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Identifying Policy Impacts in the Crisis: Microsimulation Evidence on Tax and Welfare[1]

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***Abstract*:** Ireland's banking, property and fiscal crises, combined with a worldwide Great Recession have had severe implications for household incomes. Particular attention has focused on how incomes at various levels have been affected by tax and welfare policy responses to the overall crisis. This paper describes how SWITCH, the ESRI tax-benefit model, has been rebased to use data from SILC (Survey on Income and Living Conditions) 2010, capturing the major fall in household incomes and rise in unemployment. Selected analyses based on 2008 and 2010 data are reported, to give insights into the distributional and incentive impacts of tax and welfare policy up to 2012.

Keywords: microsimulation, tax and benefit systems, income distribution
JEL Classifications: D31, H24, I38

1. INTRODUCTION

Household incomes in Ireland have been hit hard by a succession of adverse factors during recent years. The ending of the property bubble, an unparalleled banking crisis, a global recession, and a fiscal crisis have led to a severe downturn in national income and a sharp rise in unemployment. Policy adjustments have included reductions in government expenditure and increases in a range of taxes and charges. In this paper we focus in particular on how income tax (broadly defined) and welfare policies have changed over the period, and how they have shaped the distributive impact of policies designed to adjust to the new economic circumstances. Broader questions about the impact of expenditure adjustments are also of interest, but a recent study of this topic (O'Dea and Preston, 2011) suggests distinct limits on how well these can be identified.

We have already undertaken some work on identifying the distributive impact of tax and welfare policy (e.g., Callan et al., 2011, 2012). In identifying policy effects, we must hold other things constant, and simulate the impact of policy under baseline and reform scenarios. To do this we must use a tax-benefit model. We have already described the construction of SWITCH, the ESRI tax-benefit model, based on 2008 data. (Callan et al, 2010). This is the model which has been used in analysing the impact of austerity policies over the 2008 to 2012 period in a series of papers. There have been enormous changes in incomes and in unemployment rates over this period. The database underlying the SWITCH model is adjusted to take account of such changes, by uprating (or downrating) incomes, and by reweighting to take account of changes such as the increase in unemployment. In normal times, these techniques work well to produce a good representation of the population. How well do such techniques perform in the much more demanding environment of the Great Recession?

In order to examine this question, and to provide a more up-to-date database for modelling of tax and welfare policies, we have created a tax-benefit model database using the CSO's Survey on Income and Living Conditions (SILC) 2010. Section 2 describes some of the reasons for adopting a tax-benefit modelling approach,

[1] We are grateful to the SILC team – Tom McMahon, Pamela Lafferty and Marion McCann – for their help in understanding the SILC data on which this paper is based. Responsibility for the analyses in the present paper rests entirely with the authors.

focusing in particular on the measurement of financial incentives to work. Section 3 outlines the challenges faced in constructing this database and the procedures adopted. Section 4 documents the cross-checks on this database from external sources. Section 5 considers the distributive impact of policy over the whole crisis period, and the extent to which the data adjustment strategy can help to provide useful results until new data become available. Section 6 deals with measurement of replacement rates, one of the key measures of work incentives. Section 7 draws together the conclusions from work to date, and outlines some key areas for future research (housing costs, housing assistance payment, lone parents etc.)

2. MODELLING TAX AND WELFARE POLICY OPTIONS

While "example households" are easily constructed, and the calculations for such families are relatively easy to understand, this approach has very severe limitations, which are not always recognised. The major difficulty is that it is impossible to build up a picture of how real households are affected by policy changes using a small – or even quite large – number of hypothetical examples. Once calculations for a set of example households are undertaken, there is an implicit assumption that real households can be represented by the set of hypothetical households chosen.

Two examples serve to illustrate this point. First, a note by the Department of Finance (2009) sets out calculations of replacement rates for a range of circumstances. Three earnings levels were considered (the minimum wage, ⅔ of the average industrial wage and the average industrial wage) and a range of family types: single, married without children, married with one or two children or lone parent. Calculations were also undertaken for those in receipt of Rent Supplement and for those on the largest single Differential Rent Scheme (Dublin). It was carefully noted that only 12 per cent of all those in receipt of Jobseeker's Assistance or Benefit were also in receipt of Rent Supplement in September 2009, with a further 2 per cent in receipt of Mortgage Supplement. However, this information is presented separately in the text. The main table gives a replacement rate for each family type/earnings level combination, but has no corresponding information on the frequency with which these combinations occur. This means that the overall picture on replacement rate is unclear.

OECD (2012) represents an even larger scale and more systematic implementation of the "example households" approach. They consider up to 5 income levels, 4 family types, and allow for variation in receipt of benefits over a 5 year unemployment spell. Nevertheless, when it comes to arriving at an "average" replacement rate, the OECD does not take into account the frequency of occurrence of the different family types. Instead, an unweighted average appears to be used. The fundamental difficulty with the example households approach is that, no matter how many households are used, the approach cannot give an overall picture of the impact of a policy change on incomes and work incentives.

