A Recipe For Growth

The Economic Effects of Corporate Tax Reform in the UK

By Dr. Tyler Goodspeed

BRIEFING PAPER

EXECUTIVE SUMMARY

- In 2023, the UK's corporate income tax rate is scheduled to rise from 19% to 25%, and a temporary provision allowing businesses to deduct 130% of the cost of new investment in qualifying plant and machinery will expire;
- Compared to making the 19% rate and 130% deduction permanent, if enacted these changes will lower business investment by 7.6%, output by 2.3%, and average household wages by £2,500;
- If instead businesses were instead allowed to continue to deduct 100% of the cost of new investment in equipment, then relative to current law it would raise business investment by approximately 5% and real output by 1.3%, while extending 100% cost recovery to all asset types would raise investment by almost 10% and GDP by 3%;
- Over 10 years, macroeconomic feedback could offset 34% of the static budgetary cost of corporate tax reform, and 72% over the longer term.

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INTRODUCTION

Under current law enacted in the March 2021 Chancellor's budget, the corporate income tax (CIT) rate in the United Kingdom is scheduled to rise from 19% to 25% in 2023, and a temporary provision allowing firms to deduct 130% of the cost of new investment in qualifying plant and machinery will expire.[1] Using a standard neoclassical growth model and empirical estimates of the responsiveness of investment to changes in the user cost of capital, I estimate that, if implemented, these changes will lower real business investment by 7.6% and real output by 2.3%, compared to if the 2022 rate and super-deduction were made permanent. Applying a range of estimates from a large empirical literature on the responsiveness of wages to changes in corporate income taxation, I find that the scheduled rate rise alone will additionally lower average household wages by £2,500 on an annual basis.

Relative to current law, I find that maintaining the CIT rate at 19% and allowing firms to deduct 100% of the cost of new equipment investment would raise investment and GDP by 4.6% and 1.3%, respectively. Allowing the 130% super-deduction to expire but maintaining the CIT rate at 19% versus 25% would still raise investment and GDP by 2.9% and 0.9%, respectively. Alternatively, if full expensing of the cost of new investment were extended to all asset types (equipment, structures, and intellectual property products), U.K. investment would be almost 10% higher, and GDP almost 3% higher. Further lowering the CIT rate to 15% would boost average wages by approximately an additional £1,700, but would provide no additional boost to investment or GDP if the cost of new investment in all asset types were already 100% deductible.

Finally, over a 10-year window, I estimate that macroeconomic feedback from higher real output and income would offset 34% of the static budget cost of maintaining the CIT rate at 19% versus 25%. Over the longer term, that rises to 72%.

The remainder of this paper is as follows. In Section 1, I review the existing empirical literature on the effects of exogenous changes in corporate income taxation on growth, investment, and wages. In Section 2, I calculate the effect of changes in corporate income taxation in the United Kingdom on the user cost of capital, and translate changes in the user cost of capital into changes in long-run investment and growth. I also apply estimates of the elasticity of wages with respect to the CIT rate to calculate the effect of various CIT rate scenarios on average household income in the United Kingdom. Finally, I calculate the potential effect of macroeconomic feedback on tax receipts to estimate the dynamic cost of corporate tax reform. Section 3 concludes.

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1 Upon expiration, firms will have to deduct the cost of new investment over the depreciable lives of the asset, which reduces the present value of the deduction for new equipment investment from 130% to 75.8%.

1. EMPIRICAL EVIDENCE ON TAXES, GROWTH, AND WAGES[2]

Taxes and growth

Estimating the effects of income tax changes on investment and growth is complicated by the fact that the timing of tax changes is generally not random, with policymakers often lowering tax rates during periods of economic contraction and raising them during periods of economic expansion. This correlation between tax policy and macroeconomic conditions can bias estimates of the effects of tax changes on the economy.

In response to this empirical challenge, in recent years a large empirical literature has emerged to try to identify the macroeconomic effects of tax changes by exploiting changes that are purely exogenous in nature, rather than changes that are in response to underlying economic conditions. One approach, pioneered by Blanchard and Perotti (2002), is to utilise institutional details on tax and transfer systems and the timing of tax collections to identify shocks to fiscal policy through the construction of automatic fiscal responses to economic conditions. They find a peak tax multiplier effect on GDP of 1.33 after seven quarters. Using a different structural vector autoregression (SVAR) approach from that of Blanchard and Perotti, Mountford and Uhlig (2009) find a larger output response, with a peak impact of 3.57 after 13 quarters.

