Taxing Corporate or Shareholder Income: A Sufficient-Statistics Approach*

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February 8, 2025

Abstract

As tax competition and profit shifting have put pressure on corporate income tax rates across the world, the role of other capital taxes becomes more important. This paper studies the choice between income taxation at the corporate and shareholder level. I develop a tractable sufficient-statistics framework to determine optimal corporate and shareholder income taxes. The main result is that when the incidence of the corporate income tax on workers is higher than that of shareholder income taxes, lower tax rates on corporate relative to shareholder income are typically optimal. In a policy application, I derive optimal reform directions for corporate and shareholder income taxes for a large economy, the United States, and a small open economy, Norway.

JEL: F21, H21, H22. Keywords: corporate income tax, dividend taxes, optimal capital taxation

*I have benefited from discussions with Steve Bond, Giacomo Brusco, Mike Devereux, Irem Guceri, Shafik Hebous, Morten Håvarstein, Niels Johannesen, Paolo G. Piacquadio, Eytan Sheshinski, Thor O. Thoresen, and seminar participants at the Norwegian Ministry of Finance, University of Oxford, St. Gallen, Tübingen and the CESifo Conference on Public Economics. I thank Vikram Patil for research assistance. The project has received funding through Norwegian Fiscal Studies (no. 341250) and TaxFair (no. 315765) which are both funded by the Research Council of Norway, and from The Nordic Tax Research Council.

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1 Introduction

Over the last decades, a wide range of countries have reduced their corporate income tax rates (de Mooij et al., 2021). A prominent alternative to corporate income taxation is to tax shareholders on their income (dividends and capital gains) deriving from corporate profits. This paper evaluates the choice between taxing income at the corporate versus shareholder level. First, I develop a sufficient-statistics model based on the trade-off between corporate and shareholder income taxation, allowing for tax base spillovers. Second, I analyse the relationship between sufficient statistics and the optimal reform direction. In an application, I derive optimal reform directions for Norway and the U.S.

To explain why there is a trade-off between corporate and shareholder taxation, consider what an investor's after-tax income c is on an investment x. Denote by r the return rate, τ^b as the corporate income tax rate, τ^r as the shareholder income tax rate (on dividends or capital gains), and τ^p as the total tax rate on investment. After-tax income is

$$c = (1 - \tau^r)(1 - \tau^b)rx = (1 - \tau^p)rx.$$

Hence, the *total statutory marginal tax rate on investment* is the combination of taxes at the corporate and shareholder level

$$\tau^p = \tau^r + \tau^b - \tau^r\tau^b.$$

A key difference between the two taxes is to which groups they apply. Taxes on corporate income are typically applied on a *source basis*, in the country where operation takes place, such that there is a statutory corporate income tax payment by all investors in the company. Taxes on shareholder income are instead typically applied on a *residence basis*, such that they apply only to resident investors' global investments.[1] From the national government's point of view, one benefit of a corporate income tax is therefore to partly tax foreign shareholders. However, growing empirical evidence indicates that corporate income taxes affect investment and other tax bases more than shareholder income taxes do

[1] A notable counterexample is dividend withholding taxes, which apply to certain foreign investors depending on bilateral tax agreements, see Casi-Eberhard et al. (2023).

(including Chetty and Saez (2005) and Yagan (2015) on dividend taxation and Suárez Serrato and Zidar (2016) and Fuest et al. (2018) on corporate income taxation). The trade-off between these two effects is the basis for this paper.

The first contribution of the paper is to develop a tractable and applicable framework for studying the optimal taxation of corporate and shareholder income under a fixed labour income tax. The approach is to make few assumptions on the structure of the economy and connect the welfare analysis of tax reforms to empirical estimates of tax base elasticities. A key point is that taxes are in the end paid by individuals, and the model therefore accounts for incidence in an optimal tax sufficient statistic framework. Incidence matters both because of fiscal externalities on other tax bases and because governments may attach different weights to workers, resident shareholders and foreign shareholders. To determine incidence, two empirical features are accounted for. First, it matters who owns corporations. Whether owners are foreigners or residents and whether they are rich or poor may affect the weights governments attach to them and thereby optimal tax policy. Second, taxes are not necessarily paid by the groups that face the statutory incidence. The extent of economic incidence on each group is determined by the elasticity of each tax base with respect to each tax rate.

The framework is used to study optimal policy under different assumptions about the relationship between tax rates on the corporate and shareholder level. Using this model and its sufficient statistics, I evaluate the optimal corporate and shareholder income tax mix. The sufficient statistics required for this analysis are the elasticities for the two tax bases in question (shareholder and corporate), four elasticities describing cross-tax base effects (on labour, shareholders and corporations) of corporate and shareholder income taxes, two own-price elasticities of "effort" (labour supply for workers and investment for shareholders), four tax rates (top and average on labour income, on shareholder income, and on corporate income), and marginal welfare weights on each of the three groups of individuals (foreign investors, resident investors and resident workers). While this may appear to be too many sufficient statistics to estimate for the framework to be practical, I show how the number of necessary elasticities can be reduced by making different assumptions about the economy. One benefit of basing the welfare analysis on these suffi-

cient statistics is that few assumptions about the structure of the economy are necessary, which means that the framework is applicable to economies with different characteristics.

I apply the framework to a large economy, the United States, and a small open economy, Norway. In the application, welfare weights on foreign shareholders are assumed to be zero whereas weights on resident shareholders compared to workers are based on the implicit weight on high income levels in the labour income tax using an inverse optimum approach (Bourguignon and Spadaro, 2012). One result is that if all own- and cross-base elasticities are the same for the corporate and shareholder income tax, a higher corporate income tax is typically optimal, as it raises some revenue from taxing foreign investors. A second result is that the incidence on workers is a key determinant of the optimal policy mix. This is partly driven by the high relative welfare weight on workers compared to investors derived from how the current progressive labour income tax distributes from high to low earners.

Related literature

The paper contributes to a broad theoretical literature on effects and incidence of capital income taxation (Harberger, 1962, Diamond and Mirrlees, 1971, Atkinson and Stiglitz, 1976, Judd, 1985, Chamley, 1986, Nielsen and Sørensen, 1997 and Straub and Werning, 2020). The famous Atkinson-Stiglitz result of zero capital income taxation at the optimum does not apply in the setting here, since preferences are not assumed to be homogeneous and separable (Saez, 2002), investors may earn income above the normal rate of return, and there are foreign investors.

Another contribution of the paper is to apply the sufficient statistic framework for tax analysis (Feldstein, 1999, Saez, 2001, Chetty, 2009, Piketty and Saez, 2013, Saez and Stantcheva, 2018 and Piketty et al., 2023) to corporate income taxation and incidence analysis. Saez and Zucman (2023) challenge the standard approach to tax incidence. Using a neoclassical model with taxation of capital and labour, they show that supply elasticities of capital and labour are the only necessary parameters for the optimal tax problem, and that cross-base effects are irrelevant for optimal policy. Some of the reasons why results here differ are that the sufficient-statistics model allows for: non-neoclassical effects (such

as super-normal returns to capital investment), tax evasion responses of corporate income to taxation that do not affect investment, and rent-sharing with workers within the firm.

The paper also relates to specific theoretical work on corporate income taxes, dividend taxes and capital gains taxes (Feldstein and Hartman, 1979, Korinek and Stiglitz, 2009, Gourio and Miao, 2010, Auerbach and Devereux, 2018 and Bjerksund and Schjelderup, 2022). The contribution to this strand of literature is to show how aspects of these different taxes can be brought together in a sufficient statistic framework. Both Bucovetsky and Wilson (1991) and Huizinga and Nielsen (1997) study the trade-off between taxing at income at source and at residence, but limit their analysis to qualitative insights based on representative agents and do not include effects on workers or overall welfare.

Last, the paper contributes to and shows how empirical evidence from the literature on incidence and elasticities of corporate income taxation (Arulampalam et al., 2012, Devereux et al., 2014, Devereux et al., 2015, Kawano and Slemrod, 2016, Suárez Serrato and Zidar, 2016, Zwick and Mahon, 2017, Fuest et al., 2018 and Kennedy et al., 2022) and of dividend and capital gains taxation (Poterba, 2004, Chetty and Saez, 2005, Auerbach and Hassett, 2006, Desai and Dharmapala, 2011, Alstadsæter et al., 2017, Jacob and Michaely, 2017, Maffini et al., 2019, Bach et al., 2021, Isakov et al., 2021, Miller et al., 2022, Harju et al. (2022) and Bilicka et al., 2023) can inform the optimal mix of these two taxes.

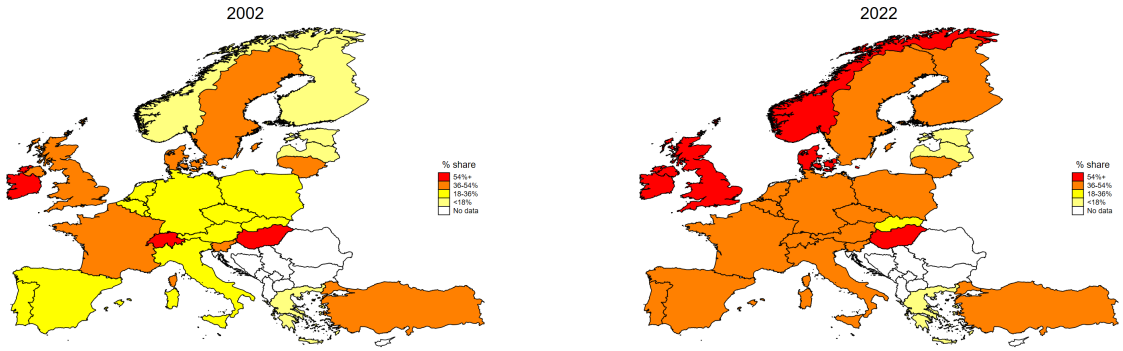
The paper proceeds as follows. Section 2 describes the evolution of corporate and shareholder tax rates. Section 3 presents the model and derives the main theoretical optimal tax results. Section 4 describes the relationship between sufficient statistics and optimal reform directions. Section 5 concludes.

2 The evolution of corporate and shareholder income taxes

The relative share of corporate and shareholder income tax rates varies across countries and time. Here, I describe the international trends in corporate and shareholder taxation in OECD countries, with a focus on Europe.[2] The downward trend in corporate income tax rates has been widely discussed, for example by the International Monetary Fund (2023).

[2]The development of capital gains tax rates is less straightforward to summarize across countries, as some vary with the length of time of each investment.

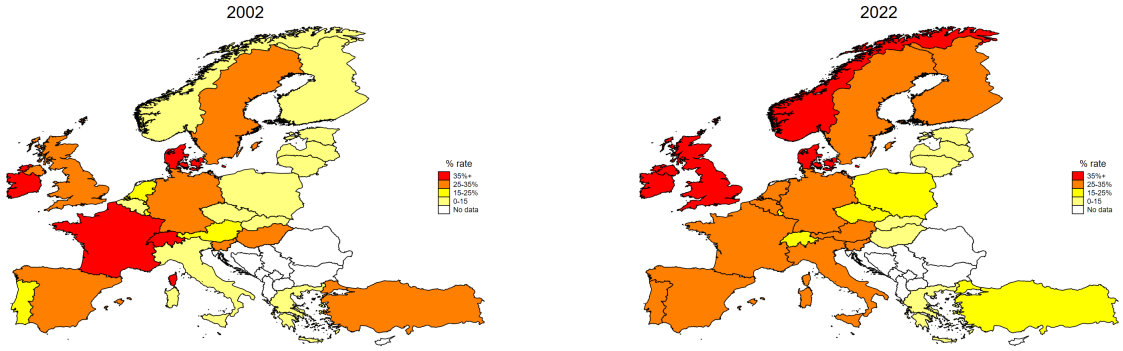
Using data from the OECD (OECD, 2023b), Figures 1 and 2 show how the share of statutory dividend tax rates to statutory corporate income tax rates have evolved in Europe from 2001 to 2022. The development has generally been that countries now have a higher share of dividend taxes to corporate income taxes, which is explained both by falling corporate income tax rates and increased dividend tax rates.



