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# A Price-Based Approach to Distributing Taxes on Business Income*

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**Abstract**

This paper proposes a new approach to distributing taxes on business income based on modeling prices. Current approaches to distributing these taxes rely on explicit incidence assumptions, which amount to implicit assumptions about how prices change in response to policy changes. Modeling prices directly offers several advantages. First, by allowing for a richer specification of the underlying policies, this approach provides more informative comparisons between different potential reforms. Second, and for the same reason, it provides more accurate estimates when a proposal would have important effects on the timing of tax revenues. Third, it provides a natural framework for incorporating the effects of deficits into distribution analysis. The proposed approach can be applied to both the taxation of corporate income under the corporate income tax and the taxation of income from pass-through businesses under the individual income tax.

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# 1 Introduction

A distribution analysis provides estimates of the impact of proposed tax changes on the after-tax incomes of families across the income distribution. These estimates can be interpreted as the impact of tax changes on families' utilities, and they are the primary ingredient in quantitative welfare analyses of proposed tax changes (Leiserson 2020).

In conducting distribution analysis, analysts assign taxes to different groups of people based on assumptions about economic incidence (who bears the burden of the tax in the form of reduced welfare) not statutory incidence (who has the legal responsibility to pay the tax). When a change in tax law induces a change in prices, the economic incidence of the tax change will differ from the statutory incidence. The statutory incidence of an increase in the employer payroll tax rate, for example, is on employers. However, if the tax increase causes wages to fall, then the economic incidence of the tax increase would be shifted, in whole or in part, to workers. In this sense, the assumptions about economic incidence used in distribution analysis, which are typically stated as shares of the tax borne by different actors, are implicitly assumptions about changes in prices that would result from tax changes.

Current approaches to distributing the corporate tax rely on an assumed split of the tax into shares that burden labor income and various types of capital income (Nunns 2012; Cronin et al. 2012; Joint Committee on Taxation 2013). The Tax Policy Center, for example, assumes that 20 percent of a change in the corporate tax rate is borne by labor, 20 percent is borne by the return to capital in general, and 60 percent is borne by corporate shareholders. The portion of the tax borne by labor would manifest as a reduction in wages and benefits received by workers. The portion borne by capital in general would manifest as a reduction in capital gains, dividends, interest payments, and other forms of capital income received by asset owners. And the portion borne by corporate shareholders would manifest as a reduction in capital gains and dividends for owners of corporate stock specifically. Within this paradigm there are two key differences in approach among organizations conducting distribution analysis of corporate tax changes. First, some analysts use the same incidence shares for all corporate tax changes while others use different shares for different tax changes. Second, some analysts assume that incidence shares do not vary over time, implicitly adopting a long-run perspective, while others use time-varying shares.[1]

Two approaches are used to distribute taxes on the income of pass-through businesses. The Joint Committee on Taxation uses an approach parallel to the one used to distribute corporate taxes while the U.S.

[1]The approach to evaluating proposed tax changes set forth in Saez and Zucman (2019*a*; 2019*b*) is an exception to the generalizations about distribution analysis in this paragraph. However, Saez and Zucman argue that the analysis of tax changes should estimate changes in incomes including behavioral responses to the tax change. Thus, rather than offering a different methodology for answering the same question that current approaches to distribution analysis answer, Saez and Zucman are proposing that distribution analysis answer a different question.

Treasury and the Tax Policy Center assume that such taxes are borne by payers, consistent with the general approach to distributing individual income taxes.[2] An important additional difference between the methods used to distribute corporate tax changes and those used to distribute changes in taxes on the income of pass-through businesses is that the portion of the corporate tax borne by capital is typically assigned to all owners of certain types of assets without regard to the ownership of a particular corporation, meaning all owners of corporate stock or all owners of corporate debt. In contrast, the portion of the tax on the income of a particular pass-through business incident on capital is typically assigned to the owners of that business.

This paper proposes a new approach to distributing taxes on business income based on modeling prices. Estimates of the price impacts of a proposed tax change are used to construct implied incidence shares for labor and capital that can replace the assumed incidence shares used in current approaches. These implied incidence shares are unique to each proposed tax change, and thus must be computed each time a distribution analysis is conducted.[3]

An approach based on explicit modeling of prices offers significant advantages over current approaches to distributing taxes on business income. First, by allowing for a richer specification of the underlying policies, the proposed approach provides more informative comparisons between different potential reforms. Second, and for the same reason, it provides more accurate estimates when a proposal would have substantial effects on the timing of tax revenues. Third, it provides a natural framework for incorporating the effects of deficits into the analysis.

A statutory corporate rate cut illustrates some of the advantages of a price-based approach. Under the fixed-shares approach to distributing taxes on business income, the reduction in tax liability resulting from a corporate rate cut is allocated between capital and labor in constant proportion each year. Because the revenue loss from a corporate rate cut is roughly constant over time as a share of income, an analysis using the fixed-shares assumption implicitly assumes that the labor and capital incidence of the corporate rate cut are also constant over time as a share of income. However, under the proposed approach, the labor incidence would be low at the outset, gradually increase over time as capital accumulates, and then ultimately reverse and decrease again as deficits grow. The exact magnitudes and the timing of the reversal would depend on the assumptions adopted by a particular analyst. (Under a time-varying approach to distributing corporate tax changes, the labor incidence would grow over time but that growth generally would not slow or reverse.)

The proposed approach offers further advantages in capturing the richness of the variation in economic

[2] In practice, the quantitative difference between these two approaches is modest. The Joint Committee on Taxation assigns only 5 percent of taxes on non-corporate business income to labor (Joint Committee on Taxation 2013).

