

**Seminar 4: 'Bridging the Gaps; Setting the Agenda'**

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**Microsimulation at the IFS: achievements and Challenges**

**Mike Brewer**

**[EDITED TRANSCRIPT]**

OK, thank you to Paul for arranging today's seminar and inviting me here. I'm Mike Brewer from the Institute of Fiscal Studies, we've already had a couple of mentions today, we're an independent research institute based in London.

So I'm going to talk about our model, the IFS called TAXBEN and achievements and challenges I think was the sort of strap line that Paul gave me. But with 3 talks all about static tax and benefit microsimulation I do feel we're all going to say pretty much the same thing. But anyway, I'll proceed anyway.

So TAXBEN is a static tax and benefit microsimulation model. We attempt to model taxes on personal incomes, local taxes, expenditure taxes, entitlements to benefits, so tax credits, and it operates on large scale representative household surveys. That's exactly the same as the model at the Treasury and at DWP. And obviously we may use it for analysing actual or prospective tax and benefit changes so the cost to Govt, winners and losers and the scale of the impact on income distribution and the impact on work incentives. I think that's pretty much the same as what David and Doug told you.

The model was originally written in the early 1980s and was last rewritten comprehensively in the mid 1990s, you may be polite enough to spot that I probably wasn't at the IFS in the mid 1990s, like Doug and David the model at the IFS is one which is handed down from user to user to users and that presents its own set of challenges as well as obviously giving you though the rich body of knowledge over time.

There's no public documentation on the current version of TAXBEN but there is on our website a working paper written in 1995 but which dates from the last time it was rewritten, because we haven't rewritten it since that working paper is still broadly accurate about the basic architecture of TAXBEN, although you have to ignore the references to floppy disks and the like! The model is written in Delphi which is a form of Pascal, this is not a language that we use anywhere else at the IFS which throws up its own challenges as well.

And sometimes, when writing this talk when we think about microsimulation I often find myself wondering what is a model, I'm not a software engineer or a computer person so they probably have courses on these things, but I don't really know what a model is. TAXBEN is a programme, a computer programme, it does have a front end which makes me think of it as a bit like, it is a bit like a model, it's got a front end, you click on something, something appears, and we do often use TAXBEN through this front end, but we also use it a lot directly and call it in batch mode from other programmes, from STATA or MATLAB or FORTRAN. And usually we use TAXBEN, we use the front end of TAXBEN to produce a STATA dataset which we then go and analyse in whatever way we can, whatever way we like sorry, in STATA or other statistical language.

So Doug has already talked about the sort of flexibility/inflexibility issues, I think TAXBEN is a little bit more flexible because as a stand alone model it's a little bit, sorry, it's not a very useful stand alone model, instead it's more of a tax and benefit calculator which we use to go and produce net incomes and we then go and analyse those in whatever we can, or we use those as an input to a wide variety of research projects. So we're more flexible.

TAXBEN is not used by outsiders, I mean those people outside the IFS and just like the Treasury we have a model, a working arrangement basically where the people who use TAXBEN are pretty much the same people who programme it and maintain it. And so that's about 4 or 5 of us at the moment at the IFS who do a great many other things as well as using TAXBEN, but the number of users and programmers of TAXBEN is about 4 or 5. Oh and we're all economists, none of us are computer programmers or software engineers or anything like that.

So the strengths, I'd forgotten this talk was about, this session was all about tax microsimulation models, so I wrote about the strengths of tax benefit microsimulation model, but I think I can skip over those. What do I see are the particular strengths of TAXBEN? And I suppose I'm comparing it to what I know about other tax and benefit microsimulation models. We think it's got a very detailed representation of the tax and benefit system, although it's probably not as detailed as the one at DWP where it comes to parts of the benefits system. We think it's very easy to programme hypothetical taxes and benefits, Paul asked that question of David a few minutes ago. Differently from the Treasury and DWP, well not differently, we keep it up to date as quickly as possible, that's not, that is the same as Govt departments but we also keep it backwardly compatible if you like, so TAXBEN can look at tax and benefit systems from 1975 and we have data that can run on back to 1978m, so it's very easy, so what would we use that for? Colleagues have just, are doing a project at the moment looking at the distribution of financial work incentives in the UK since 1979, it's very easy to use TAXBEN combined datasets to do that.

