages set at the 2008 minimum wage of \$13.74 per hour in the base data, which is then increased to \$14.31 in the policy simulation. Given the observed hours of work, this is expected to cost employers an additional 490 million dollars per year. This does not include additional costs (such as the payroll tax) which have been estimated to add about 25 per cent to this cost.⁵ Using observed hours of work to compute cost assumes individuals will continue to work the same number of hours after the FMW increase.

When designing alternative policies in the context of MITTS that would be comparable to the minimum wage increase, only the additional income paid to households is relevant for a meaningful comparison, since MITTS cannot include effects on parts of the economy outside the household sector. Therefore it does not matter in the microsimulation model whether government or employers pay the additional payroll tax and other on-costs associated with an increase in minimum wage. However, if effects on other sectors of the economy could be taken into account the results would be affected by who pays, for example, in affecting the employment level. Of the additional gross income paid by employers, around 174 million dollars flow on to the government through increased tax revenue and decreased government expenditure on income support payments.

4.2 Labour supply responses

As mentioned in Section 2, MITTS consists of two parts: a non-behavioural component, which computes the effects of tax and social security policy changes on individuals and households; and a behavioural component, which allows these individuals to make changes to their labour supply in response to tax and social security policy changes. This section focusses on the output generated by the behavioural component. For readers who are interested in an overview of the technical details underlying the determination of labour supply responses, Appendix B provides a brief description of the behavioural component. However, this is not essential for understanding the remainder of this section.

Using MITTS-B, a variety of labour supply responses can be computed in response to a range of changes in the financial incentives facing individuals and households. An increase in the FMW would be an example of a change in financial incentives since it changes the relative return to labour force participation for low-wage individuals in the population. It increases the net incomes at positive hours of work relative to being out of the labour force. The effect on labour supply depends on their current labour supply and other

⁵ Heather Ridout, chief executive of the Australian Industry Group, said the following on 8 July 2008 on ABC's Lateline Business programme in response to the minimum wage rise: '... it's going to cost employers who have to pay \$27 a week by the time they pay payroll tax and workers comp and other on costs ...' (see <http://www.investortv.com/stories/60912,1963-17056,37266.html>). This translates into an additional 25 per cent on top of the \$21.66 weekly wage increase.

income, and on the wage and labour supply of their spouses. The substitution effect is expected to increase labour supply, since the price of leisure (which is equal to the net wage rate) has increased. However, the income effect has the opposite effect since at the same level of labour supply a higher net income is obtained. Depending on which of the two effects is larger, the overall effect can be either positive or negative.

Although we can compute the financial effects of changing the minimum wage for every individual in the sample, for a number of groups it is assumed that there is no labour response and that they are fixed to their observed labour supply. These groups include those over 65 (and therefore in principle eligible for the age pension), full-time students, the self-employed, and individuals who report they are permanently or temporarily unable to work, or are receiving a disability support pension or service pension. The reason for excluding these groups from the labour supply modelling is that they are expected to behave differently compared to the other groups. For the self-employed, the relationship between total earned income and labour supply is not as simple as for many wage and salary earners, where total earned income equals labour supply multiplied by the wage rate. For this group, it seems that the FMW may just not be relevant, unless it would affect the choice of becoming self-employed. Modelling this choice would be very different to estimating labour supply for the other groups. Older people are expected to behave differently from younger people, especially once they are eligible for the age pension (and/or have access to superannuation payments). All people temporarily or permanently unable to work because of illness or disability cannot really choose their labour supply freely as they are restricted by their health status (which we do not observe in the SIHC). Similarly, full-time students have education as their main activity in life, which will affect their labour supply choices.

Table 4 shows the results from our simulation of the labour supply response to an increase in the FMW for FMW individuals (in or out of work) as identified in Section 3.4. The response is measured in terms of predicted participation rate and predicted average hours of labour supply. All groups experience an increase in their predicted labour supply due to the higher wage rate. Partnered men on minimum wages have the highest labour supply, and are expected to experience the smallest increase. Based on the numbers presented, single parents increase their expected labour supply by $(13.03 - 12.68) = 0.35$ hours when their wage is increased from \$13.74 to \$14.31 per hour. This is equal to a 2.76 per cent increase in expected hours resulting from a 4.15 per cent increase in wages. The corresponding wage elasticity for this group is about 0.66 ($2.76/4.15$). The average wage elasticity for partnered men is about 0.19 ($0.79/4.15$). Compared to the general population of partnered men, this group of minimum wage workers has lower labour supply and higher wage elasticities.

