

# The Participation Modelling Project

Anthony King<sup>1</sup>

The Participation Modelling Project (PMP) was established in Treasury in July 2005. This paper describes the origins of the PMP and the initial work conducted by the project, and outlines the modelling strategy that is being pursued.

---

1 The author is from Tax Analysis Division, the Australian Treasury. The Participation Modelling Project Team is Michael Burke, Sandra Dandie, Anthony King, Jin Liu, Joseph Mercante, Tracy Oliver and Marty Robinson. This article has benefited from comments and suggestions provided by the team, Mike Callaghan, David Gruen and Nigel Ray. The views in this article are those of the author and not necessarily those of the Australian Treasury.

## Introduction

The Participation Modelling Project (PMP) was established in Treasury in July 2005, in recognition of the need for enhanced modelling capacity to support the Government's labour force participation agenda.<sup>2</sup> The PMP has a broad objective: to establish the capacity within government to identify the likely labour market participation impacts of a range of policy proposals, including personal tax and income support changes.

This paper begins with an account of the impetus for and establishment of the PMP. This is followed by a description of the two main areas of work on initial capacity building undertaken during the first year of the project: a review of Australian estimates of labour supply response elasticities and work with the MITTS behavioural microsimulation model.<sup>3</sup> The paper then moves to cover lessons from overseas and other considerations in development of the PMP modelling strategy, before outlining the main areas of modelling activity identified in the strategy.

## The policy impetus

Participation in the labour market is a core policy focus for government, with this stemming from both macro and micro perspectives. At the aggregate level, increasing participation is a key component of policy efforts to enhance Australia's growth prospects and meet the demographic challenges ahead (Commonwealth of Australia 2004a, 2004b, Henry 2004). At another level, employment is seen as a crucial element in the wellbeing of individuals and families – evident, for example, in the welfare to work agenda (Commonwealth of Australia 2005b), and the concern for work incentives in tax and superannuation reform (Commonwealth of Australia 2006a, 2006b).

That there is scope for increased labour force participation in Australia is suggested by comparison with other OECD countries (Gruen and Garbutt 2003). This scope is given a more detailed complexion by a variety of survey data on matters such as barriers to employment and comparisons between actual and preferred hours of work. In looking to increase labour force participation, a feature is the wide range of policies that may

---

2 The PMP was announced in the 2005-06 Budget (Commonwealth of Australia 2005a, p 255).

3 MITTS is the Melbourne Institute Tax and Transfer Simulator, developed by the Melbourne Institute of Applied Economic and Social Research.

have a bearing on outcomes. Tax, welfare to work, and superannuation policy have already been mentioned and there are many other relevant policy areas: for example, child care, training and industrial relations.<sup>4</sup>

Besides the diversity of relevant policy initiatives, the participation impacts of policy measures are seldom straightforward. Consider what might be seen as a simple example: the possible impact on participation of a cut in marginal tax rates. On the one hand, the tax cut will increase the return from working and make work more attractive than leisure (the 'substitution effect'). On the other hand, it will increase the after-tax income at the current level of hours worked which will operate in the opposite direction as an incentive to reduce hours worked (the 'income effect'). The outcome will depend on the balance between these two opposing effects. Moreover, the balance is likely to vary for people in different circumstances (for example, different income levels or family arrangements), as is their ability to gain employment or change hours of work. The underlying workings of financial incentives become even more intricate when policy change involves means-tested benefits. Non-financial issues and demand-side considerations can add further layers of complexity. Clearly, modelling likely participation impacts is not a simple matter.

The prominent role of labour market participation in the current policy debate has not been matched by the capacity to analyse and quantify the potential labour market participation effects of policies. Recognition of this provided the impetus for establishment of the PMP.

## The project

The PMP has been established as a unit in Treasury's Tax Analysis Division – the location of most of the other detailed individual- and household-level modelling undertaken by the department. The work of the PMP does, however, have relevance across Treasury and this is reflected in broad Treasury representation on the steering group that guides the project.

The PMP Steering Group also reflects the whole-of-government nature of the PMP, with representation from Treasury as well as from the Department of Employment and Workplace Relations (DEWR) and the Department of Families, Community Services and Indigenous Affairs (FaCSIA). The three departments are also represented on a

---

4 A good indication of the range of policy relevant to labour force participation can be gained by reference to the scope of the recent parliamentary report on Working for Australia's future: Increasing participation in the workforce (Parliament of the Commonwealth of Australia 2005).

## The Participation Modelling Project

Participation Modelling Technical Group that has been set up to facilitate collaboration on model development and model use across departments.

