

Cardiff Business School

Response to Consultation Inquiry into the Impact of variations in national and sub-national income tax

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Introduction

We understand that the Finance Committee is undertaking an Inquiry into the effect of variations in national and sub-national income tax. In this response we seek to make the Finance Committee aware of new economic modelling frameworks being developed in Wales which can help us better understand the effects of regional tax variation. We take the view that additional research is required to examine effects across different levels of income earner. In this response we seek to summarise model development and offer some basic simulations of the Welsh effects of varying regional income tax.

The Welsh Government during 2014 sponsored a research programme to develop more complex economic models of the Welsh economy through which to understand the potential effects of changes in taxation rates at regional level. This response derives from the research programme. It is important to note that the findings reported here are very much research in progress and with work ongoing in terms of economic model development and refinement. Moreover the material in this response is the responsibility of the authors, rather than the original research sponsor.

Context for our research programme was that while there has been some history of developing economic models through which to understand changes in regional economic activity, the models developed were not suitable for examining tax variations. For example, the region has benefited from a series of Input-Output tables. While Input-Output tables are useful, they are limited in some applications because of assumptions underlying any economic modelling undertaken through the framework. Then a key element of the research programme was to develop a Computable General Equilibrium model for Wales which would allow one to investigate the effects of tax changes outside the limits of more simple economic models.

Building models to understand effects of regional tax variation

A Computable General Equilibrium (CGE) model is a large-scale numerical model that simulates the core economy-wide activities and interactions between economic agents (households, private, public, and government sectors). CGE models capture the inter-dependencies between sectors and markets, enabling analysis of how a policy change or shock targeted in one part of the economy will affect the rest of the economy. The CGE model functions through a set of equations that describe how the economy evolves over time in response to a policy change. These behavioural equations usually describe the economic behaviour of the agents based on the economic theory of general equilibrium. They ensure supply and demand for goods, services and factors of production in the economy are balanced and determine how firms and households respond to change.

CGE models can focus on a single area which can be a small sub-national region or a large country. The key advantage of single-region CGE models (such as that developed in the research programme) is their ability to simulate the impacts of policies and events, both regional and national, at the regional level. This type of assessment is valuable to authorities at all levels of government in terms of policy formulation and evaluation. The main constraint in construction is data availability.

CGE models have had a wide application in the field of tax analysis. For example, Lecca et al. (2014)¹ use CGE models to examine the regional impact of varying the rate of income tax, or so called “tartan tax” in Scotland.

The CGE model developed for our project was a single-region model. It is aggregated to 21 industry sectors and 3 production factors: labour, capital and land. The CGE model development used National Accounts data organized in the form of a Social Accounting Matrix (SAM). The SAM gives a snapshot of the Welsh economy. The model is developed in terms of different time perspectives: for example, short run and long run characterized by the different states of production factors. In the short run, the model is marked by a sectorally fixed stock of factors. In this time perspective factors cannot move freely across sectors. Hence, they are also fixed in total within the regional economy, and the factor price changes in each sector will vary in response to a policy shock.

The long run allows for free mobility of capital and labour factors across sectors and regions. A consequence of this assumption is the economy-wide factor price formed for capital and labour. Free mobility of factors enables factor-price adjustment between sectors and regions. What this means is that Wales is assumed to be a factor-price taker in the UK economy. For example, a factor price change from an initial benchmark level will cause a migration in labour and capital into or out of Wales until any regional/national price differential is eliminated.

How might variation in income taxes affect the economy?

We take here an example of a tax cut. While a cut in Income Tax tends to deliver positive effects through the private sector (Figure 1), it could have contractionary effects through the public sector as the government faces a balanced budget constraint (Figure 2). The linked boxes identify the effects that are captured by the Welsh CGE model such as price, income, consumption and investment changes. All these mechanisms happen simultaneously in the economy.

In Figure 1, a cut in Income Tax mainly affects the economy through the labour market first. On the labour supply side (households), workers face a choice between how much time to work and how much time to devote to leisure. Clearly these effects could actually be very different according to whether people are low, medium or high income earners and more model development is needed to pick up on this complexity.

As the tax cut raises the disposable post-tax wages, work becomes relatively more profitable and workers might tend to work more instead of leisure, this resulting from a substitution effect between labour and leisure. Under an income effect, however, with higher post-tax wages, the workers can maintain their standard of living through working less hours. Hence, if leisure time is treated as a normal good, higher disposable income could result in reduced working time and more leisure time.

