The Corporate Income Tax is Inherently Benefit-Based

Simon Naitram[*] and Matthew Weinzierl[†]

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Abstract

The appeal of a corporate income tax in the standard modern optimal tax framework depends on who bears its burden—that is, its incidence. Persistent and arguably irresolvable uncertainty over that incidence makes robust popular and policymaker support for the corporate income tax puzzling. We propose a resolution: if the corporate income tax is seen as a benefit-based tax, its appeal depends not on the incidence of the tax alone, but instead on how closely the incidence of the tax corresponds to the incidence of the benefit from the activities of the state that corporations' legal status enables them to enjoy. We derive the conditions under which this correspondence is exact, so that the corporate tax is a properly designed benefit-based tax. Behind this result is a mechanism, based on the relative elasticities among the parties to the corporate form, which automatically determines both who bears the burden of the tax and who accrues the benefit of the state's activities. Under this view, the appeal of a benefit-based corporate income tax is independent of its incidence.

JEL: H22; H25; H41

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1 Introduction

The case for a corporate income tax in the standard modern optimal taxation framework[1] depends entirely on a question which decades of research have left unanswered: Who bears the burden of paying it? While the corporate tax is officially levied on corporate returns to capital, since at least Harberger (1962) it has been clear that capital may not bear the full burden of the tax, as corporations' behavioral responses to it induce changes in the equilibrium allocation of, and thus returns to, capital and labor. These effects are difficult to measure in the short term and arguably impossible to measure in the (more important) long term, such that the incidence of the corporate tax remains unresolved.[2]

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[*]University of the West Indies, Cave Hill, simon.naitram@cavehill.uwi.edu.

[†]Harvard Business School & National Bureau of Economic Research, mweinzierl@hbs.edu.

[1]That framework, due to Ramsey (1927), Mirrlees (1971), Diamond and Mirrlees (1971), and others, is welfarist. See Kaplow (2008) for an overview and defense of its approach.

[2]Research on the incidence of the corporate income tax is characterised by Fullerton and Metcalf (2002). Auerbach (2006) and Gravelle (2010) provide excellent overviews of the literature. Recently, Auerbach and Devereux (2018) applies this analytical approach to the U.S. Tax Cuts and Jobs Act. Despite the long line of work, uncertainty remains: prior to 2012 the U.S. Congressional Budget Office (CBO) allocated the entire economic burden of the tax to capital owners; since 2012 it has begun to allocate 25 percent of the incidence to workers (CBO, 2012b).

Tax theorists have thus struggled to find a robust justification for the corporate income tax, and critics of it have long argued that society would be better served by imposing taxes directly as desired on the shareholders, workers, or customers of corporations, rather than risk having the burden of the corporate tax fall on an unintended party.[3] The shaky justification for the corporate income tax also makes it difficult to confidently propose policy reforms or evaluate existing policy using the standard framework.

It is a puzzle, then, that popular and policymaker support for the corporate income tax is persistent and widespread. Public opinion research from Gallup has shown that, since at least 2004, approximately two-thirds of Americans have consistently said corporations pay "too little" in taxes.[4] The United States has had a corporate income tax for over a century, the average rate among OECD countries in 2020 was 23.7 percent (all were at least 9.0 percent), and major middle-income countries such as Brazil, China, India, and Nigeria assess still greater rates.[5] Moreover, recent international policy initiatives have aimed to reduce corporate tax avoidance, deter the "race to the bottom" encouraged by tax havens, and set a floor on corporate income tax rates. Together, these opinions and choices strongly suggest that uncertainty over the incidence of the tax on corporate income is not deterring its supporters. Bird (1996) sums this puzzle up neatly:

> In sharp contrast, recent events in many countries have once again demonstrated that the general public is almost equally unanimous in holding the opposite conclusion, namely, that corporate taxes are among the best of all taxes. It is, of course, easy for economists to demonstrate that these popular views must largely be wrong, since they are based on fundamentally unconvincing beliefs about the incidence of corporate taxes – and in fact, as already suggested, the inherent uncertainty about corporate tax incidence actually provides another reason for suggesting that there is no place for such taxes in a tax system concerned to achieve efficiency and equity.

To resolve this puzzle, we need a reason to *prefer* the taxation of the corporation—and its uncertain incidence—to the certain incidence of direct taxation of corporate stakeholders. As Bird suggests, it may be tempting to attribute public and policymaker support for the corporate tax to strong beliefs about its incidence, but its incidence can never be more sure than that of direct taxes on stakeholders.[6] Administrative arguments can be marshalled,[7] but they rely on substantial (and we think questionable) pessimism toward our relative ability to enforce other aspects of tax policy,

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[3]See, among others, Musgrave, 1959 p. 173); etc.

[4]https://news.gallup.com/poll/1714/taxes.aspx

[5]https://stats.oecd.org/Index.aspx?DataSetCode=CTS_CIT.

[6]At the other extreme, some may argue that the unclear incidence of the tax is the source of its support, as all taxpayers can simultaneously believe they do not bear its burden. Collective delusion on such a long-lasting and often-debated policy seems implausible, however, especially given the prominence of incidence-based arguments in the debate.

[7]There are three main administrative arguments for the existence of the corporate tax: first, to prevent income shifting between personal and corporate income; second, to prevent firms from hoarding profits to avoid dividend taxation; third, because it is easier to tax a firm's profits rather than to tax individual shareholders. This view of the corporate tax is advanced by OECD (2001), Mirrlees et al. (2011), McLure (1979), Gordon and MacKie-Mason (1994). Zucman (2014) and Bank (2001) suggest this was the original purpose for the imposition of the tax.

and they can only count against rather than explain away the risk of misplaced incidence.

In this paper, we propose a resolution to this puzzle that is both familiar and novel: if the corporate income tax is seen as a benefit-based tax[8], its appeal depends not on the incidence of the tax alone but, instead, on how closely the incidence of the tax corresponds to the incidence of the benefit from the activities of the state that corporations' legal status enables them to enjoy. According to this benefit-based view, the appeal of a properly designed corporate tax is independent of its incidence as normally understood, and it is *preferable* to impose a tax on corporations through which its burden will fall wherever their benefit accrues, rather than to attempt the taxing of shareholders for benefit they may not enjoy.[9]

Our proposed resolution is familiar because the benefit theory of taxation is far from new; in fact, it is perhaps the oldest principle of optimal taxation[10] and was explicitly cited as the basis of the U.S. corporate income tax at its birth in 1909. But the benefit-based view of taxation has fallen out of favor over the last century, and it is rarely used today in the context of national policy analysis. Encouragingly for our purposes in this paper, the benefit-based view retains a foothold in debates over *interjurisdictional* corporate tax competition (across cities, states, or countries), where the case has been made for taxing corporations due to their benefit from local public goods (Vogel, 1988c,a,b; Weinzierl, 2018a; Escribano, 2019).[11] We provide a formal basis for such arguments that applies within jurisdictions as well as across them.

