

LITERATURE REVIEW OF THE ECONOMIC EFFECTS OF CORPORATION TAX

Part of the Economic Impact Assessment of Ireland's Corporation Tax Policy

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The authors Terence Hynes and Brendan O’Connor are economists in the Department of Finance and members of the Irish Government Economic and Evaluation Service (“IGEES”). The analysis and views set out in this paper are those of the authors only and do not necessarily reflect the views of the Department of Finance or the Minister for Finance. The authors would like to thank David Hegarty and other officials of the Department of Finance for comments and suggestions.

Executive Summary

This paper reviews academic literature on the economic effects of corporation tax with particular attention to growth effects. After reviewing the evidence on whether the burden of taxation actually falls on companies or other agents (e.g. employees), the paper considers the impact on growth through a number of channels including capital accumulation, inward investment and innovation.

Capital accumulation in an economy is affected by tax through reductions in the profit incentive to invest. Theoretical and empirical evidence suggests that capital accumulation can respond to tax rates, to depreciation allowances and to debt interest allowances, which all interact to change the optimal investment in capital by firms. The effect of tax on capital differs across assets with evidence indicating that the burden of taxation falls most heavily on investment in information and communication technology.

The impact of corporate tax on foreign direct investment flows is well established. Research by the OECD suggests that a 1% rise in corporation tax results in a fall in foreign direct investment of 3.7%. More recent research completed by the ESRI confirms their results with the finding that corporation tax negatively affects the probability of locating in a particular jurisdiction. Empirical results indicate that the type of taxation system of the home country i.e. credit or exemption system does not affect the size of the elasticity. Beyond the role of tax, agglomeration benefits are also seen to affect the location of foreign capital.

Tax is generally seen to act on innovative activity by reducing the return available to firms from introducing innovations to their product lines and production processes or through reduced investment in new capital assets which embody technological progress. Evidence from the OECD and European Commission links the effects of corporation tax on innovation at the aggregate country level and at the firm level.

In terms of the overall impact of corporation tax on growth, empirical research estimating the relationship between corporation tax and overall economic growth indicates a negative relationship of between 0.6% and 1.8% on economic growth for each 1% change in the statutory corporate tax rate. In the case of Ireland tax policy research indicates that the extension of the 12.5% corporate tax rate to firms in the business and services sector in the late 1990s increased the level of GNP in Ireland by 3.7%.

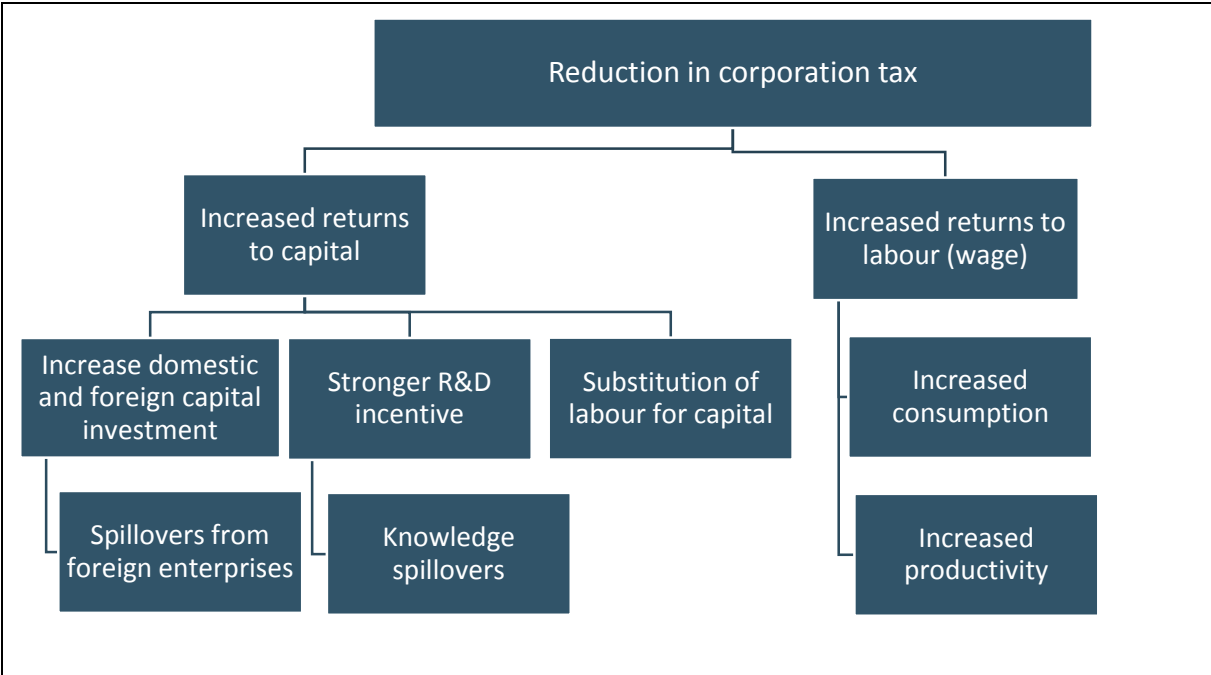
The rest of this paper deals firstly with the incidence of corporate taxation going on to discuss the effects of corporation tax on capital accumulation, foreign direct investment, and innovation in an economy.

