

TAXBEN: The IFS tax and benefit microsimulation model

Introduction

A tax and benefit microsimulation model is a programme which calculates the tax liabilities and benefit entitlements for individual households, given detailed information about those households. Since 1983 the IFS has built and maintained TAXBEN, a microsimulation model of this kind. Broadly speaking, the inputs to TAXBEN are representative survey datasets of UK households and detailed descriptions of different tax and benefit systems. TAXBEN takes the relevant details of a surveyed household and computes, under a given tax and benefit system, the household's tax liabilities, benefit entitlements, and net income. Such simulations can be performed on every actual tax and benefit system that has existed since 1975, as well as hypothetical systems.

Analysis using TAXBEN

TAXBEN uses survey datasets representative of the UK population. These describe the characteristics of a household and its members, including their sources of income, age, housing costs, council tax band, and much more. TAXBEN takes these datasets and returns an output dataset which includes what the tax liabilities and benefit entitlements of every household in the survey would be under the tax and benefit system modelled. It also calculates each household's net income – the sum of their private incomes and benefits, minus taxes. A key advantage of using a microsimulation programme to compute net incomes is that it lets us capture often-complex interactions between different parts of the system. For example, entitlement to some means-tested benefits is reduced in proportion to after-tax earnings – and so benefit entitlements are partly dependent upon the tax system.

At the time of writing, the datasets typically used in conjunction with TAXBEN are:

- The Family Resources Survey – an annual cross-sectional survey of around 20,000 households, running since 1994–95, which includes detailed information about household incomes. This is the data source used for the majority of TAXBEN analysis at IFS.
- The Living Costs and Food Survey and its predecessors – an annual cross-sectional survey of around 5,000 households, running since 1961 (and available for TAXBEN use since 1978), which includes detailed information about household expenditures and so can be used to estimate the impact of indirect taxes.
- Understanding Society: The UK Household Longitudinal Study and its predecessor (the British Household Panel Survey) – an annual household panel survey, running since 1991. The British Household Panel Survey (1991-2008) surveyed around 6,000 households per year. This was succeeded by Understanding Society (2009-present), which surveys around 25,000 households per year. The data include detailed information about household incomes, and crucially follow

the same individuals over time, allowing us to conduct a different kind of analysis from that available in the cross-sectional surveys discussed above.

TAXBEN analysis is usually done on an ‘entitlements basis’ – that is, we measure what net incomes would be if individuals claimed all the benefits that they are entitled to. We can instead look at what net incomes would be if individuals only claimed the benefits that they say in the survey that they are claiming – a ‘reported take-up basis’. This comes with some difficulties, as discussed below. We also analyse taxes on a ‘liabilities basis’ – we calculate what net incomes would be on the assumption that individuals do not evade tax.

In addition to reporting statistics about incomes, TAXBEN can also calculate the work incentives that individuals face. The two most commonly used measures of work incentives are the participation tax rate (PTR) and the effective marginal tax rate (EMTR). The PTR measures the share of earnings lost in higher taxes and reduced benefits when someone moves into work. The EMTR measures the amount by which taxes rise and benefits fall if someone increases their earnings by £1.

TAXBEN can also analyse the impact of reforms. In the public discussion of tax and benefit reforms, it is not uncommon to hear reference to impacts on a ‘typical’ family or household. While TAXBEN can report the effect of reforms on any hypothetical family, such examples are often not representative of the effect on the population as a whole. Instead, we use a representative dataset of a large number real households and compare their net incomes under two different systems – say the current tax and benefit system and a system incorporating a proposed reform - to work out for each household how the difference between the two systems (the reform) would affect their income.

These household level results can then be aggregated up into groups. The most common form of aggregation in our TAXBEN analysis is into ‘deciles’, where we calculate the effect of reform on average incomes in the bottom 10% (bottom ‘decile’), next 10%, and so on. Of course, other forms of aggregation are also possible – we can work out the impact of tax and benefit reforms on average incomes by region, household type (couple without children, lone parent, etc.), age, and so on. The results can also be aggregated up to the total UK level. This can be used to give an indication of how much a reform would cost or save the Exchequer.

What does TAXBEN model and not model?