Table 4: Predicted labour supply responses of minimum wage earners by demographic group

	Partnered men	Partnered women	Single men	Single women	Single parents
Average hours of labour supply in hours/week	27.08	14.66	22.16	20.68	12.68
Average hours of labour supply after increase in FMW	27.30	15.00	22.40	20.91	13.03
Corresponding wage elasticity	0.196	0.559	0.261	0.268	0.665
Participation rate in per cent	67.12	54.25	68.45	82.63	45.77
Participation rate after increase in FMW	67.63	55.16	68.96	83.11	46.61

Given the structure of MITTS, which is based on aggregation of income unit and individual level information, the above results on labour supply could in principle be broken down by any characteristic available in the SIHC data set.

Table 5 presents the results on average across the total population. The group of minimum wage workers is relatively small, and therefore the average overall effect is small at the national level. This table allows for a comparison of the overall labour supply response with the effects on labour supply response for alternative policy changes as presented in Section 4.5.

Table 5: Predicted labour supply responses among the whole population by demographic group

	Partnered men	Partnered women	Single men	Single women	Single parents
Average hours of labour supply in hours/week	30.267	17.638	20.568	14.016	17.789
Average hours of labour supply after increase in FMW	30.286	17.656	20.578	14.023	17.796
Participation rate in per cent	72.560	56.412	73.006	60.247	55.315
Participation rate after increase in FMW	72.604	56.465	73.026	60.265	55.333

4.3 Income distribution impacts

Both the non-behavioural and behavioural component of MITTS allow the calculation of a range of income distribution measures. The income distribution measures in the behavioural component take full account of the probabilistic nature of the labour supply outcomes. To give an example, it allows for the fact that for a single person there are 11 possible labour supply outcomes, each of which has a predicted probability attached to it. That is, the approach takes this uncertainty regarding the actual outcome into account. The approach used is described in Creedy, Kalb and Scutella (2004, 2006) and Creedy and Kalb (2006).

This allows us to estimate the implications of the various predicted labour supply responses for the overall distribution of income in the Australian population. Both the effect on poverty levels (according to a range of different definitions: absolute or relative measures) as well as the effect on inequality can be explored. There are several pre-programmed inequality measures available in MITTS. In this paper we use the Gini coefficient to summarise inequality. We use equivalised income unit income as input into the inequality measure.

The effects on income distribution are expected to be fairly small since it is a relatively limited group that would be affected (as shown in Table 3) by the modest change in FMW. This is unlikely to change the relative differences in income between individuals to a large extent. The results allowing for labour supply responses are as expected with the Gini coefficient decreasing slightly from 0.3142 to 0.3140 when increasing the FMW from \$13.74 to \$14.31 in 2008 for the group identified as core FMW workers.

4.4 Government expenditure impacts

Even at unchanged labour supply, an increase in the FMW is expected to change individuals' and income units' eligibility for a number of income support payments, family payments and rebates, due to the increased amount of taxable income. In addition, the amount of tax paid is expected to change. This will result in changes in expenditure and revenue at the aggregate level, which are estimated to decrease government's net expenditure by about

174 million dollars per year for unchanged labour supply at the observed hours worked. This of course assumes there is no reduction in labour demand due to the increase in the FMW.

The expenditure changes could be broken down into expenditure on the different types of allowances, pensions, family payments and rebates. In addition, revenue changes could be provided separately for income tax and Medicare levy. Combining the change in expenditure and revenue allows us to compute the above change in net government expenditure on households due to the change in the FMW.

4.5 Alternative policy changes

We set up a few alternatives (targeting low-income individuals) costing about 316 million dollars which, under the assumption of unchanged labour supply, would distribute the same amount to households as the increase in the FMW (490 million dollar increase in gross income minus 174 million dollars in additional tax paid plus the reduction in income support, family payments and rebates). Looking at the tax and social security reform alternatives in Buddelmeyer, Freebairn and Kalb (2006), where an amount of 5 billion dollars was used for each of the reforms, it is clear that the alternatives in our case have to be relatively modest.⁶

We choose two alternatives that are generally thought to benefit low-income earners, and which similar to the FMW increase are independent of household income.⁷ The first alternative involves an increase of the Low Income Tax Offset (LITO) with an additional \$50 per year. It affects a broader group than FMW workers. The second alternative involves the decrease of the first income tax rate with 0.15 percentage points from 15 per cent to 14.85 per cent. It affects all taxpayers; thus it is not targeted at all.

