7 March 2016

Technical report:

Measuring the economic impact of a reduced rate of Corporation Tax in Northern Ireland

Ulster University Economic Policy Centre

Contents

1. Disclaimer

The analysis contained within this technical report is based upon the UK Government's Corporation Tax policy published in Budget 2015[1] and expenditure plans published in the 2015 Autumn Statement.

Following completion of this technical report, the UK Budget 2016 announced a further reduction in the UK Corporation Tax rate to from 18% to 17% in 2020. This will reduce slightly, the costs, benefits and net impact of implementing a reduced rate of 12.5% in NI from 2018.

It is planned that a revised summary paper will be issued later in 2016 when costs become available from the UK Government.

[1] UK Corporation Tax rate of 20% during 2016 & 2017, 19% during 2018 & 2019 and 18% from 2020 onwards.

2. Introduction

The NI Executive has committed to implementing a 12.5% rate of Corporation Tax in NI from 1st April 2018 as part of the Stormont Agreement and implementation plan[2] published on 17 November 2015.

The Ulster University Economic Policy Centre (UUEPC) report on the economic impact of implementing a lower rate of Corporation Tax in NI for DETI employs a fully updated version of the model used for the Economic Advisory Group (EAG) report published in May 2011[3].

The updated Corporation Tax model is linked to the UUEPC model of the Northern Ireland economy whereas in the EAG work the model was linked to the Oxford Economics suite of models. The UUEPC Corporation Tax model has been fully updated with the latest information and provides a clear and logical approach to determining the various behavioural effects of the distinct groups of firms within the economy that will be impacted by the implementation of a reduced rate.

In summary, the groups that will be affected are;

- New FDI attracted to the region as a result of the lower Tax;
- Domestically owned firms with additional retained profits as a result of the reduction;
- Foreign owned firms already located in NI with additional retained profits as a result of the reduction;
- Domestic firms gaining business as an indirect result of the above; and
- The Public sector - by reducing expenditure as a result of the adjustment to public finances in NI.

The model makes no attempt to assess the impact on firms or organisations outside NI.

In this technical report each of the methods used in each of the steps of the model are set out in detail.

[2] http://www.northernireland.gov.uk/a-fresh-start-stormont-agreement.pdf
[3] EAG "The impact of reducing Corporation Tax on the NI Economy"
http://www.eagni.com/fs/doc/publications/impact-of-corporation-tax-on-ni-eag-report-final-report.pdf

3. UUEPC macro model

The Centre for Business Research at the Cambridge University, Judge Business School has, with support from UUEPC, developed a macro-economic model of the UK economy based on Keynesian modelling principles (henceforth UKMOD). It focuses on demand and is based on equations for each of the components of aggregate demand, which are;

- Consumer spending;
- Investment;
- Government spending; and
- Trade.

A detailed manual has been published[4] which documents the full UK model and list the equations and identities which drive the forecasts. Critically, the UK model differs from standard forecasting models (including the model used by the Office of Budget Responsibility) in that is does not include any concept of 'a stable long-term trend growth path' to which the economy converges. In the OBR model, for instance, the economy is assumed to converge to a long-term growth path for GDP (of around 2.3% pa) from wherever the economy is currently judged to be relative to this growth path.

The underlying theory is that free markets quickly move to ensure full utilisation of labour and especially capital. In the UKMOD model the growth of capital is not independently assumed but instead reflects the demand for new investment. This difference is extremely important when considering Tax changes as the long term implication of a trend based model is that any policy change will ultimately be 'absorbed' by the market and after a period of adjustment, trend growth will always be the same in the long-term. The impact of any tax change will always be minimal after two or three years.

fThe Northern Ireland model is a labour market model linked to the UKMOD macro model. It contains estimates for productivity, employment and GDP for 20 sectors over a 30-year period. The NI model is similar in nature to the regional models in use elsewhere. It does not yet contain a full Input-Output framework but rather uses location quotients to link aspects of economy (retailing links to consumer spending, construction links to overall growth etc.). Given the volatility of regional data and the lack of up-to-date Input-Output tables for NI, this is a reasonable and logical modelling approach at the regional level. The publication of an updated set of Input-Output tables for NI by NISRA later in 2016 will be incorporated to enhance the capability of the model, becoming a fully functioning macro model of the NI economy.

[4] http://www.cbr.cam.ac.uk/fileadmin/user_upload/centre-for-business-research/downloads/working-papers/wp472.pdf

4. The UUEPC Corporation Tax model

The UUEPC Corporation Tax model is a spreadsheet model which uses sectoral GVA and employment forecasts from the UUEPC Northern Ireland model as its starting point. This is the same approach as was used in the EAG research. This spreadsheet model estimates the impact of implementing a reduced rate of Corporation Tax on each group in the economy and aggregates the relevant effects. It is not a scaled down UK macro-model which would be inappropriate as the NI's regional economic conditions are materially different from those facing the national economy and therefore the effects will be different. It does not have the feedback loops and simultaneity of a full macro-economic model and therefore lacks some of the behavioural complexities and interdependencies. The potential risks that this approach builds in are discussed at the end of this technical paper.

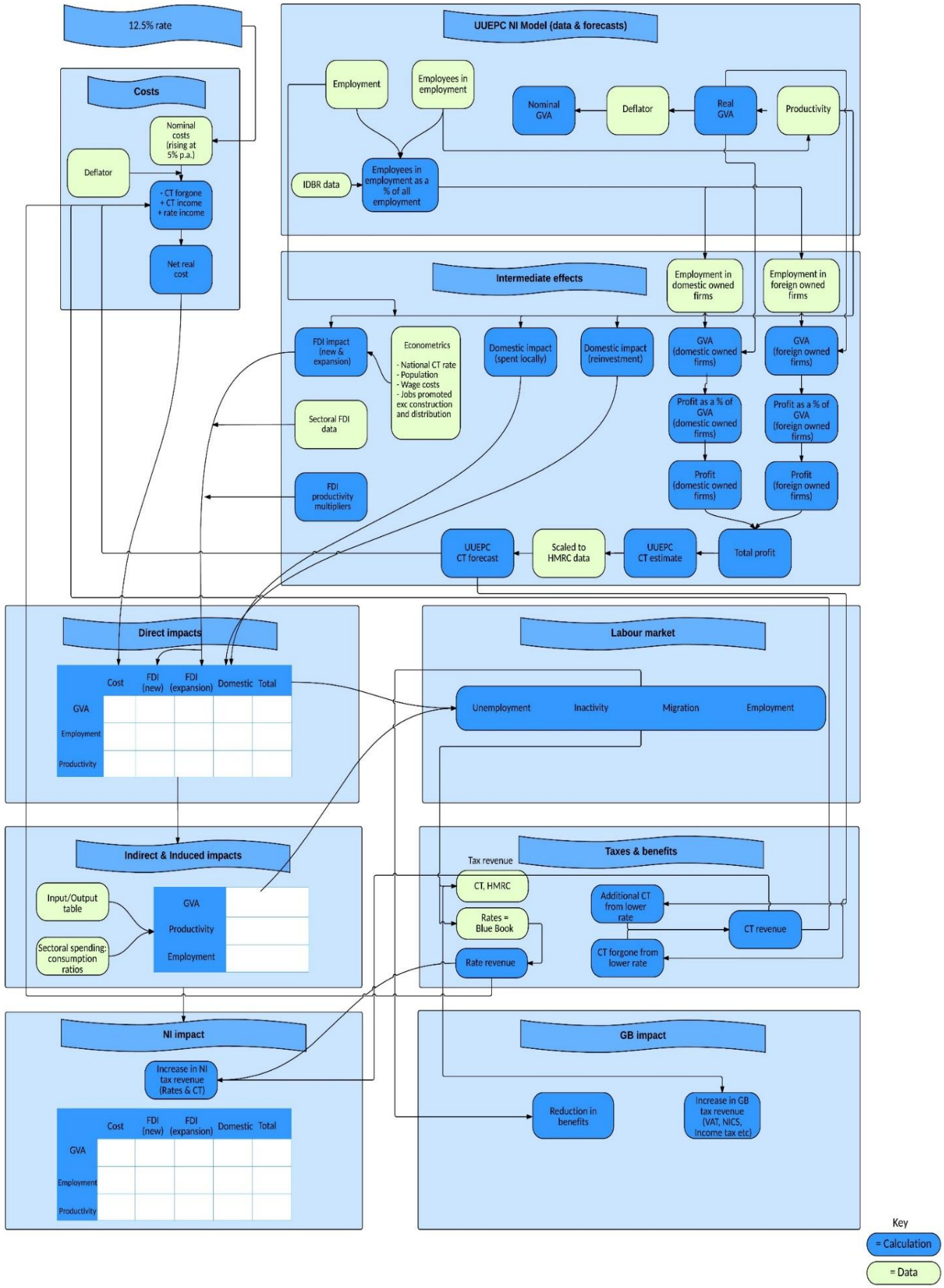
4.1. Methodological summary

The structure of the Corporation Tax model is broadly the same as that used in the ERG and EAG Corporation Tax reports. Figure 3.1 provides a detailed overview of the methodology employed in the model. The following sections of this report then describe the critical components in more detail.