(a) 2002. (b) 2022.

Figure 1: The share of dividend to corporate income tax rates in Europe.

Note: Data provided by the OECD (OECD, 2023b).



(a) 2002. (b) 2022.

Figure 2: Dividend tax rates in Europe.

Note: Data provided by the OECD (OECD, 2023b).

To provide a more comprehensive picture, I run regressions on the tax rate developments over time for all OECD countries. The full results of these regressions are presented in Table A1-A4 in Appendix B. First, regressing the share of dividend tax rates over the

total tax rates on time, the effect is significant. Then, I run regressions of the type

$$tax_i = \alpha + \beta t + \gamma pop_i + \eta gdp_i + \varepsilon_i, \tag{1}$$

where tax_i is either τ_i^d/τ_i^b or τ_i^d in country i, t is the year, pop_i is the population size of each country, gdp_i is the gross domestic product of each country, and ε_i is the error term. The regressions show a significant effect of time on both both the dividend tax rate and on the relative dividend to corporate tax rate and that countries with larger populations have higher relative levels of corporate income taxation and lower levels of dividend taxation. The latter result is in line with corporate tax competition being more important for smaller countries and hints at heterogeneities that are important in the later applications. I return to the role of country size in Section 4.

3 Model

3.1 Description

3.1.1 Individuals and tax bases

There are three types of individuals: labour income earners, l, with income z^l, resident shareholders, r, with income z^r, and foreign shareholders, f, with income z^f.[3] In addition, corporations, b, produce corporate income, z^b, which is taxable profits for each corporation. Individuals cannot relabel their income from one type to another. Each income type $k = l, b, r, f$ is distributed according to $h(z^k)$, total incomes of each type are denoted by Z^k, and $\bar{x}$ denotes income-weighted averages of variables x. The model allows for heterogeneous individuals and firms, but subscripts indicating specific individuals and firms are omitted for readability.

Individual utility functions are denoted by $u^k(c^k(w^k), e^k(w^k))$, where $c^k = z^k(w^k, e^k) - T^k(z^k(w^k, e^k)$ is consumption, z^k is the individual's taxable income, $z^k(w^k, e^k) = w^k e^k(w^k)$, w^k is the price (wages or rental rates), e^k is effort exerted (labour hours, investment, re-

[3] To fix ideas, shareholder income can be the sum of dividends and capital gains at realisation. The model extends to capital gains taxed and measured at accrual. It can in principle also account for the long-run effects of dynamic considerations, such as incentives to delay realisation (see Auerbach, 1991) through the elasticities.

sources spent) in attaining z^k for each individual, $T^k(.)$ is the income tax for each income type. Utility functions are concave in c^k and strictly convex in e^k.

The key factor is that prices are endogenous, such that returns for shareholders and wages for labour income earners depend on total corporate and shareholder income while corporate income depends on shareholder income. To ease the notation, $w^l(Z^b, Z^r, Z^f)$ is abbreviated by w^l, $w^r(Z^r, Z^f, Z^b)$ is abbreviated by w^r, $w^f(Z^f, Z^r, Z^b)$ is abbreviated by w^f, $z^b(Z^r, Z^f)$ is abbreviated by z^b, $u^k(c^k(w^k), e^k(w^k))$ is abbreviated by u^k, $\partial u^k/\partial c^k$ is abbreviated by u^k_c, $\partial u^k/\partial e^k$ is abbreviated by u^k_e and $e^k(w^k)$ is abbreviated by e^k.[4]

The shareholder income tax is based on residence (applies only to resident investors) while the corporate income tax is based on source (may apply to all investments). Shareholder and corporate income taxes are flat and denoted by τ^r and τ^b, respectively, whereas $\bar{\tau}^l$ denotes the income-weighted average labour income tax.

Individuals maximize utility given their budget constraint, $c^k = w^k e^k - T(w^k e^k)$, such that their marginal utility gain from exerting effort is equal to the marginal utility cost,

$$\left(1 - \tau(z^k)\right) u^k_c \frac{\partial z^k}{\partial e^k} = -u^k_e.$$

This is the standard trade-off between leisure and consumption for labour income earners, while for shareholders the right hand side represent the (net-of-tax) opportunity cost of investment while the left hand side represents the value of investing one dollar into stocks.

The effect on an labour income earner's utility for marginal change in the net-of-tax rate change applied to labour income is

$$\frac{\partial u^l}{\partial(1 - \tau^l(z^l))} = u^l_c z^l,$$

which is a result of the envelope theorem.

Remember that w^l is a function of Z^b and Z^r. Hence, the effect on workers from a

[4]The model allows for shareholder income tax avoidance by not specifying the relationship between corporate and shareholder income such that not all after-corporate income tax corporate income increases may lead to an equivalent increase in the shareholder income tax base.

net-of-tax rate change for corporate or shareholder income is

$$\frac{\partial u^l}{\partial(1-\tau^j)} = (1-\tau^l(z^l))u_c^l e^l \frac{\partial w^l}{\partial(1-\tau^j)}, j = r, b,$$

such that the spillover on wages determines the utility change for workers.

Similarly, the effect on shareholders from a tax change on corporate income is

$$\frac{\partial u^m}{\partial(1-\tau^b)} = (1-\tau^m)u_c^m e^m \frac{\partial w^m}{\partial(1-\tau^b)}, m = r, f.$$

Hence, the pass-through of corporate income taxes to shareholders' utility is determined by the effect on the return to their investment.

For resident shareholders the effect of a net-of-tax rate change applied to shareholder income consists of an additional effect, as total shareholder income may affect their returns ($w^r(Z^r, Z^f, Z^b)$), such that the extent of behavioural response of other investors to the tax change affects their returns. Hence,

$$\frac{\partial u^r}{\partial(1-\tau^r)} = u_c^r z^r + (1-\tau^r)u_c^r e^r \frac{\partial w^r}{\partial(1-\tau^r)}.$$

The total effect is a combination of the direct change in their consumption from a higher net-of-tax rate and the spillover from increased shareholder income of other shareholders.

Since effort changes due to price changes are welfare irrelevant on the margin (due to the envelope theorem), I define a taxable income elasticity that only accounts for price effects.[5] The *incidence elasticity of taxable income* (through effects on prices) on income type k for a tax change on base j is

$$\varepsilon_w^{kj} = e^k \frac{\partial w^k}{\partial(1-\tau^j)} \frac{1-\tau^j}{z^k}, \; k = l, r, f \text{ and } j = l, b, r. \tag{2}$$

Using this, the effects of changes to the two net-of-tax rates on resident individuals'

[5] Appendix A.1 derives the relationship between standard incidence measures and taxable income elasticities.

utility are as follows

$$\frac{\partial u^r}{\partial(1-\tau^b)} = u_c^r \frac{1-\tau^r}{1-\tau^b}\varepsilon_w^{rb} z^r, \tag{3}$$

$$\frac{\partial u^l}{\partial(1-\tau^b)} = u_c^l \frac{1-\tau^l(z^l)}{1-\tau^b}\varepsilon_w^{lb} z^l, \tag{4}$$

$$\frac{\partial u^r}{\partial(1-\tau^r)} = u_c^r(1+\varepsilon_w^{rr})z^r \text{ and} \tag{5}$$

$$\frac{\partial u^l}{\partial(1-\tau^r)} = u_c^l \frac{1-\tau^l(z^l)}{1-\tau^r}\varepsilon_w^{lr} z^l. \tag{6}$$

3.1.2 Government

The government chooses its taxes on corporate income, τ^b, and shareholder income, τ^r, to maximize welfare. Welfare is consists of a concave transformation of residents' utilities, $g^k(u^k)$, which is integrated over residents' income distributions,

$$W = \int_{z^l} G^l(u^l(c^l, e^l))h(z^l)dz^l + \int_{z^r} G^r(u^r(c^r, e^r))h(z^r)dz^r.$$

It is maximized subject to the revenue requirement

$$\int_{z^b} \tau^b z^b h(z^b)dz^b + \int_{z^r} \tau^r z^r h(z^r)dz^r \geq R,$$

where $R \geq 0$ is the exogenous revenue the government needs to raise given the revenue raised from the labour income tax. Define marginal welfare weights on the different groups by $g^k = \partial W/\partial c^k = u_c^k \times G_u^k \geq 0$, where $G_u^k = \partial G^k(u^k)/\partial u^k$. These marginal welfare weights are the marginal welfare gain from providing one more unit of consumption to the group relative to the welfare value of one unit of revenue to the government.

Define the *fiscal elasticity of taxable income*,[6] where effort changes are accounted for as they matter for revenue effects, on income type k for a tax change on base j by

$$\varepsilon^{kj} = \frac{\partial z^k}{\partial(1-\tau^j)}\frac{1-\tau^j}{z^k},\ k = l, b, r, f \text{ and } j = l, b, r. \tag{7}$$

[6]Despite not being explicitly modeled, tax competition through the response of other governments to tax changes may be reflected in the elasticities of each tax base.

Since $z^k = w^k e^k$ and e^k is a function of w^k, the fiscal elasticity of taxable income has the following relationship to the incidence elasticity of taxable income

$$\varepsilon^{kj} = \varepsilon_w^{kj}\left(1 + \varepsilon_e^{kk}\right),\ k = l, r, f \text{ and } j = l, b, r, \tag{8}$$

where $\varepsilon_e^{kk} = w^k/e^k \times \partial e^k/\partial w^k$ is defined as the elasticity of effort with respect to the price. For workers, this has a natural interpretation as the labour supply elasticity with respect to the wage, while for shareholders, it may be interpreted as the elasticity of investment with respect to the rate of return.

3.2 A simplified example

To illustrate the framework, I ignore shareholders, such that $z^r = z^f = 0$. The reform is an increase in the net-of-corporate income tax rate, $1 - \tau^b$. The effects are:

1. Mechanically (all is fixed except the tax rate), such that the tax change leads to less revenue being raised,
$$M^b = -Z^b < 0.$$

2. Corporate income may increase from higher investment, which would increase revenue,
$$B^b = \frac{\tau^b \bar{\varepsilon}^{bb}}{1 - \tau^b} Z^b \geq 0.$$
This revenue effect is determined by the tax rate, $\tau^b/(1 - \tau^b)$, the average effect on the tax base, $\bar{\varepsilon}^{bb}$ and the size of the tax base, Z^b.

3. Wages may go up from higher investment, which would increase revenue through the labour income tax,
$$B^l = \frac{\bar{\tau}^l \bar{\varepsilon}^{lb}}{1 - \tau^b} Z^l \geq 0.$$
This revenue effect is determined by the tax rate on labour relative to that on corporate income, $\tau^l/(1 - \tau^b)$, the average effect on the tax base, $\bar{\varepsilon}^{lb}$ and the size of the tax base, Z^l.

4. If wages go up, this also increases the individual welfare of workers,

$$I^l = \bar{g}^l \frac{(1-\bar{\tau}^l)}{1-\tau^b} \frac{\bar{\varepsilon}^{lb}}{1+\bar{\varepsilon}^{ll}_e} Z^l \geq 0.$$

   This individual welfare effect is determined by the difference in net-of-tax rates on labour and corporate income, $(1-\tau^b)/(1-\tau^b)$, the average incidence effect on the workers, $\bar{\varepsilon}^{lb}_w = \bar{\varepsilon}^{lb}/\left(1+\bar{\varepsilon}^{ll}_e\right)$, the size of the tax base, Z^b, and the average weight on workers, $\bar{g}^l$.