An alternative approach, pioneered by Romer and Romer (2010), is to identify exogenous tax shocks using the historical narrative record, distinguishing tax changes based on political or philosophical motivations from economic ones. Studying the United States, Romer and Romer (2010) estimate that a 1-percentage point increase in taxes as a proportion of GDP reduces GDP by 1% in the first year and 3% by the third year. Using a similar approach to analyse the United Kingdom, Cloyne (2013) finds comparable effects, with a 1-percentage point decrease in the tax share of GDP increasing GDP by 0.6% on impact, and 2.5% over three years. Cloyne additionally finds that a 1-percentage point decrease in the tax share of GDP raises investment by 1.2% on impact, and 4.6% by the third year. Other international studies yield similar estimates—using German data, Hayo and Uhl (2014) find that a 1-percentage point drop in total tax liability as a proportion of GDP raises output by 2.4%.

Utilising a hybrid method that combines elements from both the SVAR and narrative approaches, Mertens and Ravn (2013) estimate that for the United States, a 1-percentage point reduction in the average personal income tax rate has a peak impact on real GDP per capita of 1.8% after three quarters. They also find that a 1-percentage point reduction in the average CIT rate raises real GDP per capita by 0.6% after a year, and investment by 2.3% over a year and a half. Interestingly, Mertens and Ravn (2013) cannot reject the null hypothesis of no change in government tax receipts in response to a 1-percentage point cut in the average CIT rate.

2 For a fuller discussion of these issues, see chapter 1 of the 2018 Economic Report of the President (CEA 2018) as well as CEA (2017b), both of which I was a coauthor. Much of this section recapitulates studies and analysis presented there.

Though they find that a cut in the average CIT lowers the CIT rate, it also generates a large and statistically significant increase in the corporate tax base, with the increase in the base being sufficiently large that a small decline in CIT revenues in the first quarter is followed by a surplus thereafter. In contrast, they do not find the same result for reductions in the average personal income tax rate—though a cut in the average personal income tax rate does increase the personal income tax base, it is not sufficient to offset the reduction in the personal income tax rate. The corporate income tax base is thus substantially more elastic than the personal income tax base.

Corporate income taxation and investment

A key mechanism by which CIT changes affect investment and growth is through their effect on the user cost of capital, and consequently the demand for capital services. The user cost of capital is the minimum return required to cover the full cost of renting capital, including not only taxes and depreciation, but also the opportunity cost of investing in physical capital versus financial alternatives. Tax changes that decrease the after-tax return on capital assets—such as raising the CIT rate or lengthening the period of time over which firms can deduct the cost of installing those assets—effectively raises the before-tax rate of return required for the marginal output of new assets to exceed the cost of producing and using them, and therefore lowers firms' desired capital stock. A smaller capital stock then implies less capital per worker, a smaller flow of capital services, and therefore lower productivity, output, and wages. Standard neoclassical models predict that the elasticity of demand for capital services with respect to the user cost of capital should be -1.0, meaning a 1% increase (decrease) in the user cost of capital will lower (raise) investment by 1% (Jorgenson 1963; Hall and Jorgenson 1967).

However, similar to the challenge of identifying the effects of tax changes on output, identifying the effect of changes in the user cost of capital on investment is complicated by the fact that policymakers tend to lower CIT rates and enhance investment tax incentives during periods of economic contraction, and to raise CIT rates and reduce investment tax incentives during periods of robust economic expansion. In addition, estimates of the responsiveness of investment to changes in the user cost of capital are potentially biased in studies relying on aggregate data, due to simultaneity between the user cost of capital and investment shocks, as well as due to firm heterogeneity. As a result, though early studies found the user-cost elasticity of investment to be quite small—substantially smaller in magnitude than -1.0—more recent studies employing enhanced identification strategies have estimated elasticities close to the neoclassical benchmark of -1.0 (Hassett and Hubbard 2002).

For example, utilising cross-sectional variation in the change in the user cost of capital as a result of corporate tax reforms, Auerbach and Hassett (1992) and Cummins, Hassett, and Hubbard (1994, 1996) estimate an elasticity of -0.67, while Cummins and Hassett (1992) find elasticities of investment of -1.1 for equipment and -1.2 for structures. Using a database of CIT rates across 85 countries, Djankov et al. (2010) find an elasticity of -0.835 on average. Using micro data at the plant level, Caballero, Engel, and Haltiwanger (1995) find considerable variation across industries, but -1.0 on average. Using panel data from Germany, Dwenger (2014) similarly estimates a user-cost elasticity of investment of -0.9, and cannot reject the null hypothesis that the point estimate is not statistically different from -1.0.