The model comprises of a number of interlinked components. They are;

- **UUEPC NI model**
  As discussed above this model acts as an overarching framework under which the various components of the Corporation Tax model operate.
- **Intermediate effects**
  The impacts on domestic firms, Existing FDI and flows of new FDI are modelled separately (see below). Published HMRC data is used to scale estimates of the existing taxes paid that are calculated separately for domestic and foreign owned firms (to allow impacts on these two groups to be modelled separately).
- **Public expenditure implications**
  Implementing a lower rate of Corporation Tax in NI will result in a reduction in the block grant from Westminster. The impact of this is assumed to fall predominantly on the public sector and contractors (though other methods of 'paying' for the policy would be possible to model).
- **Direct employment impacts**
  Published evidence and econometric analysis suggests that lower rates of Corporation Tax will result in increased FDI inflows. A reduction in the Corporation Tax bill for domestic companies will leave them with additional profit, some of which is likely to be re-invested in the NI economy. The model includes forecasts for both increased FDI and domestic job creation.
- **Indirect and induced effects**
  Increases (or decreases in the early years of the policy) in FDI and domestic employment will generate supply chain and wage effects as companies make additional purchases within NI and employees spend their wages on goods and services.
- **Labour market effects**
  Increases in employment are sourced from other employment, the unemployed, the economically inactive, or migration. As economic activity increases the job chain effects draw some of the additional labour from the economically inactive and unemployed, increasing the size of the labour market in NI.
- **Taxes and benefits**
  The additional economic activity generated by the implementation of a lower rate of Corporation Tax will be expected to broaden the tax base in NI over the longer term. As a result, the NI Executive can be expected to benefit from future growth in Corporation tax take and rates income generated as a consequence of additional economic activity. However, in line with the Stormont House Agreement, it is assumed that the Executive will not benefit from second round effects on other tax streams that are not devolved including Income Tax, National Insurance and VAT.

Figure 3.1 – Detailed methodology of the Corporation Tax model



Source: UUEPC

The methodological approach and assumptions employed in the model are discussed below.

4.2. Rate and date of implementation

The 12.5% rate is implemented in the model from 1 April 2018, in line with the Stormont House agreement and implementation plan[5].

4.3. Academic evidence

4.3.1. Comparison with academic literature on inward investment

A review of the economic literature confirms that a reduction in the rate of Corporation Tax will increase the amount of FDI into a host economy, although it is usually difficult to undertake rigorous comparisons since studies use different data and methods. One very useful attempt to circumvent these problems is a meta-analysis of 427 estimates obtained from a wide range of studies (de Mooij and Ederveen, 2008). This shows that studies based on physical FDI have higher impacts than those which include M&A activity. Similarly studies which use average CT rates show larger impacts than those which use marginal rates, and more recent studies find larger impacts than earlier studies. The authors estimate that the semi-elasticity for physical FDI, using effective average CT rates in recent studies is 8.3 (i.e. an 8.3% change in FDI for a single percentage point change in the CT rate). The table below shows how this is made up. A benchmark analysis used pre-1980 studies with financial data and effective marginal tax rates. The table below shows how refinements change the benchmark rate. An exclusive focus on physical investment (property, plants and equipment), excluding take-overs and mergers, for instance adds 1.99 to the semi-elasticity. The form of tax rate is ambiguous. Effective average rates (i.e. statutory tax rates adjusted for tax allowances) would add 1.88. For statutory rates alone, the study found that in international studies the semi-elasticity was reduced but in US inter-state studies it was enhanced. Finally, more recent (post-1990 studies had a higher semi-elasticity reflecting a tendency for firms to relocate production more often and to be more sensitive to tax rates.

Table 3.1: Semi-elasticity Coefficients from the Meta-Analysis[6],[7]

Variables	1 (M&E)	2 (M&E)	3 (M&E)	4 (OECD)	5 (OECD)
Benchmark	2.51	2.51	2.51	7.6	7.6
PPE	1.99	1.99	1.99	2.3	2.3
STR-US States	3.26				
STR-Countries		-1.56			
EATR			1.88		2.6
Post-1990	1.88	1.88	1.88		
Total	**9.64**	**4.82**	**8.26**	**9.9**	**12.5**

Sources: R A de Mooij and S Ederveen (2008) & OECD Tax Policy Studies

Notes: PPE = Property, plant and equipment (i.e. physical investment)
STR = Statutory Corporation Tax rates
EATR = Effective Average Corporation Tax rates

The semi-elasticity in our study is 10 using a semi-log specification. For a linear specification the semi-elasticity varies from 5 at a CT rate of 12.5% to 15 at a rate of 25%. The average in this range is this close to 10. Our semi-elasticities are thus a little higher than those obtained from the meta-analysis. We can expect our semi-elasticities to be generally higher than those in equivalent academic studies since we incorporate a further data refinement not found in the academic studies and use more recent data. The refinement is a focus on sectors not dependent on local demand, such as retailing. Firms in these latter sectors will locate primarily to exploit local markets, even though low CT rates may be an added

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/477664/A_Fresh_Start_-_The_Stormont_Agreement_and_Implementation_Plan.pdf

[6] R A de Mooij and S Ederveen (2008) Corporate Tax Elasticities. A readers guide to empirical findings. Oxford Review of Economic Policy Vol 24 No.4 2008

[7] OECD Tax Policy Studies no 17 Tax Effects on FDI p77.

advantage. We can expect low impacts from sectors such as retailing and they are excluded from our study. Mooij and Ederveen (2008) found that more recent studies have higher semi-elasticities. Since our study is more recent than any included in the meta-analysis it is reasonable to expect higher elasticities again. Hence we regard our elasticity as being broadly consistent with those in the academic literature. Our elasticity is also approximately in line with studies of the impact of CT rates across US states, which may be a relevant benchmark for NI which is a region within a larger state.

Elasticities are usually applied to the existing levels of tax and FDI. An elasticity of 10 means that FDI will increase by 10%, from the existing position, for each percentage point decrease in the corporation tax rate. This is a less appropriate procedure in Northern Ireland than in some other areas because FDI is already higher than would be expected from the existing (UK-wide) tax rate. The main reasons for the high existing rate of FDI in NI are two-fold. Firstly, the grant regime is generous by UK or EU standards and attracts new jobs to NI each year. Estimates of this impact are difficult to measure precisely given the issues surrounding deadweight but are likely to be in the order of at least 1,000 jobs per annum. This estimate would be consistent with NI's FDI jobs per 1,000 people levels compared to its expected level generated by either a liner or semi-log equation. Secondly, the Annual Survey of Hours and Earnings demonstrates that average wages are low by UK or Irish standards and this has helped to attract firms in sectors in which labour costs are critical, including for example, support services.

If we were to apply an elasticity to existing FDI levels this is equivalent to assuming that lower tax rates would increase the impact of grants and low wages. Since this may not be realistic we have applied a different approach. We use our equation for FDI to estimate the increase in FDI expected if the tax rate were reduced to 12.5% and wage rates remained the same relative to other countries. This increase is then added to the current level of FDI (which includes the impact of grants and other current locational incentives). In this way the pure impact of lower corporation tax rates are added to the existing impacts of grants and low wages. The level of wages in the NI economy is projected to change over time as the labour market improves and although no impact of firms leaving owing to this cost is modelled this does have the effect of moderating the flow of new FDI.

As noted above it is possible to estimate widely differing estimates of the impact of lower tax rates by using differing specifications of the FDI equation. A semi-log equation generates approximately twice as large an impact as the linear specification used in the EAG report. The reason for this is that in a semi-log specification the elasticities are multiplicative. An elasticity of 10 over three years increases FDI not by 30% as in the linear case but by 33% (obtained as 1.1 cubed, i.e. 1.1 raised to the power 3). The difference between the linear and log-linear specifications becomes large when the change in tax rate is large. A 10 percentage point change in the tax rate (with an elasticity of 10) would lead to a 100% increase in FDI jobs in the linear case but 260% (1.1 raised to the power 10) in the log-linear case. The log-linear specification would predict an extra 2,200 jobs a year from new FDI compared with 1,000 using the linear specification. As shown in figure 3.2 there is too little evidence of low tax economies to enable us to discriminate confidently between the two specifications. A cautious approach would be to use the linear (i.e. lower) specification. A compromise position would be to use an average of the two. It is worth noting that semi-log elasticities are the preferred approach in the literature.

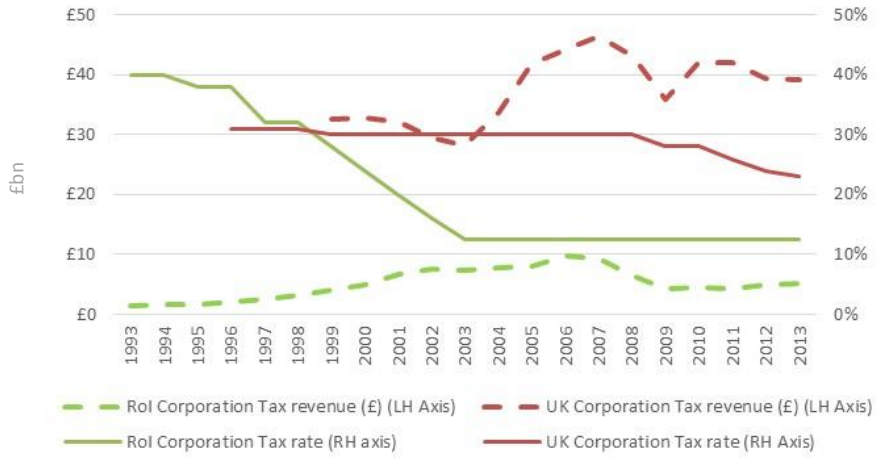
Recent research by the ESRI looked at the impact of corporation tax on the Irish economy.[8] The results are broadly in line with the figures used in the UUEPC model. The report estimates that the probability of a firm locating in the RoI is 3.12% at the current 12.5% corporation tax rate. The probability reduces to 1.43% at a Corporate Tax rate of 22.5% (pg. 35). In other words, going from 12.5% to 22.5% decreases the probability of locating in the RoI by more than half. The UUEPC model predicts an increase in the number of jobs by 1.9 on the linear model and 2.9 on the log-linear. The average of these is two approaches is 2.4. Allowing for the large difference in data and other methodological difference the results are roughly comparable for NI and the RoI.

[8] http://budget.gov.ie/Budgets/2015/Documents/Corp_Tax_and_FDI_Location_ESRI_Oct2014.pdf

4.4. UK and RoI Corporation Tax policy

The UK has now reduced Corporation Tax by ten percentage points since 2008. It is highly unlikely that the Government would have pursued such a strategy if it genuinely believed that lower rates of Tax would not benefit the economy. The recovery from the recession does make it difficult to distinguish the various effects and interpret the Tax data, but the experience of the UK and Ireland has been that when Corporation Tax rates were reduced, revenues increased, as demonstrated by figure 3.2.

