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The use of microsimulation from a northern and southern perspective: possibilities and barriers

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ABSTRACT

This paper discusses the use of microsimulation as a tool in policy making. The paper briefly describes the Swedish model FASIT and the Australian model STINMOD, their organization and who uses the models.

The paper discusses how the models are used, when they have worked well and less well from a policy perspective. We find out in what respects there are different experiences in the south and the north.

The paper answers the question "What has facilitated the use and proliferation of tax-benefit microsimulation models and what barriers have been faced?". It will also address issues like static calculations when dynamic is wanted, fast and careless vs. slow and careful, statistic calculations vs. synthetic households, the needs of customers familiar with this kind of tool, the need for advocating for the methods, problems with different assumptions, problems with not having the information wanted, the need to do approximations, the need to update models and data, the expectation of getting answers about tomorrow with data from yesterday is available, and examples of successful projects.

1. FASIT.

1.1 The history of FASIT

FASIT started as a typical tax-benefit model. It was created by Statistics Sweden at the end of the 1980s especially to meet the analytical needs in connection with the major tax-reform that was then under way.

The Swedish tax-benefit system at the end of the 1980's was quite complex and still is. Changes anywhere in the system typically impacted on other parts of the system, so that the analysis of total effects with existing traditional analytical tools was very difficult, if not impossible.

The complexity of the system was dramatically shown in a newspaper article (Pomperipossa in Monismania) just before the elections in 1976 written by the famous children's book author Astrid Lindgren. She claimed that on her effective marginal tax rate that she would pay more in taxes than she would earn on any additional income and the claim could not be truthfully countered by Treasury. It has been claimed that the article contributed to the downfall of the social democratic government.

Of course the tax-system was not meant to work the way it actually did. It was just that there were no analytical tools to analyse effects of the kind described in the Pomperipossa article. Very partial analysis led to very partial results. Different branches of government analysed their parts of any policy package and when faced with bigger changes in the total system it was not possible to sum up effects for an accurate estimate of the impact on public sector finances or for individuals/households.

So growing concern about the complexity of the tax-benefit system and the fact that there was a strong need to construct a system that created better incentives for people to work while protecting tax revenues, led

policymakers to search for analytical tools that could handle both distributional, incentive and budgetary issues coherently.

The beginning of the 1980's with the development of spreadsheets led to the possibility of creating models with typical cases and providing improved partial analysis. Maybe the Pomperipossa article would not have been written if spreadsheets had been in place in the 1970's.

When the Social Democrats returned to power in 1982 major tax-reform was announced. In connection with that work, ideas and concrete work on a Swedish tax-benefit model gained pace. Statistics Sweden was given the assignment to develop the model.

The first version of the model was delivered to the Ministry of Finance at the end of the 1980's when a Commission was working with proposals for a new tax-system. The model was intensively and extensively used for analyses of both budgetary and distributional effects of a new tax-system. During work on the new tax-system, it soon became clear that there was a need not only for tax-changes but also for changes in benefits in order to prevent unwanted distributional effects.

During the crisis in the Swedish economy in the mid 1990's the model played an important role as a tool for downsizing the welfare-system in ways that distributed the effects in, what was regarded, equitable ways.

Another aspect of the crisis in the Swedish economy was the crisis in local government finance. As an effect of ever decreasing incomes, tax revenues declined when at the same time needs in care for elderly and child-care where rising. This crisis led to a debate about whether for local government, more could be financed through fees payed by citizens. This situation led to the integration of micro data on consumption of welfare-services such as care for

children and elderly. Budgetary and distributional effects on changes in consumer fees were then possible to calculate.

During the 1990's the consumer fees rose and when the social democratic government took action at the end of the century to limit the level of fees, the model was used to calculate the effects of that action.

1.2 FASIT as it is today

Statistics Sweden is responsible for administration and development of the model. The FASIT-model has grown in different directions since the end of the 1980's.

The model nowadays can be run on two different samples.