When returning an identical amount to households as they would have received had the FMW been increased through an alternative policy, it is likely that different individuals will receive additional income and that those who receive additional income under both alternatives receive different amounts. This is likely to result in different distributional effects. For instance, the group of FMW workers identified who experience a wage increase is relatively small. The alternative of increasing the LITO will also benefit some in this group, but in addition many more further up the income scale as well. In the case of a reduction in the lowest marginal income tax rate, *all* tax payers benefit.

The increase in the LITO by \$50 to \$1,250 per annum has a day-after cost of \$309 million. The Gini based on equivalised household income, assuming the additional predicted hours of labour supply are met by additional labour demand, is reduced from 0.3138 to 0.3137, a negligible effect.⁸

At \$349 million, the day-after cost of a decrease in the lowest tax rate by 0.15 percentage points was somewhat higher than the assigned \$316 million, which should be kept in mind when comparing, for example, labour supply effects. This policy change leaves inequality unchanged as measured by the Gini coefficient of 0.3138.

6 Including a larger number of individuals as an FMW individual would increase the amount of extra income paid to households. A sensitivity analysis could explore different definitions of the group of individuals who would be affected by FMW changes.

7 Although approximately the same amount is returned to households under the increase in FMW and the two alternative policy changes, assuming unchanged labour demand (and supply), the policies themselves may have different impacts on labour demand. However, as previously pointed out we are only able to analyse the impact on labour supply.

8 Note that the Gini is changed when we set wages for a group to a particular level, relative to leaving them unchanged. As a result our starting point has changed. Comparisons to the effects of the FMW increase should therefore only be made of changes from the starting point and not of the absolute values.

Table 6 presents the results for the overall population. Compared to the July 2008 situation presented in the first row, both average predicted hours of labour supply and the predicted probability of participation increase when increasing the LITO.

The effect of a decrease in the bottom tax rate on the average predicted hours of labour supply is quite similar to the change in LITO; men benefit slightly more from a decrease in the tax rate and single parents appear to benefit slightly more from the increase in LITO. This small difference is probably due to a difference in incomes for these groups, with men being more likely to benefit from the tax rate decrease whereas single parents (being usually low-wage and low-income individuals) are more likely to benefit from an increase in LITO. The effect on predicted participation rates is slightly lower for all groups when decreasing the tax rate compared to increasing the LITO. This is according to expectation with the LITO providing a larger benefit to low-income earners who are more likely to be found among those who are currently not participating in the labour force.

Comparing the change in average predicted hours of labour supply per week and the predicted participation rate in Table 5 with the changes in Table 6, we find that except for single parents, the increase in minimum wage generates a larger increase than the other two policy changes. The different result for single parents may be due to the fact that single parents above the minimum wage rate may be more likely to work part-time. As a result, medium- to high-wage single parents (who would not benefit from a minimum wage increase) may still benefit from an increase in the LITO, which appears most effective with regard to labour responses.

Table 6: Predicted labour supply responses of a \$50 LITO increase and a 0.15 percentage point decrease in the bottom income tax rate by demographic group

	Partnered men	Partnered women	Single men	Single women	Single parents
Average hours of labour supply in hours/week ^a	30.304	17.666	20.587	14.026	17.801
Average hours of labour supply after increase in LITO	30.308	17.675	20.589	14.029	17.823
Average hours of labour supply after decrease in bottom income tax rate	30.310	17.675	20.590	14.029	17.817
Participation rate in per cent	72.644	56.493	73.046	60.275	55.349
Participation rate after increase in LITO	72.662	56.527	73.059	60.289	55.435
Participation rate after decrease in bottom income tax rate	72.660	56.517	73.058	60.287	55.393

Note: a) The starting point in this table is different from the starting point in Table 5, due to setting all wages in the sample of identified minimum wage earners to the same level in Table 5.