Figure 3.2 – Corporation Tax revenues and Main Corporation Tax rates, UK and Ireland.



Sources: HMRC, Eurostat, Department of Finance, UK Forex, UUEPC

It is important to note that UK Corporate Tax revenues have moved in line with the economic cycle and have actually increased following the reduction in the rate since 2008. Irish Corporation Tax revenues increased during the 1990's as the main rate reduced to 12.5%, reducing as the recession hit the Irish economy in 2007.

4.5. FDI flows

An econometric equation is used to project the level of new inward investment attracted as a result of implementing a lower rate of Corporation Tax. The original equation used a unique dataset of new Greenfield inward investment data on new inward investment projects in 11 countries between 2003 and 2009 provided by FDI Intelligence, (expansion of existing investment is modelled separately). It was not possible to repeat this exercise with the latest available data. However, new inward investment data was provided by Invest NI (from FDI Intelligence) containing inward investment jobs across the 11 countries used in the original modelling work. As in the previous work a number of sectors were removed from this data since local demand rather than changes in the rate of Corporation Tax are the key determinant of investment (e.g. retailing, hotels and transport). In addition, data for real estate, finance and oil were removed as the data was considered to be likely to contain considerable merger and acquisition (M&A) activity, or because they were sectors excluded from the NI Bill. The exclusion of these sectors removed for this analysis does not invalidate the equation results, rather it is a more appropriate method of estimation focusing on the sectors that are eligible and will be impacted by the implementation of a lower rate of Corporation Tax.

It should be noted that the data used in this work is more appropriate for analysis of the impact of Corporation Tax rates than the data used in most academic studies. The latter typically use official statistics on financial flows. This is inappropriate since it usually includes large amounts of M&A activity which are unlikely to be heavily influenced by Corporation Tax rates since the advantage of low CT rates should be capitalised within the purchase price of an acquisition. Even if financial data could exclude M&A activity, it still includes a range of sectors such as retailing where local demand is the key attractor and where CT rates are unlikely to have a large impact. The same point is relevant to studies which use data

on the number of projects. These may exclude M&A activity but also give little indication of the size of the activity.

The new data (summarised below) contains a higher total of jobs than the original data. In NI for instance the annual job count is around double that in the earlier data. Since the earlier data closely matched Invest NI estimates of Greenfield FDI in NI, we assume that the new data includes employment in re-investment projects. The difference in data has little impact on the estimates of the impact of reduced tax in the model.

Table 3.2 – Inward Investment flows, 2008-2014, selected sectors

	Average FDI jobs per annum	Average FDI jobs per annum per 1,000 population
Singapore	17,900	3.5
Ireland	10,000	2.2
NI	2,300	1.2
Estonia	1,400	1.1
Iceland	200	0.6
UK	33,500	0.5
NZ	1,800	0.4
Switzerland	3,100	0.4
Finland	1,700	0.3
Sweden	2,000	0.2
Denmark	900	0.2
Austria	3,100	0.1
Total	**77,900**	**0.6**

Source: FDI intelligence
Note: Excludes, retail estate, warehousing, transport, energy, oil, real estate, finance and construction

The simple regression examines the FDI per 1,000 people as the dependent variable with labour costs and the Corporation Tax rate as the independent variables. The latter variables emerge as most important in most academic studies of FDI location[9]. More complex formulations could be explored with a more extensive dataset but this is extremely resource intensive and the complexities of creating a 'clean' dataset are considerable. The published literature examines a wider range of influences but few of these would, in our view, materially change the conclusions of the present study. Indeed, FDI Intelligence[10] identified 17 variables that may influence the level of FDI and worked their way down to four variables which had a statistically significant impact (Corporate Tax, market size, average labour costs and agglomeration effects).

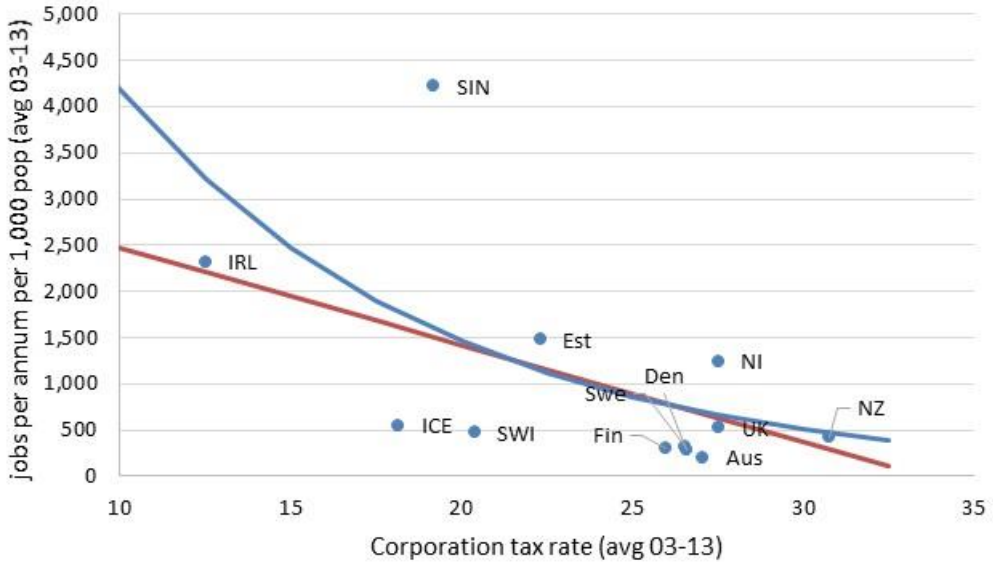
Our analysis depends on data for 11 countries. Data for a 12th country, Singapore, is also available but is excluded from the analysis due to large differences from the other (EU) nations, although inclusion does not affect the results significantly. A weakness in any analysis is the lack of evidence on countries with low CT rates. Only one country (Ireland) in our data has a rate below 15% and only two others (Iceland and Singapore) below 20%. Much thus depends on the experience of Ireland. It is helpful that Ireland shares many features with Northern Ireland, but we need to be aware that the operation of Ireland's tax code is likely to favour transfer pricing to a greater extent than that in in the UK.

A range of permutations were tested in order to identify the equation with the best level of explanatory power. Both linear and semi-log equations fit the data equally well (see Figure 3.2 below – the solid line is a linear best fit and the curved line is a semi-log best fit) with highly significant relationships for the

[9] OECD tax Policy Studies no 17 Tax Effects on FDI p77.
[10] http://www.detini.gov.uk/attracting_fdi_corporation_tax.pdf?rev=0

impact of both CT and wages on FDI jobs. It is not possible to distinguish statistically between the two specifications due to the lack of data, especially for countries with low CT rates. A semi-log equation predicts that every one percentage point change in the CT rate will have the same proportionate impact on FDI jobs. Using the linear equation each percentage point change leads to an 11% change in FDI jobs created irrespective of whether this is a change from 10% to 11% or 30% to 31%. A linear equation predicts equal arithmetic changes for given increases or decreases in the CT rate. However, the proportionate changes in FDI jobs will be lower at higher CT rates when a linear equation is used. The semi-log specification is also typically used in academic studies of the impact of Corporation Tax. Table 3.3 presents the job impacts at different corporation tax levels and the semi elasticities for both the linear and log-linear equation permutations.

Figure 3.3 – Corporation Tax rate vs. average inward investment (promoted) per capita



Source: UUEPC

Table 3.3: Elasticities and job impacts at different Corporation tax rates, linear and log-linear equations

Tax rate (%)	Jobs		Semi elasticity	
	Linear	Log linear	Linear	Log linear
5.0	5,541	13,137	3.6	11.1
7.5	5,055	10,095	4.0	11.1
10.0	4,570	7,758	4.4	11.1
12.5	4,084	5,962	5.0	11.1
15.0	3,599	4,581	5.7	11.1
17.5	3,113	3,521	6.7	11.1
20.0	2,628	2,705	13.3	11.1
22.5	2,142	2,079	10.0	11.1
25.0	1,657	1,598	13.3	11.1
27.5	1,171	1,228	20.1	11.1
30.0	686	944	39.5	11.1

Source: UUEPC

There are arguments for both types of equation. A linear equation has been used in the model, mainly because the estimated impact of CT changes are lower erring on the side of caution. It is reasonable in this case to believe that UUEPC estimates are perhaps low and could be higher. The use of a semi-log equation would approximately double the estimates obtained from the linear equation shown in table 3.5.

Table 3.4 – Explanatory variables (linear equation)

	Average FDI jobs per annum per 1,000 population (2003-14)	Average Corporation Tax rate (2003-14)	Average wages, US = 100 (2003-13)
UK	0.5	27.5%	93.2
Austria	0.2	27.1%	112.4
Denmark	0.3	26.6%	129.6
Finland	0.3	26.0%	115.4
Iceland	0.6	18.2%	152.0
Ireland	2.3	12.5%	102.1
NZ	0.4	30.8%	54.4
Sweden	0.3	26.6%	122.3
Switzerland	0.5	20.4%	141.5
Estonia	1.5	22.3%	23.3
NI	1.2	27.5%	51.8
Singapore	4.2	19.2%	80.2

Sources: FDI: FDI Intelligence & Invest NI. Wages, US Bureau of Labor Statistics. Corporation Tax rate averages calculated from KPMG data.

Notes: Average Wages are "Indexes of hourly compensation costs in manufacturing, U.S. dollar basis – US = 100". NI data is not available and is estimated using NI:UK median wage ratio from ASHE.