In order to get a representative picture, we must work with a nationally representative sample. The Survey on Income and Living Conditions (SILC) is an annual survey conducted by the Central Statistics Office (CSO) in order to obtain information regarding the income and living conditions of Irish households. It is the Irish component of an EU wide survey which aims to capture information on poverty and social exclusion across Europe. The survey is both cross-sectional and also has a panel dimension with certain households surveyed annually. The survey began in 2003. The 2010 SILC surveyed 4,642 households and 11,587 individuals between January 2010 and January 2011, with an income reference period being the 12 months prior to interview. Basing the model on SILC means that the model represents as fully as possible the great diversity of household circumstances relevant to tax and social welfare.

SWITCH simulates the disposable income each family would obtain under the current set of income tax and social welfare policies, and under an alternative policy of interest. The results are tabulated to show the patterns of gains and losses over the income distribution, or by family type. The policy change under consideration could be a simple change in one tax rate; or a complex programme of tax and welfare reform. The model is used each year to assess the impact of the budget, and over the past year has been used to examine the potential impact of a property tax, and the impact of in-work costs such as childcare and travel to work costs on financial incentives to work. The model can be used to explore long-term packages of reforms, and then examine alternative paths towards the selected long-term objective. As well as evaluating possible and actual policy changes, SWITCH can be used to examine counterfactual situations, such as the income an unemployed person would receive if they became employed, or the income an employed person would receive if they became unemployed.

3. CONSTRUCTING A MODEL DATABASE FROM SILC 2010

The tax and welfare systems use information on age, marital status, numbers and ages of children, incomes from all sources and mortgages in order to determine tax liabilities and welfare entitlements. With the advent of a property tax, information on the value of a property is likely to be added to this list. Much of this information is gathered by SILC, as part of the process of measuring disposable income – one of the key concepts used in poverty measurement.

Published results from SILC focus mostly on the household and individual levels. For tax and welfare purposes, however, there is an intermediate unit - often called the family unit or tax unit - which is very relevant for policy purposes. Most tax and welfare policies do not operate at the level of the household, though household income and household welfare are of key concern to policy. Instead, tax and welfare policies tend to operate at either individual level (e.g., contributions to social insurance, and some social insurance benefits) or at a family unit level. Detailed information on family and household composition is needed to ensure that it is possible to group individuals into family units, defined as an individual, together with his or her spouse, and dependent children. A tax unit represents a married couple or single person, together with all children aged under 15, and children aged less than 18 who are in full time education. An income sharing unit is a broader family-based concept which also includes students of any age living with their parents. The difference between income-sharing units and tax-sharing units is that third-level students living with their parents are counted as separate tax units, but are included part of the same income-sharing unit as their parents.

As indicated in Callan *et al.* (2010), SILC forms part of a set of harmonized surveys used by Eurostat to analyse issues relating to poverty, social inclusion and other issues. The income concept adopted at European level is measured in annual terms. e.g., total employee and self employed income received during the last year etc. As a result, annual incomes are the core concern of the Irish implementation of SILC. While there are good reasons to be interested in this measure of income, it is not a suitable measure for the purpose of simulating welfare entitlement. Welfare entitlements depend in the main on current income and labour market status. SILC therefore goes beyond what Europe requires to capture key elements of the current income measure as well as annual income.

The success of SILC's strategy for collection of accurate data on social welfare receipts must also be acknowledged. Most respondents (around 80 per cent) choose to convey this information by providing the interviewer with their PPSN, along with permission to use this to obtain the relevant information from official records. This provides high quality information, not distorted by problems of recall or misclassification of benefits, at low time-cost to the respondent, and is an efficient strategy.

For social insurance (contributory) benefits, we model the amount of the payment, which depends on family circumstances including the earnings of a spouse. For social assistance (non-contributory) benefits, the model uses information from the survey to establish whether the individual falls into a category covered by a particular scheme; and then whether the individual is entitled to any payment, based on the means test applicable to that scheme or broad group of schemes. Similarly, information gathered in the survey is used to estimate the income tax liabilities and PRSI contributions for each individual and/or tax unit. As well as simulating income tax and PRSI under existing rules, the model allows for policy reforms, such as the introduction of a property tax, to be analysed. (See Keane et. al., 2012).

4. CALIBRATION AND VALIDATION

The weighting procedures used by CSO help to ensure that SILC is broadly representative of the Irish household population in terms of key demographics (age group, sex, household composition and region). There is, however, no guarantee that this set of controls will ensure that the survey data represent the social welfare client population and/or the income tax base. These are key requirements for a tax-benefit model: the value added by the model will be greatly enhanced if the input database provides a good representation of the welfare client population and the income tax base.