By adding up these effects, the net change in welfare from this reform is given by

$$\Delta W = M^b + B^b + B^l + I^l = -Z^b + \frac{\tau^b \bar{\varepsilon}^{bb}}{1-\tau^b} Z^b + \frac{\bar{\tau}^l \bar{\varepsilon}^{lb}}{1-\tau^b} Z^l + \bar{g}^l \frac{(1-\bar{\tau}^l)}{1-\tau^b} \frac{\bar{\varepsilon}^{lb}}{1+\bar{\varepsilon}^{ll}_e} Z^l.$$

The next step is to use this model to study optimal tax reforms. The three policy scenarios are as following, where the first and the second provide optimal tax formulas whereas the third provides the result used in the application:

1. What is the optimal corporate income tax if the shareholder income tax is fixed?
2. What is the optimal shareholder and corporate income tax when they are set without restrictions on their relationship?
3. What is the optimal reform direction for corporate and shareholder income tax rates when the total tax rate on investment of resident investors is fixed?

3.3 Optimal corporate income tax with a fixed shareholder income tax

Here, labour and shareholder income tax rates are fixed. The corporate income tax is set by trading off revenue against the the spillover on workers and shareholders. The tax reform is to marginally increase the net-of-tax on corporate income and any revenue change is paid lump sum by all residents. Hence, the change in welfare from the tax reform is

$$\Delta_b W = \Delta_b R + \Delta_b V,$$

where $\Delta_j X$ denotes the change in variable X due to the tax change on base j, $\Delta_b R$ is the change in revenue due to the corporate income tax change and $\Delta_b V$ is the change in welfare for those affected from the reduction in the corporate income tax rate. Revenue effects can be decomposed into the mechanical and behavioural effect, such that

$$\Delta_b R = \Delta_b M + \Delta_b B.$$

Mechanical effects are simply the effect of the tax change on the tax base itself (holding all else constant)

$$\Delta_b M = -\Delta_b (1 - \tau^b) Z^b.$$

To account for behavioural effects, responses on other tax bases must also be included. Denote by $\bar{\varepsilon}^{kj}$ the elasticity of average taxable income of type k for a tax change on base j, such that

$$\Delta_b B = \tau^b \bar{\varepsilon}^{bb} \frac{\Delta\left(1-\tau^b\right)}{1-\tau^b} Z^b + \tau^r \bar{\varepsilon}^{rb} \frac{\Delta\left(1-\tau^b\right)}{1-\tau^b} Z^r + \bar{\tau}^l \bar{\varepsilon}^{lb} \frac{\Delta\left(1-\tau^b\right)}{1-\tau^b} Z^l.$$

ΔV consists of the welfare of groups affected by the corporate income tax which the government places nonzero weights on: resident shareholders and workers. Welfare effects on each group depend on the effect on that group, their total income, and the social value of that utility. Hence,

$$\Delta_b V = n^r \bar{G}^r_u \Delta_b u^r + n^l \bar{G}^l_u \Delta_b u^l.$$

The utility loss to resident shareholders is determined by the pass-through of net-of-tax corporate income to returns on their investment, while for workers, changes in corporate income taxation affects them through the wages they receive.

Hence, the two key equations are the revenue change for changes to the corporate income tax are

$$\frac{\Delta_b R^b}{\Delta(1-\tau^b)} = -Z^b + \bar{\varepsilon}^{bb} \frac{\tau^b}{1-\tau^b} Z^b + \bar{\varepsilon}^{rb} \frac{\tau^r}{1-\tau^b} Z^r + \bar{\varepsilon}^{lb} \frac{\bar{\tau}^l}{1-\tau^b} Z^l, \tag{9}$$

and the welfare changes,

$$\frac{\Delta_b V}{\Delta(1-\tau^b)} = \bar{g}^r \bar{\varepsilon}_w^{rb} \frac{(1-\tau^r)}{1-\tau^b} Z^r + \bar{g}^l \bar{\varepsilon}_w^{lb} \frac{(1-\bar{\tau}^l)}{1-\tau^b} Z^l. \tag{10}$$

Proposition 1. *The optimal corporate income tax for a fixed labour and shareholder income tax is given by*

$$\tau^b = \frac{1}{1+\bar{\varepsilon}^{bb}} - \frac{\left(\bar{g}^r(1-\tau^r)\bar{\varepsilon}_w^{rb} + \tau^r \bar{\varepsilon}^{rb}\right)}{1+\bar{\varepsilon}^{bb}} \frac{Z^r}{Z^b} - \frac{\left(\bar{g}^l(1-\bar{\tau}^l)\bar{\varepsilon}_w^{lb} + \bar{\tau}^l \bar{\varepsilon}^{lb}\right)}{1+\bar{\varepsilon}^{bb}} \frac{Z^l}{Z^b}.$$

This follows from that at the optimum, the optimal corporate income tax is characterised by equality between the revenue gain from a tax change with the welfare loss to those who pay more tax ($\Delta_b V/\Delta(1-\tau^b) + \Delta_b R^b/\Delta(1-\tau^b) = 0$).

The optimal corporate income tax in this case is characterised by the inverse elasticity rule minus the spillover on other tax bases both through the fiscal externality and incidences on shareholders and workers. Since the government is assumed to place no weight on firms or foreigners, the inverse elasticity rule is the optimal tax in the absence of spillovers on workers or resident shareholders, as it maximizes revenue from corporate earnings accruing to foreign investors.

3.4 Optimal unrestricted shareholder and corporate income taxes

Now, there are no constraints on the relationship between corporate and shareholder income taxes, while the labour income tax is still assumed to be fixed. The reforms consist in increasing the net-of-tax rate for shareholder income given the corporate income tax and increasing the net-of-tax rate for corporate income for a given shareholder income tax, while revenue gains or losses are distributed lump sum.

The optimal shareholder income tax for a given corporate income tax rate is found by equalizing the revenue gain from a tax change with the welfare loss to those who pay more tax,

$$\Delta_r W = \Delta_r R + \Delta_r V.$$

Again, the revenue effect consists of the mechanical and behavioural effects, where

$$\Delta_r M = -\Delta_r(1-\tau^r)Z^r$$

and

$$\Delta_r B = \tau^b \bar{\varepsilon}^{br} \frac{\Delta\left(1-\tau^r\right)}{1-\tau^r} Z^b + \tau^r \bar{\varepsilon}^{rr} \frac{\Delta\left(1-\tau^r\right)}{1-\tau^r} Z^r + \bar{\tau}^l \bar{\varepsilon}^{lr} \frac{\Delta\left(1-\tau^r\right)}{1-\tau^r} Z^l.$$

The behavioural effect consists in the fiscal spillover on each of the tax bases (corporate, shareholder and labour income). Hence,

$$\frac{\Delta_r R^r}{\Delta(1-\tau^r)} = \bar{\varepsilon}^{br} \frac{\tau^b}{1-\tau^r} Z^b - Z^r + \bar{\varepsilon}^{rr} \frac{\tau^r}{1-\tau^r} Z^r + \bar{\varepsilon}^{lr} \frac{\bar{\tau}^l}{1-\tau^r} Z^l. \tag{11}$$

$\Delta_r V$ consists of the welfare of the groups who may bear the incidence of higher shareholder income tax, which are resident shareholders and workers,

$$\Delta_r V = n^r \bar{G}_u^r \Delta_r u^r + n^l \bar{G}_u^l \Delta_r u^l.$$

Hence,

$$\frac{\Delta_r V}{\Delta(1-\tau^r)} = \bar{g}^r \left(1+\bar{\varepsilon}_w^{rr}\right) Z^r + \bar{g}^l \bar{\varepsilon}_w^{lr} \frac{(1-\bar{\tau}^l)}{1-\tau^r} Z^l, \tag{12}$$

such that the utility change for the resident shareholders is their mechanical change in after-tax income and the spillover from other investors changing their investment level, while for workers, the effect is determined by the spillover on wages.

Proposition 2. *The optimal tax rate on shareholder income for a fixed corporate and labour income tax is given by*

$$\tau^r = \frac{1-\bar{g}^r\left(1+\bar{\varepsilon}_w^{rr}\right)}{1+\bar{\varepsilon}^{rr}-\bar{g}^r\left(1+\bar{\varepsilon}_w^{rr}\right)} - \left(\frac{\bar{\varepsilon}^{lr}\bar{\tau}^l + \bar{\varepsilon}_w^{lr}\bar{g}^l(1-\bar{\tau}^l)}{1+\bar{\varepsilon}^{rr}-\bar{g}^r\left(1+\bar{\varepsilon}_w^{rr}\right)}\right)\frac{Z^l}{Z^r} - \frac{\tau^b\bar{\varepsilon}^{br}}{1+\bar{\varepsilon}^{rr}-\bar{g}^r\left(1+\bar{\varepsilon}_w^{rr}\right)}\frac{Z^b}{Z^r}.$$

This follows from the fact that optimum is reached when the sum of the revenue and welfare effect for the affected groups is zero, ($\Delta_r V/\Delta(1-\tau^r) + \Delta_r R^r/\Delta(1-\tau^r) = 0$).

The optimal tax in this case consists of three terms: 1) the optimal shareholder income tax when accounting for the spillover between shareholder incomes and ignoring other

groups, 2) the welfare value of the spillover on the labour income tax base, accounting both for the fiscal externality and the incidence on workers and 3) the fiscal externality on the corporate income tax base.

The expression for the optimal corporate income tax rate is the same as in Proposition 1. The jointly optimal corporate and shareholder income taxes are found by solving the Equations from Proposition 1 and from Proposition 2 simultaneously. It is important to keep in mind that even though the formulas present the main trade-offs involved, they rely on sufficient statistics *at the optimum*, which may differ from sufficient statistics at the actual tax system (since the sufficient statistics are endogenous to the allocation). Hence, to provide formulas that rely on empirical evidence from actual tax systems I will in the following focus on marginal reforms starting from the original tax system rather than optimal tax rates.

3.5 Optimal restricted shareholder and corporate income taxes

Now I assume that the the *total statutory* marginal tax rate on a resident shareholder's investment in a company is fixed and equal to $1-\hat{\tau}$.[7] The constraint is that the government must combine taxes on shareholders and corporations to abide by

$$1-\hat{\tau} = (1-\tau^r)(1-\tau^b). \tag{13}$$

I consider the following tax reform: a small decrease in $1-\tau^r$ combined with a small increase in $1-\tau^b$ (to abide by the constraint), such that the change in the net of corporate tax rate keeps the top total marginal tax rate for resident shareholder income constant,

$$\Delta\left(1-\tau^b\right) = \frac{(1-\hat{\tau})-(1-\tau^r)\left(1-\tau^b\right)}{1-\tau^r} - \frac{\left(1-\tau^b\right)}{1-\tau^r}\Delta\left(1-\tau^r\right). \tag{14}$$

In the following, I assume that the constraint, $1-\hat{\tau} = (1-\tau^r)(1-\tau^b)$ holds initially, such that $\Delta\left(1-\tau^b\right) = -\left(\left(1-\tau^b\right)/\left(1-\tau^r\right)\right)\Delta\left(1-\tau^r\right)$.

[7] The rate $\hat{\tau}$ could for example be be the same as the top labour income tax rate. This could be due to income shifting becoming too large of a problem if tax rates are different, such that corporate and shareholder income taxation act as a backstop for the labour income tax.