TAXBEN models personal taxes and benefits. It includes income tax, National Insurance contributions (employer and employee), council tax, VAT and most duties – taxes which, in 2017–18, together account for about three quarters of total government tax revenue. It also includes almost all benefits, tax credits, and state pensions. The main taxes which TAXBEN does not model are capital taxes – such as capital gains tax, inheritance tax, and stamp duty – and business taxes, such as corporation tax and business rates. While these taxes will eventually be paid in one form or another by households – through higher prices, lower wages, or lower returns for shareholders – exactly which households bear the burden is highly uncertain, and so these taxes are not included in TAXBEN analysis.

TAXBEN also does not model the receipt of any public services. There are two main difficulties with distributional analysis of public services. First, the available data on the use of public services

across the income distribution is limited. Second, there are few available estimates of what we would ideally want to measure – the value that households place on the public services they use.

Behavioural responses and incidence

TAXBEN calculates what the impact of policy reforms would be on households' finances if those households did not change their behaviour in response. For example, when modelling a reduction in income tax rates, TAXBEN calculates household incomes on the assumption that individuals continue to work the same number of hours as they did before. Similarly, if alcohol duties are increased, calculations using TAXBEN do not account for any change in the amount of alcohol purchased by households.

This approach is likely to give a reasonable approximation to the true effect on incomes of many reforms, especially if they are small, or mainly affect individuals who are fairly unresponsive to tax and benefit changes. But the true effect of a reform on household incomes may differ substantially from the static effect in cases where the reform has a significant effect on the incentives faced by a group of individuals or households that are responsive to such incentives. For example, a static approach is likely to overstate the impact that a reduction in out of work benefits would have on household incomes if in response to that reform some individuals enter employment and so increase their income.

We can incorporate these kinds of behavioural responses in our analysis by combining TAXBEN with other tools. For example, TAXBEN can calculate the income that an individual or household would receive if they changed the number of hours that they worked. By using this together with models of labour supply behaviour we can estimate what might happen to individuals' employment and hours of work a result of a reform. This also allows us to calculate the total impact of the reform on their incomes, including any changes in their earnings.

Another related issue is 'incidence'. There is sometimes a difference between the party legally responsible to pay the tax, and the party on whom the burden of the tax falls. For example, if income taxes rise, workers pay more tax – but in some cases firms may increase workers' earnings to partially offset the increased taxes workers are paying in order to attract a sufficient number of employees. In such a case, the tax is said to be partially incident people other than the worker (e.g. shareholders of the firm) through the higher wage payment. In TAXBEN analysis, we generally look at what would happen to incomes if all changes to taxes and benefits were fully incident on the directly affected households. This includes taxes such as VAT or employer National Insurance contributions, where the firm is the party legally obliged to pay the tax.

Other limitations

Three other limitations should be kept in mind when interpreting results from TAXBEN.

First, earnings are typically under-recorded in household surveys – particularly for those at the very top of the income distribution, who are under-sampled. This means that tax reforms which only affect top earners cannot generally be modelled reliably using the survey data that TAXBEN runs on. Instead, for distributional analysis, we use the survey datasets referenced above to estimate the frequency with which affected individuals appear in different deciles of the income distribution. We

then use that frequency to break the official costing of the policy (before behavioural response, wherever that is available) into different deciles.

Second, as mentioned above, analysis can either be done on an ‘entitlements basis’ or a ‘reported take-up basis’. The true take-up of benefits is somewhere between reported take-up and full take-up (entitlements): some people do not claim the benefits to which they are entitled, while others do take up benefits but neglect to say so in the household survey. Thus, analysis on an entitlements basis or reported take-up basis – while potentially interesting in their own right – will respectively overstate and understate the impact of benefit reforms on actual incomes.

A third issue concerns disability and contributory benefits, (including entitlement to the basic state pension). Whether someone is entitled to a disability benefit depends on specifics about their health, and entitlements to contributory based benefits depend upon work history. These data are mostly lacking in the survey datasets used in TAXBEN analysis. As a result, the only information we have about whether someone is entitled to one of these benefits is whether they say they claim it or not. We therefore model disability and contributory benefits on a reported take-up basis: only those who say that they claim are modelled as entitled. However, there will be some people who are entitled to such benefits but do not claim them, and some who do claim these benefits but do not report claiming them in the survey. The effect of this is that we will understate the impact of reforms of these benefits on actual entitlements and, in the latter case, actual receipt.