The standard sample has 40 000 individuals and 20 000 thousand households representing around 0,4 percent of the Swedish population in a given year. Nearly 1 000 variables describe the observations in the model. A great many of these are data captured from different administrative registers. Variables holding socio-economic information came from interviews. Rule based modules for simulating personal taxation and important benefits were in place. More modules were added over the years increasing the possibility of impact-analysis for new policies.[1]

The other sample, 10 times bigger, consists only of data from administrative registers. Since there are no interviews, the model gives poor results when calculations are done on households.

The model is written in SAS-code and the total model today consists of more than 13 000 lines of code. Pure data-handling consumes much of the code. The remainder of the SAS-code is codification of the rules of the welfare-system.

Rules for different parts of the tax-benefit system are coded to make it possible to calculate static changes in disposable income when rules are changed. There is code for pensions, unemployment benefits, sick-leave benefits, parental leave benefits, income taxes, support to lone parents, child allowance and housing allowance. There is also code for fees for child-care.

As a trial there is a labour-supply module included in the model which of course means behavioural simulation.
The base population is aged because there is a two to three year lag in available data. Both demographic changes and percentage changes in continuous variables like income for example. are captured. Statistics Sweden use calibration and updating techniques in order to create variable values and weights that give a fair description of the present population and descriptions of future populations in accordance to prognoses made by two state agencies. The advanced user can make his/her own future population based on their own assumptions of the future in general or as a result of policy. An example would be future unemployment levels such as in the Swedish micro simulation model of the income and transfer system by Klas Lindström.

These days the model runs, depending on the standard of the PC, in less then a minute when the small sample is used. On the bigger sample it takes several minutes. A server for the whole of the Government Offices hosts the data. A server in Statistics Sweden is soon replacing the government server. This technical change will lead to even faster runs and make it feasible to run larger samples.

2. STINMOD

STINMOD is Australia's most widely used tax-benefit model. It was developed by NATSEM in 1994[2]. It simulates personal income tax[3], Centrelink pensions and benefits[4], Veterans payments and AUSTUDY (payments to students). It has many of the features of FASIT, the Swedish

tax-benefit model, in particular the capacity to capture the complex interactions between the social security and taxation systems and to identify unintended effects. Its development was funded by the Commonwealth Government through the agency then named the Department of Health, Housing, Local Government and Community Services (now the Department of Health and Ageing) as part a five year block grant to establish NATSEM. It is currently used by a number of Commonwealth Government Departments including the Treasury, Department of Family and Community Services and Indigenous Affairs, The Parliamentary Library and by NATSEM for a wide range of grants, and consultancies for government and private organisations.

STINMOD is a static model that has two components. The first is a representative population with a base population built on the Australian Bureau of Statistics' Surveys of Income and Housing Costs (SIHC). These are individual level surveys of a sample of the population living in private dwellings, weighted to represent the Australian population in these residences. The data underpinning the model is aged to represent the current financial year and three future years known as "outyears" which are used in budget estimates when new policy is announced.

The second is an effective marginal tax rate model which runs simulations for a range of hypothetical families.

STINMOD is written in SAS and runs primarily on an IBM compatible PC platform although it can be run in other environments.

3. POSSIBILITIES AND BARRIERS

3.1 Possibilities which enable the use of microsimulation models

3.1.1 FASIT

Iterativity

FASIT became an important tool for analysis and debate on the effects that different proposals could have, and led to the tax reform in the beginning of the 1990's that then was described as the tax reform of the century. There was an iterative process between proposals and analysis of policy effects. The speed with which results could be delivered proved to make the model an important tool for political compromise.

Anthony Atkinson has described in the UK how during meetings with Parliament Committees he has conducted runs with tax-benefit-models and iteratively been able to adjust rules during the meetings [personal communication, 1993]. The FASIT-model was never used like that during tax-commission-meetings, but the flexibility of the model often made it possible outside meetings to run several different simulation runs a day.