Hence, the change in welfare from the tax reform is

$$\Delta W = \Delta_b W + \Delta_r W = \Delta_b R + \Delta_r R + \Delta_b V + \Delta_r V,$$

where, again, $\Delta_b R$ is the change in revenue due to the corporate income tax change, $\Delta_r R$ is the change in revenue due to the shareholder income tax change, $\Delta_b V$ is the change in welfare for those affected from the reduction in the corporate income tax rate, and $\Delta_r V$ is the change in welfare for those affected from the increase in the personal capital tax.

The optimal reform direction is derived from calculating the total welfare change, ΔW, such that that the welfare change from increasing the net-of-tax rate on corporate income must be equal to the welfare change from reducing the net-of-tax rate on shareholder income. Hence, the four key equations are, in order, the revenue change for changes to the corporate income tax,

$$\frac{\Delta_b R^b}{\Delta(1-\tau^b)} = -Z^b + \bar{\varepsilon}^{bb}\frac{\tau^b}{1-\tau^b}Z^b + \bar{\varepsilon}^{rb}\frac{\tau^r}{1-\tau^b}Z^r + \bar{\varepsilon}^{lb}\frac{\bar{\tau}^l}{1-\tau^b}Z^l, \tag{15}$$

the revenue changes for changes to the shareholder income tax,

$$\frac{\Delta_r R^r}{\Delta(1-\tau^r)} = \bar{\varepsilon}^{br}\frac{\tau^b}{1-\tau^r}Z^b - Z^r + \bar{\varepsilon}^{rr}\frac{\tau^r}{1-\tau^r}Z^r + \bar{\varepsilon}^{lr}\frac{\bar{\tau}^l}{1-\tau^r}Z^l, \tag{16}$$

the welfare change for those that are affected by the change to the corporate income tax,

$$\frac{\Delta_b V}{\Delta(1-\tau^b)} = \bar{g}^r\bar{\varepsilon}^{rb}_w\frac{(1-\tau^r)}{1-\tau^b}Z^r + \bar{g}^l\bar{\varepsilon}^{lb}_w\frac{(1-\bar{\tau}^l)}{1-\tau^b}Z^l, \tag{17}$$

and the welfare change for those that are affected by the change to the shareholder income tax,

$$\frac{\Delta_r V}{\Delta(1-\tau^r)} = \bar{g}^r\left(1+\bar{\varepsilon}^{rr}_w\right)Z^r + \bar{g}^l\bar{\varepsilon}^{lr}_w\frac{(1-\bar{\tau}^l)}{1-\tau^r}Z^l. \tag{18}$$

Proposition 3. *When the initial tax system abides by the constraint* $1-\hat{\tau} = (1-\tau^r)(1-\tau^b)$*, the total welfare change from an increase in the net-of-corporate income tax rate and a reduction in the*

net-of-shareholder income tax rate is

$$\Delta W = M + B^b + B^r + I^r + B^l + I^l,$$

where

$$\begin{aligned}
M &= \frac{(1-\tau^b)\,(1-\bar{g}^r)}{1-\tau^r} Z^r - Z^b, \\
B^b &= \tau^b \left(\frac{\bar{\varepsilon}^{bb}}{1-\tau^b} - \frac{(1-\tau^b)\bar{\varepsilon}^{br}}{(1-\tau^r)^2} \right) Z^b, \\
B^r + I^r &= \left(\tau^r + \frac{(1-\tau^r)\bar{g}^r}{1+\bar{\varepsilon}_e^{rr}} \right) \left(\frac{\bar{\varepsilon}^{rb}}{1-\tau^b} - \frac{(1-\tau^b)\bar{\varepsilon}^{rr}}{(1-\tau^r)^2} \right) Z^r, \\
B^l + I^l &= \left(\bar{\tau}^l + \frac{(1-\bar{\tau}^l)\bar{g}^l}{1+\bar{\varepsilon}_e^{ll}} \right) \left(\frac{\bar{\varepsilon}^{lb}}{1-\tau^b} - \frac{(1-\tau^b)\bar{\varepsilon}^{lr}}{(1-\tau^r)^2} \right) Z^l.
\end{aligned}$$

Proposition 3 shows how the optimal reform direction depends on sufficient statistics. With estimates of these, the proposition can be used to evaluate both ex ante and ex post tax reforms with minimal assumptions on the behaviour of firms, shareholders and workers. The proposition follows from Equations 15-18, from that when the initial system respects the constraint (Equation 13), and from $\varepsilon^{kj} = \varepsilon_w^{kj}\left(1+\varepsilon_e^{kk}\right)$, where $k = l, r$ and $j = b, r$. M is the mechanical effects on shareholder and corporate income, B^b is the behavioural effect from corporate income, $B^r + I^r$ is the behavioural and incidence effects on shareholders, and $B^l + I^l$ is the behavioural and incidence effects on workers. The welfare gains from the increase in shareholder income taxation and reduction in corporate income taxation are given by inserting for current tax rates, marginal welfare weights, elasticities and income levels. If $\Delta W > 0$, increasing shareholder income tax rates while reducing corporate income tax rates creates a welfare gain. The opposite holds if $\Delta W < 0$.

The optimal combination of the corporate income tax and the shareholder income tax such that the top tax rate on resident investors is found when the welfare change is zero, $\Delta W = 0$. Remember the constraint $1 - \hat{\tau} = (1-\tau^r)(1-\tau^b)$. Inserting for the constraint and setting the welfare change equal to zero implicitly defines the optimal combination of τ^b and τ^r for given labour income tax, $\bar{\tau}^l$, and total tax rate on resident investment, $\hat{\tau}$. To solve for the optimal tax, insert for the relative tax rates and $1 - \tau^r = (1-\hat{\tau})/(1-\tau^b)$, and

solve for $1-\tau^b$. The resulting equation defines the optimal corporate income tax rate, τ^b given the constraint on the relationship with changes in the shareholder income tax, τ^r, and the fixed tax rates, $\bar{\tau}^l$ and $\hat{\tau}$. The resulting equation for optimal tax rates is a third order polynomial in tax rates, but since the objective is to derive optimal reform directions rather than optimal tax rates, Proposition 3 provides the necessary result.

Example

To illustrate the reform direction result, I input the following values for the sufficient statistics: $\hat{\tau}=0.36$, $\tau^r=0.2$, $\tau^b=0.2$, $\bar{g}^l=1$, $\bar{g}^r=0.3$, $\bar{g}^f=0$, $Z^l=0.9$, $Z^r=0.15$, $Z^b=0.2$, $\bar{\varepsilon}^{lr}=0$, $\bar{\varepsilon}^{rr}=0.1$, $\bar{\varepsilon}^{br}=0$, $\bar{\varepsilon}^{lb}=0.1$, $\bar{\varepsilon}^{rb}=0.25$, $\bar{\varepsilon}^{ll}_e=0$, $\bar{\varepsilon}^{rr}_e=0$ and $\bar{\varepsilon}^{bb}=0.275$. Then, the change in welfare as a share of resident income is $dW/(Z^l+Z^r)=4\%>0$, such that a reform towards higher shareholder income taxation in place of corporate income taxation is welfare improving. The main reason is that the shareholder income tax creates less change in behaviour and the low marginal welfare weight on resident shareholders. If instead the marginal welfare weight on resident shareholders is the same as for workers, $\bar{g}^r=1$, then $dW/(Z^l+Z^r)=-3\%$, such that a higher corporate income tax and a lower shareholder income tax would be welfare improving, as it would shift some of the burden from resident shareholders, whom now have a high welfare weight, to foreign shareholders, whom have no weight.

3.6 The relationship between corporate and shareholder income

To determine the relationship between sufficient statistics and optimal reform directions further, it is useful to assume some structure on the relationship between corporate and shareholder income.

I divide spillovers on shareholders from changes in corporate income tax rates into two parts, the "mechanical" spillover and behavioural spillover effect. If the corporate income tax is reduced, shareholders benefit mechanically by paying less tax on their investments at the corporate level such that shareholder income increases. This also mechanically increases revenue from the shareholder income tax, such that the government recoups some of the lost revenue by the reduction in the corporate income tax.

Specifically, I model (long-run) shareholder income as a function of after-tax corporate income, $(1-\tau^b)z^b$ depending on the resident ownership share of corporate income, s^r, and shareholder income from shares abroad and other ways shareholder income is created as a function of corporate income (such as tax benefits from delayed realisation and tax evasion at the shareholder level), $f(z^b, z^{rf})$. The derivative of the latter with respect to corporate income is denoted by f_{z^b}. Hence,

$$z^r = s^r(1-\tau^b)z^b + f(z^b, z^{rf}). \tag{19}$$

This means that the elasticity of shareholder income with respect to the net-of-corporate income tax is given by

$$\varepsilon^{rb} = s^r\left(1-\tau^b\right)\frac{z^b}{z^r} + \left(s^r\left(1-\tau^b\right) + f_{z^b})\right)\varepsilon^{bb}\frac{z^b}{z^r}, \tag{20}$$

where $s^r(1-\tau^b)z^b/z^r$ is the mechanical component. Using this, the change in welfare is given by

$$\Delta W = MR + MI^r + B^b + BB^r + BI^r + B^l + I^l, \tag{21}$$

where

$$\begin{aligned}
MR &= \frac{(1-\tau^b)}{1-\tau^r}Z^r - \left(1-\tau^r s^r\right)Z^b,\\
MI^r &= \frac{(1-\tau^r)\bar{g}^r s^r}{1+\bar{\varepsilon}_e^{rr}}Z^b - \frac{(1-\tau^b)\bar{g}^r}{1-\tau^r}Z^r,\\
BB^r + BI^r &= \left(\tau^r + \frac{(1-\tau^r)\bar{g}^r}{1+\bar{\varepsilon}_e^{rr}}\right)\left(\frac{\left(s^r\left(1-\tau^b\right)+f_{z^b}\right)\bar{\varepsilon}^{bb}}{(1-\tau^b)}\frac{Z^b}{Z^r} - \frac{(1-\tau^b)\bar{\varepsilon}^{rr}}{(1-\tau^r)^2}\right)Z^r.
\end{aligned}$$

Now, MR is the mechanical revenue effect, MI^r is the mechanical incidence on shareholders, and BB^r and IB^r are the revenue and incidence on shareholders, respectively, due to behavioural changes in tax bases. The other effects, B^b, B^l and I^l, are the same as in Proposition 3. From MR and MI^r it is clear that lowering of the corporate income tax mechanically increases shareholder income as there is more after tax profit. This has a revenue effect, $\tau^r s^r Z^b$, depending on the share of income from national corporations owned

by residents, and an incidence effect on shareholders, $(1-\tau^r)\bar{g}^r s^r Z^b/(1+\varepsilon^{rr})$.[8]

The benefit of this formulation is that it is easier to measure mechanical compared to behavioural effects. For example, if the mechanical effects of the joint reform is positive and it is plausible that the net effect of each of the behavioural effects is positive, one may be able to infer the optimal policy direction without estimating the sizes of behavioural responses.

Appendix A.2 explains how a simple two-period saving model can be represented by the sufficient statistic model.

4 Sufficient statistics and optimal reform directions

4.1 Setup

To pin down tax policy implications from the model, I proceed to derive optimal reform directions depending on the signs and sizes of the sufficient statistics. As a reminder, the sufficient statistics are the following:

1. Tax rates: $\bar{\tau}^l$, τ^r and τ^b.
2. Tax bases: Z^l, Z^b and Z^r.
3. Tax base and effort elasticities: $\bar{\varepsilon}^{lr}$, $\bar{\varepsilon}^{rr}$, ε^{br}, $\bar{\varepsilon}^{lb}$, $\bar{\varepsilon}^{rb}$, $\bar{\varepsilon}^{bb}$, $\bar{\varepsilon}_e^{ll}$ and $\bar{\varepsilon}_e^{rr}$.
4. Marginal welfare weights: $\bar{g}^r/\bar{g}^l$.

