The incidence of company tax in Australia

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This paper uses a computable general equilibrium framework to provide estimates of where the costs of company tax are borne and to test the importance of certain assumptions. The welfare benefits of a small fall in the company tax rate are shared between company owners and workers. The paper finds that in the long-run around one-third of the benefit accrues to the owners of capital in the main scenario, with the remaining two-thirds flowing to households, primarily through rises in real wages. Results with alternative assumptions are also presented.

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Introduction

Taxes fund public services and transfer payments to improve the wellbeing of the Australian people as a whole, but by themselves reduce the welfare of some people. The economic incidence of a tax is an estimate of whose welfare is reduced, and by how much.

Those that bear the burden of a tax are sometimes different to those who have the legal liability to pay the tax. The legal liability for company taxes falls on the company, so in the near term the effects of raising or lowering the company tax rate will be felt by the owners of capital. However, as the economy adjusts the burden of a tax will be determined by the way it affects the behaviour of firms and consumers, including the distortions it creates. In general, the burden of company tax in terms of welfare lost is shared between company owners, workers and consumers.

Tracing the effects that taxes have on decisions within companies through to changes in prices and wages requires modelling of the economy as a whole. Modelling results depend upon the assumptions made about the capacity of companies and households to change their behaviour. The international literature generally finds that company taxes reduce real wages, including by increasing production costs and the price of final goods, so that a substantial share of the welfare costs of company taxes are borne by labour. Studies of how economies have responded to actual changes in company taxes are consistent with this finding (Sorenson and Johnson 2010).

This paper presents the concepts of legal and economic incidence, outlines the key determinants of economic incidence noted in the literature and presents results from economic modelling of the incidence of company tax in Australia. As a mechanism for conceptualising and quantifying the long-run incidence, the paper considers the welfare effects of a fall in the company income tax rate. Long-run modelling results are presented for a 1 percentage point cut in the company income tax rate. The paper also presents results from a range of scenarios to illustrate some of the uncertainties around estimates of incidence.

Economic versus legal incidence

The economic incidence of a tax is different from its legal incidence. Those entities that bear a legal responsibility to pay tax to the government are said to bear the legal or statutory incidence of the tax. Companies and other legal entities may face the legal incidence of a tax, for example by having to forward receipts to the government from a consumption tax or amounts withheld from employees.

Economic incidence is a measure of whose wellbeing is reduced by a tax and by how much. The economic incidence is the welfare reduction from the tax borne by consumers, workers or owners of capital.[2] A common approach to assessing the incidence of company tax is to look at the changes in welfare that result from small changes in the tax rate.

The economic incidence of company tax is potentially borne by both labour and the owners of capital. The general principle is that the incidence of tax is borne predominantly by the least responsive or flexible factor of production. In the short run, with the capital stock fixed, most of the incidence is borne by the owners of capital, but in the long run more of the incidence of company tax is borne by labour, which is the less responsive factor of production.

2 It is not possible disentangle consumers and workers in the modelling framework used in this paper. As such the modelling and analysis considers the income or welfare accruing to the factors of production, capital and labour.

Similarly, the benefits resulting from a reduction in the company tax are shared across these factors of production. In the near term, a decrease in the company income tax rate would increase the after tax rate of return on capital. As such, the owners of capital would gain a large share of the immediate relief from the reduction in the company tax rate.

However, the higher rate of return results in higher investment and, over time, a larger capital stock. This process continues until, in the long run, the return on further investment has fallen back to the rate required by global investors. The increased stock of capital means that labour is more productive and real wages are higher. Employment is, by comparison, relatively less responsive with households typically changing the amount of labour they supply only to a small degree in response to the higher wages on offer.

Factors affecting the economic incidence of company tax

The economic incidence of company tax depends on many factors. When examining the literature on the burden on company income taxes, findings vary based on assumptions about:

- the degree of market competition and the existence of economic rents;
- the international mobility of capital investments;
- how easy it is to substitute international and domestic products;
- the size of the domestic economy; and
- how easy it is to substitute labour for capital.

Economic rents

Economic rents are earnings in excess of normal returns on investment. Economic rents can be categorised as being derived from either location-specific or firm-specific factors.

Rents from location-specific factors may arise from legislated protection or monopolies, existing fixed investments (such as factories), exploitation of natural resources, agglomeration (where businesses obtain benefits from co-location such as economies of scale), attractive local infrastructure, public services and institutions. They may also arise from market power, for example where consumers prefer domestically produced goods over imported goods. They are relatively unresponsive to tax rates.