Two factors are important in determining the speed of iterations. One factor, of course, is purely technical. Is it possible to compute fast enough with current computer hardware? Even now, very large datasets lead to sluggish processing. The other possibility is to consider holding meetings in computational laboratories?

Even if meeting rooms these days are equipped with advanced information-technology, they are not equipped for doing live runs on micro simulation models. Maybe a few rooms should be equipped for that kind of meeting.

Another aspect of political iterativity should also be mentioned. Proposals all differ in complexity. Some can be handled with simple parameter-changes. Others are so complex in nature that they presuppose structural changes in the model. It is possible that the data required is not on the database used and must be sourced from elsewhere and linked or imputed onto the model.

Complexity is an argument for not risking failure when trying to run a model within the setting of a political meeting. Although simple policy analysis can run smoothly, it is probable that the complexity of many proposals will require reprogramming and testing requiring a longer time period.

3.1.2 STINMOD

The Development Environment

Perhaps some if STINMOD's success can be attributed to its development outside the fast paced environment of government where development is difficult to separate from the constant demands for policy analysis. STINMOD is unusual in that it was developed in a university environment where time was allocated for development alone. It was completed by a small team in 18 months.

Staff qualifications

Of the small team of four, three had double degrees which included qualifications as a computer scientist as well as solid experience in a policy environment. This mix of skills ensured that the models were built as professional software which has proven to be robust enough to form the basis of tax-benefit policy for over a decade. The integrity of the model was ensured by regular code walk-thrus where team members explained each module of new code line by line to the rest of the team.

User Engagement

From relatively early in the process of model development an expert user group was formed to provide feedback on early prototypes. This was valuable for engaging staff from government departments who would become STINMOD users who could see their recommendations appearing in subsequent versions both in terms of policy analysis supported, output produced, layout and intuitive use. It also allowed for beta testing with informed users who spotted any errors and inconsistencies.

Later in the process there were code walk-thrus on a line-by-line basis with staff from government agencies who would use and modify the source code version. STINMOD training and SAS training with STINMOD as the focus was provided for new users. This was important due to the relatively high turnover of staff within government departments. Once the model was completed there were on occasions government staff exchanges so that they were part of the process of updating STINMOD to include new policy. Over the last few years there has been movement of staff between government and NATSEM so that many of the staff within government have worked on STINMOD at NATSEM and similarly, NATSEM has benefited from gaining experienced modellers from within government with their extensive policy experience.

Documentation and usability

STINMOD was designed from the beginning to have a wide range of users. For users who would modify the source code there was extensive internal documentation describing the purpose of the code. For users who would not use the source code a human-computer interface was designed which complied with IBM standards which were state of the art at the time[5]. It has many of the features used in current windows software such as drop down menus. STINMOD also comes with an extensive documentation folder which explains and steps through the use of the model[6,7]. The interface was designed and partially built by the STINMOD team, with a SAS contractor from the Australian SAS Institute completing the front end.

Difference

For STINMOD to be accepted and picked up by government it needed to be different to alternatives already available. There had been a tax-benefit model developed by the Department of Social Security and it was important not to merely duplicate this model for STINMOD to be a worthwhile investment. It was set apart from its predecessor by being able to be run on a PC with the option to run it through an interface for staff who were not

familiar with SAS or for quick runs that did not require complex changes to the source code (changes to tax rates for example). STINMOD was built on a different base population and included code for a number of programs that were not included in the earlier model. The transparency of providing source code with user training and support ensured that the model was widely accessible.

Complexity of policy

The use of models is now much more widely accepted within government partly because policy and its interactions has become so complex that it is almost impossible to estimate the impact of policy changes even for individuals, much less for families, population groups and the nation without the use of a model.

Currency

STINMOD is updated annually to include new policy, much of which is announced during the budget in May every year. However, it can take many months for policy announced to be enacted through legislation and may involve significant modification to what was originally announced if the government does not hold the balance of power in the upper house which is the house of review of the Australian parliament.

3.2 *Barriers to the use of microsimulation models*

Like most analysts, those in Sweden and in Australia have faced a number of barriers to the use a microsimulation models. First there are *physical* barriers.