Our proposed resolution is novel because at its heart is a simple but (we believe) as-yet-unappreciated mechanism: the relative elasticities among the parties to the corporate form determine both who bears the burden of the tax and who accrues the benefit of the state's activities. Specifically, the corporate form brings with it privileges–including limited liability protection and access to liquid public equity markets–which magnify the returns to capital made possible by the broad range of the state's activities. Which party to the corporate form benefits from that magnification will depend on the outside options available to them. For example, the more that shareholders in U.S. C-corporations find partnerships, LLCs, non-U.S. companies, personal consumption, and other possible destinations for their capital comparatively unattractive, the more those shareholders benefit from the C-corporate form and the more inelastically they will supply their capital to it. That increased inelasticity also implies, as is familiar from standard tax theory, that they will bear more of the burden of the tax on C-corporations. A properly designed corporate tax, from the benefit-based perspective, yields a tight correspondence between tax and benefit for each stakeholder of the corporation.

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[8]Under the benefit theory of taxation, taxes are assessed according to the benefit taxpayers receive from the activities of the state. See the discussion in Section 1 below.

[9]That is, if benefit is tied to the corporate form's privileges, trying to assign that benefit to corporate stakeholders requires the same as-yet-indeterminate incidence analysis as for taxation.

[10]Seligman, Musgrave '59. In other words, we resolve the puzzle by proposing that support for taxing corporations derives from an alternative principle of optimal taxation, departing from the welfarism of the standard modern optimal tax framework. See Weinzierl (2017a) for a broader case for going beyond welfarism in the evaluation of tax policy.

[11]Interestingly, some have criticized the corporate tax as an imperfect way to achieve the aims of benefit taxation (Weichenrieder, 2005; De Mooij, 2005). Related, Devereux (2019) and Devereux et al. (2021) express concern whether the burden of the corporate tax actually aligns with the benefits of the public good.

The paper proceeds as follows. In Section 2, we trace the history of benefit-based thinking in the development of the U.S. corporate income tax and address some of the (we believe mistaken) reasons for which its influence, especially as a normative principle, has waned. In Section 3, we introduce a formal approach to benefit-based modeling of the corporate tax by adding a function of government spending on public goods to the representative firm's profit function in a textbook general equilibrium corporate tax incidence framework (e.g., of Fullerton and Metcalf (2002) and Saez and Zucman (2019)). To determine whether a standard corporate income tax is a properly designed benefit-based tax, we then consider small changes in the model's version of that corporate income tax rate and the level of government spending and examine the impact they have on the prices paid to factors of production.[12] Here, we uncover our main result: assuming that public goods magnify the returns to corporate capital in the firm's profit function, the incidence on capital and labor of the corporate income tax corresponds precisely to the incidence of the benefit from public goods in this setting, so that the corporate income tax is a properly designed benefit-based tax. In Section 4, we consider an alternative formalization in which public goods act as a Hicks-neutral technology in the firm's production function. In that setting, we find that the incidence of the Hicks-neutral public good's benefit corresponds to the incidence of the corporate income tax only in special cases, and we characterize departures from that perfect correspondence both qualitatively and quantitatively for realistic calibrations of the model. We conclude in Section 5.

2   The benefit-based view in the history of the U.S. corporate income tax

The idea that corporations should be taxed based on the benefit they receive from the activities of the state can be traced back centuries. An illustrative example in the context of state-level property taxation in the early United States is provided by Bank (2001, footnotes removed):

> In Massachusetts, for example, a manufacturing corporation resisted the application of a tax assessed in 1817 for the support of the church parish in which the corporation's plant was located. The attorney for the corporation argued that because "corporations have no souls" for the parish to save, the tax cannot possibly apply to them. In rejecting this argument, the court not only noted that a tax is not like a fee that may be charged only to those who benefit from it, but it also pointed out that a corporation benefits just as much as an individual when its "[p]roperty is made more secure both by the education of children, and the religious and moral instruction of adults."

In the early nineteenth century, the benefit-based view of *individual* taxation was still dominant (Cooper, 1994). Thus, this Massachusetts court's benefit-based justification for a corporation paying (property) tax reflects the then-widespread practice of treating corporations as separate entities for

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[12]As shown in Section 6.1, changes in factors prices define the overall incidence on workers and capitalists.

tax purposes, for example if (but not only if) they enjoyed obvious special benefits and privileges from their official state or federal charters (Bank, p 474).[13]

Benefit-based reasoning retained its prominence when the rising role of non-chartered, large corporations in the mid- and late-nineteenth century brought with it—as part of the Progressive Era movement toward a larger role for the state in the economy—the first U.S. federal taxes on corporate income. After two temporary impositions[14], a lasting corporate income tax was adopted in 1909. While a strong case can be made that the purpose of that tax was to reach shareholder wealth and counteract personal income tax avoidance (Bank, p. 532), the explicit justification for it offered at the time by President Taft was as "an excise tax upon the privilege of doing business as an artificial entity and of freedom from a general partnership liability enjoyed by those who own the stock." Taft's explicitly benefit-based justification was useful in preventing charges of unconstitutionality, as the use of direct income taxes would have to wait until the passage of the Sixteenth Amendment in 1913(Sutherland, 1940). But it also reflected the long tradition of seeing the special status of corporations—through the bestowing of charters, access to public equity markets, or protection from unlimited liability—as grounds for their taxation. In other words, while supporters drew on a set of justifications for the corporate income tax, the benefit-based view was an important element of that set.

A quarter century later, a benefit-based justification was behind the introduction of graduated rates on corporate income. As Sutherland (1940) wrote contemporaneously:

> The Revenue Act of 1935 was passed in answer to a tax message from the President [Franklin D. Roosevelt] to Congress dated June 19, 1935, in which he contended that the advantages conferred by the government upon corporations increased in value as the size of the corporations increased, that the advantages gained by the large corporations engaged in interstate business were derived through the federal government chiefly and that the principle of taxation in accordance with ability to pay, as well as in accordance with benefits received, should apply to corporate taxation much as it had been applied to the individual income tax.

The U.S. corporate income tax has used graduated rates ever since.

2.1 Recent skepticism of the benefit-based view

Despite its past prominence, the benefit-based view has been dismissed over the last several decades as a way of understanding the modern corporate income tax. A particularly stark example is from

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[13]As an entity—either in its artificial (e.g., state-created) or natural (e.g., entrepreneurial) form—separate from its participants, rather than merely as an aggregation of them, a corporation may be thought to benefit from activities of the government in ways to which its participants would lack access in its absence. When a government grants special charters to corporations, for example in the early years of the United States, it is readily seen as bestowing particular benefit upon them. But, as the Massachusetts court statement quoted in the text makes clear, benefits of the general activities of government also accrue to corporations, whether artificially or naturally created.

[14]The United States levied corporate income taxes during its Civil War in the 1860s and again in 1894, but both were short-lived, the former because it was intended for emergency funding and the latter because it was declared unconstitutional by the U.S. Supreme Court.

(McDonald, 2016), writing about the proper interpretation of the 1909 statute: "The [benefit-based] argument was tenuous at the time. It should not even be raised now."

At the heart of this opposition lies two claims: first, the activities of the state from which corporations benefit cost too little to justify a substantial corporate income tax; second, those activities' effects extend too far beyond Schedule C corporations to justify a special tax on them. In particular, limited liability provisions and the permission of dispersed equity ownership cost the state little, at least in terms of direct expenditure, and the former extends to a variety of corporate forms.