1. Introduction

Section Summary

The extent to which the corporation tax burden falls on firms or employees is largely dependent on the relative mobility of capital and labour. Where capital is more mobile than labour the incidence of taxation tends to fall on wages and employment. Empirical estimates suggest that a 1 euro increase in corporation tax reduces wages by between 44 and 77 cent.

A review of the effects of corporation tax can be usefully elucidated through a discussion of the various channels through which corporate taxation can affect the economy. While corporation tax is legally levied on the firm, the incidence of taxation is generally seen to be distributed in the economy between participants in the production process. Graphic describes some of the channels through which a reduction in corporation tax can affect an economy.



Graphic : Distribution of corporation tax incidence and high level effects on economy¹

The key relationship highlighted by Graphic is that the burden of corporation tax is distributed between the returns to capital (in the form of investor profits) and the return to labour (in the form of wages). It highlights the effect of a corporation tax reduction on the incentive for firms to accumulate capital, attract inward investment of foreign capital and incentivise innovation. It also demonstrates the effect that lower corporate taxes can have in terms of increasing employee wages. The extent of burden sharing between employees and firms is dependent, inter alia, on the mobility of capital and labour. It is also possible for some of the incidence of corporate tax to fall on consumers in the form of final goods prices.

A significant body of theoretical research has attempted to estimate the degree of pass through in a general equilibrium setting since Harberger (1962) suggested in a seminal paper that capital bore a substantial share of the burden in closed economies. However, recent work considering tax incidence in an open economy setting, indicates that labour bears the greater share of the corporate tax burden

¹ Final consumer prices as well as the prices of inputs to the production process will also be affected by a tax reduction. The implication of these effects or the implications of increased wages for labour on the economy are not discussed in this paper.

due to reduced investment caused by lower after-tax returns and the ability of mobile capital to be reinvested outside the economy.

Evidence of this burden sharing is presented by Arulampalam, Devereux & Maffini (2012) who focus solely on the role of wage bargaining between employees and employers in sharing the burden of corporation taxation. The authors find that a 1 euro increase in tax results in a 49 cent decrease in real wages. Fuest & Peichel (2014) estimate the effect of corporate tax on wages taking account of both wage bargaining and reduced investment within the German economy. Their paper concludes that a 1 euro increase in corporation tax liability yields a 44 to 77 cent decrease in the wage bill.

The remainder of this paper focuses on growth impacts. The next chapter discusses the capital accumulation effects of corporate tax which leads into its effect on attracting inward investment of foreign capital. The paper then discusses the reduction in the incentive to innovate by corporation tax and finishes with an overview of the direct or overall effects of corporation tax on economic growth.

2. Capital Investment and Corporation Tax

Section summary

Capital accumulation is affected by tax through changes in the incentive to invest. Theoretical and empirical evidence suggests that capital accumulation can respond to tax rates, to depreciation allowances and to debt interest allowances which all interact to change the optimal investment in capital by firms. The effect of tax on capital differs across assets with evidence indicating that the burden of taxation falls most heavily on investment in information and communication technology.

Capital accumulation plays a significant role in economic growth. Corporate taxation affects this investment in capital by altering the user cost of capital. The user cost of capital takes into account the tax rate, depreciation, capital investment incentives and sources of finance in changing the user cost of capital to the firm.