To show how those identified as minimum wage earners fare under the two alternative policy changes, Table 7 presents the labour supply responses for this group separately so they can be compared to the results in Table 4. The effects in Table 7 are clearly much smaller than those observed in Table 4. This is as expected since the increase in minimum wage targeted this group specifically, whereas the alternative policies need to divide the same amount of expenditure over a larger group. Single parents on the minimum wage appear not to benefit from these two alternative policies at all and single women even appear to be slightly negatively affected in the average predicted hours of labour supply as a result of introducing LITO. The LITO policy change is slightly better than the tax rate change for couples and vice versa for single men.

Table 7: Predicted labour supply responses of a \$50 LITO increase and a 0.15 percentage point decrease in the bottom income tax rate for the minimum wage earners by demographic group

	Partnered men	Partnered women	Single men	Single women	Single parents
Average hours of labour supply in hours/week ^a	27.544	15.131	22.594	21.030	13.280
Average hours of labour supply after increase in LITO	27.557	15.148	22.595	21.027	13.280
Average hours of labour supply after decrease in bottom income tax rate	27.553	15.144	22.601	21.030	13.280
Participation rate in per cent	68.145	55.492	69.406	73.403	47.357
Participation rate after increase in LITO	68.177	55.545	69.409	73.403	47.357
Participation rate after decrease in bottom income tax rate	68.160	55.524	69.419	73.403	47.357

Note: a) The starting point in this table is different from the starting point in Table 4, due to setting all wages in the sample of identified minimum wage earners to the same level in Table 4.

5. Concluding remarks

This paper has provided an example of how MITTS could help to obtain a better understanding of the likely labour supply effects arising from an increase in the FMW. This is no trivial task due to the need to account for the interactions between the taxation system and the means-tested social security system which is particularly relevant for the low-wage end of the labour market. An extra dollar in pay does not mean an extra dollar in net household income (often it is much less), and this discrepancy between gross and net income increase varies by FMW worker depending on the characteristics of the household of which the worker is part. Labour supply is assumed to depend on the net income variations. Proper assessment of labour supply effects therefore requires a tax-benefit microsimulation model to accurately compute net income starting from gross income.

This paper should be seen as a first step only, which would benefit from an update to the latest SIHC data and a number of extensive sensitivity analyses, since there is a fair amount of flexibility with regard to the type of analysis and the information that can be incorporated in the analyses. For example, we could have included individuals on wage rates below the minimum wage and/or individuals just above the minimum wage rate who would have been likely to have benefited from flow-on effects of a minimum wage rate increase on their award rates.

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Appendix A: MITTS

This appendix provides a brief description of the Melbourne Institute Tax and Transfer Simulator (MITTS), a behavioural microsimulation model of direct tax and transfers in Australia. Since the first version was completed in 2000, it has undergone a range of substantial developments. MITTS is based on the Australian Survey of Income and Housing Costs (SIHC), a representative sample of the Australian population, containing detailed information on labour supply and income from different sources, in addition to a variety of background characteristics of individuals and households. This allows us to replicate the social security payments received and income tax paid for each individual and household according to the income tax and social security rules at any point in time or according to a hypothetical set of rules. All results can be aggregated to the population level using the household weights provided with SIHC. Pre-reform net incomes at alternative hours levels are based on the MITTS calculation of entitlements, not the actual

receipt. Furthermore, MITTS applies only income tests, as there is at present no asset imputation in the model. All major social security payments and income taxes are included in MITTS, ensuring a reasonable approximation to net income by MITTS.

MITTS consists of two components. MITTS-A is the arithmetic tax and benefit modelling component and provides, using the wage rate of each individual, the budget constraints that are crucial for the analysis of behavioural responses to tax changes. For those individuals in the data set who are not working, an imputed wage is obtained. A static simulation of the effects of a tax change involves the use of alternative budget constraints in the pre- and post-reform situation. The budget constraints incorporate all main tax and transfer programs and are computed using MITTS. Assuming unchanged labour supply, MITTS can calculate the net income of each individual before and after the change together with the social security payments which are received and income tax which is paid. From these individual amounts, aggregate expenditure and revenue can be computed using the ABS-provided weights to inflate sample totals into population totals.