Table 3.5 – Summary of Econometric results (linear equation)

	Statistic
Multiple R	90.5%
R Square	81.9%
Adjusted R Square	77.3%
Standard Error	3.478
Observations	11
F test	18.054

	Coefficients	Standard Error	t Stat	P-value
Intercept	48.630	6.823	7.127	0.000
Average Corporation Tax rate	-1.155	0.216	-5.342	0.001
Average Wages	-0.123	0.030	-4.110	0.003

Source: UUEPC

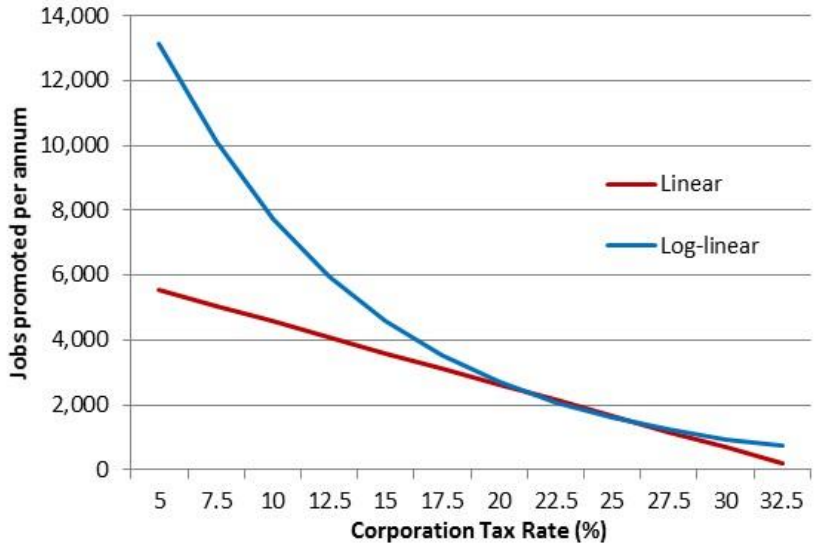
Note: Wages are the indices of hourly compensation costs in manufacturing, U.S. dollar basis - US = 100
The average CT rate is the statutory rate averaged over the period.

It is worth remarking how NI sits above the 'expected' lines for either equation in Figure 3.2. The difference between the actual number of jobs created and the predicted number of jobs is a little over 1,000. Our interpretation is that this residual represents the additional annual number of jobs created in new FDI projects achieved through the current support and grant regime.

As part of the forecast, the wages term (relative to US wages) is increased by 0.5% per annum to reflect a more competitive economy and a general rise in wages resulting from the arrival of higher value added activities. This increases the relative wage from 80% to almost 90% by 2033 which has the effect of moderating the flow of FDI over time. An increase in the global stock of FDI to compete for is projected by taking one quarter of the rate of growth in the World Trade Index (from Oxford Economics). This increase in stock will partially offset the wage effect. A range of assumptions were tested against the historic data to arrive at this assumption.

Using the semi log permutation of the equation would suggest that the public expenditure impacts are 'front loaded' and the benefits accelerate the lower rate becomes. If this equation is a better reflection of the likely trajectory of future FDI flows then the reductions in the UK rate will have incurred the 'cost' associated with the early stage of the reduction where the benefits are less and Northern Ireland would therefore enjoy greater benefits from the a reduction to 12.5% as it is further along the 'impact curve'. Figure 3.3 sets out the projected jobs promoted (note this would be factored down by 15% in the model to calculate jobs created) in Northern Ireland per 1,000 people at different corporation tax rates.

Figure 3.4: New FDI projections (jobs promoted) at differing corporation tax rates using linear and log-linear equations

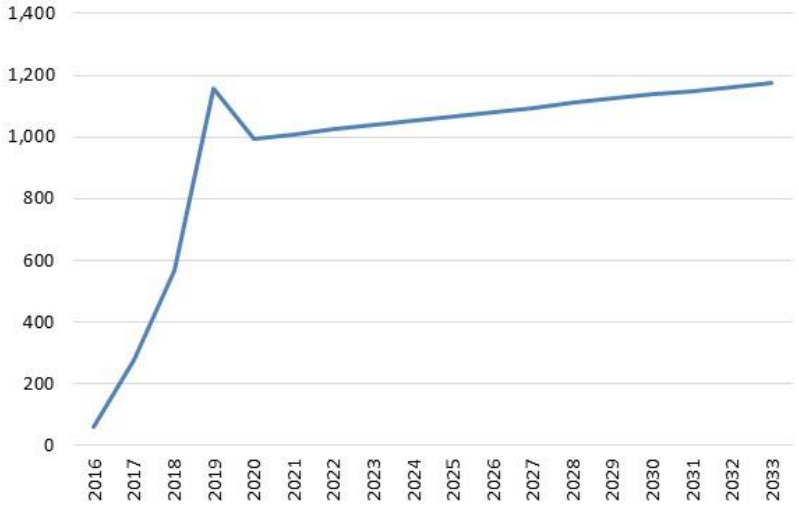


Source: UUEPC

4.5.1. FDI projections

The expected number of FDI jobs generated per annum is shown in figure 3.5.

Figure 3.5 – Annual inward investment jobs as a result of implementing a 12.5% rate of Corporation Tax in NI, 2016-33



Source: UUEPC
Note: Additional jobs are generated during 2018 and 2019 when the UK main rate of CT is 19%. In 2020 the UK rate reduces further to 18% and fewer jobs are expected to be created in NI as a result.

Forecasting the sectoral composition of new investment is complex, especially in the longer term when the sectoral make-up is likely to include sectors that are not in existence today. The basic approach to

arriving at a projection of Inward Investment was to examine the current structure in NI, the trends in Inward Investment by sector in the UK, NI and RoI over recent years. Many of the existing firms in NI are designated as cost centre for multinational companies and therefore are less likely to be impacted by the reduction in Corporation Tax. However, with a lower rate of Corporation Tax, these companies may reconsider their designation, becoming profit centres instead and focussing on higher value added activities. In any case, cost centres are included as part of the expansion of existing investment stock. UUEPC are aware that Invest NI & DETI have commissioned research to examine the potential sectoral impacts and skills requirements of future flows in more detail. The composition of investment is detailed below.

Table 3.6 – Sectoral composition of inward investment flows (2010-2014 average)

	UK	RoI	NI
Agriculture	0.0%	0.0%	0.0%
Mining	2.3%	0.3%	0.0%
Manufacturing	40.0%	27.2%	28.8%
Elect' & gas	0.0%	0.0%	0.0%
Water supply & waste	0.0%	0.0%	0.0%
Construction	0.0%	0.0%	0.0%
Wholesale & retail	0.0%	0.0%	0.0%
Transport & storage	7.1%	1.2%	3.2%
Restaurants and hotels	3.2%	0.4%	0.0%
Information & communication	13.9%	42.4%	24.1%
Finance & insurance	7.0%	11.8%	5.1%
Real estate	12.7%	0.1%	0.0%
Professional scientific & technical	0.2%	2.7%	0.2%
Admin' & support services	13.2%	13.1%	38.5%
Public admin & defence	0.0%	0.0%	0.0%
Education	0.0%	0.0%	0.0%
Health & social work	0.3%	0.4%	0.1%
Arts & entertainment	0.3%	0.4%	0.0%
Other service activities	0.0%	0.0%	0.0%
People employed by households	0.0%	0.0%	0.0%
TOTAL	100.0%	100.0%	100.0%

Source: UUEPC

Table 3.7 details the sectoral flows for selected years. The sectoral shares are adjusted over the forecast period to become more similar to the RoI profile.

Table 3.7 – NI sectoral shares, UUEPC model, selected years

	2010- 2014 average	2014	2033
Agriculture	0.0%	0.0%	0.0%
Mining	0.0%	0.0%	0.4%
Manufacturing	28.8%	17.9%	22.6%
Elect' & gas	0.0%	0.0%	0.0%
Water supply & waste	0.0%	0.0%	0.0%
Construction	0.0%	0.0%	0.0%
Wholesale & retail	0.0%	0.0%	0.0%
Transport & storage	3.2%	3.4%	4.8%
Restaurants and hotels	0.0%	0.0%	0.2%
Information & communication	24.1%	20.2%	29.6%
Finance & insurance	5.1%	0.2%	6.1%
Real estate	0.0%	0.0%	8.0%
Professional scientific & technical	0.2%	0.0%	16.9%
Admin' & support services	38.5%	58.3%	11.3%
Public admin & defence	0.0%	0.0%	0.0%
Education	0.0%	0.0%	0.0%
Health & social work	0.1%	0.0%	0.0%
Arts & entertainment	0.0%	0.0%	0.0%
Other service activities	0.0%	0.0%	0.0%
People employed by households	0.0%	0.0%	0.0%
TOTAL	100.0%	100.0%	100.0%

Source: UUEPC

Note: Finance and insurance is included in the sectoral mix as only a small element of activity within this sector is excluded from benefitting from a lower rate

The productivity of new inward investment is also likely to be higher than the existing stock. To account for this an analysis was carried out using Eurostat productivity data, in order to assess NI's sectoral productivity in relation to the Republic of Ireland. The following results were used to inform the sectoral uplifts applied to the new FDI flows:

Table 3.8 – RoI sectoral productivity relative to NI

	Average
Administrative and support service activities	1.39
Professional, scientific and technical activities	1.17
Real estate activities	0.61
Information and communication	2.46
Accommodation and food service activities	1.33
Transportation and storage	1.22
Wholesale and retail trade; repair of motor vehicles and motorcycles	1.39
Construction	1.17
Water supply; sewerage, waste management and remediation activities	0.89
Electricity, gas, steam and air conditioning supply	1.10
Manufacturing	3.16
Mining and quarrying	3.62

Source: Eurostat & UUEPC

The final productivity uplifts used in the modelling are as follows:

Table 3.9 – Productivity uplifts employed for new FDI jobs

	Multiplier
Agriculture	1.5
Mining	2.0
Manufacturing	3.0
Elect' & gas	1.3
Water supply & waste	1.3
Construction	1.3
Wholesale & retail	1.3
Transport & storage	1.5
Restaurants and hotels	1.5
Information & communication	2.5
Finance & insurance	2.0
Real estate	1.3
Professional scientific & technical	1.3
Admin' & support services	1.5
Public admin & defence	1.3
Education	1.3
Health & social work	1.3
Arts & entertainment	1.3
Other service activities	1.3
People employed by households	1.3

Source: UUEPC

4.6. Reinvestment of retained profits (domestic and foreign owned firms)

As a result of a lower tax rate, existing firms will have additional retained profits that can be re-invested, saved or retuned to owners / shareholders. An estimate of profits was arrived at using ABI data and the level of Corporation Tax paid was estimated using current rates with the final results scaled to the published Corporation Tax estimates. This approach projected an effective tax rate of about 8%, down from almost 12% in 2006/07 (meaning that roughly 8% of profits are paid in Corporation Tax) which concurs with published research in this area. The estimates of Corporation Tax paid by sector are detailed below.