[3] The price-based approach has wide-ranging implications for the conduct of distribution analysis beyond these incidence shares, and thus could motivate a broader reconsideration of the methods used to distribute taxes on business income. For example, a price-based approach could also be used to refine the allocation of the portion of business taxes incident on labor to different workers. This possibility is set aside for future work.

effects across proposals. Current approaches to distributing corporate taxes offer only modest scope for differences in the incidence of different types of tax changes. Changes in the corporate tax rate, the rules for deducting the cost of investments in tangible assets like buildings and equipment, interest deductibility, net operating losses, and the research credit are often treated similarly or identically even when their effects may be quite different. For example, in discussing the merits of different approaches to tax reform, analysts frequently assume that reducing the rate at which businesses are allowed to write off the cost of investment in tangible assets would have greater labor incidence than a limitation on interest deductibility that imposes similar aggregate burden, but these proposals are often treated in an identical fashion in a distribution analysis. The price-based approach provides a tractable means of incorporating differences in incidence across different types of changes in the taxation of business income into a distribution analysis.

Finally, the proposed approach offers advantages in the treatment of temporary policies. Consider a corporate rate reduction and expensing of capital investment, both enacted for only one year. (Expensing of capital investment refers to a system in which businesses may deduct the entire cost of an investment in the year in which it is made instead of deducting the decline in value of that investment gradually over time as it occurs.) The allocation of each tax cut to labor and capital would differ in some analyses because the first proposal changes the rate and the second changes the tax base. However, the allocation would not depend in most cases on the the fact that the policies are temporary. Yet, in reality, the incidence of a permanent version of each proposal would likely be quite different than the incidence of the temporary version. The one-year rate reduction would likely have a negligible impact on labor income because the proposal has a negligible effect on forward-looking tax rates.[4] On the other hand, temporary expensing would affect forward-looking tax rates and thus could induce a change in behavior that potentially affects prices. Moreover, while the effect of the expensing provision would likely be quite modest, it would also likely persist for a period of time even after the policy expired. In both cases, the sharp change in tax liabilities at the time the policies expire would be reflected in a sharp change in the income of corporate shareholders, not the other groups potentially affected by broader price changes.

The proposal in this paper is an application of the conceptual framework for distribution analysis set forth in Leiserson (2020), which formalizes fixed-quantities distribution analysis as the primary ingredient of quantitative welfare analysis of tax changes. It also builds on substantial prior work on the methods of distribution analysis as it applies to taxes on business income conducted at the congressional Joint Committee on Taxation, the U.S. Treasury, and the Tax Policy Center (Nunns 2012; Cronin et al. 2012; Joint Committee on Taxation 2013). These applied analyses build on extensive theoretical and empirical literatures on business

[4]If a rent-sharing channel is operative, a portion of the incidence of a one-year rate reduction could be shifted to labor through mechanisms such as union negotiations. The evidence for such a channel in the United States is limited, but the proposed approach is flexible enough to allow analysts to incorporate it if they want to do so.

tax incidence, which are reviewed in section 3.2 below in the course of selecting parameters for simulations that illustrate the proposed approach to distribution analysis.

Importantly, the approach to distribution analysis set forth in this paper provides a conceptual framework that can be used by analysts with different views about the incidence of different taxes. Put differently, the price-based approach does not itself imply an answer to the question of whether the labor incidence of the corporate tax (or any other tax) is small or large, but rather it provides a framework for conducting useful distribution analysis regardless of an analyst's views on the relevant empirical parameters. Indeed, an advantage of the proposed approach is that it clarifies the role of different assumptions about economic parameters in determining the incidence of different taxes and helps ensure consistency between an analyst's or organization's distribution analysis and other modes of analysis including revenue estimates and macroeconomic analyses (Leiserson 2020). The illustrations presented in the body of the paper below demonstrate the flexibility of the approach but do not claim to provide a new or definitive answer to the question of what the incidence of various potential business tax changes is (or an exhaustive treatment of factors that could affect it).

The remainder of the paper proceeds as follows. Section two outlines a stylized framework for thinking about tax incidence and outlines the price-based approach to distributing taxes in general. Section three illustrates the application of the approach to taxes on business income through a series of examples. Section four compares the proposed approach to current methods and identifies areas for further research. Section five concludes.

# 2 A Price-Based Approach to Tax Incidence

This section outlines a stylized economic model to motivate the price-based approach to distribution analysis.[5] It then describes how to operationalize the price-based approach. Finally, it interprets the incidence assumptions currently used in distribution analysis at the congressional Joint Committee on Taxation and Tax Policy Center in the context of a price-based approach.

## 2.1 A stylized economic model

Assume that there is a single worker, a single investor, and a constant returns to scale production function $F(k,l)$. The worker's utility function is $u^w(c_w,l)$, where $c_w$ is consumption and $l$ is labor, and the investor's utility function is $u^i(c_i,k)$, where $c_i$ is consumption and $k$ the capital stock. Assume factor markets are

[5]The model and description of it are drawn from Leiserson (2020), which also provides a more detailed description of the underlying conceptual framework.

competitive. The government imposes linear taxes $\tau_l$ and $\tau_k$ on labor and capital income.

This model is incomplete in two important ways: there is no government budget constraint and there are no market clearing conditions. These assumptions serve to place the determination of prices outside the model. Agents react to prices, but the model does not determine the prices. This incomplete framework is useful for thinking about incidence because price changes determine deviations between economic incidence and statutory incidence and yet there are many plausible models for price determination. By making the assumptions about prices explicit and outside the model itself, this model clarifies their role in the analysis. The incompleteness with respect to the government budget constraint is also useful because tax legislation often increases or decreases the deficit with no indication of how future policymaking will change as a result.