¹ See Patrizio Lecca, Peter G. McGregor, J. Kim Swales, and Ya Ping Yin, ‘Balanced Budget Multipliers for Small Open Regions within a Federal System: Evidence from the Scottish Variable Rate Of Income Tax’, *Journal of Regional Science*, Vol. 54 (3): 402-421, June 2014.

Figure 1: Impacts of a reduction in Income Tax

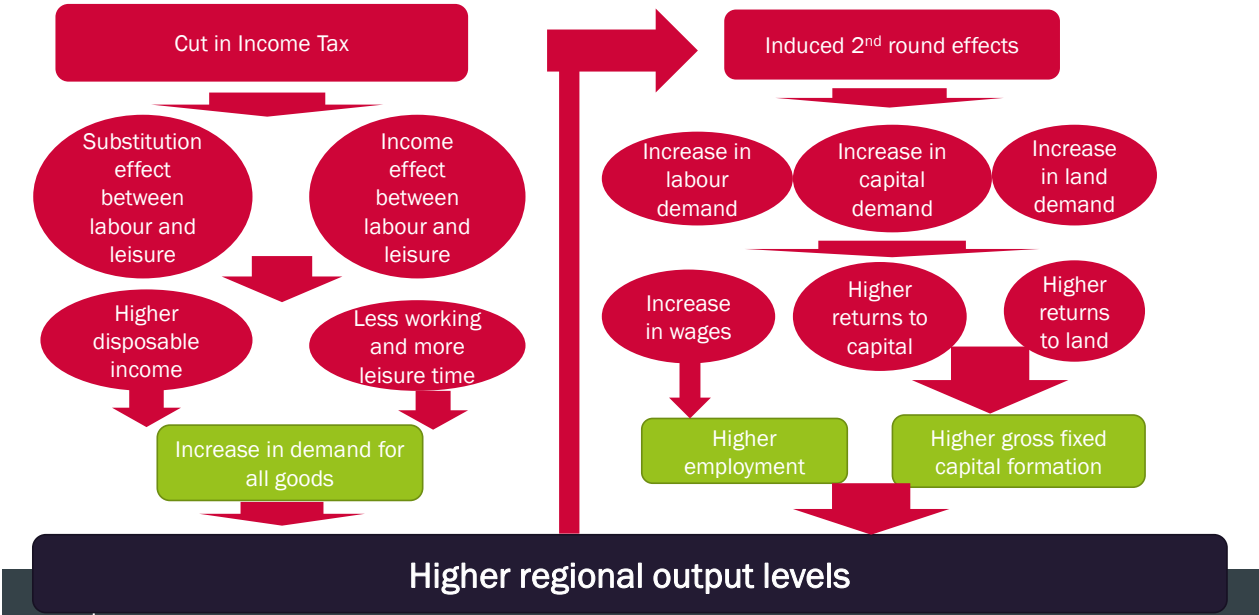
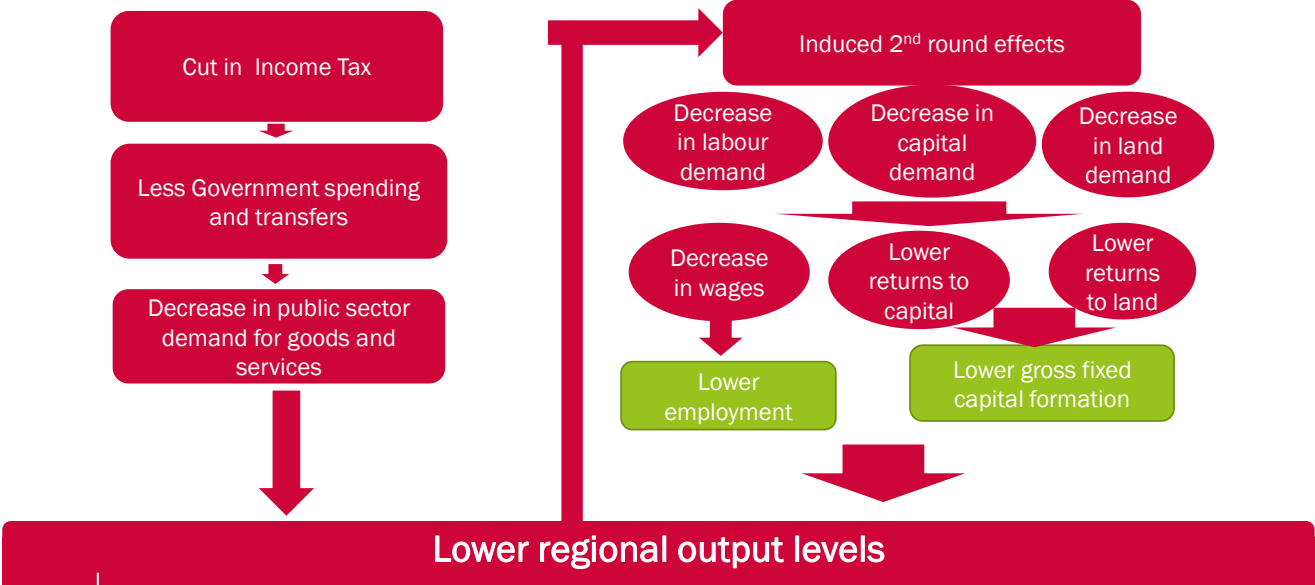