For this reason, and as discussed in Callan et al (2012), an adjusted weight to the initial weight provided by the CSO is used. The CSO weighting procedure[2] used to create household cross-sectional weights begins with household design weights, which are in inverse proportion to the probability of selection. A further adjustment is made to take account of non-response among longitudinal households. Benchmark information or "control

[2] The description given here is a summary of the information in Appendix 2, Background Notes, of CSO (2009), *Survey on Income and Living Conditions (SILC).*

totals" are then used to estimate weights which gross up the data to population estimates. Broadly speaking, the weighting estimates are derived finding the smallest adjustment to the weights which ensures that the weighted estimates reproduce the control totals or "benchmarks". The control totals or benchmarks used by CSO are:

- population estimates by sex and age group (0-14, 15-34, 35-64, 65 and over). These are based on population projections, which draw on Census data.

- Household population estimates at regional level using the eight NUTS3 regions. These are generated from the Quarterly National Household Survey (QNHS)

- Household composition controls (6 categories, depending on numbers of adults and numbers of children) which are also drawn from the QNHS.

These controls help to ensure that SILC is broadly representative of the Irish household population in terms of key demographics (age group, sex, household composition and region). The SWITCH model, however, requires an accurate and representative representation of the income tax paying and social welfare receiving population. There is no guarantee that the set of initial controls used will ensure this. Without such controls a tax benefit model may fail to accurately capture the total cost/savings to the exchequer of policy changes or the impact policy changes have on income distribution and poverty rates. For this reason SWITCH requires additional controls. Essentially the procedure used is the same as that employed by CSO in constructing the benchmark weights. The difference is that some additional control totals are used, chief among these being control totals or benchmarks relating to the distribution of income taxpayers by income band as well as estimates of the social welfare population.[3] Similar approaches have been employed for many years in UK tax-benefit models (Atkinson et al., 1988) and in Germany (Merz, 1991). The CSO benchmark weights are treated as the initial weights in our procedure, and new weights are estimated using the CALMAR software[4], which gross up the population both to the new control totals, and to the controls applied by CSO. While these weights, by design, differ as little as possible from the input weights, the differences are substantial. Part of the price for the inclusion of additional controls is that the dispersion of the weights is increased.

We now focus on how the reweighting procedure affects the accuracy of the model. We begin by comparing the estimates of the social welfare client population based on SILC using the initial weight provided in the data and the revised weight used in SWITCH and see how these compare with the official statistics on numbers of recipients of social welfare schemes. Table 1 shows the estimated numbers of social welfare recipients by major scheme type for 2010. The first column of figures shows the number of recipients by scheme as documented by the Department of Social Protections annual statistical report, *Statistical Information on Social Welfare Services* (SISWS) for 2010. These figures are based on the numbers in receipt of benefit at a certain point in time, specifically at the 31st December 2010. In order to provide a comparable picture the second column provides the SWITCH numbers in each of the broad schemes based on the initial weight provided by the CSO ('euroweight') and the third column provides the numbers based on the revised weight discussed above. The final column shows the percentage ratio of SWITCH numbers (using the revised weight) compared to the external statistics.

The SWITCH figures refer to the number of people who state that they are currently in receipt under a particular scheme at the date of interview. The figures are therefore not directly comparable with the end-December figures from SISWS, as the SILC interviews take place throughout the year – SILC 2010 interviews ran from January 2010 to January 2011. While there are some payments with a seasonal element (e.g., back to school, Christmas bonus and fuel allowance) these do not have a major impact on the comparison. Trends in unemployment have the potential to make a more serious impact. We can see that, overall, SWITCH captures well the social welfare population, particularly for the broader schemes Retired/Older People; Family and Illness./Disability/Carers with ratios above 90%. The remaining schemes Jobseekers and Employment Support have coverage levels of above 80%. Supplementary Welfare Allowance (SWA) has a low ratio, however this is due to the fact that SWITCH models each individual for the payment they are entitled to assuming no 'waiting period' for the receipt of benefits, while in reality applicants may receive SWA while awaiting another payment.

[3] There is also one additional demographic control, giving further detail on the numbers above and below 18. Without this it is possible that the numbers in the key age group for labour market participation may not be fully captured.
[4] CALMAR was developed by INSEE and is widely used by national statistical agencies in Europe and by EUROSTAT. The weights are CALibrated to recapture MARginal totals.

Table 1 : Numbers of Recipients by Social Welfare Scheme: Estimates Based on SILC 2010 and SWITCH Compared with Administrative Statistics at 31 December 2010.

Scheme:	Statistical Information on Social Welfare Services (SISWS) 2010[1]	SWITCH 2010, euroweight	SWITCH 2010, adjusted weight	SWITCH adjusted weight as % of SISWS
Retired/Older People	312.0	366.7	334.6	107%
Family	240.7	279.9	235.8	98%
Illness/Disability /Carer's	301.4	310.6	278.6	92%
Jobseeker Supports	385.3	437.2	338.2	88%
Employment Support	47.7	55.6	38.5	81%
Supplementary Welfare Allowance	37.4	8.7	5.0	13%

1 SISWS 2010 figures for State Contributory and Non-Contributory Pensions are adjusted using Census estimates of the proportion of the over 65 age group living in non-household situations (mainly nursing homes). SISWS 2010 figures for State Contributory Pensions also exclude recipients living outside the state (See Statistical Information on Social Welfare Services 2010, Table B8, category 'other'.)