The first order condition for the worker is $u_c^w (1-\tau) w + u_l^w = 0$ and the first order condition for the investor is $u_c^i (1-\tau_k) r + u_k^i = 0$. Differentiating the indirect utility function for each agent (denoted by $V^w$and $V^i$) with respect to the tax rates and substituting the optimality conditions yields equations for the impact of changes in each of the two tax rates on each of the two agents:

$$\frac{1}{u_c^w}\frac{\partial V^w}{\partial \tau_l} = -wl + (1-\tau_l)\frac{\partial w}{\partial \tau_l} l \tag{2.1}$$

$$\frac{1}{u_c^i}\frac{\partial V^i}{\partial \tau_l} = (1-\tau_k)\frac{\partial r}{\partial \tau_l} k \tag{2.2}$$

$$\frac{1}{u_c^w}\frac{\partial V^w}{\partial \tau_k} = (1-\tau_l)\frac{\partial w}{\partial \tau_k} l \tag{2.3}$$

$$\frac{1}{u_c^i}\frac{\partial V^i}{\partial \tau_k} = -rk + (1-\tau_k)\frac{\partial r}{\partial \tau_k} k. \tag{2.4}$$

The $wl$ and $rk$ terms in equations 2.1 and 2.4 reflect the statutory incidence of a change in labor or capital taxation on the utility of the worker and the investor, respectively. The terms involving price changes in all four equations reflect the difference between statutory incidence and economic incidence. Changes in prices can shift the burden of a tax increase or the benefits of a tax cut from one actor to another. Voluntary changes in behavior on the part of the worker or the investor do not have a direct effect on their utility because they were trading off the benefits and costs of each activity prior to the policy change.

Define the fixed-quantities change in the after-tax wage bill as $(1-\tau_l)\frac{\partial w}{\partial \tau_l} l$. This expression is the impact of a change in the wage rate on after-tax labor income at the baseline tax rate and the baseline level of labor supply. Similarly, define the fixed-quantities change in capital income as $(1-\tau_k)\frac{\partial r}{\partial \tau_l} k$. These two expressions determine the portion of a tax change shifted from the agent bearing the statutory incidence to other agents, and they motivate the price-based approach to distributing taxes on business income. The observation that voluntary changes in labor supply and investment do not affect the utility of the worker is an application of the envelope theorem: A change in quantities around the optimum offers no first-order utility gain to

the agent making the change.[6] The change in factor incomes is measured on an after-tax basis since it is after-tax incomes that determine consumption possibilities and thus utility.

Government revenues in this stylized model are given by $R = \tau_k rk + \tau_l wl$, and thus

$$\frac{\partial R}{\partial \tau_l} = wl + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_l}l + \left[\tau_k r\frac{\partial k}{\partial \tau_l} + \tau_l w\frac{\partial l}{\partial \tau_l}\right], \tag{2.5}$$

$$\frac{\partial R}{\partial \tau_k} = rk + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_k}l + \left[\tau_k r\frac{\partial k}{\partial \tau_k} + \tau_l w\frac{\partial l}{\partial \tau_k}\right]. \tag{2.6}$$

Define the fixed-quantities change in tax to be the sum of the first two terms in each equation:

$$\left.\frac{\partial R}{\partial \tau_l}\right|_{q_0} = wl + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_l}l \tag{2.7}$$

$$\left.\frac{\partial R}{\partial \tau_k}\right|_{q_0} = rk + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_k}l. \tag{2.8}$$

A comparison of equations 2.1-2.4 and 2.7-2.8 shows that the total utility impact of a tax change on all agents normalized by the marginal utility for each agent is equal to the fixed-quantities change in tax. The implied labor and capital incidence shares for a change in the labor tax and the capital tax can thus be computed as the ratio of the utility impact to the fixed-quantities change in tax:

$$-\frac{1}{u_c^w}\frac{\frac{\partial V^w}{\partial \tau_l}}{\left.\frac{\partial R}{\partial \tau_l}\right|_{q_0}} = 1 - \frac{(1-\tau_k)\frac{\partial w}{\partial \tau_l}l}{wl + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_l}l} \tag{2.9}$$

$$-\frac{1}{u_c^i}\frac{\frac{\partial V^i}{\partial \tau_l}}{\left.\frac{\partial R}{\partial \tau_l}\right|_{q_0}} = \frac{(1-\tau_k)\frac{\partial w}{\partial \tau_l}l}{wl + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_l}l} \tag{2.10}$$

$$-\frac{1}{u_c^w}\frac{\frac{\partial V^w}{\partial \tau_k}}{\left.\frac{\partial R}{\partial \tau_k}\right|_{q_0}} = -\frac{(1-\tau_l)\frac{\partial w}{\partial \tau_k}l}{rk + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_k}l} \tag{2.11}$$

$$-\frac{1}{u_c^i}\frac{\frac{\partial V^i}{\partial \tau_k}}{\left.\frac{\partial R}{\partial \tau_k}\right|_{q_0}} = 1 + \frac{(1-\tau_l)\frac{\partial w}{\partial \tau_k}l}{rk + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_k}l}. \tag{2.12}$$

Incidence shares depend on the statutory incidence of a tax and the ratio of the fixed-quantities change in factor incomes to the fixed-quantities change in tax.[7] A change in labor taxation has statutory incidence on the worker and a change in capital taxation has statutory incidence on the investor. Changes in wages (and

[6] As discussed further in Leiserson (2020), distribution analysis can be understood as a well-established use of the marginal value of public funds logic described in Finkelstein and Hendren (2020).

[7] The derivation of equations 2.11 and 2.12 assumes a tax on the gross return to capital. Modified versions of these equations can be derived for taxes on the net return to capital with varying capital allowances. The model can also be readily extended to an economy consisting of three agents—a worker, an investor, and a firm owner—to study the role of a separate entity-level tax. The primary added insight of a three-agent economy is a richer understanding of how changes in prices affect the total fixed-quantities change in tax, meaning the total tax change to be distributed, not the the method for allocating that change in tax to different groups. Analogs of equations 2.11 and 2.12 continue to hold.

associated changes in returns) can shift the gains or losses of these tax changes from one group to another.