3.2.1 FASIT

a: ***Often a very detailed question is asked, and the detailed information needed does not exist in the data base.***

Response: It is not uncommon for analysts to be asked to answer questions which current models were not designed to answer. Rarely is a response that nothing satisfactory can be calculated with current tools acceptable. Generally, some kind of answer must be produced no matter how rubbery. On many occasions modellers must resort to providing a proxy solution. For

the analyst, it is important to provide information in a written form describing what the proxy consists of. Initially politicians are generally not only happy but indeed often prefer to accept a single figure without caveats about how it was calculated. However, to maintain the integrity of the modelling approach it is important to clearly document any important assumptions in the event that questions are later raised either by a politician or a civil servant.

b: ***Questions are mostly asked about the situation today or tomorrow, when information exists only for yesterday***.
Response: In FASIT this question is answered by prediction of income distribution and tax/benefit rules. Forecasts to update dated data to represent today is established from a base year (2006) with predictions for every year 2006 – 2010. This step is necessary but with a limited horizon. For long run predictions, dynamic models have tended to be used. It is however possible to use static forcasting in FASIT also for long term predictions.

c: ***Second round effects are required, when only static models are available.***
It is inevitably tricky when reforms are intended to create changes in behaviour but only a static model simulating first round effects is available. Mostly there is little or no information about the quantum of behavioural effects. Sometimes (e.g. labour supply) if there is external data available it is possible to measure the effects, but even then the equations are very unsure, and there will be uncertain results.

Response: It is reasonable to consider the static calculations as immediate or first round effects. Thereafter it is possible to do sensitivity tests or what if calculations. However it is common to have a main scenario, and here the possible assumptions can vary considerably as so too the results. We have no answer beyond the costly investment of building a behavioural model to capture second round effects although as with all models there will still be many questions that the model is not designed to answer.

d: ***Speed is an important quality.***
Response: It is important that the model is ready to perform whenever a question is asked. For a simple question it makes it possible to give an answer within an hour or less, even within minutes. For a complicated question it takes longer, but much is won if quick responses can be provided.

The key issue here is that the model regularly is updated and run. If this is the case, many faults will be discovered and corrected. Faults must be reported to the model host and the model will slowly perform better. With many runs problems with the computer environment be discovered and corrected. It is difficult to find all mistakes given the scope for error through data inadequacies, miscoding, misunderstanding of policy, failure to check impacts on rare sub-populations and other types of human error when building a complex model, and it is probable that from time to time mistakes will be found.

e: ***Not understanding interactions captured in a micro simulation model.***
It is common for customers to assume that it is possible to add up partial results from different runs for different parts of the tax/benefit system. Sometimes it is true, but mostly not.

Response: The only way to get the total results is to do total runs.
The most effective way to teach this is probably to demonstrate the difference in results, when summing up partial results and doing a total run.

There are also some *psychological factors*, which can be barriers like black box syndrome, fear of using the model, not knowing what a microsimulation model is or what it can do. I think we have experienced them all.

Even for new microsimulation modellers it is easy to get lost in a new model and not fully understand the many thousands of lines of code. It is crucial

to develop a common understanding of how the simulation program works, what the different steps are and what files are created.

f: ***Fear of using the model***
Response: Training and theoretical learning is a very important part of the process. Training can be performed by the host of the model, but perhaps of greatest importance is the support of colleagues. Above all, it is important not to sit alone without access to somebody to discuss the model with. For successful microsimulation a critical mass of perhaps three persons working with microsimulation is needed.

g: ***Lack of awareness of what a model can do***
Potential customers can be unaware of the possibilities of a model. They may not understand it at all or perhaps they have some understanding but do not have a full appreciation of the extent of what the model can do. Sometimes they believe that the model can do anything and therefore have unrealistic expectations.