Given that our procedure involves re-applying the control totals from the CSO benchmarks, results on these domains tend to be similar. However there are substantial differences in terms of the implications of the alternative weighting choices for the analysis of tax policy. Table 2 reports costings of tax policy changes from the Department of Finance/Revenue pre-Budget 2012 "Ready Reckoner". These are compared with two costings based on SWITCH: one using SILC with the CSO's benchmark weight ('euroweight'), and the other using SILC with the adjusted weights involving calibration to the income distribution among taxpayers and social welfare population. It is clear that when the CSO's benchmark weights are used, the costs of tax policy changes are substantially underestimated – "coverage" of the cost ranging from about 60 per cent (for a tax band change, or a change in any of the USC rates) to 86 per cent (for a change in the personal tax credit). Using the adjusted weights, on the other hand, the costs are well represented, with the "coverage ratio" for most costings varying between 87 and 107 per cent.

Table 2: Costing of Tax Policy Changes, 2012

				As % of Ready Reckoner Estimate	
	Ready Reckoner 2012	**SWITCH 2012 based on euroweight**	**SWITCH 2012 based on adjusted weight**	***SWITCH 2012* based on euroweight**	***SWITCH 2012* based on adjusted weight**
Personal tax credit -100	190	157	219	*83%*	*115%*
PAYE tax credit -100	66	41	59	*62%*	*88%*
Tax Band -€100	11	7	12	*64%*	*107%*
Standard tax rate +1%	470	338	497	*72%*	*106%*
Top tax rate +1%	203	146	211	*72%*	*104%*
<u>USC: 1 percentage point rise in:</u>					
2% rate	214	135	193	*63%*	*90%*
4% rate	105	74	108	*70%*	*103%*
7% rate	462	301	403	*65%*	*87%*
All rates	782	509	705	65%	90%

Notes: Ready Reckoner estimates from www.finance.gov.ie/documents/budget/readyreck2012.pdf

5. IMPACT OF CHANGES IN THE UNDERLYING DATA

We now move to examine the impact a change in the data underpinning the model has for model results. As discussed in the introduction the uprating of data to the current year of analysis and the adjusting of weights to capture the income distribution and social welfare population can only aim to provide an accurate representation of the true population for a limited period of time. This is not such an important issue when unemployment rates are static. 'Stretching' the data becomes more of an issue, however, when major economic change is occurring. The previous version of SWITCH was based on data from 2008 when unemployment stood at 4.8%. By 2010 unemployment had hit 12.9%. When using the model to examine, for example, the impact of policy changes occurring in 2012 (when unemployment stands at 14.8%) we may expect differing results when using SWITCH based on data from 2008 and 2010. Table 3 presents a comparison of results obtained using the 2008 and 2010 model databases. It provides the exchequer impact and decile impact (percentage change in disposable income). The table provides these results for the impact of the 2012 Budget relative to the 2008 policy indexed by the average estimated wage decline over the 2008-2012 time period (3.7%).

Table 3 : Comparison of Results Using SWITCH based on 2008 SILC and based on 2010 SILC

2008 (indexed)-2012 Budgetary Impact

	2008 model*	**2010 model***
Exchequer Impact €m p.a.	€5,796m	€6,153m
Decile Impact**		
1	-3.2	-2.1
2	-1.4	-1.2
3	-3.6	-2.3
4	-5.9	-5.5
5	-5.9	-5.5
6	-6.4	-6.3
7	-6.5	-7
8	-7.3	-7.4
9	-8.5	-8.6
10	-10.9	-11.4

* Using adjusted weight

**Decile Impact, % Change in Disposable Income, Household Unit Level

Aggregate costings of the impact of policy changes over the 2009-2012 period are within 6 per cent of each other. The overall pattern of distributive impact is also very close. There are losses at all income levels, but the smallest percentage losses are at among the lowest income deciles. The greatest losses are among the highest income groups. Using new data for 2010 indicates that losses among the lowest income deciles are somewhat less than the earlier estimate suggested. By contrast, losses for the top income decile are somewhat greater than earlier estimates indicated.

Given the scale of the changes over the 2008-2010 period it is remarkable that the 2008 data, when uprated and reweighted, provided such an accurate indication of the distributive impact of policy.

6. REPLACEMENT RATES

A feature of the SWITCH model that has recently drawn more attention is the ability of the model to compute replacement rates. Replacement rates measure the proportion of income that would be replaced if an individual were to change his/her employment status and can, therefore, be viewed as a measure of the financial incentive to work. For the employed people in the sample the amount of their income that would be 'replaced' by social welfare if they were to become unemployed is calculated by the model. For the unemployed in the sample a wage is estimated based on characteristics of the individual.