In the case where all elasticities are zero, it is optimal to move in the direction of higher corporate and lower shareholder income taxation, as the corporate income tax raises revenue from foreign shareholders without affecting resident shareholders or workers.

Using the framework, I show how certain special cases can assist in narrowing down the optimal reform direction. Second, I analyze the relationship between the sufficient statistics and the optimal reform direction, and graph how each sufficient statistic affects

[8]The mechanical incidence depends on the effort elasticity for shareholders, ε_e^{rr}, because the utility relevant incidence has to account for the difference between the fiscal spillover on shareholder income and the incidence spillover, where the latter only accounts for the effect on returns, and not for the effect on effort, as it has no effect on utility due to the envelope condition. In one sense, dividing by $1+\varepsilon_e^{rr}$ neutralises the effect that return changes has on effort, such that the utility-relevant spillover is obtained.

optimal reform directions. Third, I describe how current global developments may affect the different sufficient statistics. Fourth, I perform an analysis of optimal reform direction depending on different values of the sufficient statistics. Fifth, I apply the framework to optimal reform directions in United States and Norway.

4.2 Special cases

1. Open and perfect international capital markets

In this case, investment can always be financed from foreign investors. Dividend and capital gains taxation do not affect investment, as resident shareholders do not affect the level of investment. Hence, there are no spillovers from shareholder taxation, $\bar{\varepsilon}^{br} = \bar{\varepsilon}^{lr} = 0$. By Proposition 3, the optimal reform direction is towards higher shareholder taxation and lower corporate taxation whenever

$$\Delta W = \frac{(1-\tau^b)(1-\bar{g}^r)}{1-\tau^r} Z^r - Z^b + \tau^b \frac{\bar{\varepsilon}^{bb}}{1-\tau^b} Z^b + \left(\bar{\tau}^l + \frac{(1-\bar{\tau}^l)\bar{g}^l}{1+\bar{\varepsilon}_e^{ll}}\right) \frac{\bar{\varepsilon}^{lb}}{1-\tau^b} Z^l + \left(\tau^r + \frac{(1-\tau^r)\bar{g}^r}{1+\bar{\varepsilon}_e^{rr}}\right) \left(\frac{\bar{\varepsilon}^{rb}}{1-\tau^b} - \frac{(1-\tau^b)\bar{\varepsilon}^{rr}}{(1-\tau^r)^2}\right) Z^r > 0.$$

There is no longer a negative spillover on corporations or workers from shareholder taxation, such that in this case, the joint reform towards higher shareholder income tax rates relative to corporate income tax rates is more appealing than if $\bar{\varepsilon}^{br} > 0$ or $\bar{\varepsilon}^{lr} > 0$.

2. The "new view"

According to the new view, marginal capital is raised from retained earnings such that dividend taxation does not affect the price of capital for the firm (Zodrow, 1991). When retained earnings is the marginal source of finance, capital gains taxation also does not affect the cost of financing, such that the outcome is the same as in Case 1. In the long-run, corporations may require capital from other sources than retained earnings, and shareholder taxes may raise the cost of other sources of capital for investment.

3. Resident shareholders only invest abroad

If resident shareholders only hold foreign shares, there are no spillovers on workers or corporations in the residence country from a shareholder income tax and resident shareholders are unaffected by the corporate income tax rate in their country. Hence, $\bar{\varepsilon}^{br} = \bar{\varepsilon}^{lr} = \bar{\varepsilon}^{rb} = 0$. By Proposition 3, a move towards higher shareholder taxation and lower corporate income taxation is optimal whenever

$$\Delta W = \frac{(1-\tau^b)(1-\bar{g}^r)}{1-\tau^r} Z^r - Z^b + \tau^b \frac{\bar{\varepsilon}^{bb}}{1-\tau^b} Z^b - \left(\tau^r + \frac{(1-\tau^r)\bar{g}^r}{1+\bar{\varepsilon}_e^{rr}}\right) \frac{(1-\tau^b)\bar{\varepsilon}^{rr}}{(1-\tau^r)^2} Z^r + \left(\bar{\tau}^l + \frac{(1-\bar{\tau}^l)\bar{g}^l}{1+\bar{\varepsilon}_e^{ll}}\right) \frac{\bar{\varepsilon}^{lb}}{1-\tau^b} Z^l > 0.$$

On the one hand, resident shareholders no longer benefit from lower corporate income taxes, such that the joint reform is less attractive. On the other hand, shareholder taxes create no negative spillovers on the corporate tax base or on workers, which makes the reform more attractive. If the welfare weight on shareholders, $\bar{g}^r$, is low, the latter is likely to dominate, such that the reform is more attractive.

4. Small open economy

In this case, there is a fixed rate of return and infinitely elastic capital supply. Corporate taxation and shareholder taxation has no effect on rates of return. This means that the corporate income tax does not affect shareholders (Harberger, 1962). Shareholder income taxes are however borne by resident shareholders, as the taxation of shareholders has no effect on the capital availability for corporation and thereby cannot affect workers. Hence, $\bar{\varepsilon}^{br} = \bar{\varepsilon}^{lr} = \bar{\varepsilon}^{rb} = 0$. Individuals may still respond to shareholder income taxation by avoidance or by moving abroad, such that $\varepsilon^{rr} \neq 0$. By Proposition 3, the expression is the same as in Case 3. Since corporate income may be partly created by location-specific factors, it may still not be infinitely elastic despite capital being so, $\bar{\varepsilon}^{bb} \leq \infty$. However, the responsiveness of corporate income with respect to the corporate income tax is likely to increase with the openness of the economy, as capital becomes more elastic.

Again, on the one hand, resident shareholders no longer benefit from lower corporate

income taxes, such that the joint reform is less attractive. On the other hand, shareholder taxes create no negative spillovers on the corporate tax base or on workers, which makes the reform more attractive. In addition, the elasticity of corporate income is likely higher for a small open economy, such that the reform is more attractive. If the welfare weight on shareholders, $\bar{g}^r$, is low, the two latter effects are likely to dominate, such that the reform is more attractive than in a large or less open economy.[9]

4.3 Developments and sufficient statistics

One recent development in taxation of corporations is the reforms initiated by the OECD, in particular on the global minimum tax (Pillar 2) (Devereux, 2023, Hebous and Keen, 2023 and OECD, 2023a). If successful, it is plausible that it could reduce the elasticity of corporate income with respect to the corporate income tax rate, as profit shifting opportunities may become more limited. The minimum tax also places a further restriction on the optimal combination of shareholder and corporate income tax rates, such that a successful minimum tax introduces two main effects. First, a lower elasticity of corporate income is beneficial for most countries, as it reduces the negative effect taxation has on revenue and the likelihood of spillovers on workers. This would make a reform towards lower corporate income taxation and higher shareholder income taxation less appealing. Second, if the optimal corporate income tax from the national perspective is below the minimum tax rate even at lower elasticities, the minimum tax imposes a loss by restricting the country from setting its optimal tax rates. If the total tax rate on resident shareholders investment is fixed, this means that a reform towards lower corporate income taxation and higher shareholder income taxation may have been optimal, but the country is constrained from benefiting from such a tax change.[10] These effects depends on how low the optimal corporate income tax rate is, and more extensive simulation work is necessary to produce credible estimates of corporate income elasticities with a broad adoption of the global minimum tax.

[9] As seen in Table A4, a larger population and higher GDP, indications of a large rather than small economy, are associated with a higher corporate income tax rate and a lower relative dividend tax rate in OECD countries.

[10] Even if this may be optimal from the national perspective, it may not be optimal from the global perspective.

Another relevant international reform is the automatic exchange of information (AEOI) (Boas et al., 2024). These reforms involve increasing the information available to governments on shares held abroad by resident shareholders that governments. This could imply that the shareholder income tax base increases and that the elasticity of shareholder income with respect to shareholder income taxation decreases, as there are fewer avoidance and evasion opportunities. All in all, these reforms can make shareholder income taxation more effective and thereby more appealing relative to corporate income taxation.

The mobility of high-wealth individuals may have increased over time (Kleven et al., 2020). If shareholders are becoming more mobile, this may increase $\bar{\varepsilon}^{rr}$ and reduce Z^r in countries with high taxation of shareholders. As long as shareholders also hold shares abroad, this makes the joint reform of lower corporate income taxation and higher shareholder taxation less attractive. This is because shareholders are more affected by an equivalent increase in the shareholder tax, which they pay depending on their residency, relative to the corporate tax, which they pay depending on where they invest. Taxation of individuals unrealised capital gains when emigrating may mitigate some of this effect.

Related, capital gains taxation at realisation may incentivize delayed realisation. In many cases, such delayed realisation is tax-favoured, either explicitly with lower capital gains tax rates on shares held for longer periods or from returns made on the tax payment shareholders would have faced, had they realised the gain. Lower taxation of long-term gains reduces the tax base, such that tax increases that lead to delayed realisation may also reduce the long-term tax base. If such base-erosion is becoming larger over time, ε^{rr} may increase and Z^r decrease, which makes a reform towards higher shareholder income taxation and lower corporate income taxation less attractive.

4.4 Comparative sufficient statistics

To illustrate the relationship between the optimal reform direction and the size of the different sufficient statistics, I exploit Equation 21[11]

$$\Delta W = MR + MI^r + B^b + BB^r + BI^r + B^l + I^l,$$

where, again,

$$\begin{aligned}
MR &= \frac{(1-\tau^b)}{1-\tau^r} Z^r - \left(1-\tau^r s^r\right) Z^b, \\
MI^r &= \frac{(1-\tau^r)\bar{g}^r s^r}{1+\bar{\varepsilon}_e^{rr}} Z^b - \frac{(1-\tau^b)\bar{g}^r}{1-\tau^r} Z^r, \\
B^b &= \tau^b \left(\frac{\bar{\varepsilon}^{bb}}{1-\tau^b} - \frac{(1-\tau^b)\bar{\varepsilon}^{br}}{(1-\tau^r)^2} \right) Z^b, \\
BB^r + BI^r &= \left(\tau^r + \frac{(1-\tau^r)\bar{g}^r}{1+\bar{\varepsilon}_e^{rr}} \right) \left(\frac{\left(s^r\left(1-\tau^b\right) + f_{z^b}\right)\bar{\varepsilon}^{bb}}{(1-\tau^b)} \frac{Z^b}{Z^r} - \frac{(1-\tau^b)\bar{\varepsilon}^{rr}}{(1-\tau^r)^2} \right) Z^r, \\
B^l + I^l &= \left(\bar{\tau}^l + \frac{(1-\bar{\tau}^l)\bar{g}^l}{1+\bar{\varepsilon}_e^{ll}} \right) \left(\frac{\bar{\varepsilon}^{lb}}{1-\tau^b} - \frac{(1-\tau^b)\bar{\varepsilon}^{lr}}{(1-\tau^r)^2} \right) Z^l.
\end{aligned}$$

This setup ensures that welfare changes are measured in monetary units. In all simulations, I divide ΔW with revenue from the two taxes, such that the welfare change is $\Delta W / \left(\tau^r Z^r + \tau^b Z^b\right)$.