These equations motivate distribution analysis. A few observations are in order. First, as expected, the incidence of a tax change depends on price changes. Estimating the welfare impact of a proposed tax change requires estimates of the changes in wage rates and changes in investment returns that will result from that tax change. In this simple model, the only price changes of relevance are the wage and investment return, but in a richer model incidence on different consumer prices could also be relevant. Second, the fixed-quantities change in tax determines the dollar-valued change in utilities. Third, the fixed-quantities change in tax for purposes of measuring welfare impacts should include the effect of price changes on different tax bases and any change in tax that results. Finally, the prices that matter are the average return to the factor, not the marginal return to the factor. With constant returns to scale and competitive factor markets the two will be the same, but in general they need not be.

The model used here is a one-period model, but a distribution analysis will need to be multi-period in practice. Changes in prices occur over time. The timing of effects is important not only for shifting incidence between factors but also computing the fixed-quantities tax change to distribute. Notably, one important contributor to changes in prices over time may be deficits. Increasing deficits can increase interest rates and reduce wages relative to what would occur otherwise. Thus, for applied distribution analysis, there is an important difference between balanced-budget analysis and analysis in which deficits are allowed to change.

Finally, as discussed in more detail in Leiserson (2020), a variety of adjustments to the basic approach could be warranted in contexts where externalities are material, where tax changes are sufficiently large such that the first-order approximation underlying an approach based on the envelope theorem is necessary, or in any other situation of greater economic complexity.

## 2.2 A price-based approach to distribution analysis

The central role of prices in the model of the previous section motivates the price-based approach to distribution analysis. The first step in distributing a proposed tax change is to estimate the impact of the proposed tax change on prices. Then, with the estimated impact on prices in hand, analysts can estimate the fixed-quantities change in factor incomes resulting from a change in tax $\tau_i$:

$$(1-\tau_l)\,\frac{\partial w}{\partial \tau_i} l \tag{2.13}$$

$$(1-\tau_k)\,\frac{\partial r}{\partial \tau_i} k. \tag{2.14}$$

Next, the aggregate fixed-quantities change in tax can be computed also using the estimated change in prices. The fixed-quantities change in tax for a change in each tax in the stylized model above is

$$\left.\frac{\partial R}{\partial \tau_l}\right|_{q_0} = wl + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_l}l \tag{2.15}$$

$$\left.\frac{\partial R}{\partial \tau_k}\right|_{q_0} = rk + (\tau_l - \tau_k)\frac{\partial w}{\partial \tau_k}l. \tag{2.16}$$

These formulas are not strictly applicable in general settings. However, they provide guidance in conducting distribution analysis. At its core, the fixed-quantities change in tax is the change in tax at baseline quantities including the effect of changing prices. Both the fixed-quantities change in factor incomes and the fixed-quantities change in tax can be computed on an aggregate basis using average marginal tax rates or on a disaggregate basis using entity- and individual-specific tax rates. The difference between these two approaches will be in the richness of the modeling of the tax structure. To manage the scope of the analysis, this paper uses a single average marginal tax rate and focuses only on aggregate changes in labor and capital income. The modeling could also be extended to reflect the full distribution of wage and return changes rather than just the change in average wages and returns.

Relative to current practice in conducting distribution analysis, a key issue highlighted by this approach is the potential for changes in prices to affect the quantity of tax to be distributed. If price changes only occur with a substantial lag or if the tax rates on the relevant bases are similar, this effect can be disregarded. However, if price changes are rapid and they shift income between bases to which substantially different tax rates apply, they must be included.

The fixed-quantities change in tax differs from a conventional revenue estimate as it excludes the impact of most changes in behavior. In the model of the prior section, the quantities held fixed are labor supply and the capital stock, but the analysis is parallel for other types of behavior that would be included in a conventional revenue estimate.[8]

## 2.3 Interpreting incidence assumptions in distribution analyses

At present, distribution analyses rely on explicit assumptions about the economic incidence of different taxes. The methodologies used by the Joint Committee on Taxation and the Tax Policy Center are illustrative of the two major approaches to specifying these assumptions.[9]

[8] See Leiserson (2020) for additional discussion of these issues. The key requirement for behavior to be excluded is, in essence, that the envelope theorem applies. Very low-cost avoidance responses, such as relabeling income of one type as income of another type or stroke-of-the-pen changes in filing behavior would be appropriately included in the fixed-quantities change in tax.

[9] See Joint Committee on Taxation (2013) and Nunns (2012) for a detailed description of these methods.

The Joint Committee on Taxation assumes that the corporate tax is borne partially by labor and partially by capital. In the long run, 25 percent of the tax is borne by labor and 75 percent of the tax is borne by capital. The portion borne by capital is allocated to owners of taxable corporate equities, taxable corporate bonds, and tax-preferred retirement accounts. The Joint Committee assumes that these shares vary over time, with the share allocated to labor set to zero in the first year and capital bearing the entire burden of the tax. The long-run assumptions are applied in year ten. In addition, the analysis assumes that about 10 percent of the portion of the tax change borne by capital is borne by foreign investors. As the distribution analysis treats the population of interest as domestic individuals, this portion of the tax change disappears from the analysis. All changes in the corporate tax have the same incidence. A parallel method is used for changes in the taxation of pass-through businesses, but the share borne by labor in general is only 5 percent. In addition, the share of the change in the tax for a particular pass-through business not borne by labor in general (95 percent) is assigned to the owners of that pass-through business.