Rents from firm-specific factors may arise from specialised production techniques or technological knowledge, corporate structure and managerial expertise, brand names and patents. Investments generating firm-specific rents can be moved from one jurisdiction to another, with the choice of location affected by the after tax rate of return available in each jurisdiction. Over time, firms are able to move these factors between countries in response to differences in the rates of return available. In the same way that a reduction in the company tax rate affects the domestic capital stock, it raises the return available to firm-specific factors and would result in a larger domestic pool of firm-specific rents.

Australian company income tax applies to the normal return to equity from investment required to draw the capital into use, as well as any economic rents. The existence and type of economic rents in the economy affects both the efficiency and the incidence of company taxation. The location-specific factors that give rise to rents are relatively immobile and hence less affected by tax rates. The larger

the extent of location-specific factors, the smaller the effect of company tax on investment, labour productivity, wages and economic activity per dollar of revenue collected. That is, the larger the extent of location-specific factors, the more efficient company tax would be and the greater the share of the incidence of company tax that would be borne by owners of capital, rather than workers.

Mobility of capital

The mobility of capital refers to how easily financial capital (debt and equity) flows into and out of a country. Greater capital mobility will shift more of the burden of taxation from capital to labour through larger changes in the domestic capital stock, and hence in domestic labour productivity and wages (Grubert and Mutti 1985; Gravelle 2010). In this situation, a reduction in the company tax rate will result in large inflows of foreign capital to ensure that there is no material difference between the after tax (risk adjusted) rate of return on investment in Australia and the rate available abroad.

While international capital is highly mobile between advanced economies, it is clearly not perfectly mobile. If capital is less internationally mobile—for example if foreign appetite to hold investments in Australia is limited—then a reduction in the company tax rate will result in a smaller inflow of foreign capital with the after tax return remaining above the international rate. This can be thought of as a premium required by foreigners to invest in the domestic market. In this situation, more of the burden of company tax is borne by capital, and less by labour as the smaller change in the capital stock flows through to a smaller change in wages.

International product substitution

The ability of consumers to substitute between domestically and internationally-produced goods and services affects the incidence of company income tax. With a high degree of substitutability, domestic producers face highly elastic demand for their products and so a reduction in the company tax rate will flow through to greater domestic production and higher demand for labour while leaving margins relatively unchanged. In this case more of the incidence of the company tax is on labour. If consumers are unwilling to substitute between domestic and international products, then a reduction in the company tax rate will see a smaller increase in domestic production and an increase in margins, so that more of the incidence of the company tax is on capital (Harberger 2008; Gravelle 2010).

Size of the economy

The size of an economy will affect the ability of domestic firms to pass the burden of taxes onto consumers, as larger economies have a greater ability to affect international rates of return on capital and product prices (Randolph 2006; Gravelle 2010). Through their implied global market power larger economies are likely to see more of the burden of company income taxes fall on capital as changes in the return to domestic capital will also affect the return to international capital.

Australia is generally considered a small economy, making up less than 2 per cent of world GDP.[3] As such, Australian taxation policy has little effect on global rates of return on capital. On the other hand, domestic changes can potentially have some (limited) effect on world prices for commodities where Australia accounts for a larger share of world production, such as wool, wheat, coal and iron ore, or where there are only imperfect substitutes available for Australian exports, such as tourism services. In these cases, domestic producers are able to pass on some of reduction in the domestic company income tax rate in the form of lower prices and so foreign consumers share some of the benefits of the reduction in the tax rate.

3 Data taken from the World Bank data resource, accessed 25 September 2013, available at http://data.worldbank.org/indicator/NY.GDP.MKTP.CD.

Labour and capital substitution

The extent to which firms are capable of substituting labour and capital in production also has an impact on the incidence of company tax (Gravelle 2010). If these factors are highly substitutable then the incidence of a reduction in the company tax rate will be felt more strongly by labour.[4]

Modelling the incidence of company tax in Australia

A computable general equilibrium (CGE) modelling approach was taken to estimate the incidence of company tax. Computable general equilibrium models are useful for exploring the economic impacts of changes to company income tax rates as they provide a detailed representation of the factor and product markets and their linkages. While these models have their limitations, they provide an integrated framework for analysis, based on economic theory and using the best available economic and tax data.