In a simple model of firm investment, firms will invest until the return on the last unit of capital stock equals the costs associated with acquiring that unit. Corporation tax affects this decision by reducing the return on this investment and lowering the profit maximising value of capital stock. This effect is somewhat mitigated by depreciation allowances, debt interest write off, and tax incentives, which form part of the corporate tax system.

Bond and Xing (2013) combine these effects along with other costs of investment like the prevailing interest rate to establish the effect that corporate taxation has on capital accumulation across 14 advanced economies over two decades. Their results show that both the statutory corporate tax rate and depreciation allowances have a significant effect on investment in assets classified as equipment. However, they were unable to clearly identify an effect of corporate taxation on buildings. They also find no effect on investment of the tax advantage for debt finance associated with the deductibility of interest payments.

A recent paper by the European Commission (2013) highlighted the ways in which the corporate tax system could affect composition of capital within an economy. This arises due to the differential treatment within corporate tax systems of different asset types because of variations in asset lives, depreciation allowances, means of financing and special investment reliefs for certain types of capital assets. In other words taxation does not have a neutral impact on investor decisions across different capital asset types i.e. information and communication technology; transportation equipment; other machinery and equipment; and buildings. The author's results show different average marginal effective tax rates across these asset classes for several countries (including Ireland) arising from their tax treatment. Information and communication technology is observed to be particularly negatively affected by the corporate tax system which may serve to limit the accumulation of ICT capital.

While corporation tax can be seen to increase investment by all firms a significant source of capital in many countries is inward investment capital. The next section considers the relationship between corporation tax and foreign direct investment (FDI).

3. Foreign Direct Investment and Corporation Tax

Section Summary

The role of corporate tax in influencing foreign direct investment flows is well established. Research by the OECD suggests that a 1% rise in corporation tax results in a fall in foreign direct investment of 3.7%. More recent research completed by the ESRI confirms these results with the finding that corporation tax negatively affects the probability of locating in a particular jurisdiction. Empirical results indicate that the type of taxation system of the home country i.e. credit or exemption system does not affect the size of the elasticity. Beyond the role of tax, agglomeration benefits are also seen to affect the location of foreign capital.

One of the most comprehensive empirical reviews of the response of FDI to corporation tax was produced by the OECD in 2005 who conducted a meta-analysis on the existing body of economic literature to that date.²³ The range of capital data, estimation methods, model specification and variable choice that form the composition of the literature makes a qualitative comparison of results between studies and the conclusion of a single elasticity estimate difficult. However, the authors indicate that the elasticities from 31 empirical studies have a mean and median of -3.72 and -2.91 respectively. The elasticity implies that a 1% rise in the corporation tax rate would decrease FDI by 3.72%.⁴ Box 1 details some of the literature contained in OECD's meta-analysis.

Box : Synopsis of OECD research on the response of FDI to corporation tax

One of the most comprehensive reviews of the response of FDI to corporation tax is authored by De Mooij and Ederveen (2005) who undertook a meta-analysis on the existing body of economic literature. The range of capital data, estimation methods, model specification, variable choice that form the composition of the literature makes difficult the qualitative comparison of results between studies and the derivation of a single elasticity estimate.

Their meta-analysis approach is useful in this situation as it provides a systematic, quantitative approach to siphoning out the characteristics of each study such as country focus, period studied or the empirical methodology employed. The process gives a more accurate estimate of the effect size independent of research design. Meta-analyses enable the researcher to draw more rigorous conclusions than would have been possible on the basis of individual studies considered in isolation. The literature below can be more easily considered under three headings according to the type of data used – cross-sectional, location choice data, and panel.

Cross section data

Cross-sectional data observes firms or countries at a given point in time. Using cross-sectional data Grubert and Mutti (1991) look at the sensitivity of US investors to foreign average tax rates in 33 countries. They find a low elasticity explained by the fact that their sample is composed of manufacturing firms which are observed to be less sensitive to taxation. Evidence that the sensitivity of firms to taxation is increasing over time was provided for by Altshuler et al. (2001) who found that the elasticity of firms' investment to tax increased between the period 1984 and 1992. The mean value of the cross sectional elasticities collected by De Mooij and Ederveen is -7.47 with the median at -4.27.