The Tax Policy Center allocates changes in the corporate tax rate to three groups: labor (20 percent), recipients of the normal return to capital (20 percent), and owners of corporate equity (60 percent). However, changes in the corporate tax base are allocated to only two groups: labor (50 percent) and recipients of the normal return to capital (50 percent). The incidence shares used by the Tax Policy Center are time-invariant, and intended to reflect the long-run incidence of the tax changes. The Tax Policy Center allocates all changes in the taxation of pass-through businesses to the owners of the pass-through business, the same treatment used for other changes in the individual income tax.

To understand the implicit assumptions in current approaches to distribution analysis, consider the implied labor and capital shares for a capital tax change derived in the prior section (repeated here for expositional purposes):

$$-\frac{1}{u_c^w}\frac{\frac{\partial V^w}{\partial \tau_k}}{\frac{\partial R}{\partial \tau_k}\Big|_{q_0}} = -\frac{(1-\tau_l)\frac{\partial w}{\partial \tau_k}l}{rk+(\tau_l-\tau_k)\frac{\partial w}{\partial \tau_k}l} \tag{2.17}$$

$$-\frac{1}{u_c^i}\frac{\frac{\partial V^i}{\partial \tau_k}}{\frac{\partial R}{\partial \tau_k}\Big|_{q_0}} = 1+\frac{(1-\tau_l)\frac{\partial w}{\partial \tau_k}l}{rk+(\tau_l-\tau_k)\frac{\partial w}{\partial \tau_k}l}. \tag{2.18}$$

Several conclusions follow from these equations. First, if a constant labor share is used, wages are assumed to change contemporaneously with any changes in the fixed-quantities change in tax. If a time-varying share is used, this assumption is relaxed somewhat. However, if the time-varying share is selected to reflect the transition to a new steady state for a single, permanent tax change, then any changes in tax related to timing shifts will be passed through to wages in a manner for which the assumed time-varying shares are

not well-suited. Second, if the same incidence assumptions are used regardless of the aggregate cost of a proposal, the effects of deficits on wages are ignored. Third, if incidence assumptions are not allowed to vary with the details of the policy, then wages may not vary with those details either. Thus, for the Tax Policy Center, wage impacts can differ for changes in the base and changes in the rate, but otherwise must be the same. For the Joint Committee on Taxation, all corporate tax changes must have the same impact on wages. For the same reason, if incidence assumptions do not differ for temporary and permanent policies, then wage impacts are assumed to be identical for temporary and permanent policies as well. As these observations make clear, the current approach to distributing taxes on business income imposes severe constraints on the economic effects of tax changes that limit the ability of the analysis to reflect the likely impacts of tax changes.

# 3 Application to Business Taxes

A price-based approach can be used to distribute any tax, but it has particular relevance for proposals to change taxes on business income, which often involve complex changes to the tax base and vary over time in ways that can cause tax changes with similar revenue impacts to have sharply different incidence. This section illustrates the application of the price-based approach to the distribution of taxes on business income through a series of stylized examples. In each case, I derive implied labor and capital shares shares from the price-based approach that can replace the explicit incidence assumptions used in current approaches to distribution analysis. These examples also illustrate the flexibility of the proposed approach, which can be adapted for use by analysts with different views about the incidence of the same tax change. Adoption of the price-based approach does not itself determine the incidence of any tax change, or require analysts to adopt any specific assumptions about the incidence of any tax change.

The section first outlines the economic assumptions that will be used in the illustrations and discusses issues in specifying a model for prices. It then illustrates the impacts of three policy changes—a corporate rate cut, expensing for capital investment, and expensing for capital investment combined with repeal of the deduction for net interest—using a model in which the wage depends solely on the cost of capital. Finally, it illustrates the impact of a corporate rate cut using a model in which the wage depends on the cost of capital and the statutory corporate rate, which could be motivated by the existence of rent-sharing within the firm. As discussed further in the next section, I approximate many aspects of the policy baseline and the policy change to facilitate interpretation of the illustrations, but, for the same reason, the illustrations should be understood as illustrations rather than estimates of realistic policy changes.

## 3.1 Economic and Policy Assumptions

The simulations rely on the Congressional Budget Office's January 2020 baseline for most economic projections (Congressional Budget Office 2020). The policy baseline is a modified version of current law as of January 2020 with two major changes. First, I assume that TCJA provisions allowing accelerated depreciation of capital investment and requiring amortization of research and development have been repealed.[10] Second, I assume that expiring provisions of current law have already expired and deferred business tax increases enacted by the Tax Cuts and Jobs Act are already in effect. Together, these assumptions serve to remove from the baseline various policy changes that are scheduled to occur under current law that could confound the time-varying impacts of proposed policy changes in the illustrative simulations with the time-varying nature of current law. The resulting simulations are thus more intuitive representations of the stylized policy changes considered, but are not estimates of the policy changes relative to current law.

Ballpark estimates of the fixed-quantities change in tax for each of the policy changes are based on estimates from the Tax Policy Center adjusted for consistency with the modified baseline (Nunns et al. 2016; Mermin et al. 2020). In addition, annual revenue losses for expensing are assumed to follow a geometric decline over the first six years and then a linear decline over the following 14 years. As above, this modification serves to remove some annual variation in the revenue estimate and thus simplify the interpretation of the results. However, as a result, the estimates for depreciation should be understood as highly stylized.

Estimates of the effective marginal tax rate on new investment are generated by the model of Leiserson (2017), with source data updated through 2016. Consistent with the modified baseline, permanent policy changes are assumed to result in a one-time permanent change in the effective marginal tax rate. In addition, the effective marginal tax rate of new investment at the business level is assumed to be bounded below by zero. In other words, positive tax rates on marginal investments in certain assets can be offset by negative taxes on marginal investments in other assets, but the overall tax rate may not fall below zero.[11] Parameter assumptions used in the computation of effective marginal tax rates and the resulting effective marginal tax rates for the policy options considered here are shown in the appendix.