The Independent Economics CGE model was used for this analysis. The model was developed by Independent Economics and Treasury to be suitable for modelling the Australian business tax system.[5] The model has been designed to estimate the economic effects of changes in the company tax system, including: the size of the capital stock in each industry; the mix of capital types; labour force participation; the location of multinational profits; and the location of multinational firm-specific assets, such as intellectual property.

The model is a comparative static long-run model. It assumes that investment, and therefore the capital stock, can fully adjust to any shock imposed. While this provides a comprehensive picture of the enduring impacts of a policy change, it is silent about the transition path over time from the existing settings to the proposed change. We analyse incidence in terms of changes in welfare and how these changes are driven by different income streams.[6]

The modelling makes the standard assumption that any change in government revenue due to changes in the company tax rate is offset by a cash or lump-sum transfer from the government to households.[7] This allows us to isolate the economic impacts of an individual policy.

Before considering the detailed incidence results, it is useful to explain the expected and actual macro-economic impacts of a 1 percentage point cut in the company income tax.

The initial effect of a cut in the company income tax rate is to increase the after tax rate of return on investment in Australia, relative to the rate of return required by foreign investors.[8] The higher domestic rate of return attracts further investment until the marginal product of capital, net of tax and

4 With more elastic substitution of labour and capital in production the capital stock increase resulting from a cut in the company tax rate will be larger. This leads to stronger increases in wages and therefore greater household welfare gains.

5 Independent Economics designed the overall economic structure of the model and Treasury calibrated the model to match the business tax data and provided a range of parameters, such as the profit shifting elasticity and the share of rents that are firm-specific. The structure of the model is described in Appendix A, with further detail published in Independent Economics (2012).

6 Incidence calculations are sometimes presented in terms of producers and consumers. This is straightforward in partial analysis, but in a CGE model this division is less clear. The benefit of lower consumer prices can be attributed not only to consumers but also to labour through higher real wages. As consumers not only consume but are also suppliers of capital and labour, in a CGE model it makes more sense to split the welfare impacts in terms of income streams.

7 This approach was adopted by KPMG Econtech (2010) in their modelling for the *Australia's Future Tax System* and was one of the options adopted by De Mooij and Devereux (2011)

8 The modelling assumes that Australian company tax acts as a final tax for 90 per cent of foreign investors. Among major categories the main exception is US direct investment.

depreciation, again equals the rate of return required by foreign investors. The extent of capital mobility is important: the higher the degree of capital mobility, the larger the increase in the size of the capital stock

This process of capital deepening—increasing the amount of capital available per worker—acts to increase the productivity of labour which flows through to higher wages. Labour supply is assumed to increase to a small degree in response to higher real wages, at the expense of a decline in leisure. The overall size of the economy increases due to increases in both the capital stock and the labour supply.

The cut in the rate reduces company tax revenue collections. However, this is partially offset as the increase in the size of the economy leads to expansion in the company income, labour income and consumption tax bases.

The cut in the company tax rate also results in windfall gains to the owners of location-specific fixed factors, including land. The larger capital stock increases the intensity of use of these fixed factors and hence the flow of income to them, while the cut in the company tax rate means that more of this income is retained by owners. Some of these fixed factors are foreign owned, resulting in a flow of income offshore.

Households, as the suppliers of labour and majority owners of capital, benefit from higher rates of return on the fixed factors they own, higher wages and greater labour force participation. As the cut in the company tax rate is assumed to be funded through a reduction in government lump sum transfers the reduced government revenues from a cut in the tax rate reduce the welfare of transfer recipients.

A range of alternative sets of assumptions (or 'scenarios') are also presented in this paper.[9] First, we will consider the small, open and competitive economy as a baseline. Arguably, a pure open and competitive economy case is not representative of the current Australian economy. An important feature of the Australian economy is the existence of economic rents in a range of sectors, such banking and finance, and mining. The second scenario builds in certain assumptions about the size and location of economic rents. A third scenario extends the model further by making assumptions about the degree of international capital mobility.

Scenario 1: The open and competitive economy

This scenario assumes that financial capital is perfectly mobile internationally, and the domestic economy is competitive, with individual firms operating as competitive price takers yielding no economic rents. As capital is highly mobile, changes in the company income tax rate produce relatively large changes in the capital stock to ensure that the domestic after tax rate of return remains at the rate required by global investors. Consequently, the incidence of the company income tax is borne almost entirely by land, which is in fixed supply, and labour, as a less responsive factor of production (Gravelle 2010).