Callan *et al.* (2012) examine replacement rates in 2012. That paper discusses the limitations of relying on 'example' cases for the calculation of replacement rates, such as a single person on the average wage or a married one earner couple with two children as is often done. Using a tax benefit model, such as SWITCH, allows us to take account of the diversity of family types and circumstances. One of the advantages of using SWITCH to calculate replacement rates is the modelling or predicting of potential wages for the unemployed. Often in the calculation of replacement rates it is assumed that an individual will earn a specified wage, such as minimum wage or an average wage. This approach fails to reflect the diversity of the potential wages which could be earned by the unemployed. Prospective wages vary with respect to a variety of factors such as education level and age, and can also differ for people with the same measured characteristics.

Predicting Wages for the Non-employed

A number of econometric techniques are used in related literature to predict the wages a non-employed individual would earn if he/she became employed. The most straightforward method is to estimate a wage equation using OLS on the log of hourly earnings for those individuals in the sample with an observed hourly wage. The estimates from this equation can be used to predict an hourly wage for non-workers based on characteristics such as age, education, sex and marital status.

One criticism that can be made of this approach is that there may be differences in unmeasured wage-relevant characteristics between those who are in employment and those who are not in employment. The standard approach to correct for such differences is to introduce what is known as a Heckman Correction for sample selection. Selection biases can occur in a wide range of microeconometric settings. In this case, unobserved characteristics may influence both the decision to work and earnings once in work, so that the individuals with an observed hourly wage in our sample may not be fully representative of those without an observed hourly wage. Heckman (1979) has shown that by estimating an equation to predict whether or not an individual is employed, one can derive a correction for this selection effect.

OLS Log Earnings Approach

To estimate hourly wages for non-workers using the OLS log earnings approach, wage equations are estimated separately for four categories: single women, single men, married women and married men. Separate equations for the sex and marital status groupings allow for differences in the wage structure for these groups, arising for whatever reasons. For each of these categories, the key variables used to predict hourly wages are age (and its square, to allow for a positive but decreasing impact) and five levels of educational qualification (none beyond primary is the base case, followed by Junior Cert or equivalent, Leaving Certificate, non-degree third level, and third-level degree or higher). We then use the estimated effects of each of these characteristics to predict hourly earnings for the non-workers in our sample. Since the characteristics in our earnings equation cannot explain all the variation in actual earnings, we add a random error term to each wage prediction drawn from the distribution of the residuals. The minimum wage for under 18 year olds, which at €6.06 is 30 per cent below the general minimum wage, is used as a floor for predicted wages.

The use of hourly earnings, as opposed to weekly or yearly earnings, means that we avoid possible biases in our estimates due to differences in earnings between full-time and part-time workers. With weekly earnings as our outcome variable, for example, workers who work less than a full week would have lower weekly earnings, and so we would risk under-estimating the true effect of some characteristics on earning potential. Using hourly earnings should negate much of this problem.

Table 4 reports the results of this regression output. As expected, wage rises with age and education. The significant negative coefficient on the age-squared variable indicates that the returns to age decrease as an individual gets older.

Table 4: OLS Wage Equations for Single and Married Men and Women, 2010

	Single Men	Married Men	Single Women	Married Women
Age	0.054	0.085	0.054	0.069
	(0.008)	(0.013)	(0.009)	(0.014)
Age squared/100	-0.049	-0.08	-0.049	-0.001
	(0.010)	(0.014)	(0.011)	(0.015)
Junior Cert	0.138	0.118	0.095	-0.024
	(0.093)	(0.062)	(0.097)	(0.080)
Leaving Cert	0.163	0.375	0.182	0.205
	(0.086)	(0.059)	(0.085)	(0.069)
3rd Level Diploma	0.342	0.153	0.164	0.222
	(0.109)	(0.080)	(0.153)	(0.135)
Degree	0.505	0.708	0.556	0.677
	(0.084)	(0.056)	(0.085)	(0.069)
Other	0.103	0.141	0.019	0.017
	(0.144)	(0.107)	(0.148)	(0.148)
Constant	1.223	0.499	1.175	0.893
	(0.176)	(0.306)	(0.176)	(0.306)
Observations	492	840	664	767
R-squared	0.31	0.29	0.27	0.27

Note: Standard errors in parentheses, Education relative to No Education category

Correcting for Selection Biases

As explained above, in certain circumstances, it is necessary to correct for possible selection biases in econometric estimation. As an intermediate step in correcting for sample selection bias, it is necessary to identify characteristics that are associated with the propensity to work but not associated with the wage offered. Household variables are often used for this purpose. In the SILC data, we can identify the number of children aged under 16 in the household, and whether a single individual is living with their partner. The Heckman correction uses these variables to correct for any selection bias present in the data. As before, we add a random error term to each wage prediction drawn from the distribution of the residuals.