## 3.2 Specifying a model for prices

The key ingredient in the price-based approach is a model for prices. The theoretical and empirical literature on corporate tax incidence provides some guidance in specifying such a model, but this guidance is limited

[10] I also assume that PATH Act provisions allowing accelerated depreciation that would have been in effect absent the TCJA are also repealed.

[11] In practice, the overall effective marginal tax rate could be negative if businesses are able to offset positive taxes on inframarginal investments with negative taxes on marginal investments. I set this possibility aside here for simplicity.

in three important ways.[12]

First, much of the literature on corporate tax incidence focuses on estimating incidence shares in a long-run, balanced-budget equilibrium, taking as given the corporate tax base. In contrast, the inputs relevant for policy necessarily relate to the transition following a tax change, must apply for policy changes that make important changes to the tax base, and must apply to policies that increase or decrease the deficit. Thus estimates from this line of research are directly relevant to current approaches to distributing the corporate tax, which rely on incidence shares, but only indirectly relevant to the price-based approach. Early research concluded that the corporate tax was borne by capital (Harberger 1962). However, subsequent analysis often found larger shares borne by labor. Harberger (1995) concludes the entire tax is borne by labor.[13] Randolph (2006) estimates that the burden of the corporate tax is borne by domestic factors roughly in proportion to their shares of output, with labor thus bearing about 70 percent of the tax. Gravelle and Smetters (2006) find that capital bears about 80 percent of the burden.[14] All of these studies take the corporate tax base as given and apply to long-run, balanced-budget changes.

Second, empirical studies that focus on measuring the impact of the tax system on wages tend to focus on a single dimension of the tax system or a single economic mechanism and thus provide limited guidance in dealing with complex tax legislation. Fuest, Peichl and Siegloch (2018) estimate that a one percent increase in the net of tax statutory rate increases wage rates by 0.4 percent in a sample of German municipalities. Heterogeneity across firms and workers is suggestive of a rent-sharing mechanism. Arulampalam, Devereux and Maffini (2012) estimate a long-run wage elasticity of about -0.08 in a sample of European countries, again focusing on a rent-sharing channel. Liu and Altshuler (2013) estimate a short-run wage elasticity of about -0.03 with respect to the effective marginal corporate tax rate using variation across industries in the United States. Garrett, Ohrn and Suárez Serrato (2020) find that accelerated depreciation had a near-zero and statistically insignificant effect on earnings per worker in the 2008-2012 period. These are only a few studies in a growing literature. All of these studies inform modeling of price impacts, but apply only to particular specifications of the relationship between the tax system and price impacts.

Third, many studies, including some cited above, evaluate the impact of the corporate tax outside the United States. However, since the key question in determining the labor incidence of the corporate tax is its impact on wages, the labor incidence may vary substantially across countries as labor market institutions vary widely. This heterogeneity may be particularly important in the context of rent-sharing mechanisms

[12]The literature on non-corporate taxes is comparatively quite limited.

[13]The applied policy discussion typically focuses on the portion of the corporate tax borne by labor and the portion borne by capital in their roles as factors of production. However, heterogeneity in incidence can also arise from differences in consumption patterns. Indeed, in studies such as Harberger (2008), the incidence on labor in its role as a factor of production far exceeds 100 percent, but there is negative incidence on consumers. The approximately 100 percent burden share is the net effect of these two effects.

[14]Relying on the interpretation of the study by Jane Gravelle as stated in Gravelle (2017).

for shifting incidence.

Nonetheless, despite these limitations, these studies are useful in providing guidance in determining the appropriate model in a couple of important ways. First, the research can identify economic mechanisms through which taxes affect prices and thus the summary measures of the tax system relevant for modeling prices. For example, traditional theoretical analyses point to the cost of capital and the effective marginal tax rate as key determinants of the pass-through to wages (Hall and Jorgenson 1967). Studies pointing to the presence of bargaining effects may suggest the statutory rate should be included (Arulampalam, Devereux and Maffini 2012; Fuest, Peichl and Siegloch 2018). Analyses such as those of Devereux and Griffith (1998; 2003) could suggest that measures of the average tax rate should be included.

The research literature can also be useful in determining what economic quantities are relevant for determining the sensitivity of prices to the tax system. Gravelle (2010), for example, identifies five key factors in determining the incidence of the corporate tax in Harberger-style models: mobility of capital, substitutability of foreign and domestic goods in consumption, the relative size of countries, substitutability of factors in production, and factor intensities.

Finally, a key challenge that arises in implementing the price-based approach is handling both corporate and non-corporate firms. Traditional incidence analyses assume perfectly mobile capital and labor, which leads to the conclusion that there is only one wage rate and only one return on investment. But if this were the case it is difficult to explain why both corporate and non-corporate firms exist given differences in tax treatment. A variety of technical modeling approaches have been used to avoid this problem, but they are not fully satisfactory. Harberger (1995) and Randolph (2006) assume non-corporate tradeables require a factor of production that corporate tradeables do not and consumers do not treat corporate and non-corporate non-tradeables as identical, for example. However, recent empirical work, such as Smith et al. (2019), clearly establishes the co-existence of organizations of the same type in different forms as well as the sensitivity of organizational form to tax policy. The analysis of this paper focuses on computing implied incidence shares that can be used to allocate the fixed-quantities tax change to different groups and sets aside the issue of allocating the change within the distribution of labor and capital income for future work. Thus, this analysis avoids directly confronting this issue.

### 3.3 An application in which wages depend solely on the effective marginal tax rate on new investment

This section illustrates the use of a price-based approach to distributing taxes on business income through an example in which the wage rate depends of the tax system solely through its impact on the effective

marginal tax rate on new investment and the cost of capital.