Scenario 2: Economic rents (main scenario)

The main scenario allows for the presence of economic rents in the mining, financial, telecommunication and selected other industries, while maintaining the assumption of perfect capital

9 The scenarios reported are those, identified in the literature review, which had the most significant impact for a plausible change in their parameterisation. Further results are presented and briefly discussed in Appendix B.

mobility. An industry is said to be earning economic rents when the calculated rate of return on capital, based on the input-output tables and national accounts data, is higher than a 'normal' rate. For the mining industry, rents were calculated assuming the level of the terms of trade seen in 2007-08.

Economic rents may be location-specific or firm-specific. Modelling of the European business tax system by De Mooij and Devereux (2011) assumed that 70 per cent of rents are location-specific. Given the significance of the finance sector and the larger role of natural resources in the Australian economy, the modelling assumes that 90 per cent of economic rents are location-specific.

Compared to the first scenario, a reduction in the company income tax rate produces smaller rises in economic activity as less of the tax is levied on a mobile resource. Domestic welfare increases are also smaller because part of the tax cut accrues to foreign owners of fixed factors.

Table 1: Assumed level of economic rents by sector

	Mining sector[1]	Finance sector[2]	Telecommunications services	Other industries[3]
Economic rents				
Level ($m 2011-12)	21,219	36,820	4,217	2,180
Share	33%	57%	7%	3%

(a) Mining covers the coal mining, oil and gas extraction, iron ore mining and non-ferrous metal ore mining industries.
(b) Finance covers the finance, and insurance and superannuation funds industries.
(c) Other industries covers the soft drinks, cordials and syrup, wine, spirits and tobacco, and beer manufacturing industries.
Source: Independent Economics database.

Scenario 3: Economic rents and imperfect capital mobility

The third scenario reflects an economy with the same economic rents as the main scenario, but with less mobile capital. Imperfect capital mobility has been implemented in the model by placing a premium on the domestic returns to capital required to attract foreign investment. This premium is a positive function of foreign investment, so as the stock of foreign investment grows, the premium drives a growing wedge between the domestic after tax rate of return and the required rate of return, dampening the capital flows associated with changes in the company income tax rate.

Limited mobility of capital results in smaller welfare gains from a company income tax cut due to smaller inflows of financial capital and smaller increases in the capital stock. This is compounded by the fact that some of the tax cut benefits foreign owners of capital and economic rents in Australia. This scenario yields the smallest gains in output and productivity and thereby the largest reductions in government revenue and transfers to households.

Modelling by KPMG Econtech (2010) for the *Australia's Future Tax System* report used a semi-elasticity for the required rate of return with respect to the foreign value of foreign owned capital of 0.5.[10] That is, a 10 per cent increase in the foreign ownership of the capital stock results in a 5 percentage point increase in the required rate of return. This scenario is presented as an upper bound of the likely premium required to attract foreign investment.

Aggregate effects of a company income tax cut

The modelling suggests that a company income tax cut from 30 to 29 per cent would increase the level of GDP by between 0.15 and 0.35 per cent in the long-run compared with what would otherwise be

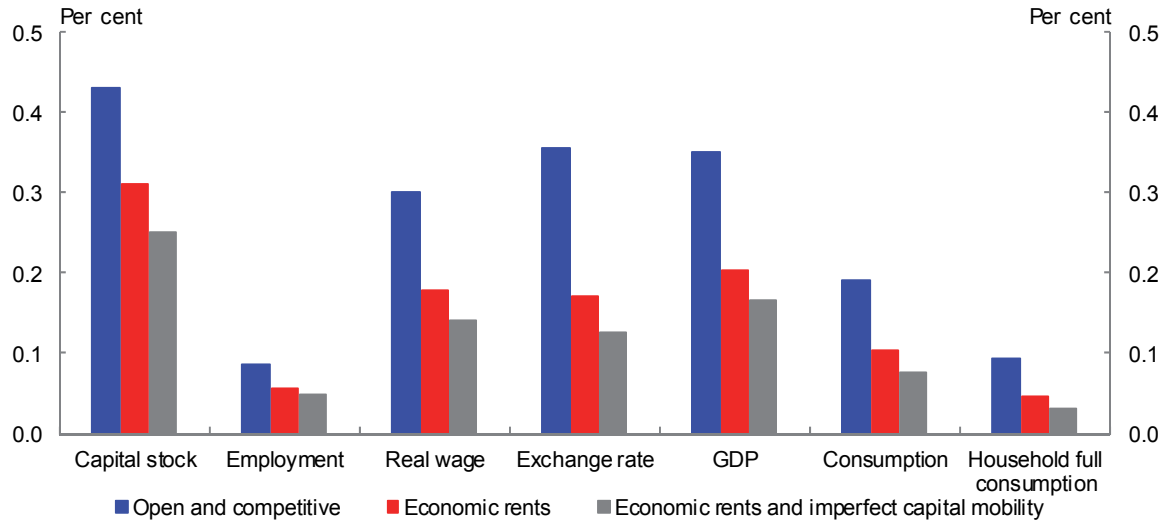
10 A semi-elasticity is the percentage change in a variable for a unit (or marginal) change in another. For the function y = f(x) it is $\frac{\delta \ln(y)}{\delta x}$.