An Academic Reference Panel has been established to provide continuing input of academic expertise to the PMP. The panel, comprising Australian and international labour market experts, is ensuring that the work of the PMP is conducted to a high standard of rigour and draws on latest developments in the field.

## Initial capacity building

At the outset of the PMP, two areas were identified where better capacity to estimate participation impacts could be developed quickly. These were reviewing estimates of labour supply response elasticities and getting the MITTS behavioural microsimulation model operational in Treasury. These two activities accounted for much of the PMP effort over its first year.

## Elasticities of labour supply response

Summary labour supply elasticities can give an initial view of the likely labour supply response from a change in the financial incentives attached to work; for instance, stemming from a change in tax rates. Thus, for example, there is the established view that males of prime working age have labour supply elasticities that are very low – possibly around 0.1 or 0.2. This means that a 1 per cent increase in their financial returns from work will result in just a 0.1 or 0.2 per cent increase in their labour supply. The corresponding elasticities for secondary earners, such as many partnered women, or sole parents are generally taken to be much higher, perhaps around 0.5 or even approaching 1.0 for some groups in the population.

A shortcoming with these summary elasticities is that they are just that – summary estimates at a broad level which conceal a complex pattern of responsiveness. They may provide a broadbrush impression of likely responses, but policy analysis typically requires a finer grain. Estimates of labour supply elasticities are, however, notorious for the considerable variation they exhibit. They vary, for example, according to estimation technique, data source and population subgroup, over time and across countries. As a result, a number of surveys of labour supply elasticities have sought to draw conclusions from the array of estimates.<sup>5</sup> These reviews, however, have generally

---

<sup>5</sup> See, for example, the major reviews by Killingsworth and Heckman (1986) and Blundell and MaCurdy (1999), and the more recent work by Evers, Mooij and van Vuuren (2005).

not covered Australian estimates.<sup>6</sup> A first task for the PMP has been to fill this gap with a comprehensive survey of Australian estimates of labour supply elasticities.

The published Australian research contains broadly similar results to overseas studies. It reveals significant variation in elasticities across groups in the population – differentiated, for example, by income level, hours of work or family status. This highlights the importance of modelling based on individual- or family-level data. Reviewing elasticities has also been instructive in tracing the development of labour supply modelling. This is an evolving field with important developments over recent decades to take better account of the potential wages of those not working and of the complexities of tax/transfer systems.

### Melbourne Institute Tax and Transfer Simulator

The Melbourne Institute Tax and Transfer Simulator (MITTS) is a behavioural microsimulation model that has been developed by the Melbourne Institute of Applied Economic and Social Research (the Melbourne Institute) and incorporates the advances in labour supply modelling mentioned above (Creedy, Duncan, Harris and Scutella 2002). The development of MITTS from 1998 had drawn on the earlier experience with behavioural microsimulation at the United Kingdom Institute for Fiscal Studies.

Development of the Australian model was undertaken with Commonwealth assistance (through the then Department of Family and Community Services) and the intellectual property in MITTS is jointly owned by the Melbourne Institute and the Commonwealth. MITTS has increasingly been used by the Melbourne Institute and by third parties in analysis of tax and income support policy proposals.<sup>7</sup> The Commonwealth had not yet established the capacity to operate the model fully, and doing so became a major initial task for the PMP. This has been combined with a detailed evaluation of the model. The work has been undertaken in close liaison with, and with assistance from, the Melbourne Institute.

In part, MITTS is like other static microsimulation models that estimate the budgetary and distributional impacts of changes in personal income tax and/or transfer payments, such as Treasury's personal income tax model or STINMOD (Lambert et al, 1994). But MITTS also includes a behavioural labour supply component that assumes that individuals, or couples, choose the number of hours they wish to work to maximise utility subject to a budget constraint. This provides the facility to estimate detailed labour supply responses to changes to personal income tax and income

---

6 An important exception is the survey of Australian women's labour supply elasticities by Birch (2005).

7 Examples can be found on the MITTS website at <http://www.melbourneinstitute.com/labour/behavioural/MITTS.html>.

## The Participation Modelling Project

support. The static nature of the model means that it creates a 'before' and 'after' snapshot for individuals but takes no account of the time path of change.

MITTS is an advanced and complex microsimulation model that can be very useful for exploring some of the labour market incentive effects of possible changes to tax and income support policy. This is despite the fact that the behavioural elements of MITTS only cover part of the population. Excluded groups are full-time students, the self-employed, people over 65 years old, and disabled people. The labour supply of these groups is fixed in the model.