It should be noted that these calculations are based on HMRC estimates of aggregate Corporation Tax revenue. Hopefully, in advance of implementing a lower rate, actual Corporation Tax revenue data will be gathered and published, which will allow this analysis to be revisited. At present only manufacturing, transport and storage have a higher assumed proportion of profits within GVA in foreign owned companies due to limited data to explore other sectors, though this assumption has only modest impacts on the final results.

Table 3.10 – Estimates of proportion of GVA that is profit, foreign and domestic owned firms

	Estimate of proportion of GVA that is profit in Foreign owned companies	Estimate of proportion of GVA that is profit in Domestically owned companies
Agriculture	67%	67%
Mining	21%	21%
Manufacturing	42%	25%
Elect' & gas	62%	62%
Water supply & waste	45%	45%
Construction	25%	25%
Wholesale & retail	29%	29%
Transport & storage	29%	18%
Restaurants and hotels	21%	21%
Information & communication	31%	31%
Finance & insurance	31%	31%
Real estate	2%	2%
Professional scientific & technical	31%	31%
Admin' & support services	23%	23%
Public admin & defence	0%	0%
Education	2%	2%
Health & social work	6%	6%
Arts & entertainment	22%	22%
Other service activities	12%	12%
People employed by households	1%	1%

Source: Annual Business Inquiry

Table 3.11 – Profit and Corporation Tax estimates by sector, 2014

	Profits (£m)	Estimated Corporation Tax (£M)
Agriculture	£228	£18
Mining	£10	£1
Manufacturing	£1,391	£110
Elect' & gas	£151	£12
Water supply & waste	£148	£12
Construction	£437	£35
Wholesale & retail	£1,351	£107
Transport & storage	£211	£17
Restaurants and hotels	£181	£14
Information & communication	£352	£28
Finance & insurance	£445	£35
Real estate	£55	£4
Professional scientific & technical	£412	£33
Admin' & support services	£234	£18
Public admin & defence	£0	£0
Education	£58	£5
Health & social work	£200	£16
Arts & entertainment	£92	£7
Other service activities	£74	£6
People employed by households	£0	£0
TOTAL	**£6,030**	**£476**

Source: HM Revenue & Customs, IDBR, UUEPC

The assumption used for modelling purposes was that both foreign and domestic owned firms would re-invest one third of their retained profits. In addition, one third of domestically owned firm's profits would be spent in the local economy (as a result of greater profits for owners / staff bonuses). This is a relatively arbitrary assumption and other proportions could easily be justified. The sectoral distribution of foreign

firms is shown in table 3.12. These assumptions could be considered very conservative as, in surveys and consultation, firms have suggested a much higher inclination to reinvest (for example results from an interactive poll by EY at a breakfast meeting in January 2015 suggested 71% of firms would re-invest additional profits, albeit from a small sample) but it was felt these responses would be biased by the desire to secure the lower Tax and were therefore not considered in arriving at the assumption.

The proportion of firms that are foreign and locally owned was calculated, by sector, using data from the IDBR.

Table 3.12 – Share of foreign owned firms, by employment, 2013

	Proportion of employees working for FDI firms
Agriculture	0.4%
Mining	-
Manufacturing	35.1%
Elect' & gas	48.4%
Water supply & waste	8.9%
Construction	7.5%
Wholesale & retail	17.8%
Transport & storage	15.5%
Restaurants and hotels	5.8%
Information & communication	34.0%
Finance & insurance	55.3%
Real estate	3.1%
Professional scientific & technical	4.9%
Admin' & support services	23.3%
Public admin & defence	0.0%
Education	-
Health & social work	4.5%
Arts & entertainment	1.4%
Other service activities	1.5%
People employed by households	0.0%
TOTAL	**13.1%**

Source: IDBR, UUEPC
Note: "-" indicates that data has been suppressed to avoid disclosure of individual firm information

The final estimates of the additional profits reinvested and the jobs that result from the model are detailed below in table 3.13. The impact of additional expenditure by domestic owned firms retained profits are covered in the induced effects section.

Table 3.13 – Reinvested profits and associated jobs created, domestic and foreign owned firms, selected years

	2018	2019	2020	2025	2033
Domestic reinvested	£49.0	£50.0	£51.0	£56.7	£67.4
Domestic jobs created (cumulative)	359	605	857	2,197	4,668
Foreign reinvested	£18.6	£19.0	£19.5	£22.1	£27.7
Foreign jobs created (cumulative)	90	182	277	788	1,770

Source: IDBR, UUEPC

The jobs estimates for re-invested profits are based on a crude assumption that one job results from £200,000 of investment (£500,000 in utilities), based on analysis of the UK Blue Book. Figures from the 2014 Blue Book suggest a capital stock per employee ratio of 160K for manufacturing and finance and 40K for professional services. A higher estimate is used to reflect greater capital intensity in new investments. This estimate errs on the conservative side. There is likely to be a greater variation across sectors and the figures may well be a conservative estimate of jobs created. As a general frame of reference the evaluations of various grant schemes in NI suggest much higher levels of jobs creation for a given level of investment. For example, the Selective Financial Assistance evaluation[11] reports that the scheme cost £275m from 2004 – 11, creating 21,250 jobs and safeguarding 9,750. The resulting cost per job is £12,941 using only jobs created, or £8,871 using both created and safeguarded.

The productivity of the jobs generated in existing firms is set at the sectoral average which is likely to understate the impact as the additional investment should not only create employment but increase productivity.

4.7. Public expenditure implications

The policy 'cost' is in terms of a reduction to the block grant from Westminster to the NI Executive. This is a subject that has generated considerable debate and remains the topic of engagement between the UK and NI Governments. The Fresh Start Stormont Agreement and Implementation Plan states that "***The Executive attaches importance, on the basis of fairness and proportionality, to Northern Ireland bearing the full costs and receiving the full benefits of the devolution of Corporation Tax consistent with the Azores criteria.[12]"*** As such, the impact of Corporation Tax devolution on the block grant and how that will take hold are yet to be agreed. Any revisions to costs and benefits of the policy will likely have an impact on the outcomes generated by the UUEPC Corporation Tax model.

At the time of writing, the detailed mechanism for calculating the costs and benefits and the definition of what is included in full costs and full benefits have not yet been made. Nevertheless, the UK Government has provided broad estimates of the public expenditure implications of reducing the NI rate to 12.5% over the period 2018-19 to 2020-21. DFP has rolled these estimates forward to 2022-23 to reflect further the impact of the reduction in the UK rate to 18% which is expected to take 3 years (until 2022/23) to take hold fully. UUEPC then calculate the net impact by offsetting the gross costs from HMT & DFP with estimates of the additional corporation tax receipts and rates income that are expected as a result of the additional economic activity that is generated.

Income Tax, National Insurance, VAT and other taxes are not used to rebate against the NI Public Expenditure implications of Corporation Tax reduction in line with the position set out in the Stormont House Agreement. On the basis of these calculations, it is expected that the real net annual average public expenditure implications are £165m including additional Corporation Tax and Rate revenue from additional economic activity, or £190m excluding the Rate revenue[13]. The annual real and nominal net cost estimates are included in table 3.14.

[11] http://www.detini.gov.uk/executive_summary_-_sfa_evaluation.pdf?rev=0
[12] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/477664/A_Fresh_Start_-_The_Stormont_Agreement_and_Implementation_Plan.pdf

Table 3.14 – Public expenditure impact estimates used in the model (£M)

	2018	2019	2020	2021	2022	2023	2024	2025
Nominal	£110	£250	£256	£245	£240	£241	£242	£243
Real	£101	£226	£228	£215	£206	£203	£199	£196

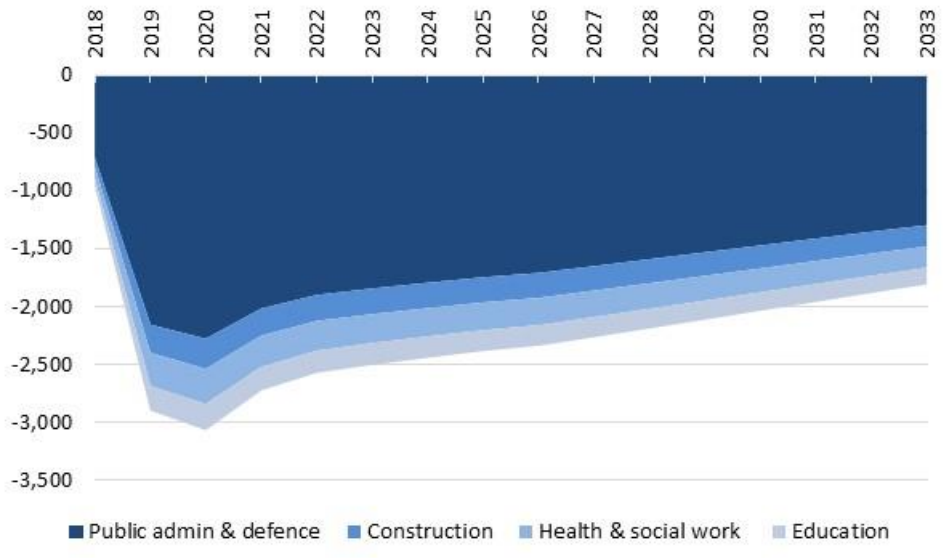
	2026	2027	2028	2029	2030	2031	2032	2033
Nominal	£243	£243	£242	£241	£240	£237	£235	£232
Real	£192	£188	£183	£178	£173	£168	£163	£157