² Meta-analysis in this context is a statistical analysis of the impacts research methodology (e.g. model specification or data type) on research outputs (e.g. the size of the FDI elasticity).

³ Research published in De Mooij and Ederveen (2005)

⁴ One concern with this study is that just under half of the elasticities used in the analysis were statistically insignificant. Omitting these insignificant results may change the average elasticities given. In addition, the average statistics given above could be distorted by an overabundance of elasticities taken from studies using a particular type of capital data or tax variable.

*Location choice data*⁵

Another approach is to use data on firms' actual investment location choices and estimate the effect of taxes on the probability of a firm choosing to locate in a given jurisdiction. Swenson (2001) distinguishes between different types of investment make-up; new plant, plant expansions, mergers and acquisitions, joint ventures, equity increases and other FDI based on the investment choices of 46 countries into 50 US states. They use state statutory tax rates as the source of tax rate variation in the model. The elasticity for new plants and plant expansions is significantly negative. The mean and median elasticity for all location probability models observed is -3.8 and -3.07 respectively.

Panel Data

The last category of studies in De Mooij and Ederveen are panel data studies which relate bilateral FDI flows between jurisdictions at either country level or among US states to tax rates. Pain and Young (1996) focus on FDI from Germany and the UK into 11 locations between 1977 and 1992. Moreover, they stress the importance of the home country tax system on the responsiveness of FDI to host country tax rates. The long-run elasticity in Pain and Young's study is significantly negative and large for the UK, but insignificant and small for Germany. The mean value of the elasticities for panel studies is -2.9 with the median at -2.51.

By regressing the elasticities on the characteristics of the study such as the type of capital data used, tax variable, type of FDI (plant & machinery, merger and acquisition), this controls for variation in the size of the elasticity due to these characteristics. Beyond the above characteristics the authors also control for whether the study took account of: whether the parent country's tax system was credit or exemption based, the openness of the economy, agglomeration effects, and whether wages or time were controlled in the studies producing the estimates.

De Mooij and Ederveen's meta-analysis reveals that whether or not a study controls for the taxation system of the parent country is irrelevant for the size of the elasticity. Interestingly controlling for agglomeration tends to reduce the size of the elasticity, the openness of country does also. This latter result is surprising as the openness of an economy would be expected to increase capital mobility and the sensitivity of the capital to the tax rate. They also find evidence to support the theory that capital is becoming more responsive to tax over time.

Source: Ruud A. de Mooij & Sijf Ederveen, 2005. "Explaining the Variation in Empirical Estimates of Tax Elasticities of Foreign Direct Investment".

In a separate paper published as part of the Department of Finance's review of the corporate tax system, the ESRI (2014) examine the effects of country characteristics and corporation tax on firm location decisions using data on newly established multinational subsidiaries across 26 European countries from 2005 to 2012. The authors find a consistently negative effect of tax on locational decisions of firms. Their benchmark model indicates that tax has a marginal effect of 1.15 percent. This indicates that a one percent increase in the effective average tax rate would lead to a reduction in the probability of choosing a destination of 1.15 percent controlling for all other factors. The paper noted that the marginal effect for tax was the largest of all variables included in the model specification.

Lawless (2009) looks beyond the interactions of the corporate tax rate and tax base on FDI flows by estimating the effect of the complexity of the tax system on FDI. The number of payments and time to comply with tax obligations are found to have significant negative effects on the presence of FDI flows although they do not significantly impact on the level once the FDI relationship has been established. In terms of its economic significance, the author estimates that a 10% reduction in tax complexity is approximately comparable to a one percentage point reduction in the effective corporate tax rate.

⁵ This is the approach used by the ESRI (2014) in its research on the impacts of tax policy on the locational decisions of FDI.

While taxes are an important factor in foreign investors' decisions to locate in Ireland, Hines (2003) noted that a significant number of countries in the 1990s offered near-blanket tax exemptions for foreign investors, yet few of these have experienced the influx of foreign direct investment on the scale which occurred in Ireland. This points to the importance of other factors influencing firm decisions including the existence of physical infrastructure, human capital, research and development capacity, stable political climate etc.