These critiques reflect a particular—and we believe mistaken—view of benefit-based taxation in general (i.e., not just for taxing corporations) which has handicapped its acceptance for the last century. That view holds that the benefit being taxed comes from specific activities of the state which have a direct effect on the taxpayer, and it arises naturally from a focus on the idea that benefit-based taxes are meant to charge a "price" for public services which taxpayers are willing to pay, as in the marketplace for private services.Justifying modern corporate income taxes as benefit-based taxes of this type would, for the reasons mentioned above, indeed be difficult.

But an alternative view of benefit-based taxation—extending back to at least Smith (1776), present in Lindahl (1919), and more recently resuscitated by Cooper (1994), Stewart (2015), and Weinzierl (2017b)—holds that benefit for a given taxpayer comes not from specific activities of the government but from the way in which the state's full set of activities magnifies the taxpayer's economic capacity, or "ability". The difference between these two views of benefit-based taxation— what we might call the "input view" and "output view"—is whether one ties benefit to the cost of the services provided by the state or to the outcomes made possible by them.

Under this alternative, output view, the proper approach to benefit-based taxation is not to assign particular activities to particular beneficiaries, but to use a measure of the benefit from the state's activities for each actor which best captures their effect on that actor.

2.2 An alternative (classic) view that addresses the skeptics

In the case of the corporate tax, this output view suggests seeing limited liability and dispersed equity ownership not as isolated activities of the state which benefit C-corporations but, instead, *as the privileges through which a C-corporation's benefit from the state's broad activities is magnified.* While passing the laws establishing these privileges may require little expenditure, their value relies on the maintenance of an entire economic society through a wide range of costly state activities. Establishing and enforcing the rule of law, preserving peace and political stability, regulating markets, and all other fundamental activities of the state are inseparable pieces of a whole, and corporations benefit from that whole. Of course, corporations are not the only beneficiaries of those activities, but the privileges corporations enjoy—limited liability and dispersed equity ownership, in particular—offer corporations unique power to make use of them. These privileges are worth very little, after all, to corporations without a functioning marketplace. And they are of particular value to large corporations (or those who wish to become large, and thus choose C-status), explaining the

differential tax treatment across corporate forms. Our analysis in Sections 2 and 3 below explore ways in which to formalize this "output view" for the corporate income tax.

Strikingly, and as noted above, benefit-based reasoning following this output view has a prominent place in contemporary analysis of local public finance and international tax competition. Tiebout (1956) theory provides a direct connection between the holistic set of public goods offered by a local jurisdiction and the taxes assessed on its residents in exchange, and local property taxes are often seen as the paradigmatic example of benefit-based taxes. Similarly, debates over residence-based or source-based taxation of corporate income have often relied on benefit-based reasoning, focusing on which country's provision of public goods should be assigned the credit for supporting the company's returns (see Stewart, 2015).

Critics of the benefit-based view will sometimes point out that the relationship between the tax base of corporate taxation and benefit is unclear. Indeed, as we show in this paper's analysis, different views of how the state's activities benefit corporations will align with different corporate tax bases. Examining early attempts to tax corporations in the nineteenth-century United States, we find substantial variation in how individual states defined the tax base; that variation may suggest that states were themselves trying to find the base which best corresponded to the benefit they were providing. Debate continues over whether the current base in the United States is justifiable (see Schlunk, 2003, for example), and we hope the formal treatment we provide will help to inform that debate.

Our analysis is related to some important previous contributions which consider public goods as intermediate goods. Building on the famous Samuelson (1954) condition for the efficient provision of public goods, Kaizuka (1965) derived the analogous condition for intermediate public goods used by firms in production. Following this, a literature began to ask: how should these intermediate public goods be paid for? The benefit principle was seen as a natural way to determine the financing of intermediate public goods. Sandmo (1972) proposed a Lindahl (1919) benefit-based approach to taxing the firm, considering a public good that takes the form of an unpaid factor of production (firm-augmenting public goods).

However, Boadway and Bruce (1984) and Henderson (1974) suggest that in a competitive market, the rents created by a public good taking the form of an unpaid factor of production are likely to be dissipated. The literature thereafter has taken the view that intermediate public goods are more likely to take the form of "atmosphere externalities" (factor-augmenting public goods), implying that the production function is constant returns to scale in private factors of production (Manning and McMillan, 1979). Feehan (1998) calls this a Hicks-neutral public good.

Under this setting, Manning et al. (1985) proposes an efficient flat tax on all factors of production to finance the intermediate public good, suggesting that Lindahl pricing would lead to negative output. However, Feehan and Matsumoto (2000) argue that such a tax scheme bears no resemblance to the principle of benefit taxation, since factors will benefit in differential ways but will be taxed in a homogeneous way—breaking the link between benefit received and taxes paid. To recreate this link, Feehan and Matsumoto (2000) propose a system of differential factor taxes that depends on

the elasticity of each factor's returns with respect to the public good. In more recent work, Gugl and Zodrow (2015, 2019) and Matsumoto and Sugahara (2017) compare the efficiency of capital taxes against production taxes[15] in financing the intermediate public good.

We diverge from this literature in a few ways. First, we focus on the corporate income tax. Second, we consider different views of *how* the state's activities benefit corporations. Specifically, along with the more general public good which affects total output, we examine the more compelling case where the corporate tax is intended to target a benefit accruing to the corporate form. Third, we formalise the positive relationship between the incidence of the benefit from the public good and the incidence of the burden of the corporate tax for each factor of production. Specifically, we show that the same elasticities which determine the incidence of the corporate tax are those which determine the incidence of the benefit from the public good.

3   Benefit through increased returns to corporate capital

In this section, we formalize a benefit-based approach to the corporate income tax, focusing on the idea that the tax is intended to target the increased returns to corporate capital made possible by the interaction of corporate privileges—such as limited liability and access to liquid public equity markets—with public goods provided by the government. Specifically, we have a function of public goods spending multiply the returns to capital in the firm's profit function of an otherwise-standard general equilibrium corporate tax incidence framework (e.g., of Fullerton and Metcalf, 2002 and Saez and Zucman, 2019). We then determine whether a corporate income tax (for example, that of the United States) is a properly designed benefit-based tax by examining the incidence—on the factor payments to labor and capital—of small changes in the tax rate and the level of government spending.

This approach accords with the historical justifications for the tax reviewed above, namely that the capital owners who form and fund taxable corporations operate under a set of rules and regulations allowing them uniquely to magnify their capital's reach (and, they hope, return) throughout the economic system sustained by the state. Though likely unfamiliar to readers accustomed to the modern, welfarist approach to optimal taxation, under this benefit-based approach corporate income taxes are created and sustained not as a crude form of capital income taxation but as a specially designed component of a broader benefit-based tax system. Within such a system, each tax targets taxpayers who benefit in particular ways from the activities of the state; understanding and properly modeling those ways is essential for an accurate appraisal of the net incidence of a tax.[16]

The representative firm's profit function is:

$$\Pi = (1 - \tau)g\left(G\right)\left[F(K,L) - wL\right] - rK,$$

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[15]Which are akin to the flat tax proposed by Manning et al. (1985).