Sources: UK Government from 2018-19 to 2020-21 (figures rounded to nearest £5m and are calculated on a receipts basis).
DFP estimates from 2021-22 to 2022-23 reflect further impact of the reduction in the UK rate to 18% which is expected to take 3 years (until 20122/23) to take hold fully
UUEPC estimates from 2023 onwards, based on DFP advice to use the latest OBR estimate of nominal GDP growth (4.5% per annum) to inflate costs and benefits
UUEPC estimates of Corporation Tax increases and extra rates income which arise as a consequence of the additional economic activity that is anticipated to flow from a reduced corporation tax are included from 2018 onwards

Note: Real figures are in 2012 prices

Costs are critical to the affordability this policy. Understanding how the mechanism for calculating the cost works is essential, particularly in the event of an increase in the UK rate or receipts which could escalate the cost to NI depending on the mechanism agreed. There is no clear direction at this point in time on how the cost of implementing a lower CT rate may be funded within NI, which it is expected, will be determined as part of the 2016 Programme for Government and related budgetary process. The assumptions employed in the model presume that funding comes directly from the block grant and they are applied to Public Admin and Defence, Education, Health and construction contracts (at a proportion of 80%, 5%, 5% and 10% respectively). There are other possible approaches that would create a different impact, for example reducing grants or rate reliefs to existing businesses, public sector pay cuts or increasing domestic rates but these have not been modelled at present. Figure 3.7 illustrates the sectoral impact of employment reductions over time.

Figure 3.7 – Cumulative employment impacts of public expenditure reductions, 2018 – 2033



Source: UUEPC

The number of job losses increase in the early years in line with the profile of public expenditure reductions. Over the longer term, job losses reduce on an annual basis as the overall reduction in public expenditure remain stable and increased rates and Corporation Tax revenues counteract the rising gross cost to the block grant.

UUEPC have used the cost estimates provided and have not scrutinised the assumptions underpinning the figures nor been involved in the extensive and ongoing engagement between DFP and HM Treasury officials relating to the figures. The review procedures built into the Fresh Start Agreement are helpful to allow ongoing consideration of the elements of costs that cannot be certain in advance of implementation.

4.8. Taxation impacts

The EAG Corporation Tax model included the impact of a number of taxes that were used to 'offset' the cost of implementing a reduced rate. In effect, this reduces the net cost of the policy. The UUEPC model, reflecting the approach set out in the Stormont House Agreement, includes the offsetting effect of only Corporation Tax and Rates income to the gross costs. EAG included Income Tax and National Insurance in its calculations. Those wider tax impacts are estimated in the UUEPC Model as they give rise to an impact regardless of whether that accrues to the NI Executive/local NI Government, or to Whitehall. The tax impacts are largely in line with the overall GVA and employment effects and therefore are modest in the short run but larger the longer the policy is in effect. The approach taken by UUEPC to forecasting the tax receipts is relatively straightforward with the taxes linked to wider economic trends. UUEPC do not operate a detailed fiscal model and thus this impacts should be treated with caution.

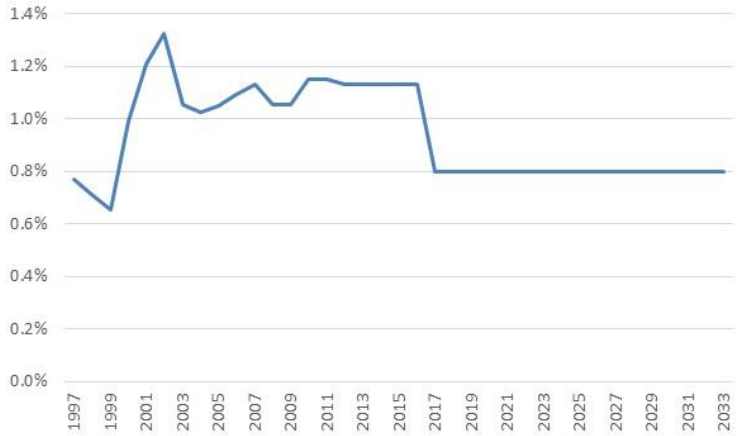
Table 3.16 – Summary of methods used to calculate changes in tax revenue

Tax	Method of calculation
Corporation Tax	Ratio of corporation tax receipts to total GVA, growing at a factor of 0.1pp per annum to account for increasing CT intensity
Income tax	Ratio of income tax receipts to total wage bill
National Insurance	Ratio of national insurance receipts to total wage bill
VAT	Ratio of VAT receipts to total GVA
Business rates	Ratio of non-domestic rate receipts to total GVA
Domestic rates	Ratio of domestic rate receipts to total GVA
Other taxes	Ratio of all other tax receipts to total GVA
Welfare savings	Number of employees moving from the unemployment or economic inactivity register multiplied by the average annual direct cost of unemployment benefits.

Source: UUEPC

Tax estimates are calculated (and presented below) but in considering costs, only Corporation Tax revenue and rates income should be rebated as these are retained locally (in the case of rates). Rates income is protected by linking to the overall GVA of the economy. It could be argued that rates and GVA may diverge as the profit centres attracted by lower tax will not require significant premises and thus incur a lower share of rates. The assumption employed in the model is that current trends continue, at a conservative level of 0.8%, as illustrated in figure 3.6.

Figure 3.6 – Rates income relative to GVA, 1997 – 2033



Source: UUEPC

Table 3.17 – Tax forecasts in real terms, selected years (£m constant prices)

	2018	2019	2020	2025	2033
Additional Corporation Tax from larger private sector	£0	£10	£20	£160	£690
Income tax	£0	£10	£20	£300	£1,370
National Insurance	£0	£10	£20	£230	£1,090
VAT	£10	£20	£50	£480	£2,320
Business rates	£0	£0	£0	£50	£230
Domestic rates	£0	£0	£0	£40	£170
Other taxes	£0	£10	£40	£340	£1,470
Welfare savings	£0	£0	£0	£60	£250
NI Taxation impacts	**£0**	**£10**	**£20**	**£250**	**£1,090**
UK Taxation impact	**£10**	**£50**	**£130**	**£1,410**	**£6,500**

Source: UUEPC

The 'GB impact' set out above is only the modelled impact on GB as a result of the additional economic activity in NI. If a proportion of this stems from displaced activity or transfer pricing, then the net impact on the GB economy would be more modest than set out in the table.

4.9. Inflation

Is included in the model at 2.0% per annum, for both wages and benefits, in line with the Bank of England inflation target.

4.10. Indirect effects

Indirect effects, essentially the supply chain impacts, are estimated using the experimental NI Input/Output (I/O) tables from NISRA. Updated official NI tables are due for publication in later in 2015 which will allow this analysis to be revisited. Indirect effects are calculated separately for new FDI, domestic firms and costs. This is to allow adjustment of the supply chain due to the highly probability that international firms will have a more global supply chain and hence a greater level of leakage out of NI.

As the I/O tables are used at the aggregate 20 sector level there are small adjustments required to account for the fact that the manufacturing attracted is likely to be different in sub-sectoral structure than the existing stock and hence the supply chains may differ. In particular, a large part of NI manufacturing is food processing which is expected to be only a modest beneficiary of lower Corporation Tax. Without

adjustments to control for this effect, the model would suggest a very large increase in the number of farmers in NI. The following adjustments are applied to account for leakages outside NI and impact on agriculture:

Table 3.18 – Adjustment to multiplier effects, by sector and component

	New FDI	Existing FDI	Domestic	Costs
Agriculture	0.25	0.25	0.50	1.00
Mining	0.50	0.75	1.00	1.00
Manufacturing	0.50	0.75	1.00	1.00
Elect' & gas	0.50	0.75	1.00	1.00
Water supply & waste	0.50	0.75	1.00	1.00
Construction	0.50	0.75	1.00	1.00
Wholesale & retail	0.50	0.75	1.00	1.00
Transport & storage	0.50	0.75	1.00	1.00
Restaurants and hotels	0.50	0.75	1.00	1.00
Information & communication	0.50	0.75	1.00	1.00
Finance & insurance	0.50	0.75	1.00	1.00
Real estate	0.50	0.75	1.00	1.00
Professional scientific & technical	0.50	0.75	1.00	1.00
Admin' & support services	0.50	0.75	1.00	1.00
Public admin & defence	0.50	0.75	1.00	1.00
Education	0.50	0.75	1.00	1.00
Health & social work	0.50	0.75	1.00	1.00
Arts & entertainment	0.50	0.75	1.00	1.00
Other service activities	0.50	0.75	1.00	1.00
People employed by households	0.50	0.75	1.00	1.00

Source: UUEPC

By way of summary, the following table summarises the basic multipliers (prior to the above adjustments) that result from the experimental I/O tables. The UUEPC model and DETI data is used for conversion from output to GVA and to employment levels to arrive at the employment multipliers from initial output data. Note that use of Scottish tables alters the sectoral multipliers only very modestly.