4. Innovation, Productivity and Technological Change

Section summary

Tax is generally seen to act on innovative activity by reducing the return available to firms from introducing innovations to their product lines and production processes or through reduced investment in new capital assets which embody technological progress. Evidence from the OECD and European Commission links the effects of corporation tax on TFP at the aggregate country level and at the firm level.

Economic growth in the long run is driven by productivity improvements resulting from technological progress or innovation and increases in human capital. The seminal work on innovation in economics is attributed to Schumpeter (1942) who introduced the idea that new innovations in products, transportation methods, and intermediate goods etc. replace older versions of the same good implying that growth is achieved through more productive capital rather than accumulation of capital (see also Aghion and Howitt (1992) who captured this insight in a growth model).

According to Myles (2009), the common property of recent growth models are that choices made by economic agents affect productivity growth and these choices can be influenced by economic policies such as taxation. For instance, an increase in taxation reduces the returns to investment (in both physical and human capital) and research and development (R&D). Lower returns mean less accumulation of human and physical capital and innovation in terms of productivity, and hence a lower rate of growth. In general, the effect of taxes in growth models which explain long-run growth can be seen to have a negative effect on growth in productivity through a reduction in the incentive for private agents to engage in innovative activity.⁶

Research by the European Commission (2014) has investigated the role of structural factors in determining the growth of Total Factor Productivity (TFP) in 20 OECD countries focusing on the effects of these variables on countries which are considered behind the technological frontier.⁷ The technological frontier is a concept which the authors define as the growth rate of TFP for the country with the highest growth rate. Among these structural variables are measures of the level of product market legislation, an index of government effectiveness, the age-dependency ratio, and the corporate income tax rate. Their results show that the corporate income tax rate is negatively related to the rate of TFP growth in countries which are far from the technological frontier with the effect declining for countries at the technological frontier. This result is consistent with Ireland's significant growth rate in TFP during the '90s. It also suggests that to the extent that Ireland is at the technological frontier now the lower corporation tax rate will not deliver similar effects on technological growth it as it did in the 1990s.

Schwellnus and Arnold (2008) investigate the impact of corporation taxes on TFP growth at the firm level. They indicate that corporate taxes reduce productivity and investment at the firm level. This is especially the case for firms who are catching up to the technological frontier. The effect of taxes also plays a role in reducing investment by firms which can embody technological progress increasing productivity.

⁶ The effect of tax on growth in this paper is divorced, for the purposes of analytical insight, from the effects of the spending allowed by such taxes such as education systems and government research which are an important source of productivity and innovations.

⁷ Total factor productivity is the part of economic growth that is not accounted for by increases in capital and labour. It is typically taken as a measure of innovation or technological progress in an economy.

5. Corporation Tax and Economic Growth

Section summary

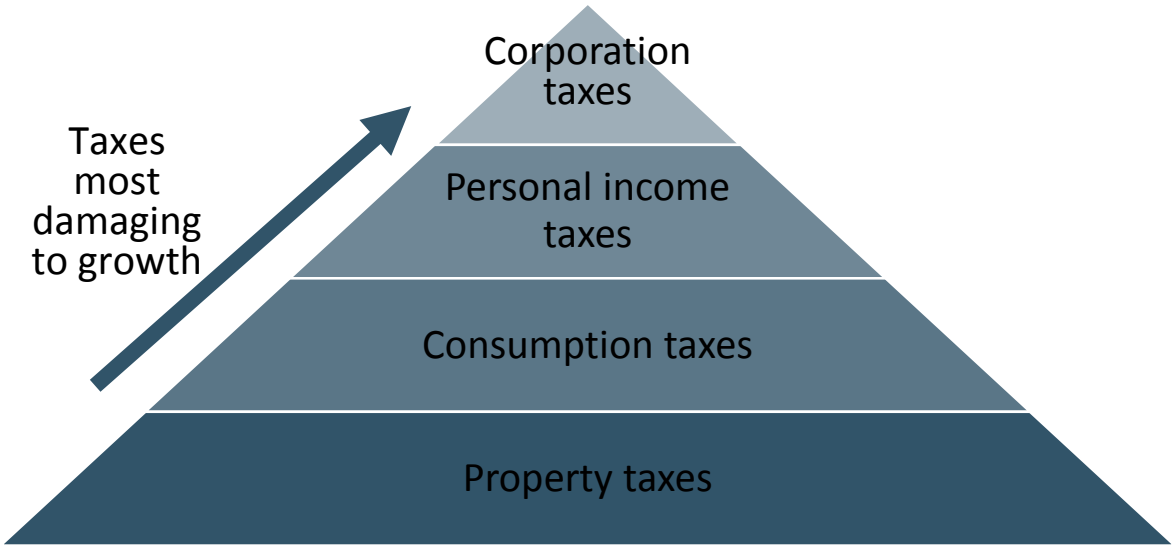
Evidence based on a wide number of countries indicates that a 10% reduction in corporation tax could have anywhere between a 0.6% and 1.8% effect on economic growth rates. In Ireland, the effect of lowering the corporate tax rate in the business and services sector was shown to have significantly increased GNP in the years following the change.