Corporate income taxation and wages

The effect of changes in the user cost of capital on investment is important not only because investment increases the productive capital stock and thus potential output of the U.K. economy, but also because increasing productive capital per worker raises labour productivity, and higher labour productivity generates higher wages. This is the primary indirect channel through which changes in corporate income taxation impact wages. A second, direct channel is through rent-sharing from bargaining between workers and employers. Since the 1980s, academic studies have demonstrated that more profitable industries tend to utilise some of their rents to hire better quality labour, thus bidding up wages (e.g. Krueger and Summers 1987; Arulampalam, Devereux, and Maffini 2012). More recently, Liu and Altshuler (2013), Barth et al. (2016), Card et al. (2016), and Song et al. (2015) confirm that rent-sharing remains a feature of labour markets in advanced economies. In an international context, lower domestic taxation of corporate income can enhance workers' bargaining power by lowering the relative value of firms' external options in lower-tax, lower-cost foreign jurisdictions.

Empirical evidence on the effect of corporate income taxation on workers' wages is surveyed at length in CEA (2017a, 2017b, 2018). In a cross-country study, Felix (2007) finds a semi-elasticity of wages with respect to the corporate tax rate of -0.7 to -1.23, meaning that a 1-percentage point increase in the CIT rate is associated with 0.7-1.23% lower wages. A cross-country study of 65 studies over 25 years by Hassett and Mathur (2015) estimate an elasticity of workers' wages in manufacturing after five years with respect to the marginal CIT rate of -0.5, meaning a 1% increase in the marginal CIT rate lowers wages by 0.5%. In a study just of advanced economies, the results of Azémar and Hubbard (2015) imply a semi-elasticity of -0.43, with approximately three quarters of that effect deriving from the indirect capital-per-worker channel and one quarter from the direct bargaining channel.

Multiple studies have also attempted to estimate the elasticity of wages with respect to CIT rates using variation within countries. Exploiting variation at the U.S. state level, Felix (2009) estimates a semi-elasticity of wages with respect to state CIT rates of -0.14 to -0.36, which is consistent with an elasticity of wages with respect to the U.S. statutory corporate tax rate of -0.1 to -0.2. Carroll (2009) finds similar results, estimating an elasticity of wages with respect to the U.S. statutory corporate tax rate of -0.1 to -0.2, meaning a 1% increase in the statutory corporate tax rate is associated with a 0.1-0.2% decline in wages. Similarly exploiting variation in local business taxation across German municipalities between 1993 and 2012, Fuest, Peichl, and Siegloch (2018) estimate a wage elasticity of -0.14. Using industry-region variation in Germany, Dwenger, Rattenhuber, and Steiner (2013) estimate slightly larger elasticities of -0.19 to -0.28. Analysing corporate tax rate changes across and within Canadian provinces, Ebrahimi and Vaillancourt (2016) likewise estimate an elasticity of hourly wages of -0.15 to 0.24, while McKenzie and Ferede (2017) estimate -0.11 to -0.15.

The extant empirical literature therefore demonstrates that CIT rates have a material impact on workers' wages, which is why studies generally find that between 21% and 75% of the total burden of corporate taxation is ultimately borne by workers through lower rent sharing, fewer plants and establishments, less investment in plant and equipment per worker, and thus lower labour productivity growth and lower wages (CEA 2018).

2. ESTIMATING THE EFFECTS OF CORPORATE TAX REFORM

To quantify the effects of alternative CIT and bonus depreciation scenarios—such as the temporary 130% super-deduction—for the U.K. economy, I use a neoclassical growth model in which changes in the user cost of capital translate directly into changes in the demand for capital services, which in turn raises the long-run capital stock and potential output of the U.K. economy. As a baseline, I assume equity financing of marginal investment, parameterising the estimation of user costs by broad asset type—equipment, structures, and intellectual property products.[3]

Data on the productive capital stock and gross fixed capital formation are from the Office of National Statistics' (ONS) annual Volume Index of Capital Services (VICS). I then estimate depreciation rates by asset type from the coefficient estimate for δ in the regression $K_{t+1} - K_t - I_t = -\delta K_t + \varepsilon$, where K_t and I_t are the productive capital stock and gross fixed capital formation, respectively, at time t. The net present value of depreciation allowances by asset type are from Hogreve and Bunn (2022), while parameter values for the real annual discount rate are consistent with Devereux, Griffith, and Klemm (2002); Bilicka and Devereux (2012); and Mathur and Kallen (2017).