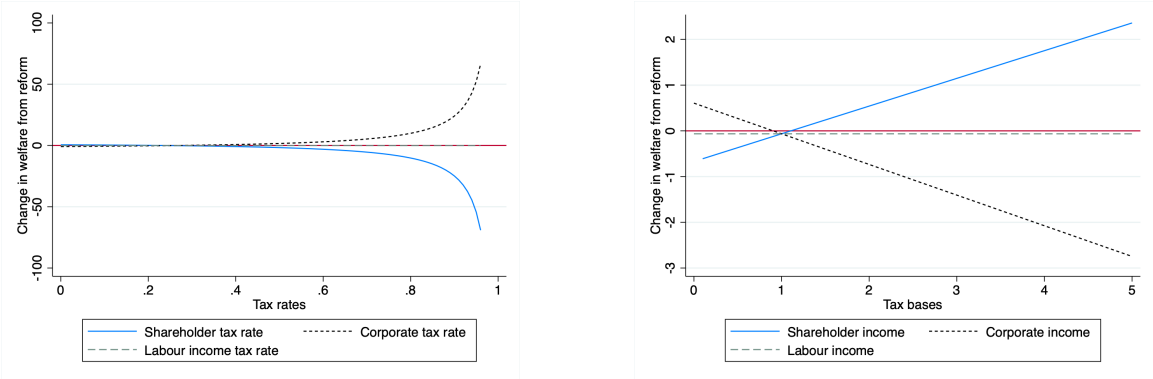
As a baseline, I set the values in Table 1. These values are selected to make corporate and shareholder income taxes similar. Labour income is five times as large as corporate and shareholder income ($Z^l = 5Z^b = 5Z^r$). All tax rates are 25 percent ($\tau^r = \tau^b = \bar{\tau}^l = 0.25$). The relative weight on shareholders is 0.5 ($\bar{g}^r/\bar{g}^l = 0.5$). All fiscal elasticities are set to 0.25 whereas effort elasticities are set to 0.1 ($\bar{e}^{lr} = \bar{e}^{br} = \bar{e}^{ll} = \bar{e}^{rr} = \bar{e}^{lb} = \bar{e}^{bb} = \bar{e}^{rb} = 0.25$ and $\bar{e}_e^{rr} = \bar{e}_e^{ll} = 0.1$). Resident investors own half of all shares in corporations with corporate income subject to the corporate income tax in the country ($s^r = 0.5$). There is no indirect effect of corporate income on shareholder income $f_{z^b} = 0$.

[11] While the exercise illustrates the importance of each sufficient statistic, changing one of them while keeping others fixed is not necessarily providing an accurate description of what the economy would be like were one of the statistics different, as they are all endogenous to the allocation. Hence, the exercise can more accurately illustrate the role of parameter uncertainty for a given economy, such that if everything else stays the same, it describes what happens if, for example, one tax base is more elastic than empirical estimates suggest.

Table 1: Initial values of variables

Variable	Initial value
Z^r	1
Z^b	1
Z^l	5
t^r	0.25
t^b	0.25
$\bar{t}^l$	0.25
$\bar{g}^r/\bar{g}^l$	0.5
$\bar{\varepsilon}^{lr}$	0.25
$\bar{\varepsilon}^{br}$	0.25
$\bar{\varepsilon}^{ll}$	0.25
$\bar{\varepsilon}^{rr}$	0.25
$\bar{\varepsilon}^{lb}$	0.25
$\bar{\varepsilon}^{bb}$	0.25
$\bar{\varepsilon}^{rb}$	0.25
$\bar{\varepsilon}_e^{rr}$	0.1
$\bar{\varepsilon}_e^{ll}$	0.1
s^r	0.5
f_{z^b}	0

Figures 3a, 3b, 4a and 4b display the net welfare effect of increasing $1-\tau^b$ while decreasing $1-\tau^r$. When the net effect is positive, a reform towards higher shareholder income taxation and lower corporate income taxation is optimal. Along a curve, only the tax or tax base in question changes, whereas all else is constant. In Figure 3a, tax rates on the different tax bases are on the x-axis. This shows that the higher is the tax on the base, the higher is the welfare gain of reducing the tax rate. This is due to the traditional Laffer-effect: when the tax is higher, less revenue is raised from increasing it further. Effects are fairly symmetric, since elasticites are assumed to be quite similar for shareholder and corporate income. Figure 3b shows the effect of the different tax base sizes. The larger is a tax base, the more social gain is there in increasing the tax rate on it, as the tax rate increase raises more revenue and all other effects are kept constant. When all tax bases are as in Table 1, it is optimal to replace shareholder income taxation with corporate income taxation.



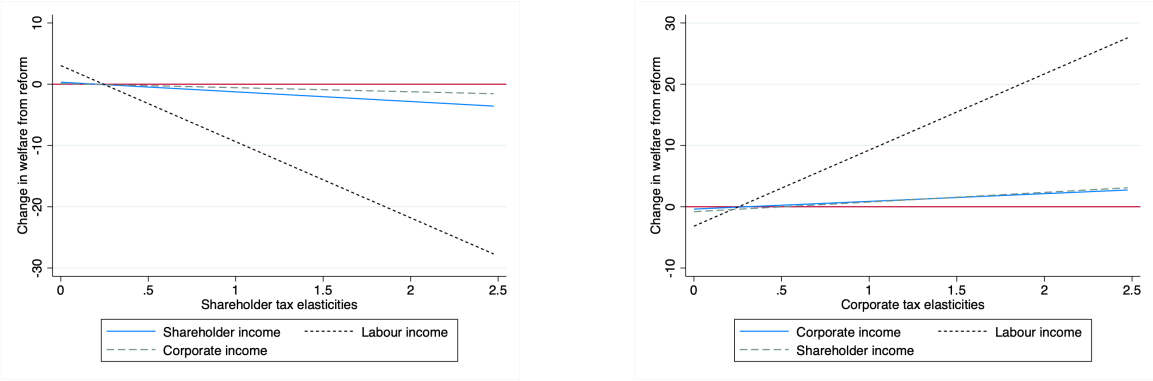
(a) Tax rates.

(b) Tax bases.

Figure 3: Welfare change depending on initial tax rates and tax bases.

Note: The figure displays the net effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income for different tax rates in a) and for different sizes of tax bases in b), keeping everything else constant. When the effect is positive (negative) a reform towards a higher (lower) shareholder income tax rate and a lower (higher) corporate income tax rate is optimal. The y-axis is measured in terms of the monetary value of welfare per revenue from the corporate income tax and shareholder income tax.

In Figure 4a, elasticities of shareholder taxation are on the x-axis while in 4b elasticities of corporate taxation are on the x-axis. Along a curve, only the elasticity in question changes whereas all else is fixed. This shows that the higher is the tax on the base, the higher is the welfare gain of reducing the tax rate. Both graphs show that the larger are elasticities with respect to the tax, the better it is for social welfare to reduce the tax rate. In addition, both graphs show that the impact on labour income is particular important. This is because the labour income tax base is assumed to be five times larger than the other tax bases and that workers are assumed to have twice the welfare weight of shareholders.



(a) Shareholder tax elasticities.

(b) Corporate tax elasticities.

Figure 4: Welfare change depending on fiscal taxable income elasticites.

Note: The figure displays the net effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income for different shareholder tax elasticities a) and for different corporate tax elasticities in b), keeping everything else constant. When the effect is positive (negative) a reform towards a higher (lower) shareholder income tax rate and a lower (higher) corporate income tax rate is optimal. The y-axis is measured in terms of the monetary value of welfare per revenue from the corporate income tax and shareholder income tax.

Returning to the different special cases in 4.1, I set the following baseline parameter values to illustrate the interaction between the different special cases and the marginal welfare weight on shareholders. In the open economy case, shareholder taxes have no behavioural effects whereas corporate taxation affects workers and revenue. In the open capital market case, shareholder income is responsive to shareholder taxation, but there are no effects on workers or corporate income. Corporate income affects workers but not shareholders and is somewhat less elastic than in the open economy case. The closed economy case is the same as the initial values in Table 1 except that resident shareholders own all shares in corporations subject to the corporate income tax in the country.

Table 2: Parameter values for different cases

Case	ε^{lr}	ε^{rr}	ε^{br}	ε^{lb}	ε^{bb}	s^r
Open economy	0.00	0.00	0.0	0.5	1.0	0.5
Open capital markets	0.00	0.20	0.0	0.1	0.4	0.5
Closed economy	0.25	0.25	0.25	0.25	0.25	1

Figure 5 shows the net welfare effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income for different marginal

welfare weights on shareholders. This shows that, for these parameters, in an open economy, moving towards more shareholder rather than corporate taxation is optimal independently of how much lower weights are on shareholders compared to workers. The same holds in the open capital market case, although the social welfare gains from the reform are always smaller. In the closed economy case with these parameters, a move towards higher corporate and lower shareholder taxation is optimal when the welfare weight on shareholders is 80 percent or higher than the weight on workers. This is because the tax on shareholder income is borne by shareholders to a larger extent than the tax on corporate income, such that at a high enough weight on shareholders, benefiting them through lower shareholder taxation is optimal.

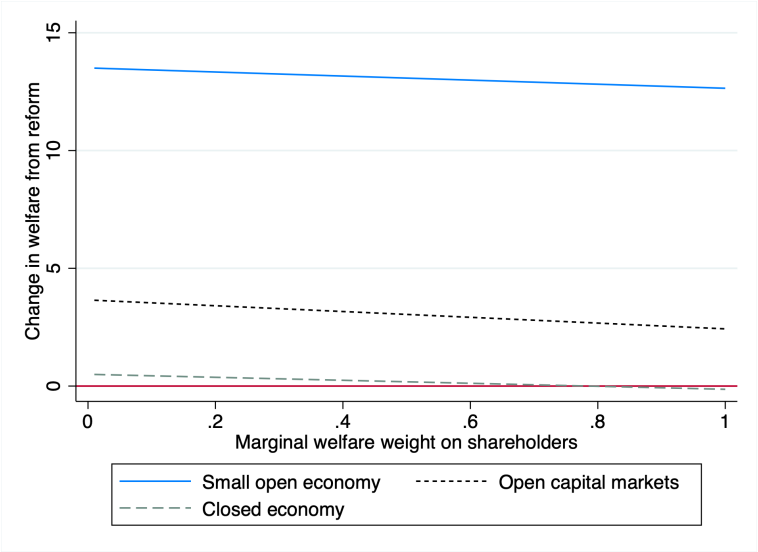


Figure 5: Welfare change for each case depending on shareholder weight.

Note: The figure displays the net effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income for different marginal welfare weights on shareholders, keeping everything else constant. When the effect is positive (negative) a reform towards a higher (lower) shareholder income tax rate and a lower (higher) corporate income tax rate is optimal. The y-axis is measured in terms of the monetary value of welfare per revenue from the corporate income tax and shareholder income tax.

4.5 Country applications

Next, I apply the framework to find the optimal reform direction for the US, a large economy, and Norway, a smaller and more open economy. Whereas tax rates and tax bases can be measured directly based on aggregate data, I rely on the empirical literature to select

tax base elasticities and effort elasticities.

For marginal welfare weights on workers, I assume that the value of revenue is equal to the value of providing one more unit of consumption for workers, such that $\bar{g}^l = 1$. For shareholders, I exploit that the reforms considered keep the labour income tax schedule fixed, such that one can use the design of the labour income tax to assign marginal welfare weights to investors. The idea is to assume that high income earners are assigned with the same weight irrespective of whether their income derives from labour or from investment. I follow Bourguignon and Spadaro (2012) to reveal the implicit marginal welfare weights on high labour income earners. I assign $\bar{g}^r$ by assuming that $g^l(z^l) = \bar{g}^r(z^r)$, where z^l is some high income level with a flat top income tax rate and where the Pareto distribution is better described by a Pareto distribution than a lognornmal distribution (see the role of the Pareto tail in Saez (2001)). I infer $g^l(z^l)$ from high income wage earners by using estimates of the labour income distribution Pareto parameter and the top tax rate. Solving this for the average marginal welfare weight $g(z^l)$ gives

$$\hat{g}(z^l) = 1 - \frac{\tau^l}{1-\tau^l} \frac{\bar{\varepsilon}^l_u \hat{z}^l/z^l - \hat{\eta}^l}{\hat{z}^l/z^l - 1}, \tag{22}$$

where $\hat{z}^l$ is the average income, $\hat{\varepsilon}^l$ is the average (uncompensated) elasticity, $\hat{\eta}^l$ is the average income effect, all among labour income earners in the top tax bracket.