Table 5 reports the Heckman regression. Where rho is statistically significant, this indicates that a selection bias exists in the data. A selection bias only exists in the cases of married men and single women.

Table 5 : Heckman Corrected Wage Equations for Single and Married Men and Women, 2010

	Single Men	Married Men	Single Women	Married Women
Age	0.052	0.107	0.024	0.082
	(0.018)	(0.018)	(0.010)	(0.021)
Age squared/100	-0.047	-0.11	-0.011	-0.084
	(0.022)	(0.020)	(0.013)	(0.024)
Junior Cert	0.104	0.105	0.065	-0.019
	(0.088)	(0.059)	(0.089)	(0.075)
Leaving Cert	0.119	0.377	0.043	0.234
	(0.114)	(0.057)	(0.078	(0.070)
3rd Level Diploma	0.298	0.11	0.053	0.253
	(0.132)	(0.079)	(0.155)	(0.136)
Degree	0.452	0.748	0.331	0.726
	(0.166)	(0.058)	(0.083)	(0.081)
Constant	1.333	-0.082	2.137	0.49
	(0.595)	(0.434)	(0.241)	(0.537)
Sigma	0.412	0.484	0.539	0.467
	(0.018)	(0.031)	(0.029)	(0.022)
Selection Equation				
Age	0.094	0.136	0.144	0.200
	(0.013)	(0.021)	(0.013)	(0.021)
Age squared/100	-0.121	-0.183	-0.183	-0.250
	(0.015)	(0.021)	(0.015)	(0.022)
Junior Cert	0.209	0.095	0.266	0.122
	(0.126)	(0.098)	(0.125)	(0.113)
Leaving Cert	0.552	0.207	0.568	0.444
	(0.114)	(0.096)	(0.107)	(0.097)
3rd Level Diploma	0.512	-0.032	0.385	0.538
	(0.171)	(0.135)	(0.240)	(0.239)
Degree	1.008	0.472	0.915	0.715
	(0.115)	(0.089)	(0.109)	(0.099)
Number of children under 16	-0.139	-0.131	-0.262	-0.274
	(0.074)	(0.028)	(0.036)	(0.031)
Cohabiting	0.304	.	0.261	.
	(0.116)	.	(0.091)	.
Rho	-0.073	0.52	-0.65	0.27
	(0.513)	(0.165)	(0.075)	(0.260)
Observations	492	840	664	767

Note: Standard errors in parentheses, Education relative to No Education category

Although in this case the result suggests that there is a statistically significant selection bias in two of the four wage prediction equations, Table 6 below shows that the magnitude of the correction is modest, averaging less than €0.75 an hour. Taking the unemployed group all together, the Heckman correction reduces the average predicted wage from 91 per cent to 87 per cent of the actual hourly wage observed in the data.

Table 6 : Predicted Wages for Non-Working Individuals Aged 65 or Lower

Predicted Earnings per Hour	
	Mean
OLS Log Earnings Equation	18.56
Heckman Correction Prediction	17.82
Predicted Earnings as Percentage of Average Actual Earnings per Hour	
OLS Log Earnings Equation	91%
Heckman Correction Prediction	87%

Replacement Rates: Irish Results in Context

Callan *et al.* (2012) give a detailed picture of replacement rates in Ireland and how they have evolved over time. They also examine in-work and out-of-work incomes net of travel to work costs and childcare costs. Here we focus on how the Irish results compare with those in the UK. Simple comparisons of payment rates for Jobseekers in the two jurisdictions suggest that UK rates are much lower, and therefore that replacement rates would be higher in Ireland. Even more systematic comparisons, such as the OECD tables on replacement rates, suggest that UK replacement rates are much lower than Ireland's. But there are other factors which are not well accounted for in these approaches. Housing Benefit is a very important component of the UK's welfare system, and is received by about half of the UK's unemployed. Ireland's housing support, Rent and Mortgage Supplement, is received by only 1 in 8 of Ireland's unemployed. Microsimulation estimates take this into account, along with the detailed income and family circumstances of each employed and unemployed individual.

Table 7 below reports the results obtained by Callan et al for Ireland and by Adam and Browne (2010) for the UK. We focus first on the findings for non-workers. A higher proportion of UK non-workers are found to have high (above 70 per cent or 80 per cent) replacement rates. A higher proportion of Irish non-workers have very high (above 90 or 100 per cent) replacement rates. The latter finding has much to do with the Rent and Mortgage Supplement, which offers housing support to those not in work, but not to those in work. This is associated with more than 6 out of 10 of the replacement rates above 100 per cent.