Like probably the other tax benefit models, TAXBEN itself runs on, I guess we've got a generic dataset and then we have suites of programmes which produce that generic dataset from other, from any sort of underlying household dataset you might think of. And we have programmed that up for rather more datasets than the people in Govt, so TAXBEN can work on the Family Resources Survey and the Expenditure and Food Survey which are the two most commonly used surveys in the UK for microsimulation; but it also works in the British Household Panel Survey, the English Longitudinal Survey of Ageing and the Labour Force Survey. Obviously the challenge for any of these datasets is in where the datasets don't ask enough questions or as many questions as you would like about things you need to know for tax and benefit modelling. So particularly for those last three, the BHPS, ELSA and LFS, there's rather more imputation of variables, in one particular project using the LFS we basically mapped in variables from the Family Resources Survey directly into the Labour Force Survey. So imputation of one kind or another.

And lastly we think TAXBEN is very good for analysing work incentives. It's very easy for the model, to ask the model to calculate net income at arbitrary wage/hours combinations for individuals in the data and that is basically what you need to do if you're doing discrete choice labour supply modelling for example.

And as a matter of course just the simplest possible run of TAXBEN if you like as well as producing all the things I already talked about, automatically tells you or automatically calculates for you at somebody's observed wage what's the trade off between hours of work and net income? What's the budget constraint for each individual? That's produced very quickly as a matter of course. And we get summary measures of financial incentives produced automatically as a matter of course, what are people's marginal tax rates, replacement rates and average tax rates?

So achievements, I wasn't quite sure whether that meant in sort of research terms or strategic terms so I've given both.

So first of all four different examples of what we've used TAXBEN for, which we are all quite pleased with: As David described, or Doug described, I can't remember now, Doug described, the Treasury Select Committee held an enquiry into the abolition of the 10% tax band and measures that could compensate the losers and that required the Treasury to do a great deal of distributional analysis, and the Treasury Select Committee also required us to do a great deal of distributional analysis, so we basically did exactly the same piece of work as the Treasury did and have published that.

Also like the Treasury we've been looking at child poverty in 2010. This is different from the bog standard tax and benefit simulation because we wanted to forecast the population in 2010/11 and we don't usually do that when we're doing our tax and benefit analysis, and we did that through re-weighting techniques essentially, we took forecasts of known demographic and socio economic variables and we re-weighted the household survey to look like what we thought 2010 would look like.

Thirdly, we did a project looking at forecast of the income distribution for pensioners in every year from 2002 to 2017, and that was a project where we produced a fairly simple ageing model and we applied to people who were aged 50 in 2002 and we aged them all 15 years, so by 2017 they were all pensioners, and we used that to look at the distribution of income of pensioners in every year. Obviously TAXBEN was the very last and probably least interesting component of that project, but I wanted to mention that because it's an example of where we are combining TAXBEN with other microsimulation techniques, i.e. in this case ageing of the population.

And lastly I and colleagues, slightly more dated this one, did an evaluation of the Working Families' Tax Credit and its impact on labour supply, and that was based on a structural labour supply model which we estimated using data produced by TAXBEN. So TAXBEN told us about the budget constraints of each individual, the trade off between hours of work and net income, and those were inputs into a labour supply model where we estimated people's preferences for work and then we use that to evaluate the labour supply impact on the Working Families' Tax Credit.

So those are all sort of particular things that we're quite proud of that have used TAXBEN.

At a strategic level what did I think of as being the achievements of TAXBEN? Well from a research point of view, the accurate representation of the budget constraints, being able to map very accurately what's the link between hours of work and net income has enabled researchers at the IFS over the last 2 decades almost to do world class research into labour supply models, into labour supply and its relationship with taxes and benefits.

From a policy point of view, two related points, the fact that TAXBEN exists I think helps keep the Govt honest when it talks about personal tax and benefit changes. I'm sure that Dave and Doug and Chris and his colleagues know that if the Govt announces some change in taxes and benefits the IFS has the potential to analyse it and say what it thinks are the winners and losers in the cost, and the fact that they know we might do this, the threat of us doing it if you like must surely act as a constraint upon what they, you know, what they advise their ministers to say in public and what they write in Govt documents. So I'm sure that the existence of a model outside of Govt, just the existence of it, helps keeps the Govt honest.

And my third bullet is the same point sort of re-written slightly, but the fact that the model not only exists, but the fact that we actually use the model to engage in these public policy debates must surely enrich the quality of public debate about welfare reforms and about personal tax changes and that must, we hope, or surely, hopefully, leads to improved policy making overall.