the case. This increase in GDP is mainly driven by greater foreign investment flows into Australia to fund additional projects that are made viable by the reduction in the tax rate. Additional capital investment increases the capital stock by between 0.25 and 0.45 per cent.

The modelling also suggests that Australian workers benefit from the company income tax cut in the long-run. The productivity of labour increases with the increase in the size of the capital stock and this flows through to an increase in after tax real wages of between 0.14 and 0.30 per cent and a small increase in labour supply of between 0.05 and 0.09 per cent. Overall, the modelling shows that cutting the company income tax rate can deliver a permanent rise in consumption by Australian households of between 0.07 and 0.19 per cent.

Household welfare is measured by changes in full consumption, which is the combination of conventional household consumption of goods and services and the consumption of leisure priced at the wage rate. Full consumption improvements range from 0.03 to 0.09 per cent.

Figure 1: Macro-economic impacts of cutting the company income tax by 1 percentage point



Source: Treasury modelling results from the Independent Economics CGE model.

While the macro-economic benefits across these measures are all positive, it is also important to consider the cost associated with achieving these results. In isolation, a reduction in most taxes would be expected to produce such positive results, however, where budget-neutrality is required, the relative efficiency of raising revenue based on different mixes of taxes is important.

The marginal excess burden describes the welfare gain associated with forgoing an additional dollar of government revenue. The reduction in the company income tax affects government revenue in two ways: the lower rate generates less revenue for a given base; while growth in the economy increases the base.

Table 2: Welfare and revenue implications of a 1 percentage point company income tax cut

Change ($m 2011-12)	Open and competitive	Economic rents	Economic rents and imperfect capital mobility
Household full consumption	1,294	636	421
Government revenue	-769	-1,143	-1,242
Marginal excess burden	168%	56%	34%

Source: Treasury modelling results from the Independent Economics CGE model.

Estimates of the marginal excess burden of the company income tax vary across the scenarios. The highest estimate occurs in the open and competitive scenario. In this scenario, the loss of 1 dollar of government revenue is accompanied by a gain of 1.68 dollars of household welfare. For the central and imperfect capital mobility scenarios, household welfare increases by 56 cents and 34 cents respectively.

To put these estimates in context, Table 3 presents previous KPMG Econtech (2010) estimates of the marginal excess burden of the company tax and some other major taxes. In all three scenarios, our modelled marginal excess burden of company income tax is higher than their earlier estimates for labour income tax or the goods and services tax.[11] Some caution is warranted in drawing comparisons, though, given that these results come from different models, with different assumptions and calibrated to represent the Australian economy at different points in time.

Table 3: Marginal excess burden across a range of taxes

Source	Tax	Marginal excess burden
KPMG Econtech 2010	GST	8%
KPMG Econtech 2010	Labour income tax	24%
Economic rents and imperfect capital mobility	Company income tax	34%
KPMG Econtech 2010	Company income tax	40%
Economic rents	Company income tax	56%
Open and competitive	Company income tax	168%

Source: KPMG Econtech (2010) and Treasury modelling results from the Independent Economics CGE model.

The incidence of a company income tax cut

Changes in household full consumption can be decomposed into components associated with labour income, capital income, government transfers and leisure (Table 4).

A reduction in the company tax rate leads to an increase in labour income in all scenarios through both higher labour force participation and higher wage rates. Initially the increase in capital improves the productivity of labour which pushes up wages. This higher wage increases labour-force participation at the expense of leisure, which further increases labour incomes. The associated declines in leisure partially offset these increases in full consumption.