Table 7 Incidence of High Replacement Rates, Ireland and the UK

Workers	**Workers**		**Non Workers**		**All**	
% with replacement rate above	UK 2009-10	Ireland 2012	UK 2009-10	Ireland 2012	UK 2009-10	Ireland 2012
70%	21.8	19.6	37.2	32.7	26.1	23.5
80%	11.4	11.4	20.0	17.2	13.8	13.1
90%	3.8	6.5	5.0	9.5	4.1	7.4
100%	0.3	4.5	0.2	4.4	0.3	4.4

Sources: UK: Adam and Browne (2010), Figure 2.5
Ireland: Authors' estimates using SWITCH model based on SILC 2010.

Results for workers, and for all cases, show a similar pattern: Ireland with slightly lower proportions having high replacement rates and higher proportions with very high replacement rates. These results are very different from what the headline payment rates and example households suggested. The value of having a survey and a tax-benefit model to obtain a representative picture are clear. Policy based on examples rather than a representative picture could easily be misled.

7. CONCLUSION

This paper has set out some of the technical components required to construct a working tax-benefit model which can be used for policy analysis. Building from a large-scale nationally representative survey (SILC 2010), we show that weighting adjustments are needed to provide a better representation of the income tax base. This is accomplished using published income distribution information from Revenue, and the CALMAR weighting program. Detailed simulation modelling of the existing income tax and social welfare codes is needed to provide a baseline analysis, and then to permit exploration of policy options.

Two key results were reported in our applications. First, we found that results on the distributive impact of tax and welfare policy over the 2008-2012 period were similar whether based on actual 2010 data (which incorporate much of the impact of the recession) or on 2008 data, with reweighting and (downward) income adjustment. Given the extraordinary changes over the 2008 to 2010 period, this represents a very striking result. Second, we show that the incidence of high replacement rates in Ireland (measuring the balance between in-work and out-of-work incomes) is quite similar to that in the UK. This is very different from what simpler comparisons, which do not have the benefit of nationally representative data, would have us believe. This contrast emphasises the importance of using tax-benefit models based on large-scale surveys to analyse national policy and make accurate international comparisons.

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VOTE OF THANKS PROPOSED BY MARION McCANN, CENTRAL STATISTICS OFFICE

Ladies and Gentlemen it is my pleasure to propose the vote of thanks to Tim Callan, Clare Keane, Michael Savage, John Walsh and Kevin Timoney on their very interesting paper. In discussing the paper, I will deal with three issues:

- The value of good quality data
- Interconnectedness
- Policy related issues

I will also draw attention to a few aspects of the paper, where with further clarification, I would suggest, the paper would be improved somewhat. These are not major, but nevertheless they are worth mentioning.

The value of good quality data

Firstly, I would like to congratulate the ESRI and the authors on the detailed and thorough work that has been done to rebase the SWITCH model. I'm sure there were some difficult times during the project. SILC, like all household surveys is expensive to compile, so from a CSO perspective it is gratifying to see the data being put to good use. In its own right, SILC has proven itself as an invaluable tool for informing both public and policy makers alike about the trends in income, income distribution, poverty and deprivation. Consequently, it enjoys a relatively high profile.

But the role of SILC in feeding sophisticated models such as SWITCH is perhaps not as obvious. So this paper serves a very useful role in outlining the important role that SILC plays in SWITCH. I congratulate you and your co-authors on describing the model and its potential so well. The paper also shows clearly the importance of using a nationally representative dataset, in this case SILC, and thereby illustrates the broader importance of good quality official statistics.

CSO plays a key role in feeding SWITCH through the provision of detailed microdata. Thus it is important to acknowledge the importance of the Research Microdata Files (RMF) service that CSO has put in place, provided for by the Statistics Act, 1993. The conditions and obligations associated with RMFs are strict but absolutely necessary as these protections safeguard the confidentiality of individual persons and households. Again, in these straitened times, it is important to recognise the resource burden RMFs impose on CSO, but we recognise that the provision of these data is critical if policy formulation is to be informed.

Interconnectedness

The paper highlights how SILC is dependent on information from Census of Population and Quarterly National Household Survey (QNHS) in order to design representative samples and to weight to the overall population.
As the paper illustrates, SILC data for SWITCH is further re-weighted using information from the Dept of Social Protection and the Revenue Commissioners. It is possible to reweight SILC data to facilitate this type of detailed analysis with a specific focus. This highlights both the complexity of the SILC survey but also illustrates that the suite of CSO household surveys, along with the use of administrative data, are all mutually supporting. Furthermore, given the complexity of household social and economic transactions today, these surveys may not always be sufficient in themselves. By having a suite of household surveys, researchers and policy makers can begin to make sense of our world.

The Household Budget Survey (HBS) is another important pillar of the household survey suite, not mentioned in the paper, but worthy of mention, particularly as expenditure data provide the flip side of the equation to income data. I'll say more about this shortly. There will also be the Wealth Survey, run by CSO, which is due to go into the field in 2013, which could be considered. The more of these connections we understand, then the better the chance that we can inform decisions wisely.