And challenges? I think the title was future challenges, but my first main bullet on conceptual challenges is really past and existing challenges, ongoing challenges in tax and benefit modelling. Just like the Treasury and other people building these models, a key constraint of tax benefit microsimulation is that you are limited by the quality of the underlying household survey, if data is not collected on some component of incomes or on something you need to know to calculate entitlement to a contributory benefit then you're not going to be able to model it very accurately. I guess a link to Paul's research is that household surveys don't tell you very much about where people live and so you can't use the TAXBEN to give analysis of regional incomes or differences below the level, below very high level of region.

We've been thinking recently about employer National Insurance and incidence changes, so what, how should we model the impact on people of a change in employer National Insurance? It seems silly to argue that such, to a change in employer National Insurance has no impact on people, but to try and say what it is required, to try and work out what it is required you to say something about incidence.

And lastly, I think David and Doug touched on this implicitly, the main survey we use is the Family Resources Survey and that is the survey which is used by the Govt when it produces the household low average income dataset, that's the official measure of the income distribution in the UK, and the information there is based on what benefits people say they receive and what taxes people say they pay. A challenge for us, especially when doing projects that are about poverty or the income distribution is in relating that, information from that to the information that comes out of TAXBEN where we simulate entitlement to benefits and we simulate liability to taxes.

Practical challenges, obviously maintenance. The second point, yes, I mean something which is becoming actually increasingly true now rather than becoming less of a problem is that TAXBEN is not fast enough for all research applications and so it might surprise you, it surprises me to think that there are more than one tax and benefit calculator in existence and in use at the IFS and we, sometimes my, the colleagues in my team think that after over 20 years of producing TAXBEN we might hope that that was the definitive source of tax benefit calculations. But basically TAXBEN isn't fast enough for all the research projects that people at the IFS want to do, so inevitably, so that means that people end up writing their own tax and benefit calculators maybe for a particular year or for a particular population, and you know even the IFS can't ensure standardisation across all our research projects. And that obviously you know kind of defeats the object of having a tax and benefit model.

Strategic challenges – reminding outsiders of its limitations, particularly amongst the wider policy community, people outside Govt and outside academia but who engage in public policy debates. We have to repeatedly remind people that just because we have a model doesn't mean that it's telling us anything interesting about economic behaviour, it's just a tax and benefit calculator ultimately, albeit a very sophisticated one, it doesn't tell us in itself how people respond to tax benefit changes, it doesn't tell us you know whether that's labour supply responses or fertility responses or partnership responses.

And I also think that one of the challenges is that TAXBEN is not available for outsiders to use, and that, there are two implications there. The first one is that that, from a research point of view you know that's not a good thing, we're not transparent, to the world at large: TAXBEN is a black box, it means that no one else can replicate our results, it also means sort of from a selfish point of view that we don't have anybody sort of checking our results which might help us spot our own errors, so there is an issue of lack of transparency, lack of verification, lack of ability(?16.38) [sorry – no idea what I could have said] and that's in general not a good thing.

It can also mean, the last bullet has disappeared, that says "IFS monopoly on personal tax and benefit analysis". Because policy makers in the UK I think have got used to the, well certainly within Govt, they got used to the idea of when they think about tax benefit changes they want to know what the cost is, they want to know what the impact is on distribution of income, they want to know about winners and losers and because they're used to producing that themselves, when people come to them and say what about this tax change, their first thought will be "well do we know how much it will cost, do we know who the winners and losers are, have you thought about the impact on work incentives?" and for most, for organisations other than the IFS that's very hard for them to do. And I think what that means in practice is that some organisations find it difficult to put forward credible policy proposals, and it means that I and my team often get asked by outsiders, "will you help us model this policy change?" And that is right now an extremely important issue in the run up to a general election. All sorts, basically any think tank wanting to prove its worth is now trying to think up, trying to come up with its own policy proposals for the next election and many of them are coming to me and saying will I help them do their analysis.

And yes that is all, that's all I had to say. CLAPPING.

## QUESTIONS

*Mike Brewer* – Thank you, while you think of a question, could I start by answering Paul's question to the previous speaker about why are there so many models. I mean I think I've argued why there are models inside and outside Govt and why that's a good thing, it's basically you know in public policy terms a check on Govt. Why are there 2 models within Govt? I think and Chris will confirm, it's because DWP basically were frustrated with the limitations of the Treasury model, the IGOTM model came first and then I guess it's all linked to the development of the Family Resources Survey, but I think in the 1990s DWP were frustrated by the Family Expenditure Survey as the underlying household survey and they were frustrated by IGOTM, neither of them were doing what they wanted and so they developed both the [FRS] survey and then the model [PSM] to go with it, and the PSM model does do different things from IGOTM in certain instances. OK.