[16]As Schlunk (2002) points out, a government trying to levy a benefit-based corporate tax would define its tax base by the measure of who (it believes) benefits from the use of the corporate organizational form.

where Π is profit, τ is the corporate tax rate on revenue less wage costs, and $g(G)$ is a function of public goods spending G, which multiplies and thus can magnify the returns to corporate capital. Those returns are $F(K,L) - wL$, where the firm's production function $F(K,L)$ uses capital K and labor L as inputs. Labor earns the wage w and capital earns the rate r. We assume perfect competition and production that is constant returns to scale in capital and labor, so economic profits are zero.

The first order conditions for the firm are:

$$(1-\tau)\, g\,(G)\, F_K = r, \qquad F_L = w.$$

Note that under this specification of how benefit accrues to the firm, both the corporate tax and public goods alter the optimal choice of capital and do *not* alter the choice of labor. To be clear, however, this section's view does not forbid the assumption that public goods also affect the productivity of labor. Instead, it simply assumes that the intention of the corporate tax is to levy a tax on the returns to corporate capital; other taxes (notably, the personal income tax) not explicitly included in our analysis may be assumed to target the benefit directly accruing to labor from the activities of the state.[17]

Given the assumption of constant returns to scale in production $F(K,L)$, we can write Euler's theorem as: $g(G)\, F(K,L) = \bar{r}K + wL$, where we define the term $\bar{r} = r/(1-\tau)$ as the firm's tax inclusive cost of capital. We define the share of output accruing to capital as $\alpha = (\bar{r}K)/F(K,L)$ and the share accruing to labor as $1 - \alpha = (wL)/F(K,L)$. Differentiating and substituting in these factor shares and the first order conditions of the firm yields:

$$\alpha \left(\frac{g'(G)\, dG}{g(G)} - \frac{d\tau}{1-\tau} \right) = g(G)(1-\alpha)\frac{dw}{w} + \alpha\frac{dr}{r}. \tag{3.1}$$

The firm's elasticity of substitution is defined as $\sigma = \left(\frac{dK}{K} - \frac{dL}{L} \right) / \left[\frac{dw}{w} - \left(\frac{d\bar{r}}{\bar{r}} - \frac{g'(G)\,dG}{g(G)} \right) \right]$.

We assume pared-down preferences for the capitalist and worker, with utility functions of the form:[18]

$$u^K(K) = rK - \frac{K^{1+1/e_K}}{1+1/e_K}, \qquad u^L(L) = wL - \frac{L^{1+1/e_L}}{1+1/e_L},$$

where the terms e_K and e_L are the elasticities of capital and labor supply with respect to their respective factor prices. These utility functions show that capitalists and workers trade off the returns to supplying capital and labor with the disutility from supplying them (e.g., in foregone outside options for the capitalist and lost leisure for the worker).

While this form is familiar for the suppliers of labor, its use for suppliers of capital may be less so. In this context, it allows us to capture in a simple manner that capitalists could invest in non-corporate businesses, foreign corporations, or even personal consumption instead of in the corporations being taxed. Analytically, these forms cleanly deliver the elasticities of supply for both

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[17]See Weinzierl (2018b) for an exploration of this idea.

[18]Used also by Saez and Zucman (2019) in their incidence analysis.

capital and labor which are critical to determining relative incidence.

The individuals' optimal choices of K and L are determined by the first order conditions $r^{e_K} = K$ and $w^{e_L} = L$. Fully differentiating these yields $e_K \frac{dr}{r} = \frac{dK}{K}$ and $e_L \frac{dw}{w} = \frac{dL}{L}$. These conditions allow us to simplify the definition for the firm's elasticity of substitution in general equilibrium, yielding:

$$\sigma \left(\frac{g'(G) \, dG}{g(G)} - \frac{d\tau}{1-\tau} \right) = (e_K + \sigma) \frac{dr}{r} - (e_L + \sigma) \frac{dw}{w}. \tag{3.2}$$

3.1 Incidence results

As described informally above, a corporate tax is a properly designed benefit based tax if the incidence of the tax corresponds to the incidence of the benefit from the activities of the state. We now use equations 3.1 and 3.2 to obtain the relevant incidence results; that is, for changes in dr/r and dw/w due to changes in τ and $g(G)$.

For brevity, we use the following notation: $\eta_{i,j}$ is the elasticity of i with respect to j. For example, $\eta_{r,\tau} = \frac{dr}{r} / \frac{d\tau}{1-\tau}$ and $\eta_{r,G} = \frac{dr}{r} / \frac{g'(G) dG}{g(G)}$ are the elasticities of the return to capital with respect to the corporate tax rate and the benefit from public goods, respectively. Using this notation, we have:

$$\eta_{r,\tau} = -\frac{\alpha(e_L + \sigma) + (1-\alpha)\sigma g(G)}{\alpha(e_L + \sigma) + (1-\alpha)(e_K + \sigma)g(G)}, \quad \eta_{r,G} = \frac{\alpha(e_L + \sigma) + (1-\alpha)\sigma g(G)}{\alpha(e_L + \sigma) + (1-\alpha)(e_K + \sigma)g(G)}; \tag{3.3}$$

$$\eta_{w,\tau} = -\frac{\alpha e_K}{\alpha(e_L + \sigma) + (1-\alpha)(e_K + \sigma)g(G)}, \quad \eta_{w,G} = \frac{\alpha e_K}{\alpha(e_L + \sigma) + (1-\alpha)(e_K + \sigma)g(G)}. \tag{3.4}$$

In these expressions, the signs on the right-hand sides indicate that–as expected–increases in the corporate tax tend to reduce returns to the factors of production while increases in public goods spending tend to raise them (all terms are individually non-negative).

These results reveal that a common mechanism is behind the incidence of both the tax and the benefit on the factors of production, a commonality which we believe is not widely appreciated. Note that, aside from their signs, the right-hand sides of these incidence expressions are identical within factors of production. The elasticities of capital and labor supply, in particular, enter in the same ways in the expressions for the incidence on each factor of both taxes and benefit.

For example, in the case of capital, we can see that as $e_K \to \infty$, $\eta_{r,\tau}$ and $\eta_{r,G}$ both shrink to zero, so that infinitely elastic capital bears no burden from the tax and enjoys no benefit from the activities of the state. The same holds for labor, in expressions for $\eta_{w,\tau}$ and $\eta_{w,G}$, as $e_L \to \infty$. Away from these limit cases, the relative elasticities of capital and labor supply determine the shares of the burden and the benefit for capital and labor from the government's tax and spending activities. The more elastic is capital supply relative to labor, the less of the burden capital bears and the less of the benefit it enjoys.

3.1.1 Net incidence

We are particularly interested in the idea of "net incidence", which we define as the combined effect on r or w of a joint policy change in both the corporate tax and spending on public goods. Using

the expressions above, we can express net incidence generally as:

$$\frac{dr}{r} = \eta_{r,\tau}\frac{d\tau}{1-\tau} + \eta_{r,G}\frac{g'(G)\,dG}{g(G)},$$

$$\frac{dw}{w} = \eta_{w,\tau}\frac{d\tau}{1-\tau} + \eta_{w,G}\frac{g'(G)\,dG}{g(G)},$$

for capital and labor, respectively.