### 3.3.1 The price model

Assume the following model for changes in wages:

$$\%\Delta w_t = \eta_w \sum_{j=1}^{\infty} \lambda^{t-j} \%\Delta \rho_j, \tag{3.1}$$

where $w_t$ is the wage in period $t$; $\rho_t$ is the cost of capital in period $t$; and $\eta_w$ and $\lambda$ are parameters. To choose values for $\lambda$ and $\eta_w$, assume that there is a constant elasticity of investment with respect to the current period cost of capital, a constant rate of depreciation, and a constant rate of investment growth in the baseline. Under these assumptions, equation 3.1 could summarize a richer model given by

$$\%\Delta w_t = \varepsilon_{w,k}\varepsilon_{I,\rho} \left(\frac{k_\rho}{k_{labor}}\right) \left(\frac{I}{k}\right) \sum_{j=1}^{\infty} \left(\frac{1-\delta}{1+g}\right)^{t-j} \%\Delta \rho_j, \tag{3.2}$$

where $\varepsilon_{w,k}$ is the elasticity of the average wage with respect to the capital stock, $\varepsilon_{I,\rho}$ is the elasticity of investment with respect to the cost of capital, $\frac{k_\rho}{k_{labor}}$ is the ratio of the capital stock in sectors affected by the tax change to capital in sectors determining the wage rate, $\frac{I}{k}$ is the baseline investment to capital ratio, $\delta$ is the depreciation rate, and $g$ is the baseline growth rate of investment.

In the simulations, I assume $\delta = 0.055$, $g = 0.04$, and $\frac{I}{k} = 0.07$ based on historical experience. The ratio of the capital stock included in the cost of capital computation to the capital stock in all sectors determining the wage rate is an assumption about the determination of productivity and wages. I assume $\frac{k_\rho}{k_{labor}} = 0.75$ motivated by the idea that the tax system affects only the private, for-profit business capital stock, but the wage rate also depends on the public capital stock.[15] I assume $\varepsilon_{I,\rho} = 0.7$, the value used by CBO in its assessment of the economic effects of the 2017 tax act (Congressional Budget Office 2018*b*).[16] Finally, I assume $\varepsilon_{w,k} = 0.35$. The assumption that the elasticity of the wage with respect to the capital stock is equal to the capital share would follow exactly in a model with competitive factor markets and a Cobb-Douglas production.

Taken together these assumptions imply $\lambda = 0.91$ and $\eta_w = -0.013$ in equation 3.1.

Finally, assume that the return adjusts in response to any tax change by the amount necessary to exactly offset the change in the fixed-quantities wage bill. In other words, assume that the return changes in proportion to the change in the wage rate multiplied by the ratio of capital income to labor income.

[15] Alternative assumptions could, for example, include the household sector in the wage determination process or exclude public capital.

[16] CBO also assumed a sensitivity of the capital stock to changes in average tax rates across countries, which I do not include here.

Generically, in the conceptual framework of section 2, price changes will offset in the aggregate except to the extent they affect the government fiscal balance (Leiserson 2020). As noted above, a further question is which forms of capital income this reduction in returns should apply to. This issue is set aside in this paper, which focuses on estimating implied incidence shares. However, it would be straightforward to apply assumptions like those implicitly used by the Joint Committee on Taxation (apply the reduction in returns only to corporate capital income for corporate tax changes) or the Tax Policy Center (allocate a share to the normal return and a share to corporate equity for corporate tax changes). Analysts could also adopt distinct models for both corporate and pass-through returns and simulate these impacts directly.[17]

The change in the cost of capital is central to the price model. Changes in the cost of capital are driven primarily by changes in the effective marginal tax rate resulting from policy changes, for which I use the change in a weighted average effective marginal tax rate for the corporate and pass-through sectors. However, the change in the cost of capital also depends on financial market equilibrium, which may, in turn, depend on government borrowing behavior. As tax legislation often changes government borrowing behavior, it is necessary to model these effects. In determining the impact of deficits and debt on prices, the relevant measure of the deficit impact should include all behavioral responses. I approximate macroeconomic revenue feedback not included in the conventional revenue estimate as follows. First, a gross feedback value is generated based on the wage changes determined by the pricing equation above:

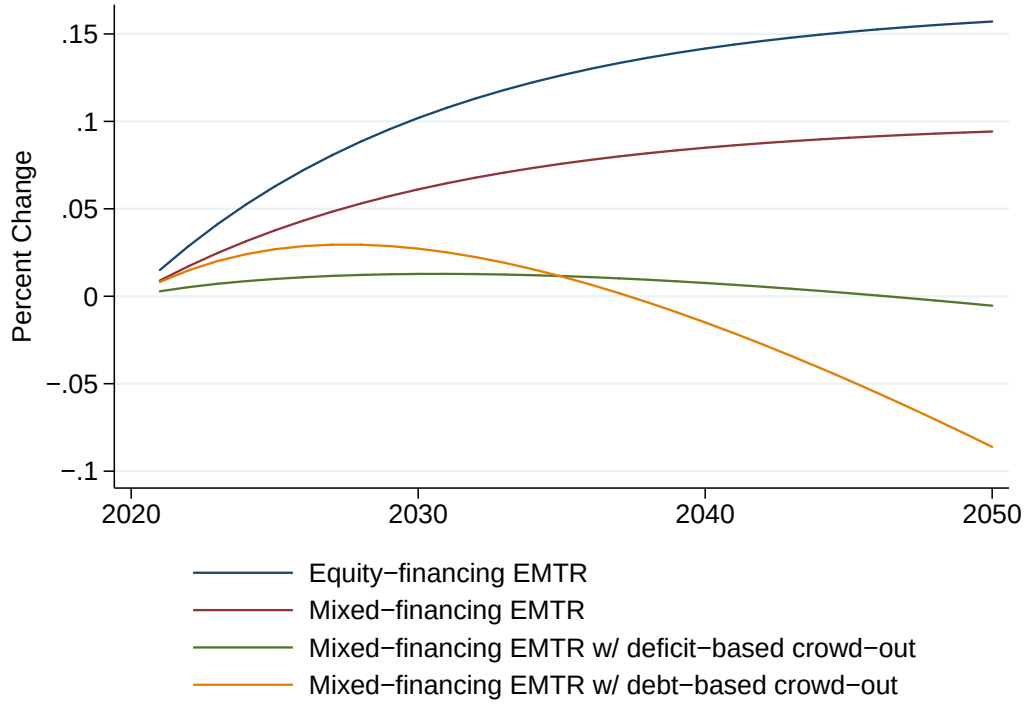
$$\%\Delta R_t = \frac{\alpha \tau_y}{\varepsilon_{w,k}} \%\Delta w_t, \tag{3.3}$$