And why are there 2 models outside Govt? That one I don't know. In this particular case you'd probably have to ask Holly Sutherland who has been involved in doing these things for much longer than I have.

*Male question 1* - Your point about the limitations placed on what you can do based on the data available from the surveys, one would wonder if there is an inter agency statistical policy working group that goes into those issues that might include units like yours that are beyond Govt so that there is conversations about this ongoing in an institutionalised way, about how change surveys so that there is more use out of them by different potential and actual users.

*Mike Brewer* – That goes on to some extent, but I think a lot more could be done. So the individual surveys, the owners of all individual surveys will from time to time hold open consultations on "please tell us what variables you would like us to include". I don't see any evidence that they do that on a joined up basis and certainly it's not the case, for example, that all microsimulators get together and say "we as a whole would like the following things". So no there's not there(?) [I think I said "so there's room for improvement there"].

*Female question 1 - ??? coping with the database by using ? data and incomes and ? (20.34) [it was about combining administrative data with survey data]*

*Mike Brewer* – There's, administrative data is not as widely available in the UK as it is in some countries and as far as I, there are almost no examples where a survey has been linked to administrative data. So I mean you know yes in principle administrative data would help improve the quality of tax and benefit modelling but we don't really have anything to use. Administrative data alone, well we don't, we're not like a Scandinavian country where they put all their data together, you know for modelling the impact of tax changes on tax revenues, one can use administrative data based on people's income tax, liabilities and that's a much better source for modelling changes to income tax than household surveys, but that's all it does. The DWP have administrative data about benefit entitlements which one could use, and they probably do use, to model the changes in benefit rules, but that's all it does. So administrative data is better in case by case applications but at the moment it couldn't replace household survey data.

*Male question 2* – Some of us has faced similar situations, I'd be very interested in your current answer to requests for your services from those outside. And also what's your preferred long run solution for the fact that TAXBEN is a black box?

*Mike Brewer* – Yes, that's a very good point. I have been trying to make TAXBEN more available to outsiders because it seemed to me a bad thing that we had the monopoly on the tax and benefit model. But we've been proceeding fairly cautiously. From a practical point of view the front end of TAXBEN looks horrible and it's not easy to use, so it's not in a situation where I can just give somebody the computer programme and say "go ahead and do it yourself". So what we've been doing instead is we've been accepting requests to do some work ourselves and we do that on a, when I say "commercial basis", I mean that we charge for it to recover our costs and I've been trying to you know accept as many as possible to avoid any accusation of bias in terms of the requests I accept. So that's been working quite well; usually outside groups want the answers next week and that's not compatible with my, what I have on, in practice that's probably the biggest reason why we haven't done that much more of it. If people would learn to come to us with 6 months' notice then we could make a lot more use of it. So we've done 3 or 4 over the last couple of years and we'll probably do 3 or 4 more in the next 9 months in the run up to the 2010 Budget. But perhaps we can talk more about that privately. Oh I'm sorry and what's my long run solution? I mean I would like a user friendly version of TAXBEN to be available on the internet. I think the only thing stopping that happening is that it would require huge amounts of effort from us and that would require somebody to fund it, but there's no technological or intellectual property barrier to that happening as far as I can see.

*Male question 3* – Do you get many cases where your model disagrees with Govt models, in the data ? (23.57)

*Mike Brewer* – Not really, I mean it's the same underlying survey, so, you know, unless you've made mistakes, unless someone's made a mistake in the way they write something it would be surprising if you got a different answer, a different answer to exactly the same question. What tends to happen is that we might ask slightly different questions, I mean for example the Treasury always take the household income into assessment, so they look at changes in household income and they rank householders by their position in the household and distribution and we tend to look at changes in family income and rank them by their position in the family income distribution. The Treasury had to write a fantastic memo to the Treasury Select Committee explaining that difference to them in great detail. We often find that TAXBEN gives a different answer to the cost of a reform than the one the Govt says, but usually that's because the Govt's used extra data, or the Govt's come to its own best guess about what this measure will have cost and it probably would have based that not only on IGOTM or PSM but also on other data sources or just its own kind of judgement. And in those cases I think the Govt's right and we're wrong. So no, I wouldn't say we've caught the Govt out in anything, no.

[END OF RECORDING]