It may be worth noting that the standard modern optimal tax theory judges the corporate tax's appeal based on its direct incidence alone, namely the $\eta_{i,j}$ terms, rather than on its net incidence as expressed here.

3.2 Zero net incidence of the corporate tax

We now uncover our paper's main result by using the expressions above to characterize the net incidence of the corporate tax in this setting. The expressions for net incidence on capital and labor are, respectively:

$$\frac{dr}{r} = \left(\frac{g'(G)\,dG}{g(G)} - \frac{d\tau}{1-\tau}\right)\left(\frac{\alpha(e_L+\sigma)+(1-\alpha)\sigma g(G)}{\alpha(e_L+\sigma)+(1-\alpha)(e_K+\sigma)g(G)}\right); \qquad (3.5)$$

$$\frac{dw}{w} = \left(\frac{g'(G)\,dG}{g(G)} - \frac{d\tau}{1-\tau}\right)\left(\frac{\alpha e_K}{\alpha(e_L+\sigma)+(1-\alpha)(e_K+\sigma)g(G)}\right). \qquad (3.6)$$

The first term on the right-hand sides of these expressions shows immediately that the incidence of the benefit from public goods and the incidence of the corporate tax offset exactly for both capital and labor whenever the percentage change in the benefit due to the public good equals the percentage change in the tax. That is, if we consider a policy experiment in which $\frac{g'(G)dG}{g(G)} = \frac{d\tau}{1-\tau}$, then we obtain that:

$$\frac{dr}{r} = \frac{dw}{w} = 0, \qquad (3.7)$$

so that net incidence is zero for both capital and labor.

In other words, the incidence of the corporate tax increase precisely matches the incidence of the increase in the benefit of public goods to the corporation, on both capital and labor.[19] The corporate tax is, in this setting, a properly designed benefit-based tax—the appeal of which is independent of the incidence of the tax alone.

One interesting implication of this analysis is that a benefit-based approach to incidence can explain why local and national governments may experiment with changes to the corporate tax base. If the corporate tax is meant to tax the same income which is magnified by the corporation's privileged access to the benefits of the activities of the state, changes in how policymakers perceive those benefits accruing to corporations should translate into adjustments to the tax base.[20]

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[19]This is analogous to what Kaplow (1996) describes as being the case where the "incidence of the tax adjustment matches the incidence of the benefits of the public good" (Kaplow, 1998).

[20]Schlunk (2002, pg. 364) notes that the under a benefit-based tax, the government should define the tax base

3.3 Deductibility

Most corporate tax systems around the world allow some portion of the cost of capital to be deducted from the corporate tax base. We generalize our results to the case of partially deductible investment costs. Let θ be the share of the cost of capital which can be deducted from the corporate tax base, where $0 \leq \theta \leq 1$. The corporation's first order condition with respect to capital becomes:

$$g(G) F_K = \frac{(1 - \theta\tau)}{(1 - \tau)} r.$$

We can define υ as the marginal effective tax rate, where $(1 - \upsilon) = (1 - \tau)/(1 - \theta\tau)$, and thus redefine the tax inclusive cost of capital to be $\hat{r} = r/(1 - \upsilon)$.

Conceptually, our preceding analysis can be directly extended to this case if tax policy changes are always thought of as changes in the effective tax rate υ; that is, as a combination of changes in the corporate tax rate τ, the deductibility of capital costs θ, or both.[21] Then, our incidence and net incidence results can be readily used so long as they are understood in terms of this marginal effective tax rate rather than the statutory tax rate.

The policy pairing which would give a zero net incidence is now: $\frac{g'(G)dG}{g(G)} = \frac{d\upsilon}{1-\upsilon}$. This result has at least two implications of interest. For a larger initial θ, a smaller increase in public goods spending offsets any given change to τ. Intuitively, the larger θ makes the increase in the statutory rate τ less burdensome, so a smaller increase in public goods benefit is required to offset it. Second, an increase in τ and a decrease in θ (that is, a decrease in the deductibility of capital) both imply that a larger increase in public goods spending is required to offset the greater burden on corporations.

4 Benefit through increased Hicks-Neutral productivity

In this section, we consider an alternative formalization of the benefit from state activities targeted by the corporate income tax. In particular, we add a function of public goods spending as a Hicks-Neutral productivity factor to the representative firm's production function, rather than as a magnifier of the returns to corporate capital. The main appeal of this alternative approach is its familiarity: readers are likely to have considered this as a natural way to incorporate benefit from public goods into a model of the firm. Though we have argued earlier in this paper that a more targeted view of the benefit channel is appropriate, examining this case will help to illuminate the

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(entity income) as whatever base it believes would best correlate with the benefits produced by the use of the corporate form.

[21] An alternative approach is to consider a change in the corporate tax rate τ assuming that θ remains constant. Then allowing both r and τ to change, the total change in the cost of capital is: $\frac{d\hat{r}}{\hat{r}} = \frac{dr}{r} + \frac{(1-\theta)d\tau}{(1-\tau)(1-\theta\tau)}$. This approach effectively considers the way in which a change in the statutory tax rate affects the marginal effective tax rate, but it is still the marginal effective tax rate which matters for eventual incidence. For example, with complete deductibility so that $\theta = 1$, then we find that $d\hat{r}/\hat{r} = dr/r$ so that the change in the corporate tax rate will have no impact on the cost of capital. However, it also means the corporate tax raises no revenue under the assumption of zero economic profits. The main result of this extension is that it is the marginal effective tax rate that matters for incidence. This implies that the greater the deduction allowed, the lower the aggregate burden imposed on capital but the less revenue is raised.

mechanism which operates so seamlessly in the previous section.

The representative firm's profit function is:

$$\Pi = (1 - \tau)[g(G) F(K, L) - wL] - rK,$$

We assume production is constant returns to scale in capital and labor,[22] while government spending on public goods increases the marginal productivity of both capital and labor in similar proportions. We follow Feehan (1998), who describes this formulation of $g(G)$ as a Hicks-neutral public good. For simplicity, we assume that the cost of capital is not deductible.[23]

The first order conditions for the firm are:

$$g(G) F_K = \frac{r}{1 - \tau}, \qquad g(G) F_L = w.$$

Assuming constant returns to scale in production, we can write Euler's theorem as: $g(G) F(K, L) = \bar{r}K + wL$, where (as before) $\bar{r} = r/(1 - \tau)$ is the firm's tax inclusive cost of capital. As total output accrues to the factors of production, we can define each factor's share of output as: $\alpha = \frac{\bar{r}K}{g(G)F(K,L)}$, $1 - \alpha = \frac{wL}{g(G)F(K,L)}$. Differentiating and substituting in these factor shares and the first order conditions of the firm yields:

$$\frac{g'(G) dG}{g(G)} = (1 - \alpha) \cdot \frac{dw}{w} + \alpha \cdot \frac{d\bar{r}}{\bar{r}}. \tag{4.1}$$

The firm's elasticity of substitution is $\sigma = \left(\frac{dK}{K} - \frac{dL}{L} \right) / \left(\frac{dw}{w} - \frac{d\bar{r}}{\bar{r}} \right)$.