Table 3.19: Sectoral (output) multipliers (Type 1) resulting from the experimental NI I/O tables and UUEPC model

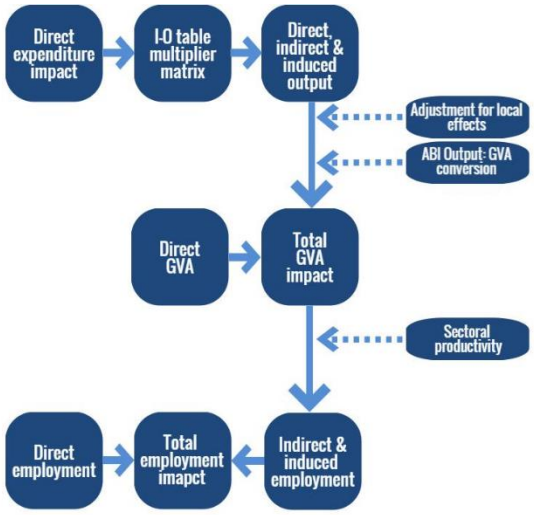
Sector	Type 1 Multiplier
Agriculture	1.68
Mining	1.67
Manufacturing	1.39
Elect' & gas	2.05
Water supply & waste	1.54
Construction	2.12
Wholesale & retail	1.69
Transport & storage	1.56
Restaurants and hotels	1.44
Information & communication	1.19
Finance & insurance	1.82
Real estate	1.28
Professional scientific & technical	1.28
Admin' & support services	1.26
Public admin & defence	1.76
Education	1.37
Health & social work	1.74
Arts & entertainment	2.09
Other service activities	1.35
People employed by households	1.00

Sources: NISRA experimental input / output tables & UUEPC

4.11. Induced effects

Induced impacts are the spending effects of the additional income generated by the increased employment in the economy. In the model this is supplemented by one third of domestically owned firms retained profits. Induced effects can be measured in a range of ways (including through input/ output tables or maintaining the share of spending dependent sectors in the economy). In this model they are calculated by using type 2 multipliers.

Figure 3.8 – Approach to modelling multiplier effects

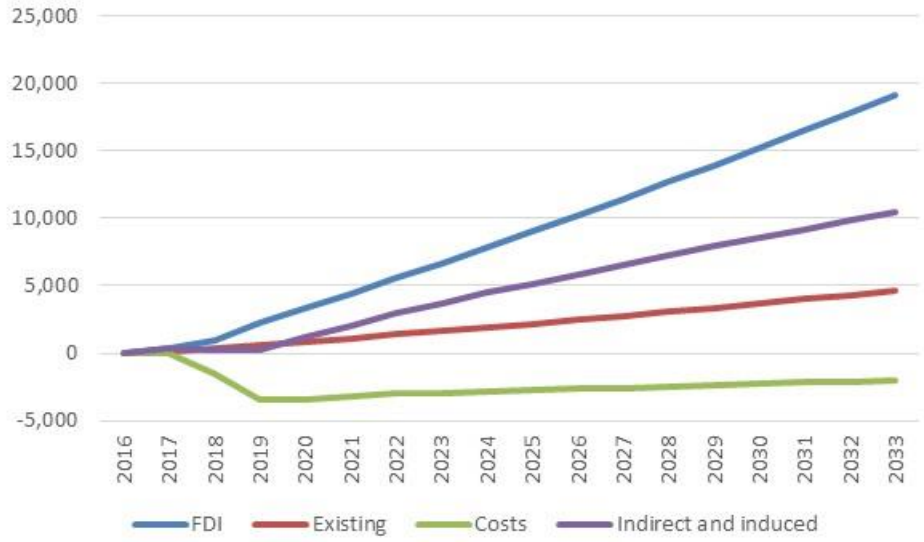


Source: UUEPC

The results produce an overall multiplier that averages 1.28 in GVA terms and 1.62 in employment terms over the period to 2033. The annual multipliers are much more difficult to interpret and use, as the offsetting effects of cuts in public sectors and growth in the private sector can create spurious results in

any given year (e.g. a direct effect of -100 could have an indirect effect of +100 due to patterns of supply chain in the various elements of the direct effect calculation).

Figure 3.9 – Employment impacts by group, 2016-33



Source: UUEPC

4.12. Labour supply

It is assumed that 10% of new employees will come from the unemployment register, 10% will come from other benefit claimants, 10% from migration. The remaining 70% are expected to take up jobs created by a lower rate of Corporation Tax from other employment, which will, in turn, have follow-on effects on unemployment and benefit claiming. This approach is extremely conservative; it could easily be argued that ultimately any increase in employment will though a job chain effect removes some benefit costs outside of those jobs taken by migrants or people currently claiming no benefits (education leavers for example). Tax benefits from benefit savings should therefore be considered a very conservative and largely illustrative estimate. By way of illustration, cumulative benefits savings are estimated at £300m by 2030, this would rise to £1,500m if the assumptions are altered to 50% from inactivity and 50% from unemployment.

4.13. Potential modelling risks

As with all economic models there are a number of critical assumptions that underpin the findings and it is important to set these out as context when considering the report. The key risks are outlined below:

- **Downside risk: feedback to cost and wage pressures:** There is no link back from the improving economy outcome in the modelling to underlying wages and costs which could arise and stifle employment and economic activity (though higher wages would have a positive impact on consumer spending). An effect on wages in the FDI section of the model is built in but this is not replicated in the domestic or existing FDI sectors. The level of this risk is likely to be fairly modest as the NI economy, even allowing for the positive impacts of a lower Corporation Tax rate, is still well below the levels of employment rate or overall productivity (measured relative to the UK) that would be likely to exert significant upward pressures. However, the lessons from the path of wages in RoI during the boom mean this risk cannot be entirely dismissed.
- **Downside risk: level of Corporation Tax elsewhere:** The modelling assumes a flow of investment which originates from a model based on the reduction of the rate by 7.5 percentage points, evidently if the rates were to be lower elsewhere the competitive advantage would lower thus reducing the possible impacts. It is impossible to gauge what Corporation Tax rates might be in

20 years' time so the model is perhaps most helpfully considered an exploration of rate which remains *relatively* lower than other economies at a fixed proportion over time.

- **Upside risk: productivity impacts on local business:** A more competitive economy is likely to improve productivity levels in existing firms as they 'up their game' to match new entrants in the market. This rising tides raises all boats concept is not built to ensure balance as the rising costs and wages are not considered. Given the overall growth in jobs is relatively modest compared to the stock of employment (about 1.9 % by 2025) it was felt prudent not to build in this potential effect, particularly as no additional wage pressures are factored in beyond new FDI flows.

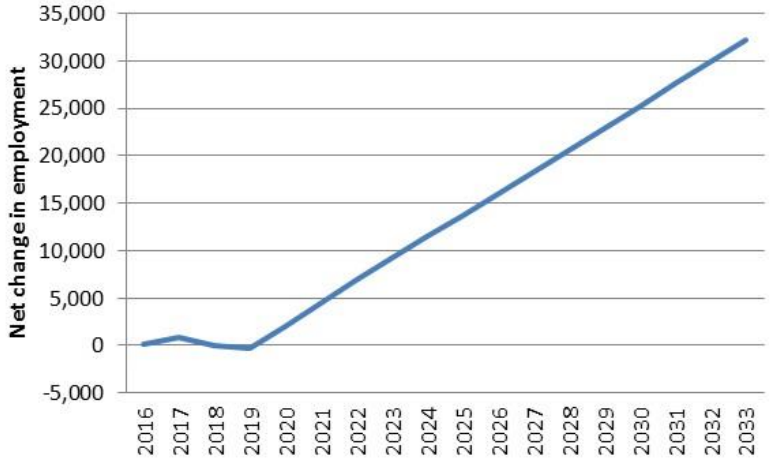
- **Downside risk: Rates income undershoots:** There is a stable historical link between rate revenue and GVA. The pattern is expected to remain reasonably stable over the forecast period. On the upside, additional economic activity should result in higher occupancy rates and therefore revenue. On the downside, a more material risk is that the reduced rate of Corporation Tax may attract more profit centres that require less physical space and infrastructure. Therefore, the ratio of rate income to GVA is set at a conservative level. It should be noted that if this risk does materialise, it will have a relatively small impact on the overall results.

- **Upside risk: Migration:** The experience of the UK and RoI suggests that migration flows can adjust rapidly if there are sufficient job opportunities. In the case of RoI an influx of multinational companies was followed by significant in-flows of migrants. Whilst this arguably displaces an element of local labour it does create considerable demand for housing, travel and basic services. The levels of migration experienced under an increasingly internationalised NI economy with lower Corporation Tax and greater numbers of international businesses could be much larger than current estimates.

5. Summary

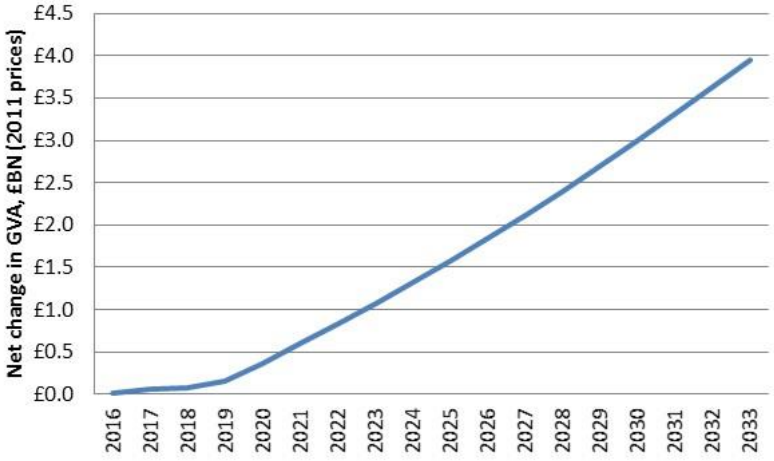
The overall impacts of the modelling are set out below in jobs and GVA terms. The main report focusses in more detail on the outputs from the model.

Figure 4.1 – Employment forecast, difference from base



Source: UUEPC

Figure 4.2 – GVA forecast, difference from base, £Bn



Source: UUEPC

The debate around devolving Corporation Tax setting powers to NI and implementing a differential rate to the UK has taken place over a number of years. These tax setting powers could be very powerful in economic development terms, helping to grow and rebalance the NI economy. The approach adopted to monitor costs and benefits and review the impact after four years when actual outturn data will be available is prudent and will help to allay any fears over the uncertainties associated with both the costs and benefits of this significant policy change.