For the population that is covered by MITTS, various considerations suggest that the model, at its current stage of development, is more useful for exploring relative orders of magnitude and patterns of possible labour supply responses than for making estimates of absolute labour supply responses. These considerations include issues with the timeframe of the model estimation data and with the quality of the modelling of labour supply for particular groups, and an assumption that people's observed labour supply is their preferred labour supply.

Perhaps most importantly, the usefulness of MITTS does not extend to providing a reliable basis for forecasting the employment impacts of changes to tax and income support policy. MITTS does not deal explicitly with the demand side of the labour market. It provides estimates of potential impacts based on incentives for individuals to vary their labour supply after a policy change. In the case of the labour market impact of tax cuts, MITTS will estimate the potential increase in employment, assuming the existence of adequate and appropriate labour demand. The impact of the demand side, and the timeframe over which any change in employment is likely to take place, are fundamental qualifications to estimates from MITTS. These questions are receiving attention in PMP work.

## Lessons from overseas

Drawing on the overseas experience with participation modelling has been an important input into identification of the PMP modelling strategy. There is a good deal of common ground in the participation policy issues, and thereby modelling questions, being faced by Australia and other countries.<sup>8</sup> Looking at overseas experience provides a reminder of the potentially vast scope of participation modelling – in terms of policy issues, particular population groups, and timeframes.

---

<sup>8</sup> Leaders in the field include Norway, Sweden, Denmark, the Netherlands, the United Kingdom, the United States and Canada.

Related to the diversity of participation questions, and also to the difficulty of modelling behaviour, it is clear that there are no easy answers to modelling participation, nor are there standard approaches. Instead, governments draw on a wide range of techniques and information to address these issues. This range spans formal modelling (such as microsimulation and computable general equilibrium modelling), natural experiments, informal and ad hoc modelling, rule-of-thumb elasticities and, of course, a good dose of informed judgment.

While the emphases and approaches vary from one country to another, there are two themes in the general approach to participation modelling in other countries:

- ‘An eclectic approach’ – given the uncertainties about behavioural responses, and the modelling difficulties, other governments frequently use a range of estimation and modelling techniques to hone in on likely responses (‘triangulation’).
- ‘Keep it simple’ – while there is a common quest for more sophisticated modelling of labour market response, this is accompanied by concerns about the useability of modelling and care not to stretch modelling beyond its capabilities.

Technical and conceptual advances in participation modelling are being made, though these stand to add to or strengthen strings in the bow, rather than revolutionise the approach by governments to the analysis of these issues. Finally, the overseas experience repeatedly reinforces the point that modelling possibilities are very much constrained by the quality of available data.

## Developing the modelling strategy

Given the broad objective for the PMP, the appropriate modelling direction for the PMP was not immediately evident at the outset of the project. Embarking on a particular course of detailed and sophisticated model development is not a trivial decision. Indeed, the PMP evaluation of MITTS, including detailed checking of computer code, served as a salutary reminder to all involved of the importance of, and resources needed for, maintenance and quality control of a complex model.

Given the range of possible modelling directions, development of the PMP modelling strategy was the other emphasis in the first year of the PMP alongside the initial capacity building. Development of the modelling strategy has drawn on a range of inputs. These have included: continuing discussion with the PMP Steering Group, consultation with overseas government and research organisations, and advice from the Academic Reference Panel (including at a workshop held in June 2006) and other experts. In addition, the strategy has been informed by the evaluation of MITTS, the review of labour supply elasticity estimates and their underlying methodologies, and

## The Participation Modelling Project

broad-ranging background research into policy issues, modelling techniques and data availability.

### Considerations

A number of key considerations have had a bearing on development of the PMP modelling strategy.

#### Purpose of modelling

The role of the PMP is to enhance participation modelling capacity within government. The purpose is to contribute to practical policy analysis – by enhancing and complementing the range of tools that can be used to develop a view on likely participation impacts. This has some implications for the general design principles and modelling approaches to be used. In particular, use in the provision of policy advice highlights the need for rigour and the importance of: transparency, ease of understanding, the ability to explain model outcomes, and recognition of the inevitable uncertainty about estimated behavioural responses. It also means that model run-time is important.

Building lasting capacity, rather than a one-off modelling effort, has implications for the attention given to the ease of updating, documentation and training. This is particularly the case with modelling in government where staff turnover tends to be higher than in academia. The purpose of the modelling – notably the ‘useability’ of modelling – may also place some constraint on the scale and complexity of modelling.

#### The modelling environment

The PMP was established with the understanding that capacity would be developed either by adopting and modifying existing quantitative models or by developing new modelling. There is a need to avoid duplication with other modelling development, to take advantage where possible of other modelling work, and to have consistency where appropriate with other modelling in government.<sup>9</sup>

#### Resources

The PMP budget allows for significant development of modelling capacity. Besides work undertaken by the PMP team, the project includes provision for the external commissioning of aspects of research and development (including joint work), and for collaborative work with other government departments.