We assume the same pared-down preferences for the capitalist and worker as above, yielding the first order conditions $r^{e_K} = K$ and $w^{e_L} = L$ and their differentiated forms: $e_K \frac{dr}{r} = \frac{dK}{K}$ and $e_L \frac{dw}{w} = \frac{dL}{L}$. These conditions allow us to simplify the expression for the firm's elasticity of substitution, yielding:

$$-\sigma \frac{d\tau}{1 - \tau} = (e_K + \sigma)\frac{dr}{r} - (e_L + \sigma)\frac{dw}{w}. \tag{4.2}$$

4.1 Incidence results

We now use equations 4.1 and 4.2 to obtain the relevant incidence results; that is, for changes in dr/r and dw/w due to changes in τ and $g(G)$. Using our notation from before, we have:

$$\eta_{r,\tau} = -\frac{\sigma + \alpha e_L}{(1 - \alpha)e_K + \alpha e_L + \sigma}, \quad \eta_{r,G} = \frac{\sigma + e_L}{(1 - \alpha)e_K + \alpha e_L + \sigma}; \tag{4.3}$$

$$\eta_{w,\tau} = -\frac{\alpha e_K}{(1 - \alpha)e_K + \alpha e_L + \sigma}, \quad \eta_{w,G} = \frac{\sigma + e_K}{(1 - \alpha)e_K + \alpha e_L + \sigma}. \tag{4.4}$$

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[22] All returns accrue to private factors of production. This definition of the public good is similar to the Meade (1952) definition of atmospheric inputs. Even if the public good is thought of as unpaid factors of production, under competitive markets, the long-run equilibrium zero-profit condition implies that rents will be captured by private factors of production in their factor prices (Henderson, 1974; Feehan and Batina, 2007).

[23] We relax this assumption in the Appendix.

As in the previous section, the signs on the right-hand sides of these expressions indicate that—as expected—increases in the corporate tax tend to reduce returns to the factors of production while increases in public goods spending tend to raise them (all terms are individually non-negative).[24]

Unlike in the previous section, however, the numerators of these expressions differ within each factor, suggesting that the mechanism which produced an exact correspondence between the incidence of both tax and benefit for each factor when benefit magnified the return to corporate capital may not have the same effect in this setting, where we consider the Hicks-neutral benefit.

4.2 Non-zero net incidence outside of special cases

As these incidence results suggest, we can show that the incidence of the tax and of the benefit from public goods will, other than in special cases, only imperfectly correspond in this setting.

To see this formally, recall the concept of net incidence from the previous section. For zero net incidence to hold, given expressions 4.3 and 4.4, the following conditions must hold for capital and labor, respectively:

$$\frac{\sigma + \alpha e_L}{(1-\alpha)e_K + \alpha e_L + \sigma} \frac{d\tau}{1-\tau} = \frac{\sigma + e_L}{(1-\alpha)e_K + \alpha e_L + \sigma} \frac{g'(G)\,dG}{g(G)},$$

$$\frac{\alpha e_K}{(1-\alpha)e_K + \alpha e_L + \sigma} \frac{d\tau}{1-\tau} = \frac{\sigma + e_K}{(1-\alpha)e_K + \alpha e_L + \sigma} \frac{g'(G)\,dG}{g(G)}.$$

These expressions imply that, for $\alpha \subset (0,1)$ and positive σ, e_L, and e_K, a policy experiment will have zero net incidence on both capital and labor in only three cases: namely if $e_K \to \infty$, $e_L \to \infty$, or $\sigma = 0$.[25]

These special cases provide useful intuition for the general case. When either elasticity of supply is very large, incidence of the tax and benefit are both shifted entirely to the other factor, and the tax and public spending changes can be scaled to offset each other on the less elastic factor. For example, if $e_K \to \infty$, then $\eta_{r,\tau} = 0$ and $\eta_{r,G} = 0$, while $\eta_{w,\tau} = -\frac{\alpha}{1-\alpha}$ and $\eta_{w,G} = \frac{1}{1-\alpha}$, so a policy in which $\frac{g'(G)dG}{g(G)} = \alpha\frac{d\tau}{1-\tau}$ will have zero net incidence for both factors. Intuitively, the large elasticity of capital allows workers to capture the benefit from the state's activities just as it forces them to bear the burden of the tax. A similar story applies if $e_L \to \infty$. If $\sigma = 0$, the fixed proportions of capital and labor in production neutralize an asymmetry—in this section's setting—between the way in which the corporate tax and the benefit from public goods affect the firm's choices. While the corporate tax is imposed on only the returns to capital (i.e., because wages are expensed while the costs of capital are not), the Hicks-neutral $g(G)$ benefits both factors symmetrically. Only when $\sigma = 0$, so that firms must always scale capital and labor inputs in the same ratio, does this

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[24]In this case with only a corporate tax, our result is identical to Saez and Zucman (2019).

[25]Interestingly, outside these special cases, the ratio of the net incidence expressions can be written as:

$$\frac{dr/r}{dw/w} = -\left(\frac{1-\alpha}{\alpha}\right). \tag{4.5}$$

In this case, the factor supply elasticities e_K and e_L do not matter for the *relative* changes in r and w.

asymmetry not distort the incidence of tax away from that of benefit. In particular, with $\sigma = 0$ we can show that $\frac{\eta_{r,\tau}}{\eta_{w,\tau}} = \frac{e_L}{e_K}$, $\frac{\eta_{r,G}}{\eta_{w,G}} = \frac{e_L}{e_K}$, so that the relative incidence of the change in taxes and the change in public goods are both spread across capital and labor quite simply: namely, in inverse proportion to their relative elasticities of supply. Positive σ distorts such a simple correspondence.

4.2.1 Quantification of non-zero net incidence

Figure 1 shows how positive σ distorts this simple correspondence using a simple parameterisation of net incidence. As σ gets larger, net incidence moves in opposite directions for the two factors. Labour receives a net benefit since $dw/w > 0$, while capital receives a net loss since $dr/r < 0$. The larger is σ, the larger is the deviation from zero net incidence.

Consensus estimates suggest that the elasticity of substitution is low, falling in the range of 0.3 to 0.7 (Antras, 2004; Chirinko, 2008; Chirinko and Mallick, 2017; Gechert et al., 2021). We assume realistic values of the remaining parameters. We take $\alpha = 0.4$ so that 60 percent of income goes to labour (Karabarbounis and Neiman, 2014). We assume $e_L = 0.19$, and $e_K = 1.3$, so that capital is more elastic than labour by an order of magnitude.[26]

For a one percent increase in the tax rate such that the increase in the benefit is $\alpha \times d\tau/(1-\tau) = 0.4$ percent, Figure 1 gives an estimate of the size of percentage changes in the returns to capital and labour. As before, when $\sigma = 0$, both $dr/r = 0$ and $dw/w = 0$. At $\sigma = 0.3$, r falls by 0.156% while w increases by 0.104%. As σ increases, this gap widens: when $\frac{g'(G)dg}{g(G)} = \alpha \frac{d\tau}{1-\tau}$ and $\alpha = 0.4$, the percentage change in r is always -1.5 times the percentage change in w.