Response: The most successful approach is to provide information about what is possible using the model and to give examples of what can and has been done. A project of interest to politicians is generally very effective.

h: ***Typical cases instead of statistics***
It is common, that the customers want real results for the ordinary family Svensson (or Smith), not the blurred, sometimes incomprehensible statistics they might receive as output from the model.

Response: The statistics are never as simple as a single typical family. Population based models typically produce a "true" picture for an average of different circumstances after pooling of composition of incomes, household- and work situations.

Nonetheless, statistical results and calculations on typical cases are not contradictory but complementary. By using typical cases it is often simpler

to analyse the system characteristics of a policy option. They can also be a powerful tool for discovering faults in the programming.

i: ***Little time for debugging.***
Modellers not unreasonably feel insecure about their results if they do not have sufficient time to properly check and debug the program.

Response: Insufficient time for debugging is a downside of working within fast-paced government environments which can lead to inaccuracy in simulations. Experienced modellers to some extent will have a sense of what their results should look like particularly for fairly common options. However, with new or complex policy options it is advisable to consult with the policy experts to see if the results seem reasonable. Sometimes however you just have to ask for more time.

j: ***Different expectations and purposes.***
Sometimes different customers can have different aims, expectations or preconceived ideas of the simulation results. This can lead to different assumptions at critical points.

Response: When this situation occurs, we have found that the best thing to do is to produce alternative calculations to demonstrate reasonable bounds within which the outcome could vary. When the situation is truly very unclear, the best approach may be to create different scenarios, and perhaps a main scenario. Mostly it is possible to come to a reasonable common standpoint.

k. ***Behavioural policy change modelled with a static model***

The fees for childcare are a good example when it comes to the discussion of static vs behavioural simulation. When the government took action to limit fees, simulations using on the FASIT-model were run. Since parents to some extent were entitled to community-based child care the question of behavioural effects was raised. The government proposed a narrow limit to fees which would lead to substantial cuts in the fee-levels for most households. The question was to what extent this would lead to an increased demand for child-care. The basic model does not include any elasticities or other mechanisms to capture behavioural effects.

Response: During the modelling effort there was an attempt to deal with behavioural impacts in different ways. However, local government champions and central government representatives disagreed on the dynamic effects.

l: *Results wanted for small groups or a very rare benefit.*

The customer often wants results at a detailed regional level or very rare benefits allocated among detailed age classes and/or gender.

Response: Generally the modeller must explain the limits of how far you can break down a survey. Mostly Swedish customers accept these limits.

3.2.2 STINMOD

While STINMOD has experienced a number of barriers in common with FASIT there have been a number of unique barriers.

a. Data access

Although the development of STINMOD outside of the fast paced policy environment was a distinct advantage when producing a high quality robust model this can also present some barriers, in particular in relation to data access. Large administrative data sets can be useful supplements or adjuncts to the survey data which forms the base population. However access to unit record administrative data such as tax or social security records in not possible due to Australia's privacy regulations outside of government. It is

often possible to partly overcome this hurdle by seeking aggregated information however it is always subject to negotiation.

b. Funding

The development and maintenance of STINMOD is dependant on a government contract and this adds an element of uncertainty and can make it somewhat difficult to retain experienced staff. Staff retention for NATSEM has grown more difficult as the use of microsimulation within government has expanded and government salaries and conditions have improved at a faster rate than for academia.

4. THE USE OF THE MODELS and FUTURE DIRECTIONS.

4.1 FASIT

In this paper we have pointed to some of the factors that have facilitated or presented barriers to the use of microsimulation.

In Sweden FASIT is now well established and used by many institutions. It is hosted by Statistics Sweden. Having a stable host institution is of great value in ensuring the longevity and continued improvement of a complex model like FASIT.

FASIT is mostly used by the Government Offices, the Budget Office of the Parliament, the Association of Local Authorities and Regions, trade unions, the social insurance agency, the national financial management authority and more. The general modelling in Sweden is built on the FASIT-model. The model is common, even if assumptions for prices, wages, capital income etc can vary.