Figure 2: Impacts of a reduction in Income tax through the Public Sector



The net effect is determined by the balance between the two effects. However, both effects have positive impacts on the economy: higher disposable income brings higher consumption, and so does more leisure time which increases demand for entertainment, leisure, cultural and travel goods. Once again these effects could vary markedly according to whether people are low or high earners.

Moreover, on the demand side of the labour market, a cut in Income Tax may reduce the labour cost of firms, and firms substitute labour for other factors to take advantage of relatively cheaper labour. This is the substitution effect between production factors which will raise employment as well as regional output. Cheaper labour only results if wage costs to the employer decrease because of a supply effect. This works only if the income tax effect increases the labour supply of hours (a substitution effect) which in aggregate shifts the supply of labour schedule down and reduces the real wage to the employer. This would be a long run outcome. In the short run workers will take on extra hours because the tax cut makes it worthwhile. In the long run labour migrates to Wales, real wage costs decline, increasing employment and output.

Therefore, aggregate demand in the economy will increase through all the channels described above. To meet this additional demand firms will need to hire more workers, rent more capital and acquire more land. To do so firms may have to increase wages and payments to capital and landowners to induce higher labour supply, investment, and gross fixed capital formation (GFCF) in the economy.

Higher factor demand from firms will stimulate investment in capital goods and higher employment to meet additional consumer demand. Increased investment and employment affects gross value added (GVA) through its short-run effect on the level of demand in the economy and through its long-run effect on how much output the economy can supply. A larger utilized capital and labour stock enables the economy to produce more output in the future, although it may take time for the effects of this larger capital stock to fully feed into a higher GVA.

The tax cut can, however, also deliver contractionary effects through the public sector as shown in Figure 2. As the government faces a balanced budget constraint, the government spending and transfer will reduce given a fall of tax revenue. This implies a decrease of public sector demand and resource which lowers regional output. The contractionary effect originating from the public sector could spread into the private sector further to induce second-round effects. Firms shrink production and cut factor demand to cope with lower demand.

The final macroeconomic effects are determined by the net of the positive effects shown in Figure 1 and the negative effects shown in Figure 2. If the positive effects derived from the private sector dominate the negative effects from the public sector, the tax base will be enlarged and the tax receipts can be partially or even fully recouped. However, the opposite case may also occur, where the stimulation mechanism through the private sector does not generate sufficient growth of the tax base to offset the contractionary effects from tax cut.

A Simple Simulation Using the Welsh CGE Framework

In what follows we provide some basic simulations. In the Table below, we report the results of simulations for the short run (SR) medium run (MR) and long run (LR) under assumptions concerning the substitutability between capital, labour and land. Specifically, we use in the example a relatively low degree of factor substitutability (elasticity of 0.5). The elasticity of substitution value measures the percentage change in the ratio of any pair of factor inputs used in response to a percentage change in their relative factor price ratio. It measures here the assumed substitutability between inputs, i.e. how easy it is to substitute one input for the other, for example how easy it is for firms to substitute labour for capital in response to lower labour cost.

From April 2019, the UK government reduced the 3 rates of Income Tax paid by Welsh taxpayers: basic rate from 20% to 10%, higher rate from 40% to 30% and additional rate from 45% to 35%. The Welsh government can then decide how much to collect on top of the reduced rates and bear the fiscal consequence, which may directly affect their budgets.