The previous sections have presented evidence on the relationship between corporation tax and important components of economic growth including capital accumulation and innovation. A more direct line of research looks at the effects of corporation tax on economic growth.

Taking this approach Lee & Gordon (2005), use data for 70 countries over the period 1980 to 1997 to find that statutory corporate tax rates are significantly negatively correlated with cross-sectional differences in economic growth rates. Estimating the relationship between corporation tax and economic growth, the authors' results suggest that reducing the corporate tax rate by 10 percentage points can increase the annual growth rate by 0.6% to 1.8% depending on control variables included.

The paper's strength lies in the broad range of countries covered and the relatively long period of observation. However the analysis may be limited in some respects. Firstly, the paper uses statutory corporation tax rates which may not capture the true burden of corporate taxation on firms. Secondly, countries may have multiple corporation tax rates (for example in the sample Ireland is listed as having a corporation tax rate of 50% in 1985 which in reality only applied to the non-exporting sector).

Lee and Gordon consider the effects of corporation tax largely independent of other taxes' effects on growth. Empirical work by Arnold et al. (2008) on 21 OECD countries over the period 1971-2004 investigates the effects of tax structure on economic growth. They define tax structure to mean the degree to which countries rely on corporation, personal income, consumption and property taxes to achieve a given level of tax as a proportion of GDP in an economy. Their work suggests a tax and economic growth hierarchy with recurrent taxes on immovable property being the least distortive tax instrument in terms of reducing long-run GDP per capita, followed by consumption taxes and other property taxes as well as environmentally-related taxes. Corporation tax was found to be the most damaging to growth followed by personal income taxes.



Graphic : OECD's hierarchy of taxation

In terms of domestic research, Conefrey & Fitzgerald (2011), estimate the impact of corporation tax rates on the Irish economy in the 1990s and early 2000s. Their analysis focuses on the reduction in the rate of corporation tax in the business and financial services sector (excluding the IFSC) from 40% in 1994 to 12.5% by 2003. This policy change provides a useful natural experiment allowing the authors to derive an estimate of the broader macro-economic impact of this tax change using the HERMES macroeconomic model of the Irish economy. Using this model the policy change was shown to have increased the level of GNP by 3.7% in 2005 over what it would otherwise have been.

Conclusion

This paper discussed economic literature on the effects of corporation tax in an economy with particular attention given to growth effects. Establishing the incidence of taxation between firms and employees the paper concluded that a significant proportion of corporation tax is borne by employees in terms of reduced wages.

Evidence was presented on the negative effects corporation tax can have on capital accumulation and it was noted that corporation tax can have a non-neutral effect on different classes of assets, specifically information and communication technology. Corporation tax was also shown to reduce the incentive to engage in innovative activity at both the firm and country level with this effect attenuating as firms and countries reached the technological frontier.

Within capital accumulation the paper also addressed the role corporation tax plays in attracting foreign capital into a country. Findings for the OECD indicated that a 1% rise in corporation tax results in a fall in FDI of 3.7% which is based on an average of the estimated elasticities of empirical literature up until 2005. Evidence was also presented on the benefits of reduced tax compliance for firms in attracting new sources of FDI to a country.

The paper indicates that corporation tax has negative effects on economic growth generally and that the reduction of the corporation tax rate in Ireland increased economic activity post-1990s. Empirical work estimating the relationship between corporation taxes and economic growth indicates a negative relationship of between 0.6% and 1.8% of economic growth for each 1% change in the statutory corporate tax rate.

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