FASIT has been used for quite a number of major projects. Examples include:

Distributional effects of the tax reform of 1990/1991[8].

FASIT was used for the first time, with simulations undertaken at three stages an official report for further consideration, a government bill, and

an evaluation of the reform. 40-50 different changes were implemented, some very simple and some complex, including a number of assumptions and broadening of the base for taxable income.

Sweden's financial crises of the 1990s
FASIT was used to assist the government in developing a comprehensive smorgasbord (smörgåsbord) of options, where the net effect for different savings and tax-raises were shown.

A comprehensive study of the marginal effects of going from sickness or unemployment to work.
This study was published in 1997 and repeated and expanded in 2004[9]. One conclusion was that the marginal effects were biggest for low income earners (especially for single parents with children).

A change of government
In 2006 the budget office for the parliament used FASIT to estimate the impacts of a number of options supported by the opposition for the general election the same year. Now this opposition forms the new government.

Net social expenditure
Eurostat reports the gross social expenditure for EU-countries in the ESSPROS system. These figures can be misleading if differences in tax systems between countries are not considered. With the help of FASIT we have calculated net expenditure for Sweden in 1991- 2000. The net expenditure in Sweden is about 4-5 % lower (as per cent of GDP) when considering taxes[10].

Reducing the need for social assistance
In the budget spring bill 2001, the Swedish government proposed that the parliament set a a target to reduce the need for social assistance by fifty per cent over the period 1999 to 2004. A follow-up was published in the government budget bill for 2002. The goal was measured as the number of full year equivalent benefit recipients(FYE) with social assistance.
The possible types of changes to benefit rules that could achieve the target were examined using microsimulation modelling.

The results seemed to be similar to some conclusions in the report about the follow up of the social assistance goal published in the government bill for 2002. The goal of halving the social assistance dependence was expressed to be very ambitious and that good economic development was probably not enough to reduce the FYE by fifty per cent[11].

These are just a few examples of the use of the FASIT-model. It has been used many more times for projects large and small. Today the discussions are about how to make the model more user friendly, and including new

modules in areas such as public consumption, collective negotiated insurances, and indirect taxes, and upgrading to at least partially dynamic modelling.

One obvious area for development has of course been, and is, the introduction of new simulation possibilities of a rule based character. One recent example is the ongoing development trying to integrate a module to study financing. Up until now the model has only consisted of variables describing amounts received/given in the area of study financing. Another example, that was once included more than a decade ago, is the possibility of simulating customer fees on child care.

Another issue is the size of the sample. The present size of around 0,3 percent of the population is enough for most budgetary and distributional calculations concerning systems that are widespread in the population. The major parts of the tax-system and benefits are better represented. However, often the sample size is too small to suffice for situations that are rare in the population. One example is a calculation of changed rules in high school study financing that was directed to very low income households. Only a few thousand households in the population were effected by it and obviously only rough budgetary estimates could be made considering the size of the sample. There is now a development towards increasing the sample size.

While the FASIT-model of course is an important tool for micro simulation within the Swedish government, there are a number of developments beyond this model. The following provides two examples.

Sweden is fortunate to have a much larger and longitudinal database than the base population for FASIT of about 3 percent of the Swedish population. This database consists only of register based variables so it has fewer socio-economic variables such as household composition. The database does not

come with a pre-programmed set of rules so when using it for other purposes than pure description one needs to do ones own programming. This data-base has been used when there is need for information on individuals for more then one year. One example is the description of how many years people are on social assistance. Another example is work on the possible effects if Sweden were to introduce obligatory unemployment insurance. The tested proposals required information on the labour- and income-status of an individual for several years before the year of calculation.

The second example points towards the opportunities for microsimulation to be used in new areas outside demographically oriented populations. One example is a project that involved changing rules related to business failures. The problem at hand was to understand the actual distribution between stake holders when rules limiting the banking sectors claims were changed. The Swedish state was one of the stakeholders, so there was a clear state-interest in finding out the effects for the state. The problem was clearly a non-linear one. Luckily one state agency had undertaken a study collecting data on all business-failures in a region during a given period. These data were used and reweighted to represent the whole of Sweden for a later year and the relevant rules were programmed. The results of the calculations from this model were substantially different from results that came from adding up the estimates from a number of different sources. This was caused by the fact that the micro simulation model could handle interrelationships that of course others could not.