Policy related issues

Tim Callan has outlined the power of the SWITCH model for testing policy alternatives. In the paper the example of property tax is highlighted. While the power of SWITCH is clear for calculating the effect of a property tax on households, perhaps it might be unwise to design a taxation policy based on income alone. We see this already in SILC with the incidence of deprivation rising for persons who are not deemed to be at risk of poverty, or income-poor. People now have high personal financial commitments, even those with relatively high income.

Furthermore, a recent paper by Durkan and O'Hanlon in this summer's edition of the Quarterly Economic Commentary, which used Household Budget Survey data, highlighted that certain age cohorts, irrespective of their income, are struggling to cover their living costs and meet their financial obligations – in particular their mortgage. One of the implications from their research is that any remaining savings are at the mercy of interest rates.

Similarly, childcare costs and commuting costs are significant for some age cohorts. Again, it might be wise to consider integrating HBS expenditure data into the SWITCH model to give more tailored analyses and recommendations. The detailed 2010 HBS will be available next week and the aggregates were published in March 2012. The next HBS will be conducted in 2015 but thereafter, it is the intention of CSO to move to a continuous collection model which would make data available on an annual basis. Thus, it might be sensible that any recommendations regarding property tax take into consideration both incomes and expenditure patterns of households.

Improvements or clarifications
As I noted at the beginning, there are a few aspects, if altered or clarified in the paper would I feel, improve the paper. The concept of 'Replacement rates' are introduced early in the paper but not defined until later. For the non-specialist reader it would be useful to define this concept earlier. *It might also be useful (and certainly interesting to know) if the derivation of the 'replacement ratios' has improved now that the SWITCH model has been rebased.* On a related issue, one wonders if there are additional complications in calculating 'replacement ratios' for the self-employed? I say this because self-employed are not entitled to Social Welfare payments and also these people would not necessarily be easily classified into income groups based on education and age, when calculating replacement rates.

The paper makes a number of references to the potential of SILC to address data gaps relating to property tax. While it is not exactly clear what is being suggested, the impression is that SILC might in future collect additional data relating to property. I would argue that there are better sources for many of these data. In time as new datasets become available, most recently the PRSA House Price Register, these data may be linkable to the SILC. Of course, SILC does collect information on house price, mortgage repayments, house size, urban/rural identifiers and region which would be of some use in this regard.

Conclusion
To conclude, I would again like to congratulate Tim Callan and his co-authors on a stimulating and very relevant paper. It is my great pleasure to propose the vote of thanks. Thank you.

DISCUSSION

Steve MacFeely:- I would like to congratulate the authors on a thought provoking paper and presentation. In your presentation, you noted that the SWITCH model is given out to policy departments, allowing them to test scenarios and helping them to inform policy decisions. One wonders, considering the point raised by Marion McCann in her remarks about how one might sensibly look at poverty from both an income and an expenditure perspective, whether it is wise to provide a tool that only looks at one side of the equation? For example, a property tax designed exclusively from an income perspective might not properly take account of affordability, leading to real implementation problems downstream.

John Dunne:- The paper described the various sources and their limitations with respect to the SWITCH model. If you could have a wish list of data sources that could be used what would be high on that list?

Pamela Lafferty:- On the use of HBS expenditure data - As SILC data shows households are struggling to make ends meet and I wonder is the value of the SWITCH model limited by the fact that it cannot fully take account of the ability of households to pay additional taxes? HBS data may offer some insight into the amount of committed expenditure (e.g. mortgage/child-care/travel costs) different types of households have, in turn highlighting the ability of households to pay additional taxes. On childcare costs**,** the primary focus of the SILC survey is the collection of information on income and living conditions. I wonder how the authors/ if the authors validated information on child-care costs and property values which were taken from the SILC data? As to **weight,** the SILC weight is calibrated using 4 classifications and I wonder how the authors managed to add additional classifications to the calibration process given cell size limitations? Does the weight remain robust at the original 4 classifications?

Gregg Patrick:- The SWITCH model seems to assume that the employed and unemployed are just as likely to have a car. Therefore the only overheads for commuting to work for those who drive are the fuel costs, based on the National Travel Survey mean distances. The purchase price of the car, depreciation, tax, insurance, tolls, parking and servicing costs do not appear to figure. I would have expected that the reason many people buy a car is simply to get to work (they may indeed retain their car if they subsequently become unemployed, but this may be because they have already paid for it and its resale value is typically a small fraction of this cost). Perhaps a better way of estimating the cost of travel to work is to assume that everyone pays the equivalent cost of public transport. In the majority of cases, this would probably be more than the fuel costs of driving a car but less than the total costs of car usage. Arguably, the differential between the cost of public transport and the total usage costs would account for the lifestyle or non-work related element of car usage.

Originally, in a working paper on its website, the ESRI estimated that 44% of working people with children would be better off on welfare. This paper estimates that just 14% of such people would be better off on welfare. Was the original estimate not based on the SWITCH model? If so, what data, parameters or assumptions have changed in the model to produce this very significant revision?