Assuming a user cost elasticity of demand for capital services equal to the neoclassical benchmark and emerging empirical consensus of -1.0, a user cost shock equal to φ will then lower investment by $I_t \cdot (1 - \varphi)$. The evolution of the productive capital stock can then be iteratively calculated by the equation:

$$K_{t+1} = K_t + I_t - \delta K_t$$

under the baseline, current-law scenario, and by:

$$K_{t+1} = K_t + I_t \cdot (1 - \varphi) - \delta K_t$$

under alternative reform scenarios. I then use estimates of capital income by asset type from the VICS to increment aggregate income and output in accordance with

3 This means the user cost of capital is given by:

$$UCC = \frac{(r + \delta)(1 - \tau Z)}{(1 - \tau)}$$

where r is the real annual discount rate, δ the rate of depreciation, τ the statutory CIT rate, and Z the net present value of depreciation allowances. With full expensing of new investment, Z = 1.

the change in the productive stock of each asset. By this approach, in 2023 current law will raise the user cost of capital and lower investment by 7.6%[4] and reduce long-run real GDP by 2.3%, versus if the 2022 rate of 19% and 130% super-deduction for new investment in qualifying plant and machinery were made permanent.

Table 1: Investment and GDP Responses to CIT Reforms		
Reform scenario (Baseline: CIT = 25%, no bonus depreciation)	Real Investment (weighted average)	Real GDP
CIT = 19%, no bonus depreciation	2.8%	0.9%
CIT = 19%, 100% bonus depreciation for equipment	4.6%	1.3%
CIT = 19%, 100% bonus depreciation all assets	9.6%	2.9%
CIT = 15%, no bonus depreciation	4.5%	1.4%
CIT = 15%, 100% bonus depreciation for equipment	5.8%	1.7%
CIT = 15%, 100% bonus depreciation all assets	9.6%	2.9%

Table 1 reports investment and GDP effects of alternative corporate tax scenarios relative to current law, under which in 2023 the CIT will rise to 25% and 130% bonus depreciation for qualifying plant and machinery will expire, meaning the present value of depreciation allowances for investment in machinery will revert to 0.758, or 75.8% of cost. Relative to current law, maintaining the CIT at 19% would alone raise investment by almost 3%, and GDP by approximately 1%. Maintaining the CIT at 19% and extending bonus depreciation at a lower rate of 100% would raise real investment by almost 5% and real GDP by 1.3%, while extending 100% bonus depreciation to all asset types would raise investment by 9.6%, and real GDP by approximately 3%.

To cross-reference investment and growth responses as estimated by the neoclassical growth accounting approach with alternative approaches, I also apply the estimated impacts of exogenous tax shocks from Cloyne (2013) to a tax shock of the magnitude of a reduction in the CIT rate from 25% to 19%. Taking the static revenue gain from the March 2021 budget of the CIT rate increasing from 19% to 25% (£11.9 billion in the first year) and scaling that up to an estimated 12-month static revenue gain generates a tax shock equal to approximately 0.6% of projected 2023 nominal GDP. Estimates in Cloyne (2013) then imply that reversing an impulse of that magnitude would raise GDP by as much as 1.5% and investment by 2.8%. Though the investment response is exactly in line with that generated by the user cost of capital approach, the implied GDP response suggests that the output results reported in Table 1 may even be conservative, as the neoclassical growth accounting generates gains of just 0.9% for GDP.

Table 2: Change in Average Annual Household Wages by CIT		
Reform scenario, (Baseline: CIT = 19%)	Change in average household wages	Change in average household wages (trimmed)
CIT = 25%	-£2,485	-£2,209
CIT = 15%	£1,657	£1,472

4 Calculated as a weighted average of the declines in investment in equipment, structures, and intellectual property products.