MITTS-B examines the effects of any specified tax reform, allowing individuals to adjust their labour supply. Behaviour is based on quadratic preference functions where the parameters are allowed to vary with individuals' characteristics (for more detail on the labour supply modelling, see Appendix B). Individuals are considered as being constrained to select from a discrete set of hours levels. For singles, 11 discrete points are distinguished. For the couples in the labour supply estimation, two sets of discrete labour supply points, one for males and one for females, are used. The female hours distribution covers a wider range of part-time and full-time hours than the male distribution, which is mostly divided between non-participation and full-time work. Therefore, women's labour supply is divided into 11 discrete points, whereas men's labour supply is represented by just 6 points. The joint labour supply of couples is estimated simultaneously, unlike a popular approach in which female labour supply is estimated with the spouse's labour supply taken as exogenous. Thus, for couples there are 66 possible joint labour supply combinations.

Simulations are probabilistic, as utility at each hours level is specified as the sum of a deterministic component (depending on hours worked and net income) and a random component. Hence MITTS generates a probability distribution over the discrete hours levels. The self-employed, people with disability, students and those over 65 have their labour supply fixed at observed hours. Simulations begin by recording the discrete hours level for each individual that is closest to the observed hours level. The deterministic component of utility is obtained using the parameter estimates of the quadratic preference function. To generate the random component, a draw is taken from the distribution of the error term for each hours level (an Extreme Value Type I distribution). The utility-maximising hours level is found by adding the two components of utility for each hours level and choosing the hours with the highest utility. Draws from the error terms are taken conditionally on the observed labour supply; that is, they are taken in such a way that the optimal pre-reform labour supply is equal to the actually observed labour supply. As a result, post-reform labour supply is simulated conditional on the observed pre-reform labour supply. A user-specified number of draws is produced.

For the post-reform analysis, the new net incomes cause the deterministic component of utility at each hours level to change, so using the same set of draws from the calibration stage, a new set of optimal hours of work is produced. This gives rise to a probability distribution over the set of discrete hours for each individual under the new tax and transfer structure. Post-reform labour supply is based on the average value over the draws. This is equivalent to calculating the expected hours of labour supply after the change, conditional on starting from the observed hours before the change. In computing tax and revenue levels, an expected value is also obtained after the policy change.

Appendix B: The determination of labour supply responses in MITTS-B

The labour supply model used in MITTS is described in detail in Kalb (2002).⁹ The parameter estimation and microsimulation of discrete hours labour supply in this paper follows the general method outlined in Van Soest (1995), which is explained in more detail in Creedy and Kalb (2005). In this appendix, only a brief overview is provided. Given the aim of simulating policy changes with regard to taxes and transfers, priority is given to incorporating all possible details of the taxation and social security system.

B.1 The economic model

The approach follows most of the literature in adopting a neoclassical framework: utility is maximised conditional on the total amount of time available to each adult and a household budget constraint. It is expected that utility increases with an increase in leisure and home production time (referred to as leisure for convenience) and income (consumption of all other goods). Households maximise utility by choosing leisure (and hence labour supply) for each adult.¹⁰ The labour supply values for each parent are the endogenous variables in the model. Wage rates, non-labour income (other than taxes and transfers), household composition and other household attributes are exogenous. Specifically, the exogenous factors include the number and ages of children, the age and education level of each parent, and components of income other than labour earnings, transfers and taxes. The rules of the taxation and social security systems are used to relate the net income of the household with its choices of labour supply. Separate models are specified for single men, single women, single parents and couple families.

Turning to the choice of functional form, the labour supply function is modelled as a discrete choice. Restricting the number of possible working hours to a limited set of discrete values is done in many other studies (for example, Van Soest, 1995; Keane and Moffitt, 1998; Duncan *et al.*, 1999). The advantage of using a discrete choice framework is that it allows more complex modelling of the budget constraint. Assuming there are two adults in the household, the labour supply is derived from the following:

$$\max. U(x, l_1, l_2) \quad (\text{B.1})$$

subject to a time constraint for each adult:

$$\begin{aligned} l_1 + h_1 = T \quad \text{and} \quad l_2 + h_2 = T \\ (h_1, h_2) \in A \times B \end{aligned} \quad (\text{B.2})$$

and subject to a budget constraint:

$$\begin{aligned} x = w_1 h_1 + w_2 h_2 + y_1 + y_2 + B(c, w_1 h_1 + w_2 h_2 + y_1 + y_2) - \\ \tau(B, w_1 h_1 + y_1, w_2 h_2 + y_2, c) \end{aligned} \quad (\text{B.3})$$

where $U(\cdot)$ is the utility function of a two-adult household; l_1 and l_2 indicate the leisure hours (including home production) per week of the husband and wife (married or de facto) respectively; h_1 and h_2 are the hours of work of husband and wife; A and B are the sets of discrete points from which values can be chosen for h_1 and h_2 ; T is the total time

⁹ The labour supply parameters are currently being updated. Instead of using the SIHC from 1994/1995 to 1997/1998, we use the SIHC from 1999/2000 to 2003/2004 to estimate labour supply parameters for couples, single men, single women and single parents.