4.2 STINMOD

STINMOD has now been used as the basis for a wide range of analyses and simulations beyond the tax benefit simulations it was originally intended to run. STINMOD is now a very complex model with a sophisticated human-computer interface and a separate external module for reweighting not just to capture demographic change but also to benchmark to key policy figures

such as the total number of beneficiaries or pensioners for each benefit and pension.

As STINMOD is so complex, additional policy simulations have tended to be run as separate versions of the model which are developed for a particular purpose and not necessarily kept updated as part of the core model. For example, child care benefits[12,13] and legal aid[14] have been simulated using STINMOD. STINMOD played a pivotal role in the introduction of a Goods and Services Tax (GST) (similar to the European VAT) and the introduction of A New Tax System (ANTS) designed largely to compensate people on fixed incomes for the impost of the GST through lower marginal personal income tax rates and higher pensions and benefits[15].

A range of microsimulation[16] and other techniques (such as group models) were used in Treasury's Intergenerational Reports (IGRs) of 2002[17] and 2007[18]. The IGRs were mandated to be produced every five years by an Act of Parliament called the *Charter of Budget Honesty ACT 1998* (Cth)[19]. These reports were particularly important because they took policy debate from the short term horizon of the three year forward estimates to an analysis of policy and its intergenerational impacts on the budget balance over forty years. These reports have had a far-reaching impact on the approach to State and Australian Government expenditure policy. They have in particular fundamentally altered the understanding of the impact of ageing on future demand for health expenditure in Australia. The early work for the IGR in Australia was first reported in a 2001 OECD report on the fiscal implcations of ageing[20] and was influential in leading first world nations to recognise that demographic change will place as much pressure on health care as it will on pension systems. The term "non-demographic growth" used in the IGRs to describe growth driven by factors beyond ageing has now become common usage amongst economists.

The Intergenerational Reports have also fundamentally changed the way the Australian Government plans policy expenditure, especially for health care. The Prime Minister at the time referred to the Intergenerational Report as the most influential publication to come out of government in recent years. The then Treasurer, addressing the National Press Club claimed that "in practically every portfolio area – health, education, family benefits, welfare, superannuation, pensions – the IGR now provides the overall architecture within which we operate"[21] and was quoted in the Australian Financial Review as saying "the whole economic agenda of the government at the moment is drawn from the IGR"[22]. The newly elected government has concurred on the importance of the IGR, with it setting the scene for its agenda paper on health care entitled "Fresh Ideas, Future Economy: Preventative health care for our families and our future economy"[23].

A recent innovation which flows from the findings of the Intergenerational Reports and builds on their methods is the linkage of STINMOD with a new model called **Health&WealthMOD.** Health&WealthMOD is funded through an Australian Research Council grant with Pfizer Australia as the industry partner. Health&WealthMOD uses the Australian Bureau of Statistics Disability Ageing and Carers Survey as its base population. It is designed to estimate:

- the impact of health and particular conditions on early retirement;
- the impact of early retirement from illness on individual income and savings;
- the impact of early retirement from illness on government revenue and benefit payments;
- those health conditions which have the greatest economic impact in relation to early retirement; and
- the potential economic impacts of reduced illness in the older working age population

STINMOD is being used to impute within Work&HealthMod exactly how much of each type of government cash transfer particular families should receive, given their demographic, family and earned income characteristics. It will also be used to identify the income tax payments that families should pay and the various tax rebates and deductions that they should receive.

Some of the earliest work from Health&WealthMOD identifies conditions that lead to premature retirement and the total size of this lost pool of labour[24], and the industries in which people with chronic health conditions remaining in the workforce are employed[25].

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