A reduction in the company tax rate also leads to a reduction in government revenue in all scenarios. The modelling makes the standard technical assumption that the reduction in government revenue flows through to a reduction in lump sum transfers to households to maintain the budget balance; this partially offsets the gains in household income from other sources.

11 KPMG Econtech (2010) estimated the marginal excess burden of company income tax to be 40 per cent. The current modelling exercise provides a more detailed analysis of the company tax system. This includes separating economic rents into firm-specific and location-specific rents, and allowing for profit shifting and foreign ownership.

Table 4: Contributions to changes in household full consumption

Welfare change and contributions ($m 2011-12)	Open and competitive	Economic rents	Economic rents and imperfect capital mobility
Leisure	-510	-333	-284
Consumption	1545	842	622
Labour income	2307	1391	1129
Capital income	-481	174	333
Variable capital	-913	-790	-566
Fixed factors	432	964	899
Lump sum transfers	-281	-722	-840
Household full consumption	1035	509	337

Source: Treasury modelling results from the Independent Economics CGE model.

The effects of a reduction in the company tax rate on capital income flows to Australian households vary markedly across the scenarios. The reduction in the tax rate delivers a windfall gain to the owners of fixed factors in all scenarios, both directly by the cut in the tax rate and indirectly by the rise in the return on fixed factors as they are used more intensely when more variable capital is available. The extent of this gain varies across the scenarios mainly due to the assumed size of the fixed factors: in the open and competitive economy scenario, the only fixed factor is land, while the other scenarios include additional sources of rents.

On the other hand, in the long-run, the reduction in the company tax rate tends to reduce income flows to domestic owners of variable capital. This, perhaps, requires some explanation. The modelling assumes that the domestically-owned stock of capital is fixed in volume terms, but the price of the capital stock is determined within the model. The reduction in the company tax rate makes capital cheaper to use and so reduces the price of goods whose production is capital-intensive. Capital itself is produced in a relatively capital-intensive fashion, and so its price falls relative to the price of consumer goods and services. This means that the value of the domestically-owned capital stock falls when measured relative to the price of consumer goods and services. Hence the purchasing power of income flows to domestic owners of variable capital declines. This effect is partially offset in the scenario with imperfect capital mobility because the rate of return on capital, which is determined by the rate required by foreign investors, rises as the size of the foreign-owned capital stock increases.

Table 5: Aggregated welfare change and contributions

Welfare change and contributions ($m 2011-12)	Open and competitive	Economic rents	Economic rents and imperfect capital mobility
Domestic			
Labour & lump sum transfers	1517	336	4
Capital income	-481	174	333
Household full consumption	1035	509	337
Foreign			
Fixed factors	202	223	207

Source: Treasury modelling results from the Independent Economics CGE model.

Another way to think about incidence is to aggregate changes in household full consumption into changes due to capital income (to both variable and fixed factors) and changes due to labour market outcomes (labour income net of leisure) and lump sum transfers (Table 5). In the main scenario, around two-thirds of the increase in domestic household welfare occurs through changes in labour market outcomes net of lump sum transfers, and only one-third of the welfare gains accrue to the domestic owners of capital.

Results vary across scenarios. In the open and competitive scenario, labour is substantially better off, while the domestic owners of capital are worse off. In the scenario with economic rents and imperfect capital mobility, almost all of the increase in household welfare occurs through an increase in capital income.

The discussion of incidence has focussed on the flow of benefits to Australian households. Foreigners will also be affected in a range of ways, through changes in their level of investment in Australian capital and through changes in Australian demand and supply of traded goods and services. The welfare effects of these changes are complex given the range of alternative foreign investment and trade options available. As foreign households are not modelled explicitly and given that the changes in trade and investment flows with Australia are likely to be due to substitution away from other countries, the model does not produce complete estimates of foreign welfare impacts. However, it is possible to quantify the windfall gains received by foreign owners of fixed factors in the Australian economy, which can be seen as a partial estimate of the change in foreign welfare due to a cut in the Australian company tax rate.

Conclusion

While the legal incidence of company tax is borne by companies themselves, the economic incidence of company tax, in terms of whose welfare is affected and by how much, is determined by the way the tax affects the behaviour of firms and consumers. To explore the incidence of company tax, this paper presents estimates of the long-run welfare effects of a 1 percentage point cut in the company tax rate. At an aggregate level these estimates suggest that, in comparison with previous modelling by KPMG Econtech (2010), the welfare gain from cutting the company tax rate is higher per dollar of revenue forgone than is the case for labour income tax or the goods and services tax.