¹⁰ It is assumed that all non-employed are voluntarily not working and that participants are at their preferred labour supply points.

available for each person in the household; x indicates net income per week, which is assumed equal to household consumption; w_1 and w_2 are the gross wage rates of husband and wife respectively; y_1 and y_2 are the non-labour incomes of husband and wife; c is a set of household attributes; $B(\cdot)$ is the amount of benefit a household is eligible for given their household characteristics c and household income; and τ is the tax function which indicates the amount of tax to be paid.

In the discrete choice case the budget constraint is defined on a discrete set of points $h_1 \in A = \{0, h_{11}, h_{12}, \dots, h_{1m}\}$ and $h_2 \in B = \{0, h_{21}, h_{22}, \dots, h_{2k}\}$ on the interval $[0, T]$, instead of being defined on a continuous set of working hours $[0, T]$.¹¹ Using these sets, net income x is calculated for all $(m + 1) \times (k + 1)$ combinations of h_1 and h_2 . For this limited set of hours, one can then calculate the level of utility generated by each possible combination of hours. The choice of labour supply is simultaneously determined for both adult members of the household. Depending on the choice of utility function, different interactions between household income and the labour supply of adults can be modelled. For one-adult households, the model is simplified by excluding everything related to the second adult.

B.2 The econometric model

To deal with unobserved market wages for people who are not working, we estimate their potential wage using a wage equation estimated on workers.¹² A two-stage selection model is used to correct for possible selection bias. Separate wage equations are estimated for married men, married women, single men, single women and single parents (see Kalb and Scutella, 2002).¹³

Based on the assumption of utility maximisation for each household and assuming households behave independently, the likelihood function can be written as:

$$\prod_i \Pr(U(x((h_{1i}, h_{2i})_r), (h_{1i}, h_{2i})_r, \varepsilon_r) \geq U(x((h_{1i}, h_{2i})_s), (h_{1i}, h_{2i})_s, \varepsilon_s) \text{ for all } s) \quad (\text{B.4})$$

where r stands for the combination h_1 and h_2 that is preferred; s stands for all possible combinations which can be made, given the discrete choice sets for hours worked; and ε_r and ε_s represent error terms. Adding an error term to the utility function prevents contributions to the likelihood of any data point from becoming zero, by allowing for optimisation errors. Equation (B.4) states that the utility of the observed labour supply point is higher than the utility in any other labour supply point. Choosing an extreme value specification for the error term in (B.4) results in a multinomial logit model.

Following Keane and Moffitt (1998), a quadratic specification is used for the utility function. This utility function is simple but quite flexible in that it allows for the leisure of each person and income to be substitutes or complements. Parameters representing fixed costs of working are included in the utility when positive labour choices are made. The fixed cost of working parameter, γ , is included in the income variable x to indicate the cost of working versus non-participation (following Callan and Van Soest, 1996). As a result of the inclusion in x , this cost of working parameter is measured in dollars per week. The utility is specified as follows:

11 $0, h_{11}, h_{12}, \dots$ etc. represent the discrete values which labour supply can take. Here we have chosen 0, 5, 10, 15, ..., 50 hours of labour supply for married women and singles. Given the low number of married men working low part-time hours, they are assumed to choose from 0, 10, 20, 30, 40 or 50 hours.

12 This follows the approach used by Van Soest (1995) and many others in the area.

13 As before with the labour supply models, the wage models have been updated using more recent data: the SIHC 1999/2000 to 2003/2004 instead of the SIHC 1994/1995 to 1997/1998.

$$U(x, h_1, h_2) = \beta_x(x - \gamma_1 - \gamma_2) + \beta_1 h_1 + \beta_2 h_2 + \alpha_{xx}(x - \gamma_1 - \gamma_2)^2 + \alpha_{11} h_1^2 + \alpha_{22} h_2^2 + \alpha_{x1}(x - \gamma_1 - \gamma_2) h_1 + \alpha_{x2}(x - \gamma_1 - \gamma_2) h_2 + \alpha_{12} h_1 h_2 \quad (\text{B.5})$$

where $\alpha_{..}$ and β are preference parameters and γ_1 and γ_2 are the fixed cost of working parameters to be estimated (where the indices 1 and 2 denote the husband and wife respectively). The fixed cost is zero when the relevant person is not working. For single adult households, all terms related to h_2 drop out of the utility function and γ_2 is set to zero.