When the tax and the benefit bases do not correspond, as when the public good takes the form of Hicks-neutral productivity, non-zero net incidence arises for positive values of the elasticity of substitution. As long as the corporation is able to adjust the ratios in which it employs factors of production, then the asymmetry created by the distorted correspondence between the tax and benefit bases leads to non-zero net incidence. This non-zero net incidence does not arise when the tax base and the benefit base are appropriately aligned, as under a benefit that affects only the returns to corporate capital. This section therefore shows how non-zero net incidence arises as a deviation from the proper design of a benefit-based corporate tax.

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[26]The CBO's central earnings-weighted estimate of the labour supply elasticity is 0.19 (CBO, 2012a). Their estimates range from 0.06 at the lower end to 0.32 at the higher end. The capital supply elasticity is best measured with respect to corporations. Hassett and Hubbard (2002) suggests the elasticity of investment with respect to the user cost of capital lies in the range between -0.5 and -1. If we consider the capitalist's outside option to be consumption, then the saving elasticity of the interest rate might provide an appropriate measure: Boskin (1978) suggests an estimate of around 0.4. The highest responses are likely to be observed if we consider the capitalist's outside option to be shifting capital out of the country. The literature examining the cross-border effects of corporate taxation reports semi-elasticities in the range of 2.9 (De Mooij and Ederveen, 2008). These are similar to the upper range of estimates uncovered by Suárez Serrato (2018) for multinational firms in the U.S. Their main estimate of the semi-elasticity is 1.77. For an effective tax rate of around 28 percent they report in 1995, this implies a net-of-tax elasticity of investment for corporations of around 1.3—significantly higher than elasticities based on domestic responses only.

Figure 1: Net incidence is non-zero for positive elasticity of substitution under Hicks-neutral public good
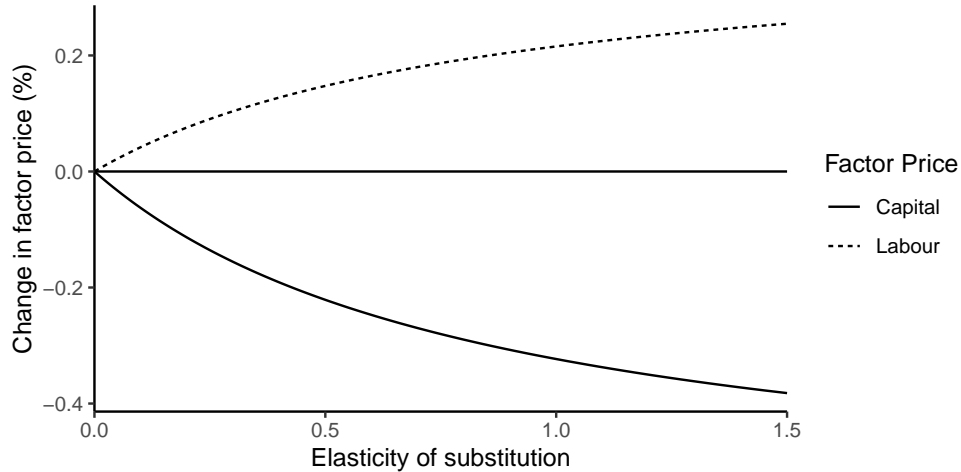
This chart plots the percent change in w and r for $\sigma \in (0, 2)$ using equations 4.3 and 4.4. The calibrated values are $\alpha = 0.4$, $e_K = 1.3$, $e_L = 0.19$, and $g'(G)dg/g(G) = \alpha d\tau$.

5 Conclusion

This paper establishes something of a possibility result: the corporate income tax can be justified without regard to its direct incidence, if the objective of the tax system is to assess taxes based on the benefit taxpayers enjoy from the activities of the state. While a benefit theory of taxation has waxed and waned over time as a criterion of optimal taxation, it has held a place of prominence in reasoning over interjurisdictional corporate tax policy, and it had pride of place throughout the twentieth-century history of political rhetoric on corporate taxation in the United States.

This possible justification for the corporate income tax resolves the puzzling coexistence of irresolvable uncertainty over who bears its burden and persistent support for it among the public and policymakers. It can do so because it is a (we believe the only) justification that establishes a reason to *prefer* taxing corporations rather than the stakeholders of corporations directly. That is, the benefit-based logic for the corporate tax is built on the idea that the burden of the tax falls most on those who benefit most from the corporate form, whether owners, workers, or customers. We show that this correspondence between tax and benefit is a result of the same underlying factors–namely, relative elasticities of supply for capital and labor–determining the incidence of both.

This paper also shows that the correspondence of the corporate tax burden and the corporation's benefit from the activities of the state depends upon precisely what form the taxed benefit takes. If the tax is meant to target activities of the state which affect firms as does Hicks-neutral technology, the correspondence is generally imperfect. But if the tax is meant to target the special benefit in increased returns to corporate capital to which corporations' legal privileges–such as limited liability and access to public equity markets–give them access, the correspondence is exact, and the corporate tax is a properly designed benefit-based tax.

6 Appendix

6.1 Defining incidence

To formally define incidence on the worker, consider their indirect utility function V_L. For a general equilibrium change in their wage, w, the impact on indirect utility is $dV_L = L \cdot dw$, using the envelope theorem to simplify. Analogously, for a capitalist who receives both a return on capital rK and the firm's profits Π, the change in their indirect utility function is given by $dV_K = d\Pi + K \cdot dr$. For a firm with the profit function $\Pi = (1 - \tau)[F(K, L) - wL] - rK$, the change in profits is:

$$d\Pi = -T \cdot d\tau - (1 - \tau)L \cdot dw - K \cdot dr,$$

where T is the tax base of the firm's profits, $T = F(K, L) - wL$. This means for the capitalist, the change in indirect utility is $dV_K = -T \cdot d\tau - (1 - \tau)L \cdot dw$. The incidence of the corporate tax on the worker is defined as the change in the worker's utility as a fraction of the sum of the change in the worker's and capitalist's utility: $I_L^{\text{tax}} = dV_L / (dV_L + dV_K)$. Substituting in and solving, we get:

$$I_L^{\text{tax}} = \frac{-wL\delta_L}{(1 - \tau)T - \tau wL\delta_L},$$

where δ_L is defined as the elasticity of wages with respect to the tax,

$$\delta_L = \frac{dw}{d\tau} \frac{(1 - \tau)}{w}.$$

The magnitude of the final incidence of the burden of the corporate tax on the worker is increasing in the responsiveness of the wage to the tax change.

To see this formally, the government provides a public good from which corporations derive a benefit. In an incidence-style approach to the distribution of benefits, both capital and labor can be expected to benefit from an increase in public good provision. To capture the public good's effect on output, we write the production function as $F(K, L, G)$. The general equilibrium change in the profit function in response to a small increase in the public good is:

$$d\Pi = (1 - \tau)F_G \cdot dG - (1 - \tau)L \cdot dw - K \cdot dr$$

setting $d\tau = 0$. Plugging this into the incidence formula above, we get a corresponding expression for the benefit of the public good received by the worker:

$$I_L^{\text{public good}} = \frac{wL\eta_L}{(1 - \tau)F_G G + \tau wL\eta_L},$$

where

$$\eta_L = \frac{dw}{dG} \frac{G}{w}$$

is defined as the elasticity of wages with respect to the public good. Similar to the tax incidence,

the magnitude of the incidence of the benefit on the worker is increasing in the responsiveness of the wage to the change in the public good.