Corporations are also owned by governments and institutions. As state ownership may involve different objectives and a different tax treatment, I exclude firms completely owned by the government. The taxation of institutional owners vary and pension funds are typically exempted from paying shareholder taxes. However, taxation may be paid when individuals receive their pensions. Hence, I assume that institutional owners are taxed at the same rate as individual investors.

Benchmark numbers for the U.S. and Norway are provided in Table 3. The Norwegian tax rates reported in the table are sourced from the Norwegian Tax Authority (Norwegian Tax Authority, 2025), while the corresponding tax bases are derived from Statistics Norway (Statistics Norway, 2025), excluding the petroleum sector due to its unique tax regime. I assume Norway has the features of a small economy with open capital markets,

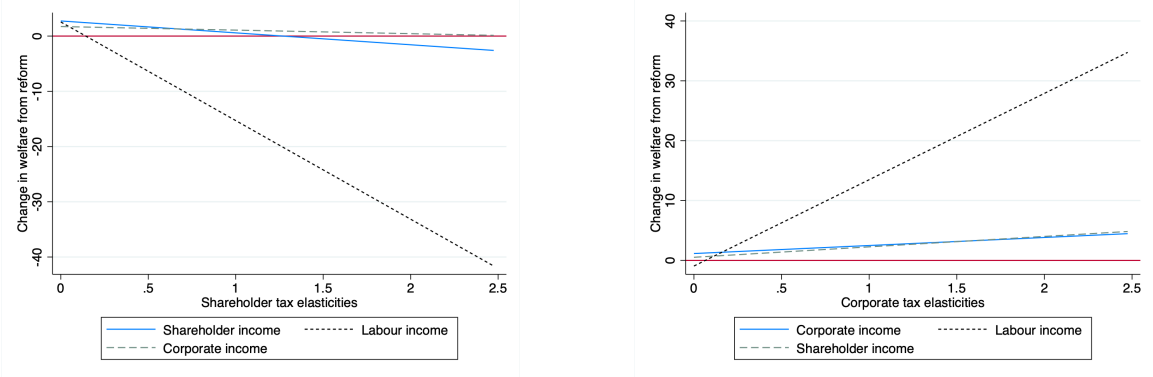
such that shareholder income taxes have no spillovers. For the U.S., tax rates are obtained from the Tax Foundation (Tax Foundation, 2025), with shareholder tax rates calculated as a weighted average of dividend and capital gains tax rates, where the weights reflect the relative importance of dividends and capital gains. The U.S. tax bases are sourced from the OECD (OECD, 2023c), whereas resident shareholder income and the split into dividend and capital gains for the purpose of calculating the average tax rate is gathered from the Luxembourg Income Study (Luxembourg Income Study (LIS) Database, 2025). According to Yagan (2015), dividend tax changes did not affect investment in the U.S., such that I assume that the spillover from shareholder income taxation on workers and corporations is small. The other elasticities for the U.S. are inspired by those in Kennedy et al. (2022). The foreign ownership shares of corporate value for the U.S. are taken from Tax Policy Center (2022) whereas for Norway, I calculate the share of direct investment as a share of total investment using Statistics Norway (2025). Marginal welfare weights rely on Hendren (2020) for the U.S. and Berg (2025) for Norway.

Using the formulas for the relationship between elasticities and incidence derived in the Appendix (Equation A.2), elasticity numbers for the U.S. imply that 56 percent and 16 percent of the incidence on residents falls on workers for corporate and shareholder income tax changes, respectively. For Norway, elasticities imply that 74 percent and 0 percent of the incidence on residents falls on workers for corporate and shareholder income tax changes, respectively.

Table 3: Initial Values for U.S. and Norway in 2022

Category	U.S.	Norway
Tax rates		
Average marginal labor tax rate ($\bar{\tau}^l$)	30%	35%
Shareholder income tax rate (τ^r)	29%	37.84%
Corporate income tax rate (τ^b)	21%	22%
Tax bases (bn. currency)		
Labour income (Z^l)	USD 2,300	NOK 1,750
Resident shareholder income (Z^r)	USD 384	NOK 202
Corporate income (Z^b)	USD 370	NOK 478
Share of non-foreign ownership (s^r)	62%	56%
Elasticities		
$\bar{\varepsilon}^{lr}$	0.05	0.00
$\bar{\varepsilon}^{rr}$	0.50	0.25
$\bar{\varepsilon}^{br}$	0.10	0.00
$\bar{\varepsilon}^{lb}$	0.18	0.25
$\bar{\varepsilon}^{bb}$	0.38	0.275
$\bar{\varepsilon}^{rb}$	0.84	0.8
ε_e^{ll}	0.10	0.00
ε_e^{rr}	0.10	0.00
f_{z^b}	0	0
Marginal welfare weight		
$\bar{g}^l$	1	1
$\bar{g}^r$	0.6	0.4

Notes: U.S. tax rates are from the Tax Foundation (Tax Foundation, 2025), and tax bases are from the OECD (OECD, 2023c) and the Luxembourg Income Study (Luxembourg Income Study (LIS) Database, 2025). Norwegian tax rates are from the Norwegian Tax Authority (Norwegian Tax Authority, 2025), and tax bases are from Statistics Norway (Statistics Norway, 2025), excluding the petroleum sector. U.S. elasticities are based on Yagan (2015) and Kennedy et al. (2022). Norwegian elasticities are based on the open capital markets case.



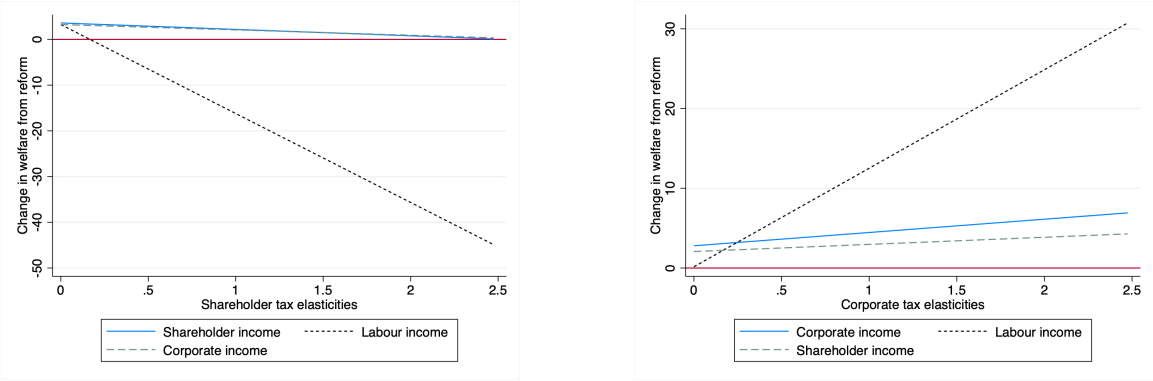
(a) Shareholder tax elasticities.

(b) Corporate tax elasticities.

Figure 6: Welfare change depending on fiscal taxable income elasticites: U.S.

Note: The figure displays the net effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income in the U.S. for different shareholder tax elasticities a) and for different corporate tax elasticities in b), keeping everything else constant. When the effect is positive (negative) a reform towards a higher (lower) shareholder income tax rate and a lower (higher) corporate income tax rate is optimal. The y-axis is measured in terms of the monetary value of welfare per revenue from the corporate income tax and shareholder income tax.

The baseline numbers imply that it is optimal for the U.S. to reduce the corporate income tax and increase the shareholder income tax. Figure 6 shows results of different elasticites on the welfare change depending on the reform direction for the U.S. If shareholder tax elasticites are high, it is optimal to replace shareholder income taxes with corporate income taxes, whereas the opposite holds for corporate income tax elasticites. The figures illustrate that the effect on workers is particularly important for the optimal reform direction, and the baseline assumes that the corporate income tax affects workers more than the shareholder income tax does.



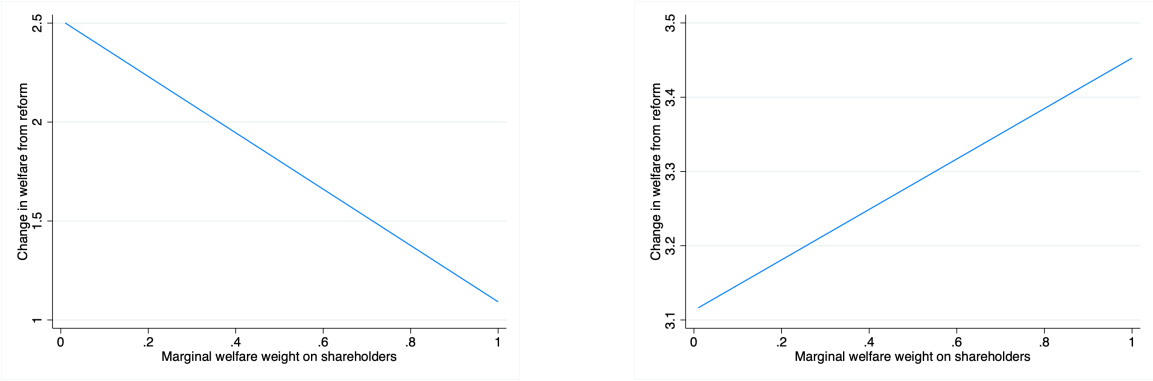
(a) Shareholder tax elasticities.

(b) Corporate tax elasticities.

Figure 7: Welfare change depending on fiscal taxable income elasticites: Norway.

Note: The figure displays the net effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income in Norway for different shareholder tax elasticities a) and for different corporate tax elasticities in b), keeping everything else constant. When the effect is positive (negative) a reform towards a higher (lower) shareholder income tax rate and a lower (higher) corporate income tax rate is optimal. The y-axis is measured in terms of the monetary value of welfare per revenue from the corporate income tax and shareholder income tax.

Similarly, the baseline numbers imply that it is also optimal for Norway to reduce the corporate income tax and increase the shareholder income tax. Figure 7 shows results of different elasticites on the welfare change depending on the reform direction. If shareholder tax elasticites are high, it is optimal to replace shareholder income taxes with corporate income taxes, whereas the opposite holds for corporate income tax elasticites. Compared to the U.S. case, more elasticity numbers imply that it is optimal to reduce the corporate income tax and increase the shareholder income tax. This makes sense, given that Norway has more features of a small open economy than the U.S. has. While only one elasticity changes along a curve, Figure 7a suggests that a spillover on workers may be necessary the opposite reform direction to be optimal for Norway.



(a) U.S. (b) Norway.

Figure 8: Welfare change depending on shareholder weights: U.S. and Norway.

Note: The figure displays the net effect of a reform towards higher net-of-tax rate on corporate income and a lower net-of-tax rate on shareholder income in the U.S. and Norway for different marginal welfare weights on shareholders, keeping everything else constant. When the effect is positive (negative) a reform towards a higher (lower) shareholder income tax rate and a lower (higher) corporate income tax rate is optimal. The y-axis is measured in terms of the monetary value of welfare per revenue from the corporate income tax and shareholder income tax.

Last, Figure 8 shows the effects of different marginal welfare weights on resident shareholders on the optimal reform direction. Whereas for the U.S., the higher the weight on shareholders, the smaller is the gain of replacing corporate with shareholder income taxation, the case for Norway is the opposite. The slope of the line depends crucially on the ownership share and the effect that shareholder and corporate income taxes have on shareholders. If the resident ownership share in Norway were 45 percent, the line would be almost flat. A lower ownership share is required for this relationship to be downward sloping in Norway than in the U.S. since shareholder income taxes do not affect shareholders to the same extent ($\varepsilon_e^{rr} = 0$).