---

<sup>9</sup> For example, there is the APPSIM dynamic microsimulation modelling project being undertaken by NATSEM in partnership with a number of Australian Government agencies (see [www.natsem.canberra.edu.au/appsim](http://www.natsem.canberra.edu.au/appsim)).



### Data availability

The scope of potential model development is largely constrained by available data. It is true that much modelling work can be concerned with filling gaps in available data, though this is more a marginal activity and the richness and timeliness of available data are very real constraints. These constraints will apply differently to specific areas of modelling. They need to be viewed not only in terms of data availability at present, but also with regard to the future availability of data – important for updating purposes and possible model extensions. Cross-sectional and longitudinal survey data are primary sources. Administrative data can also be an important source. Modelling of particular policy areas and population groups is likely to require some imputation of information.

### Multiple models

The PMP is proceeding with the view that different types of models will be appropriate for particular aspects of modelling participation impacts. The expected outcome is thus a suite of tools, rather than a single model. Certainly, there are advantages where a single model or model framework can be used to address a range of policy issues. However, differences in the nature of policy issues, different timeframes, different data requirements, and the general experience that useful models tend to be those that have been developed with a specific purpose, all point to the need to be open to multiple models. There is also the argument for using more than one model to provide estimates on a particular question, with the greater confidence this may provide on both the likely direction and magnitude of impacts.

### Incremental development of capacity

A staged approach to model development – with discrete steps within the model development plan – provides a number of benefits for the project. An incremental approach to development provides the discipline of milestones with the opportunity for periodic review and, if necessary, redirection along the way. It also allows for the progressive increase in modelling capacity which is important for both practical reasons and for demonstrating the value of the modelling development.

### The need to focus the modelling effort

The range of policy areas with potential labour market impacts is vast, and it has been important to identify the priority policy areas for the PMP. Addressing this question has been an initial emphasis for the project. The focus of attention has been determined with regard to current priorities and emerging policy areas, the feasibility of useful modelling, and the need to avoid duplication with other modelling work. A number of policy areas have been identified as high priority for initial investigations (though not necessarily formal modelling) by the PMP. These include: personal income tax, family

payments, welfare to work, child care, retirement and superannuation, child support, and wages.

## The PMP modelling strategy

The resulting PMP strategy identifies three main areas of modelling work: behavioural microsimulation, modelling of the retirement decision, and accounting for the demand side and adjustment paths. In support of these three focus areas, and also across the broader scope of participation issues, the strategy includes maintaining an understanding of the policy debate, the body of evidence on participation responses, and relevant data.

### Behavioural microsimulation

There is a central, feasible and useful role for behavioural microsimulation (in the style of MITTS) in a number of the policy areas that have been identified as priorities for investigation. There are three parts to the planned work on behavioural microsimulation modelling:

- maintenance of the MITTS capacity;
- improvements to the behavioural microsimulation capacity; and
- extensions to the behavioural microsimulation capacity.

MITTS provides the capacity to estimate the potential labour supply responses from changes to the personal tax and income support systems (for the population excluding the self-employed, full-time students, the disabled and people aged 65 years or over). Basic maintenance of MITTS will provide continued capacity for this type of analysis. This will require the updating of MITTS (base data, behavioural estimations, and parameters) and training to ensure that staff are skilled in the use of MITTS. It will involve continued liaison with the Melbourne Institute and collaboration with MITTS users in DEWR and FaCSIA.

The evaluation of MITTS has identified a number of areas where the model may be improved. These include technical issues, such as model run-time, and modelling issues, such as the way that the wages that non-workers could earn if they gained employment are imputed. There is also the broad question of whether the behavioural microsimulation capability of MITTS is best kept in a separate model or whether it should be integrated with other Treasury modelling.

Regarding extensions to the behavioural microsimulation capacity, as mentioned above, MITTS currently excludes a number of population groups: disabled people,

full-time students, people aged 65 years and over and the self-employed. There are also key policy areas which are not modelled, including aspects of welfare to work policy, child support, child care and minimum wages. Extending behavioural microsimulation to include some of these population and/or policy areas would greatly expand the potential range of policy options that could be modelled.