6.2   Partial deductibility of capital costs under Hicks-neutral productivity

We examine the effect of partial deductibility of the cost of capital from the corporate tax base when the public good takes the form of Hicks-neutral productivity. Once again, we allow θ to represent the share of the cost of capital which can be deducted from the corporate tax base. Formally, our net incidence expressions in equations 4.3 and 4.4 change so that $d\tau/(1-\tau)$ is replaced with $dv/(1-v)$:

$$\frac{dr}{r} = -\frac{\sigma + \alpha e_L}{(1-\alpha)e_K + \alpha e_L + \sigma}\frac{dv}{1-v} + \frac{\sigma + e_L}{(1-\alpha)e_K + \alpha e_L + \sigma}\frac{g'(G)\,dG}{g(G)},$$

$$\frac{dw}{w} = -\frac{\alpha e_K}{(1-\alpha)e_K + \alpha e_L + \sigma}\frac{dv}{1-v} + \frac{\sigma + e_K}{(1-\alpha)e_K + \alpha e_L + \sigma}\frac{g'(G)\,dG}{g(G)},$$

where

$$\frac{dv}{1-v} = \frac{(1-\theta)}{(1-\theta\tau)}\left(\frac{d\tau}{1-\tau} - \tau\frac{d\theta}{1-\theta}\right).$$

For net incidence to be zero in the three special cases identified above (if $\lim e_K \to \infty$, $\lim e_L \to \infty$, or $\sigma = 0$), we now need a policy pairing that satisfies:

$$\frac{g'(G)\,dG}{g(G)} = \alpha\frac{dv}{1-v} = \alpha\frac{1-\theta}{1-\theta\tau}\left(\frac{d\tau}{1-\tau} - \tau\frac{d\theta}{1-\theta}\right).$$

In words, the percentage change in the benefit from public goods spending has to be a proportion α of the percentage change in the effective tax rate, not the statutory rate τ.

Our explanation of our results from the case with no deductibility of capital suggests that including it should matter for relative incidence, as deductibility reduces the asymmetry between how labor and capital enter corporate profits. To see this formally, consider policy change in which the percentage change in $g(G)$ is a multiple α of the percentage change in the statutory tax rate τ, as above, and θ is held fixed. Then, the net incidence expressions become:

$$\frac{dr}{r} = -\frac{\left(\frac{(1-\theta)}{(1-\theta\tau)} - \alpha\right)\sigma - \theta\alpha e_L\frac{(1-\tau)}{(1-\theta\tau)}}{(1-\alpha)e_K + \alpha e_L + \sigma}\frac{d\tau}{1-\tau}$$

$$\frac{dw}{w} = \frac{\alpha\sigma + \alpha e_K\frac{\theta(1-\tau)}{(1-\theta\tau)}}{(1-\alpha)e_K + \alpha e_L + \sigma}\frac{d\tau}{1-\tau},$$

These expressions are difficult to interpret, but an extreme case offers some insight. Suppose $\sigma \to \infty$, in which case the results without capital deductibility reduced to $dr/r = -(1-\alpha)\,d\tau/(1-\tau)$ and

$dw/w = \alpha d\tau / (1 - \tau)$. Here, the results reduce to:

$$\frac{dr}{r} = -\left(\frac{(1-\theta)}{(1-\theta\tau)} - \alpha\right)\frac{d\tau}{1-\tau}$$

$$\frac{dw}{w} = \alpha\frac{d\tau}{1-\tau}.$$

Because $\frac{(1-\theta)}{(1-\theta\tau)} < 1$ for $\theta > 0$, the expression for dr/r suggests a smaller drop in r in response to the tax increase than in the case when $\theta = 0$, as expected.[27]

6.3 Net incidence under bargaining

We extend our analysis to include the possibility that labor markets are imperfectly competitive, so that determining the incidence of the corporate income tax requires understanding its effects on the bargain struck between owners and workers.[28] To simplify the analysis by narrowing our focus to the incidence on labor, we assume $\theta = 1$; that is, capital costs are fully deductible, and the corporate tax does not distort the firm's choice of capital.

Workers and firms bargain over the wage and employment to maximize utility $u(w)$ and profit Π, respectively, with the firm's bargaining power parameterized by μ and workers' bargaining power $(1 - \mu)$. Both workers and capitalists have outside options, which we define as $u(\bar{w})$ and $\bar{\Pi}$ respectively. We assume the parties reach the Nash bargaining solution, which maximizes the expression:

$$[(u(w) - u(\bar{w}))L]^{1-\mu} \times [\Pi - \bar{\Pi}]^\mu,$$

or, plugging in our expression for Π from above (with $\theta = 1$),

$$[(u(w) - u(\bar{w}))L]^{1-\mu} \times [(1-\tau)[g(G)F(K,L) - wL - rK] - \bar{\Pi}]^\mu.$$

The first order conditions with respect to w and L are:

$$\frac{u'(w)}{u(w) - u(\bar{w})} = \left(\frac{\mu}{1-\mu}\right)\frac{L(1-\tau)}{\Pi - \bar{\Pi}},$$

$$F_L = \frac{1}{g(G)}\left[w - \left(\frac{1-\mu}{\mu}\right)\frac{\Pi - \bar{\Pi}}{L(1-\tau)}\right],$$

while the first order condition for capital is $F_K = r/g(G)$. We can use the first of these expressions and the approximation $u(\bar{w}) \approx u(w) + u'(w)(\bar{w} - w)$ (or $\bar{w} + \frac{u(w)-u(\bar{w})}{u'(w)} \approx w$) to solve for the relationship between the wage and profit (per unit of labor):

$$w = \bar{w} + \left(\frac{1-\mu}{\mu}\right)\left(\frac{\pi - \bar{\pi}}{1-\tau}\right). \tag{6.1}$$

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[27]Fuest et al. (2018) similarly suggest that the incidence of corporate tax on factor prices depends on the level of deductibility of the cost of capital.

[28]See Arulampalam et al. (2012), Azémar and Hubbard (2015), and Fuest et al. (2018).

The *direct* net incidence is the effect on the wage and profit per worker that results from the change in surplus due to a combined change in τ and G. To examine the direct net incidence, in contrast to the preceding analysis, we hold behavioural responses constant, apart from the parties bargaining over the surplus. Holding r and K constant, the change in the optimal wage is given by:[29]

$$dw = \left(\frac{1-\mu}{\mu}\right)\left(f(k)g'(G)\cdot dG - \frac{\pi}{(1-\tau)^2}\cdot d\tau\right).$$

The increased tax burden and the increased surplus from the public good both work through the relative bargaining power of workers and capitalists: $(1-\mu)/\mu$. In this setting a precisely benefit-based policy pairing is found where $f(k)g'(G)\cdot dG = \frac{\pi}{(1-\tau)^2}\cdot d\tau$.

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[29]This is $dw = (\partial w/\partial G)dG + (\partial w/\partial \tau)d\tau$.

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