While the model is developed with only one representative household due to regional data constraints regarding income allocation and the consumption pattern of different income bands, the tax rate in the simulation is always an effective rate which is defined as the total tax receipts divided by the underlying total tax base. Therefore, any differentiation by the three tax bands is not currently available in the model. However, the simulation is developed in the example to ensure that the variation of the Income Tax will exclusively account for the Welsh government spending change as a result of a balanced budget. The Income Tax simulation is set as a 5% tax cut i.e. a 5% cut on the effective rate, or a 5p-per-Pound cut of the tax revenue. Alternatively, the 5% cut can therefore be seen as a 5% tax refund for what each taxpayer pays in Wales, no matter which band this taxpayer belongs to. We note that the ability to reduce tax by 5% evenly across each tax payer is beyond the Welsh Government's powers, as it only has power over the Welsh rates of income tax (i.e. 10 percentage points of each rate) which are in addition to the non-devolved rates. Then any potential Welsh Government change would not reduce tax evenly across tax payers. For these reasons the example taken here is only illustrative of how our model works.

Table: Income Tax Simulation: Effects of a 5% Cut (% changes)

Major variables: Income tax (-5%)	SR	MR	LR
Devolved Government Revenue	-3.90	-3.87	-3.79
Income Tax revenue	-5.07	-5.05	-4.94
Welsh Government spending	-1.24	-1.23	-1.20
Gross value added (GVA)	-0.09	0.03	0.13
Household consumption	0.47	0.49	0.61
Gross fixed capital formation	0.56	0.89	0.95
Total labour factor income	0.37	0.33	0.35
Employment	0.00	0.00	0.35

The 5p per Pound reduction of Income Tax causes devolved government revenue to decrease by around 4% in the short, medium and long run. This is mainly because of the weak recoupment of the Income Tax revenue (note this all income tax contributed from Wales). The Income tax revenue initially falls by slightly more than the scale of the tax cut, 5%, but recovers a little in the long run falling by 4.94%. The small scale of the recoupment implies that the tax cut does not boost the private sector enough to substantially offset the contractionary effect from the public spending cut.

The Welsh Government spending decreases by 1.24% in the short run and 1.20% in the long run. The reason that the scale of the government spending cut is less than that of the devolved government tax revenue, lies in the existence of fiscal transfers from central government. While the devolved government revenue is insufficient to sustain the spending on Wales, the gap is fulfilled by the fiscal support from the UK government. Hence, while the cut of government spending solely results from the cut in devolved tax revenue, the spending decreases by a relatively smaller percentage because this spending itself is more than the devolved revenue.

Major macroeconomic variables, including GVA, consumption and gross fixed capital formation, have generally weak positive responses to the tax change. GVA reduces slightly in the short run but recovers and rises in the medium and long run. The initial fall of GVA is a result of the contractionary effect from the government spending cut. In the medium to the long run, however, the stimulation to the private sector starts to emerge and covers the negative effects from the spending cut.

While the GVA is basically an aggregation of factor incomes, the driving component for GVA here is labour income. The Income Tax cut raises the disposable post-tax income and stimulates labour to work more because the tax cut makes it worthwhile. In the long run, this will in aggregate increase the labour supply and hence lower the labour cost for firms. However, the total labour stock is assumed to be fixed in the short and medium run. Therefore, the increases of labour income in this two time perspective are fully linked with the rise of wage, and the total employment fixed at the regional level. In the long run, the regional labour stock is fully flexible, making the real wage level decline and converge gradually back to the initial equilibrium level. Hence, the increase of labour income in the long run is fully linked with the rise of employment which may come from inactive labour in Wales or migration from outside of Wales. If it was assumed that total full time equivalent in Wales was around 1.2m people, then the tax cut might be connected with around 4,000 more FTE jobs in the long run

Conclusions

In the context of regional tax devolution in Wales the development of new regional economic models is critical, and with national UK models unlikely to pick up adequately on specific characteristics of the Welsh economy. We accept that our model, as presented here, operates under a number of relative assumptions and uncertainties. This should be borne in mind when examining the findings and deriving inference for policy purposes. However, the purpose of our response to the consultation is to highlight the nature of the model development and as an example application.

However, this research marks progress in regional CGE modelling of the Welsh economy regarding tax variation issues, and sheds some light on tax policy development in the devolved tax regime. There are avenues for further research not least in terms of better understanding how tax changes made in Wales work to affect different income groups, and with the current iteration of our model having just one household sector at present.



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