The welfare effects of a 1 percentage point cut in the company tax rate are shared between company owners and workers. Estimates from the main scenario, which includes economic rents, suggest that in the long run only around one-third of these benefits accrue to the owners of capital, with the remaining two-thirds flowing to households primarily through higher wages. This has implications for the social distribution of income as capital ownership is significantly more concentrated than labour income (ABS 2013).

Alternative assumptions about the structure of the economy result in different estimates of the incidence of the company tax. As a sensitivity analysis, the paper presents estimates for an open and competitive economy in which there are no companies earning economic rents. In this scenario, none of the benefits of a company tax cut accrue to the owners of capital in the long-run. The paper also presents estimates from a scenario in which there are both economic rents and limits to international capital mobility, in which almost all of the benefits of a company tax cut accrue to the owners of capital in the long-run. Over time, as the Australian economy transitions through the current mining cycle and the rates of profit in that industry return towards more normal levels, and if the world economy continues to become more open and closely interconnected, it is likely that the results from the open and competitive scenario will become more relevant.

Taken together, these results suggest that there may be larger welfare gains available from cutting the company tax rate than from other major revenue sources and that in the long-run, only a minority of the welfare gains will accrue to the owners of capital, with the majority shared more broadly through the community. That said, such estimates of the marginal excess burdens of various taxes in isolation ignore their potential interactions, such as the ability for taxpayers to move their income between labour and capital forms in response to differences in statutory rates. The efficiency gains are dependent on the assumptions made in the three scenarios in this paper.

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Appendix A: Independent Economics CGE model

The analysis was undertaken using the Independent CGE Model, Independent Economics' computable general equilibrium model. This is a comparative static model of the Australian economy. Treasury and Independent Economics worked together to extend and calibrate the model to make it suitable for modelling the business tax system.[12] The model has been designed to represent economic effects of changes to the company tax system including: the size of the capital stock in each industry; the mix of capital types; labour force participation; the location of multinational profits; and the location of multinational firm-specific assets, such as intellectual property.

The modelling results represent long-run changes to the economy. They provide an analysis of the change in the economy from now to a time in the future when capital and labour markets have fully adjusted to policy changes. A reasonable working assumption may be that half of the change in the economy will occur within approximately seven years, and the adjustment will be largely complete within 20 years.[13]

Key features of the baseline model include the following.

- **Up-to-date database.** The model is designed to represent the 2011-12 Australian economy, based on an uprated version of the Australian Bureau of Statistics' 2007-08 input-output tables. The model is calibrated based on the 2007-08 level of the terms of trade.

- **Rich industry detail**. The model distinguishes 111 industries.

- **Sophisticated production processes.** Output in the model is produced by labour, land, location-specific factors, firm-specific factors and nine additional types of capital: transport equipment; machinery; information technology; structures; dwellings; transfer costs; mineral exploration; research; and other intellectual property.

- **Company tax system.** The model reflects many features of the company tax system, including: deductibility of debt; revenue clawback through dividend imputation; depreciation allowances that reflect a historical cost basis and other aspects of tax laws; expensing of certain investments; and foreign tax credit arrangements.

- **Fixed factors.** The model identifies fixed factors in industries in which Australian Bureau of Statistics data suggest there may be above normal rates of return on capital and where there are economic grounds for believing these may be sustainable: mining, banking and finance, telecommunications, and beverage manufacturing. These are further divided into location-specific, immobile factors (90 per cent) and firm-specific, mobile factors (10 per cent).[14]

12 Independent Economics designed the overall economic structure of the model; Treasury calibrated the model to match the business tax data and provided a range of parameters, such as the profit shifting elasticity and the share of rents that are firm-specific.

13 This timeline is consistent with the transition path in response to tax changes within the Monash Multi Regional Forecasting Model, a widely used dynamic model of the Australian economy.

14 Actual rates of return have been estimated for each industry using data on capital stocks and net operating surplus from the Australian Bureau of Statistics. An industry is said to be earning economic rents, attributed to fixed factors, when their estimated actual rate of return is higher than a 'normal' rate for that industry. In modelling the European business tax system, De Mooij and Devereux (2011) assumed that 70 per cent of rents are location-specific (and hence 30 per cent firm-specific). Given the greater significance of natural resources in the Australian economy, the modelling assumes that 90 per cent of economic rents are location-specific.