Results of applying the 13 empirical estimates of the elasticity of wages with respect to the corporate income tax rate discussed in Section 1 are reported in Table 2, with the current CIT rate of 19% constituting the baseline. The first column reports averages of all estimates, while the second column reports average changes with the highest and lowest two estimates dropped, to remove potential outliers. For estimates based on semi-elasticities, I multiply the point estimate of the semi-elasticity by the percentage-point change in the statutory corporate tax rate, and then apply the implied percentage change in wages to average household income, as reported in Table 30 of the ONS' statistics on average household income (£60,437), multiplied by the wage-and-salary share of income (68%, from Table 28 of the ONS' statistics on average household income). For results where elasticities are reported, I apply the percent change in the statutory tax rate to average household income, again multiplied by the wage-and-salary share of income.

Results indicate that raising the CIT to 25% from 19% will lower average household income by £1,060 to £6,489, with an average decline of £2,485 across all 13 point estimates. If we drop the two highest and two lowest estimates, the decline in average household income ranges from £1,389 to £3,115, with an average decline of £2,209. In contrast, lowering the CIT from 19% to 15% would raise average household income by £707 to £4,326, with an average increase of £1,657. Dropping the two highest and two lowest estimates yields an increase in average income ranging from £926 to £2,076, with an average increase of £1,472.

To estimate whether the growth and income effects of maintaining the CIT rate at 19% versus 25% would be sufficient to partially or fully offset the static budgetary cost, I extend the Office of Budget Responsibility's (OBR) latest five-year forecast of CIT revenue by assuming that beyond the forecast window, baseline CIT receipts grow at the same rate as OBR's latest long-run forecast of GDP. I then compute the OBR's March 2021 estimate of the static revenue gain of raising the CIT from 19% to 25% as a percentage of their projected CIT revenues, and assume that with no dynamic feedback, CIT revenues would be perpetually below projection by that same percentage in the event the CIT rate were maintained at 19%. This yields a 10-year estimated static revenue cost of £175 billion.

I then calculate potential macroeconomic feedback in two ways. First, I compute the integral between the baseline path of nominal GDP, and the path under the reform scenario, both as generated by the neoclassical growth accounting model discussed above. I then multiply that cumulative difference by the OBR's final pre-March 2021 projection of total tax receipts as a share of GDP for the first 10 years, and by the U.K.'s long-run tax receipts share of GDP thereafter. This is a conservative approach, as the historical long-run tax share of GDP (32%) is lower than the OBR's pre-March 2021 forecast.

In the second approach, I assume that the average household wage gains reported in Table 2 accumulate linearly over ten years, and then grow thereafter at the same rate as the OBR's latest long-run inflation forecast. I then aggregate those gains across all households, assuming household growth as projected by the ONS' latest household estimates and long-run projections, with household growth beyond the forecast horizon growing at the last projected rate. Finally, I calculate an average tax rate on wage income using U.K. tax statistics from the OECD,[5] and apply that average tax rate to the aggregate increase in household wages.

Results of estimating dynamic revenue effects via the wage approach suggest that macroeconomic feedback from higher aggregate income could offset 50% of the static budgetary cost over 10 years of maintaining the CIT rate at 19%, and more than 100% over the longer run. Estimating dynamic revenue effects via the growth accounting approach suggest that macroeconomic feedback from higher output could offset 17% of the static budgetary cost over 10 years, and 42% over the longer run. Averaging the results of both approaches suggests dynamic revenue effects could offset approximately a third (34%) of the static budget cost over 10 years, and more than half (72%) over the long run, with annual estimates for 2023-2032 reported in Table 3.

Table 3: Static and Dynamic Revenue Cost, 2023-2032 (Billions of £s)

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2023-32
Static	11.9	16.3	17.2	17.6	17.9	18.2	18.5	18.9	19.2	19.5	175.1
Dynamic	10.8	14.1	14.0	13.3	12.5	11.8	11.1	10.3	9.6	8.9	116.3

3. DISCUSSION

A large empirical literature indicates that changes in corporate income taxation have important implications for investment, economic growth, and wages. Drawing upon that literature, I find that current plans to raise the corporate income tax rate from 19% to 25% and eliminate the ability of firms to fully expense new equipment investment will substantially lower investment and output in the United Kingdom. Raising the corporate rate to 25% will alone lower average household wages by approximately £2,500. I also estimate that over 10 years, macroeconomic feedback from higher growth in output and income could offset 34% of the static budgetary cost of corporate tax reform, rising to 72% over the longer term.

5 I calculate this as *1 – (Total gross earnings before taxes – Net income after taxes).*

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