### The retirement decision

While clearly an important policy issue, Australian modelling of the retirement transition/decision is not well advanced by international standards. Reasons for this have included the limited availability of longitudinal and asset data, although these impediments are gradually reducing. Modelling of the retirement decision requires a different approach to MITTS-style static behavioural microsimulation. In particular, it needs a better capacity to handle dynamics. The aim of the work in this area is to develop modelling which will allow estimation of the impact on labour force participation of older workers of policy changes in the areas of taxation, superannuation and income support.

### The demand side

Behavioural microsimulation models such as MITTS do not include explicit consideration of the demand side of the labour market and they abstract from the time path of adjustment after a policy change. Addressing this limitation is important to understand better how changes in financial incentives translate into employment. It is similarly important that modelling of the retirement decision takes account of the demand side.

Consideration of alternative approaches to addressing these issues has led to the view that the most promising way forward for the PMP is through the addition of some form of demand side constraint to labour supply modelling, rather than through attempting any sophisticated macro-micro model linkage. Examples of such demand-side constraints include the application of demand elasticities to the output of a labour supply model, the application of demand side restrictions to labour supply preferences for individuals within a microsimulation model, and the development of a view on the likely time path of adjustment.

A related issue is macro feedback (through, for example, changing wage rates) which may be important with large-scale policy change. Consideration of the options for dealing with this issue will continue.

### The next steps

The focus of PMP work over the coming period will be on the three areas described above. This modelling development will continue to draw on the advice from the PMP Steering Group and Academic Reference Panel and, importantly, will proceed in an incremental and flexible manner. The PMP strategy allows for possible shifts in emphases in response, for example, to changing policy priorities, the availability of new data, or other modelling developments. Above all, the approach being taken by the PMP reflects the need for the modelling effort to be useful in practical policy analysis, by enhancing and complementing the range of tools that are available for developing a view on likely participation impacts.

## References

- Birch, E 2005, 'Studies of the labour supply of Australian women: what have we learned?', *The Economic Record*, vol 81, no. 252, pp 65-84.
- Blundell, R and MaCurdy, T 1999, 'Labor supply: a review of alternative approaches', in Ashenfelter, O and Card, D (eds), *Handbook of Labor Economics Volume 3A*, North-Holland, Amsterdam.
- Commonwealth of Australia 2004a, *Australia's Demographic Challenges*, 25 February, Canberra, [www.demographics.treasury.gov.au](http://www.demographics.treasury.gov.au).
- Commonwealth of Australia 2004b, 'Sustaining growth in Australia's living standards', Statement 4 in *Budget Strategy and Outlook 2003-04*, Budget Paper No. 1, 13 May, Canberra, [www.budget.gov.au](http://www.budget.gov.au).
- Commonwealth of Australia 2005a, *Budget Measures 2005-06*, Budget Paper No. 2, 10 May, Canberra, [www.budget.gov.au](http://www.budget.gov.au).
- Commonwealth of Australia 2005b, *Welfare to Work*, 10 May, Canberra, [www.budget.gov.au](http://www.budget.gov.au).
- Commonwealth of Australia 2006a, *Continuing Tax Reform*, 9 May, Canberra, [www.budget.gov.au](http://www.budget.gov.au).
- Commonwealth of Australia 2006b, *A Plan to Simplify and Streamline Superannuation*, 9 May, Canberra, [www.simplersuper.treasury.gov.au](http://www.simplersuper.treasury.gov.au).
- Creedy, J, Duncan, AS, Harris, MS and Scutella, R 2002, *Microsimulation Modelling of Taxation and the Labour Market*, Edward Elgar, Cheltenham.
- Evers, M, de Mooij, R and van Vuuren, D 2005, 'What explains the variation in estimates of labour supply elasticities?', *CPB Netherlands Bureau for Economic Policy Analysis*, Discussion Paper no. 51, The Hague.
- Gruen, D and Garbutt, M 2003, 'The output implications of higher labour force participation', *Treasury Working Paper 2003-02*, [www.treasury.gov.au](http://www.treasury.gov.au).
- Henry, K 2004, 'The fiscal and economic outlook', Address to the Australian Business Economists, 18 May, Sydney.
- Killingsworth, MR and Heckman, JJ 1986, 'Female labor supply: a survey', in Ashenfelter, O and Layard, R (eds), *Handbook of Labor Economics Volume 1*, North-Holland, Amsterdam.

## The Participation Modelling Project

Lambert, S, Percival, R, Schofield, D and Paul, S 1994, 'An introduction to STINMOD: a static microsimulation model', *STINMOD Technical Paper No. 1*, National Centre for Social and Economic Modelling, Canberra.

Parliament of the Commonwealth of Australia 2005, *Working for Australia's future: Increasing participation in the workforce*, House of Representatives Standing Committee on Employment, Workplace Relations and Workforce Participation, Canberra.