5 Conclusion

This paper has presented a general sufficient statistic framework for studying the trade-off between taxing income at the corporate and the shareholder level.[12] The main trade-off is between the taxation of the more elastic corporate income tax base partly paid by foreign

[12]There are other alternatives to taxing income from corporate profits, such as taxing pure profits at final sales through a destination-based cash-flow-tax (Devereux et al., 2020). To include destination-based taxation in the model presented here would be an interesting extension, which I leave to future work.

investors and a less elastic shareholder income tax base for which foreign investors are exempt. One result is that the incidence on workers is a key sufficient statistic, since it is a large tax base and it is plausible that the government attaches higher marginal welfare weights to workers than to foreign and resident investors. By combining the theory with estimates from the literature on effects of the corporate and shareholder income tax base, I derive optimal reform directions.

The framework of this paper relies on a national perspective, where effects on other countries are not accounted for. This means that when a country lowers its corporate income tax, it only considers the effects on its own residents. It may appear that the model assumes that other countries do not respond to marginal tax rate changes by the country in question, but such strategic responses by other countries can be accounted for by the elasticities of each tax base. An alternative framework with a different social welfare evaluation is required to study optimal tax policy from the perspective of the world rather than for each individual country.

Importantly, the optimal policy analysis here is based on local analysis of reforms using estimates of effects in actual tax systems. Even though local formulas for optimal tax rates display the policy trade-offs involved, it is unlikely that sufficient statistics would stay constant under a different tax system, which means that the framework cannot be straightforwardly applied to simulate optimal tax rates that are not in the vicinity of the initial tax system. Hence, the objective has instead been to present results on the optimal reform direction given the initial tax system. Local estimates of effects for the initial tax system are then exactly the relevant sufficient statistics for this reform analysis. An implication of this is that the framework presented here is not an alternative but rather a complement to more structural analysis of tax policy (such as Suárez Serrato and Zidar, 2016 and Smith and Miller, 2023). In any case, given estimates of effects in different tax systems from such structural approaches, the framework in this paper may provide a guide to optimal policy implications.

Last, my results rely on the size of the different own-base and cross base elasticities, and more empirical evidence is needed for a wider set of countries to inform these elasticities. Given such estimates, the framework presented here can be applied to other countries.

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A Appendix

A.1 The relationship between incidence and elasticities of taxable income

Empirical estimates are sometimes defined in terms of marginal incidence. I first define marginal incidence, t^{kj}, as what ends up being paid by the monetary value of a utility change for each group ($\Delta_j u^k / u_c^k$) as a share of after-tax income on the taxed tax base ($(1-\tau^j)Z^j$).[13] The role of u_c^k is to define incidence in terms of monetary rather than utility. Marginal welfare weights translate incidence measures into social welfare measures.

For a tax change on a (potentially) different base,

$$t^{kj} = \frac{(1-\tau^k)}{1-\tau^j}\varepsilon_w^{kj}\frac{Z^k}{Z^j}\ \forall k,j. \tag{A.1}$$

This highlights that if the incidence elasticity, $\varepsilon_w^{kj} = 0$, there is no incidence on this group for a tax change on a different tax base. When $k = j$ and $\varepsilon_w^{kj} = 1$, the expression becomes the mechanical effect. When $k = j = r$, $\varepsilon_w^{kj} = (1 + \varepsilon_w^{rr})$, which implies that the incidence of shareholder taxes on shareholders is weakly larger than 1, since it combines the mechanical and indirect effect of the tax on shareholders.

A simpler definition of incidence, $\hat{t}^{kj}$, ensures that the total incidence on residents sums to 1,

$$\hat{t}^{kj} = \frac{(1-\tau^k)\varepsilon_w^{kj}Z^k}{\sum_K (1-\tau^K)\varepsilon_w^{Kj}Z^K}\forall k,j. \tag{A.2}$$

This is more line in with the definition of incidence in Fuest et al. (2018), where they explain their incidence measure as follows: "We do so by relating the welfare change of workers induced by a marginal change in the net-of-tax rate to the sum of the welfare changes of workers and firm owners".

If all elasticities are zero, incidence is fully borne by the base on which the tax applies, such that mechanical effects determine incidence. The approach here is to focus on residents and not account for incidence on foreigners, as they are assumed to have no weight. This is why Equation A.2 measures incidence on group k from a tax change on base j as a

[13] An alternative measure of incidence is to account for the elasticity of the tax base on which the tax is levied in the denominator, such that incidence is measured as a share of new revenue raised on that tax base.

share of incidence on residents.

A.2 Two-period saving model

A representative individual lives for two periods, $t = 1, 2$, earns income $y_t = wl_t$ in each period, where w is a fixed wage rate and l_t is labour supply in each period, and saves $s = (1 - t_y)y_1 - c_1$. There are flat taxes on income, t_y, such that $c_1 = (1 - t_y)y_1 - s$. The individual saves at interest rate r and savings are taxed at a flat rate of t_s, such that $c_2 = (1 + r)(1 - t_s)s + (1 - t_y)y_s + R$ where R is a lump sum transfer. The individual has lifetime utility $u(c_1, c_2, l_1, l_2)$, which is increasing and concave in consumption in each period and decreasing and convex in labour supply in each period. The individual maximizes lifetime utility, which gives optimal values c_1^*, c_2^*, l_1^* and l_2^*.

The government faces a zero interest rate, such that $R = t_y y_1 + t_y y_2 + t_s s$, and values revenue at $W(R)$. Consider a tax reform where $1 - t_s$ increases marginally while $1 - t_y$ is fixed. Government welfare is the utility of the representative agent and the value of revenue, $W(u(c_1, c_2, l_1, l_2), R) = u(c_1, c_2, l_1, l_2) + W(R)$. The individual welfare effect is given by the mechanical effect $\partial u(c_1, c_2, l_1, l_2)/\partial(1 - t_s) = u_{c_2} s$ (due to the envelope theorem) while the revenue is affected by the behavioural response to the savings tax,

$$\frac{\partial W(R)}{\partial(1 - \tau_s)} = W'(R)\left(-s + t_y \frac{y_1}{(1 - t_s)}\varepsilon_{y_1} + t_y \frac{y_2}{(1 - t_s)}\varepsilon_{y_2} + t_s \frac{s}{(1 - t_s)}\varepsilon_s\right),$$

where $\varepsilon_x = \partial x/\partial(1 - t_s) \times (1 - t_s)/x$. In total, the reform is welfare increasing if

$$\left(1 - \frac{W'(R)}{u_{c_2}}\right) s + \frac{W'(R)}{u_{c_2}} \frac{t_y}{(1 - t_s)}\varepsilon_{y_1} y_1 + \frac{W'(R)}{u_{c_2}} \frac{t_y}{(1 - t_s)}\varepsilon_{y_2} y_2 + \frac{W'(R)}{u_{c_2}} \frac{t_s}{(1 - t_s)}\varepsilon_s s > 0.$$

Comparing it to the model presented in Section 3, $W'(R)/u_{c_2}$ represents relative weights on the average individual compared to group that the tax is changed for. The total welfare effect depends on the mechanical effect, $(1 - W'(R)/u_{c_2})\, s$, and fiscal spillovers on the three tax bases, $W'(R)/u_{c_2} \times t_y/(1 - t_s)\varepsilon_{y_1} y_1 + W'(R)/u_{c_2} \times t_y/(1 - t_s)\varepsilon_{y_2} y_2 + W'(R)/u_{c_2} \times t_s/(1 - t_s)\varepsilon_s s$. As long as sufficient statistics account for long-term effects, the two-period saving model can be (locally) represented by the sufficient statistic framework.

B Online Appendix

B.1 Further empirical results

Table A1: Development of the share of dividend taxes over the total tax rate

	Dividend tax rate over the total tax rate			
	Panel A: All OECD countries			
	Basic	With population	With GDP	With both
Year	0.636***	0.644***	0.647***	0.502***
	(0.094)	(0.094)	(0.095)	(0.095)
Obs	836	836	836	836
R^2	0.052	0.064	0.053	0.103
	Panel B: Only Europe			
Year	0.708***	0.704***	0.674***	0.659***
	(0.109)	(0.109)	(0.112)	(0.121)
Obs	594	594	594	594
R^2	0.066	0.069	0.070	0.070

Notes: Year is year dummies from 2001 to 2022. "With population" adds the population of the country (in millions) as a control. With GDP adds the GDP ($ million) as control. "Both" includes both population and GDP as controls. *** indicates significance at 1%, ** at 5%, * at 10%.

Table A2: Development of the dividend tax rate percentage

	Dividend tax rate %			
	Panel A: All OECD countries			
	Basic	With population	With size	With both
Year	0.217***	0.215***	0.193***	0.122*
	(0.064)	(0.064)	(0.064)	(0.065)
Obs	836	836	836	836
R^2	0.014	0.017	0.027	0.054
	Panel B: Only Europe			
Year	0.222***	0.214***	0.133*	0.045
	(0.076)	(0.075)	(0.075)	(0.081)
Obs	594	594	594	594
R^2	0.014	0.048	0.072	0.083

Notes: Year is year dummies from 2001 to 2022. "With population" adds the population of the country (in millions) as a control. With GDP adds the GDP ($ million) as control. "Both" includes both population and GDP as controls. *** indicates significance at 1%, ** at 5%, * at 10%.

Table A3: Development of the total tax rate

	Total tax rate %			
	Panel A: All OECD countries			
	Basic	With population	With size	With both
Year	-0.089*	-0.101*	-0.140***	-0.133**
	(0.055)	(0.053)	(0.053)	(0.054)
Obs	836	836	836	836
R^2	0.003	0.081	0.086	0.087
	Panel B: Only Europe			
Year	-0.119*	-0.133**	-0.251***	-0.321***
	(0.070)	(0.066)	(0.065)	(0.071)
Obs	594	594	594	594
R^2	0.005	0.113	0.157	0.166

Notes: Year is year dummies from 2001 to 2022. "With population" adds the population of the country (in millions) as a control. With GDP adds the GDP ($ million) as control. "Both" includes both population and GDP as controls. *** indicates significance at 1%, ** at 5%, * at 10%.

Table A4: The Relationship Between Tax Rates, GDP, and Population Size for the OECD and Europe

	OECD countries				Only Europe			
	Relative dividend tax rate				Relative dividend tax rate			
GDP	-0.012*		0.116***		GDP	-0.003		0.233***
	(0.007)		(0.019)			(0.026)		(0.064)
Population		-1.428***	-6.933***		Population		-1.700*	-9.897***
		(0.349)	(0.982)				(0.993)	(2.461)
Obs	836	836	836		Obs	594	594	594
R^2	0.004	0.020	0.060		R^2	0.000	0.005	0.027
	Corporate income tax rate				Corporate income tax rate			
GDP	0.800***		-1.428***		GDP	2.319***		0.141
	(0.078)		(0.208)			(0.254)		(0.628)
Population		0.526***	0.120***		Population		0.096***	0.091***
		(0.004)	(0.105)				(0.010)	(0.024)
Obs	836	836	836		Obs	594	594	594
R^2	0.112	0.190	0.233		R^2	0.124	0.144	0.144
	Total tax rate				Total tax rate			
GDP	1.003***		0.614*		GDP	4.075***		4.811***
	(0.119)		(0.341)			(0.422)		(1.056)
Population		0.501***	0.210		Population		0.139***	-0.031
		(0.603)	(0.173)				(0.017)	(0.041)
Obs	836	836	836		Obs	594	594	594
R^2	0.078	0.076	0.080		R^2	0.136	0.107	0.137

Notes: Population is in billions and GDP is in trillion USD. Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.