- **Foreign marginal investor.** The model assumes that the marginal investment is funded by a foreigner, that capital is perfectly mobile between countries and that investments at the margin are funded through a mix of debt and equity that matches the historical average.

- **Profit shifting.** Company tax can affect where firms declare their profits for tax purposes. The model assumes a semi-elasticity of the tax base to the statutory tax rate of -0.5. This affects both the revenue take and the firm's cost of capital.[15]

- **Labour force participation.** Households choose between employment and leisure, taking account of the after tax wage available.[16]

The model also relies on a range of general assumptions, many of which are shared with other long-run computable general equilibrium models. Consumers choose between different purchases to maximise their wellbeing. Firms choose how to produce and how much to produce in order to maximise profits. Wages adjust so that labour markets clear. The capital stock adjusts so that the after tax rate of return matches the required world rate. Australia is a price taker in import markets and is close to a price taker in most export markets.[17]

The main welfare measure is full household consumption. This takes account of household consumption and leisure.

Modelling exercises are always a simplification of the real world. They are designed to capture the most important features of the economic response to policy changes in a sufficiently flexible way. Not all features of the decisions affected by tax changes are incorporated. In particular, while the modelling takes account of the historical shares of corporations and unincorporated entities in the economy, and the historical shares of debt and equity financing, it does not model potential changes in the legal structure of business operations or leverage in response to policy changes.

15 Recent modelling of European business tax (de Mooij and Devereux 2010) assumed a semi-elasticity of -0.73. The model assumes a lower elasticity reflecting the smaller role of multinational corporations in the Australian economy.

16 The assumed uncompensated elasticity of labour supply of 0.2 is consistent with the range of empirical estimates from Australian studies (Dandie and Mercante 2007).

17 An elasticity of demand of -12 for Australian exports is assumed for most industries, but a lower elasticity of -6 applies in industries where Australia has some market power (some parts of agriculture and mineral commodities) or product differentiation (such as tourism and education).

Appendix B: Further modelling outcomes

The body of the paper presented three scenarios based on changes to the modelling assumptions that are most important for understanding the incidence of company tax. This appendix presents the results of additional sensitivity analyses around the main scenario.

Price elasticity of export demand

The Independent Economics CGE model assumes that Australia is close to being a price taker in export markets. By varying this assumption we can approximate the impacts of increasing and decreasing the size of the economy.

Generally the export price elasticities in the model are -12 although a value of -6 is used for industries in which Australia is assumed to have some market power or product differentiation (including some agriculture, mining, tourism and education related industries). In performing sensitivity analysis on export demand, the elasticities were doubled or halved. It was found that with greater (weaker) global market power the change in all measures is smaller (larger) than in the main scenario.

Price elasticity of import demand

The impact of stronger and weaker substitutability between domestic and imported products is modelled by directly inputting higher and lower import price elasticities. The central assumption is for an import price elasticity of 3, meaning that if the price of imports relative to local production is 1 per cent higher, the quantity of imports used relative to local produced goods will be 3 per cent lower. Sensitivity analysis on this elasticity uses values of 4 (high) and 2 (low).

Factor substitution (capital-labour substitution elasticity)

The elasticity of substitution between these factors is exogenous in the model and can therefore be directly altered. The central estimate for the elasticity of substitution for labour and capital is 0.9 meaning that a 1 per cent increase in the ratio of the price of labour to the price of capital will lead to a 0.9 per cent fall in the ratio of labour to capital used in production. Sensitivity analysis is conducted for the substitutability of the factors of production by varying this elasticity: using values of 0.7 (low) and 1 (high).

Table B1: Contributions to changes in household full consumption

Welfare change and contributions ($m 2011-12)	Central scenario	Export price elasticity		Import price elasticity		Capital-labour elasticity	
		High	Low	High	Low	High	Low
Leisure	-333	-327	-341	-332	-333	-323	-354
Consumption	842	906	734	848	834	843	839
Labour income	1391	1414	1345	1395	1385	1366	1446
Capital income	174	191	148	171	178	182	156
Variable capital	-790	-788	-792	-788	-793	-789	-793
Fixed factors	964	980	940	959	971	971	949
Lump sum transfers	-722	-699	-759	-717	-729	-705	-763
Full consumption	509	578	393	515	500	519	484

Source: Treasury modelling results from the Independent Economics CGE model.
Note: Relative to the main scenario increases are in green and decreases in blue.