Compared to a path where Northern Ireland continues with the current and planned UK rates, the UUEPC model projects an additional economic impact of 32,000 jobs and £4.0bn GVA by 2033 as a result of implementing a 12.5% rate of Corporation Tax in 2018. When considered against the baseline forecasts, employment is projected to increase by 3.3%, productivity by 4.1% and GVA by 8.5%.

Annex A: Detailed results tables

Table A1 – Cumulative GVA impacts by component (£m constant prices)

	2018	2019	2020	2025	2033
New FDI	£100	£300	£400	£1,200	£2,700
Existing FDI expansions	£0	£0	£0	£100	£200
Domestic company expansions	£0	£0	£0	£0	£100
Impact of public expenditure cuts	-£100	-£200	-£200	-£200	-£100
Indirect effects	£0	£0	£0	£100	£400
Induced effects	£0	£0	£100	£300	£700
Total impact	**£100**	**£200**	**£400**	**£1,600**	**£4,000**

Sources: UUEPC
Note: Figures may not add exactly due to rounding

Table A2 – Cumulative employment impacts by component

	2018	2019	2020	2025	2033
New FDI	900	2,100	3,100	8,300	17,300
Existing FDI expansions	400	600	900	2,200	4,700
Domestic company expansions	100	200	300	800	1,800
Impact of public expenditure cuts	-1,600	-3,400	-3,400	-2,700	-2,000
Indirect effects	-100	-300	100	1,800	4,000
Induced effects	300	600	1,100	3,400	6,300
Total impact	**0**	**-200**	**1,900**	**13,700**	**32,000**

Source: UUEPC
Note: Figures may not add exactly due to rounding

Table A3 – Cumulative tax impacts, in real terms (£m)

	2018	2019	2020	2025	2033
Additional Corporation Tax from larger private sector	£0	£10	£20	£160	£690
Income tax	£0	£10	£20	£300	£1,370
National Insurance	£0	£10	£20	£230	£1,080
VAT	£10	£20	£50	£480	£2,340
Business rates	£0	£0	£0	£50	£230
Domestic rates	£0	£0	£0	£40	£180
Other taxes	£0	£10	£30	£340	£1,450
Welfare savings	£0	£0	£0	£60	£250
NI Taxation impacts	**£0**	**£10**	**£20**	**£250**	**£1,100**
UK Taxation impact	**£10**	**£50**	**£120**	**£1,410**	**£6,490**

Source: UUEPC
Note: Figures may not add exactly due to rounding

Annex B: Data sources

Indicator	Source
Employment by sector	Workforce jobs
Employees in employment by sector	Quarterly employment survey
Employees in foreign / domestically owned firms	Inter Departmental Business Register
Employees in foreign / domestically owned firms	Inter Departmental Business Register
FDI employment by sector and country	OCO
Nominal GVA	Regional Accounts
Real GVA	Regional Accounts / UUEPC calculations
Deflators	UUEPC modelling suite
Global Corporation Tax rates	KPMG
Revenue from taxation, by tax (excluding CT and Rates)	HM Revenue and Customs
Corporation Tax receipts	HM Revenue and Customs & Department of Finance and Personnel
Domestic and non-domestic rate revenue	ONS Blue book
Productivity	Workforce jobs / Regional Accounts / UUEPC
Public expenditure impacts	UK Government from 2018-19 to 2020-21. DFP estimates from 2021-22 to 2022-23. UUEPC estimates from 2023 onwards.
Profits by sectors for foreign and domestically owned firms	UUEPC calculations
Average wages	Annual Survey of Hours and Earnings
Output : GVA ratios	NI Annual Business inquiry
Multipliers	DETI input output tables
Unemployment and inactivity benefits per person	Department of Work and Pensions
Population by country	OECD
Indexes of hourly compensation costs in manufacturing, U.S. dollar basis - US = 100	US Department of Labor, Bureau of Labor stats
Capital to employee stock ratio	Blue Book

Annex C: Public expenditure implications

The following sets out how the public expenditure implications of a reduced rate of corporation tax which underpin the main report were built up.

Underpinning these figures are public expenditure cost estimates which were produced by UK Government for the period 2018-19 to 2020-21 (with figures rounded to the nearest £5m and calculated on a receipts basis). The UK Government estimates assume a 12.5% Northern Ireland rate is applied from April 2018 in line with the Northern Ireland Executive's commitment as set out in the Fresh Start Agreement. The estimates also take account of the planned UK Corporation Tax reductions to 19% from April 2017 and to 18% from April 2020 and build in the latest forecasts of corporation tax receipts from the OBR which accompanied the 2015 Autumn Statement. DFP provided further estimated cost figures for the period 2021-22 to 2022-23 which used the UK Government estimates as a base but further reflected the impact of the reduction in the UK rate to 18% which is expected to take three years (until 2022-23) to unfold fully. UUEPC estimates are presented from 2023 onwards which, based on DFP advice, use the latest the OBR estimate of nominal GDP growth (4.5% per annum) to inflate costs and benefits.

These figures are presented in Table C1 as **Estimated cost profile/Method 1** and are set out in both nominal and real terms. Method 1 excludes the impact of additional corporation tax receipts that are expected to be derived from additional activity generated as a consequence of reducing the rate.

Estimated cost profile/Method 2 includes estimates of costs identified in method 1 but nets off the impact of UUEPC estimates of additional corporation tax receipts from the total cost.

Estimated cost profile/Method 3 includes estimates of costs identified in Method 1 but nets off the impact of UUEPC estimates of additional corporation tax and non-domestic rate receipts from the total cost.

Table C1 details the net cost estimates that result from these three cost profiles. Figure C1 illustrates how the anticipated additional corporation tax take and non-domestic rates income are expected to impact on the overall scale of the estimated costs. The model used in the main report deploys method 3.

These serve to illustrate that the assumptions employed, method of calculation and offsetting effects are particularly important in terms of calculating the public expenditure implications for NI.

Table C1 – Comparison of Corporation Tax estimates

Method 1 - Estimated costs excluding increased Corporation Tax revenue to NI

	2018	2019	2020	2021	2022	2023	2024	2025
Nominal	£115	£260	£275	£273	£278	£291	£304	£317
Real	£105	£235	£245	£240	£239	£245	£250	£256

	2026	2027	2028	2029	2030	2031	2032	2033
Nominal	£332	£346	£362	£378	£395	£413	£432	£451
Real	£262	£267	£274	£280	£286	£293	£299	£306

Method 2 – Estimated costs including UUEPC estimates of increased Corporation Tax revenue to NI

	2018	2019	2020	2021	2022	2023	2024	2025
Nominal	£111	£252	£262	£254	£253	£259	£265	£270
Real	£102	£228	£233	£224	£218	£218	£218	£218

	2026	2027	2028	2029	2030	2031	2032	2033
Nominal	£276	£282	£287	£293	£298	£304	£309	£315
Real	£218	£218	£217	£217	£216	£215	£214	£213

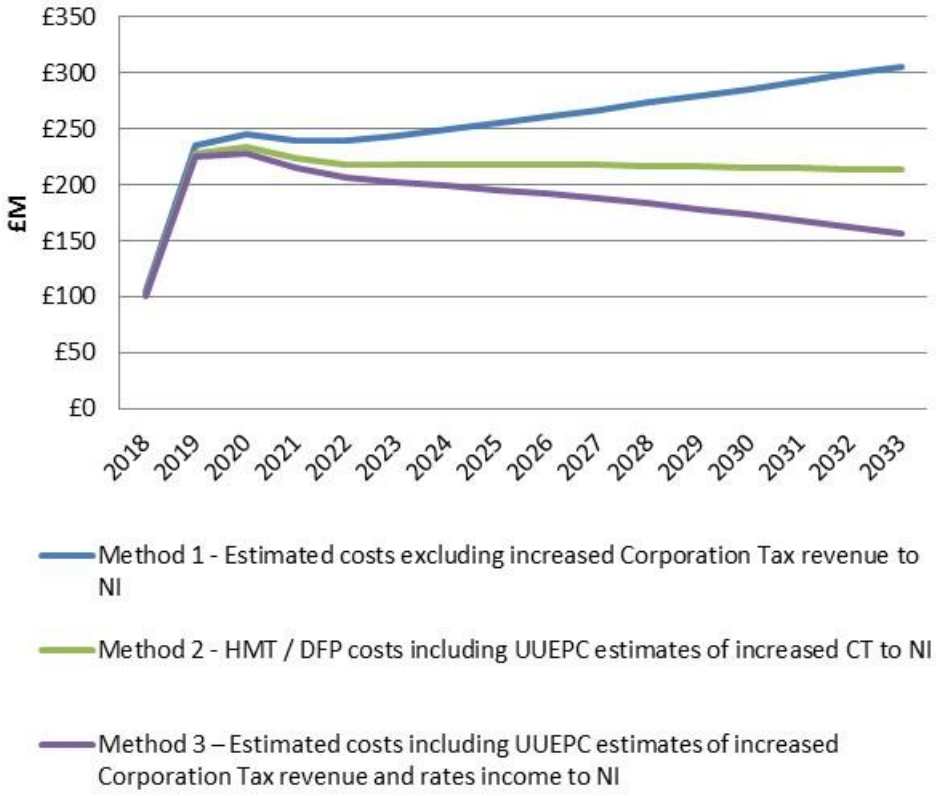
Method 3 – Estimated costs including UUEPC estimates of increased Corporation Tax revenue and rates income to NI

	2018	2019	2020	2021	2022	2023	2024	2025
Nominal	£110	£250	£256	£245	£240	£241	£242	£243
Real	£101	£226	£228	£215	£206	£203	£199	£196

	2026	2027	2028	2029	2030	2031	2032	2033
Nominal	£243	£243	£242	£241	£240	£237	£235	£232
Real	£192	£188	£183	£178	£173	£168	£163	£157

Source: UUEPC

Figure C1 – Annual real cost estimates of implementing a lower rate of Corporation Tax in NI, (£M constant prices)



Source: UUEPC