We include observed heterogeneity by allowing β_1 , β_2 , β_x , γ_1 and γ_2 to depend on the personal and household characteristics listed in Section 5.1.1. Note that the estimated parameters of the labour supply model are actually those of the utility function.

B.3 Calculation of expected labour supply in simulation

Once the complete model has been estimated, the results can be used to calculate the expected labour supply for people with certain known characteristics and under known social security and taxation rules (as is done in MITTS).

The parameters of the utility function indirectly determine labour supply in terms of a distribution of hours worked. By assuming an 'extreme value' distribution for the error term in the utility function, it is possible to derive the relationship between the probability distribution of hours of work and measured utility levels at each hours level in a convenient form. After estimation, a point estimate of the expected hours of work (that is, labour supply) can be computed by multiplying the probability of working at each discrete value of labour supply by the corresponding discrete value of labour supply, and taking the sum of these product terms.

Thus, to obtain the expected labour supply of the husband, we first calculate the utility $U(x(h_1, h_2), h_1, h_2)$ for each possible combination of labour supply for both adults in the household. This is achieved by substituting the estimated parameter values into equation (B.5) after calculating the net income for the relevant combination. Once the utility values are known, a simple logit transformation (associated with the 'extreme value' distribution for the error term) provides the probability of each possible combination occurring according to the estimated model:

$$p(h_1, h_2) = \frac{\exp(U(x(h_1, h_2), h_1, h_2))}{\sum_{\substack{\text{over all} \\ h_1, h_2}} \exp(U(h_1, h_2), h_1, h_2))} \quad (\text{B.6})$$

These probabilities can then be used to calculate the expected value of labour supply for the husband by simply aggregating the probabilities over all possible values of h_2 for each value of h_1 . In this manner, the marginal probability of h_1 is obtained, which can then be used to calculate the expected value of h_1 in the usual way. The formula for this procedure looks as follows:

$$E(h_1) = \sum_{h_1} \left[\left(\sum_{h_2} p(h_1, h_2) \right) h_1 \right] \quad (\text{B.7})$$

The expected value for the wife's labour supply can be obtained in a similar way and to calculate similar values for singles, equations B.6 and B.7 can be simplified by leaving out all components that relate to h_2 .

The effect of minimum wage changes on labour supply and income distribution

In simulation, using calibration to start from the observed values of labour supply, extreme value random error terms ϵ are drawn and added to the deterministic component of utility U . Error terms resulting in the observed hours are stored and used to simulate labour supply responses due to a policy change. Labour supply responses after a policy change are calculated by computing the new deterministic utility levels and adding the stored error terms. Usually a set of error terms is used per observation so that a distribution of labour supply after the change can be generated.

Fourm discussion

General discussion following the presentation focussed on:

- the extent to which changes in labour supply following an increase in minimum wages might be offset by changes in labour demand;
- the effect of Commission decisions on the whole range of Pay Scales, and the resultant difficulties this may pose for modelling labour supply effects; and
- the usefulness of modelling a range of possible policies that would not affect labour demand.

A number of participants commented that understanding the labour supply effects of increases in minimum wages is of limited value unless it is combined with an understanding of the effects of those increases on demand for low-paid labour. The author agreed that this is a limitation of the MITTS model, but maintained that it was nevertheless important to know the direction of the net effect of changes in minimum wages on labour supply.

There was also a discussion of the implications for labour supply modelling of the fact that minimum wage increases affect far more workers than just those at or near the FMW. It was agreed that this posed some challenges, which might be at least partly overcome with Secretariat assistance to more accurately assess the likely characteristics of jobs affected by Commission decisions.

Another suggestion was that it would be more appropriate to focus the modelling on policies such as earned income tax credits targeted specifically to single parents, which might have a powerful effect on labour supply without adversely affecting labour demand. In this context, the usefulness of modelling small changes to the Low Income Tax Offset (LITO) was questioned, given that this may be an 'unknown entity' for many people and thus unlikely to affect labour supply significantly.