where $\alpha$ is the capital share of output and $\tau_y$ is the average marginal tax rate on output. Second, a value for interest feedback is generated using the net impact on the deficit inclusive of the gross feedback. Simulations are shown that assume a link between deficits and interest rates (7.5 basis points for each 1 percent of GDP change in deficits) and, alternatively, between debt and interest rates (1 basis point for each 1 percent of GDP change in debt).[18] Different specifications of the relationship between deficits and debt and interest rates have substantial implications for the long-run impacts of any tax change.

[17] A related question is whether wage changes should be allocated solely to workers in one sector or to all workers. Standard practice is to apply the wage changes to all workers. However, if wage changes are assigned to workers in the pass-through sector and no portion of the change in tax is allocated to owners of pass-through businesses, the owners of pass-through businesses are made worse off by a corporate rate cut and better off by a corporate rate increase. While these types of impacts are not ruled out as a theoretical matter, the magnitudes that result from this method are unlikely to be correct.

[18] This analysis further adopts the assumption of Congressional Budget Office (2018*a*) that deficit-based crowdout effects phase in over four years.

Figure 1: Effects of Reducing the Corporate Rate from 21 to 15 Percent on Wages Under Four Sets of Economic Assumptions

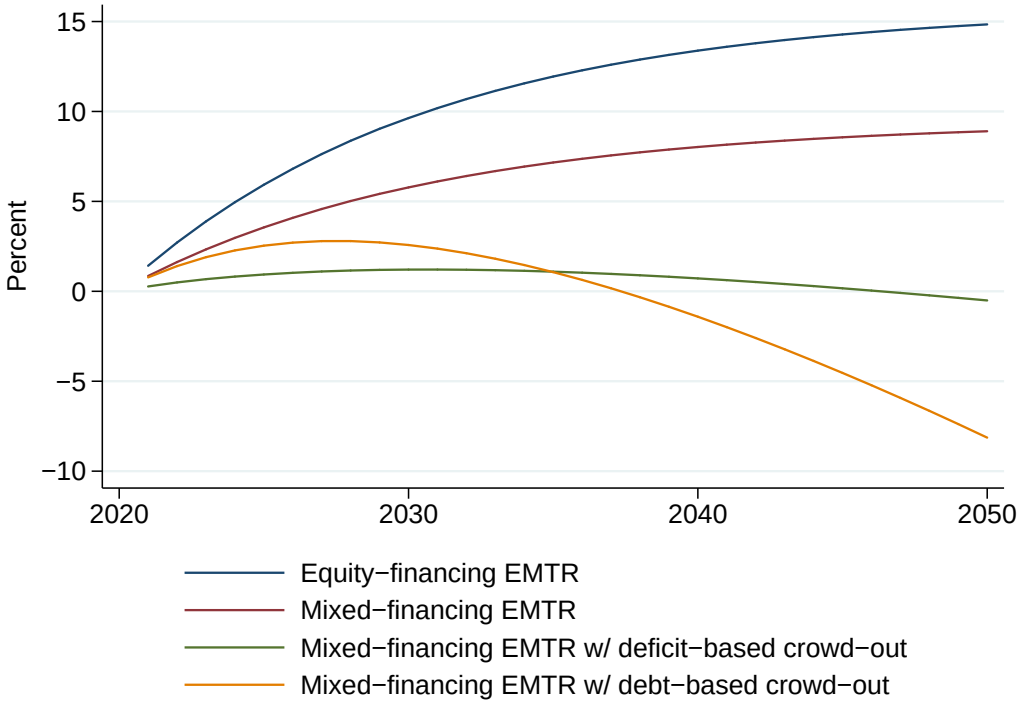



### 3.3.2 Distributing a corporate rate cut under alternative economic assumptions

The price-based approach to distributing taxes on business income makes the relationship between economic assumptions and results explicit. Consider a reduction in the statutory corporate rate from 21 percent to 15 percent. Figure 1 shows the impact of this rate cut on wage rates under four different sets of economic assumptions. The first assumes businesses make decisions as if equity is the marginal source of funds for all investment and there is no crowd out. The second assumes businesses make decisions as if projects are financed with a mix of debt and equity and there is no crowd out. The third is identical to the second but adds crowd out based on feedback from deficits to interest rates. The fourth assumes crowd out based on feedback from debt to interest rates.

The four scenarios yield sharply different predictions about the impact of a corporate rate cut on wages. A corporate rate cut increases wages in the scenarios without crowd out. As tax rates on equity-financed investment are higher than tax rates on debt-financed investment, the first scenario yields the largest increase in wages and the second scenario more modest effects. Due to the presence of crowd out, the third and fourth scenarios show increases that are more modest in scale and ultimately reverse. Crowd out based on deficits leads to smaller wage increases in the short run but a more modest long-run decline, while crowd out based

Figure 2: Implied Annual Labor Incidence Shares for Reducing the Corporate Rate from 21 to 15 Percent Under Four Sets of Economic Assumptions

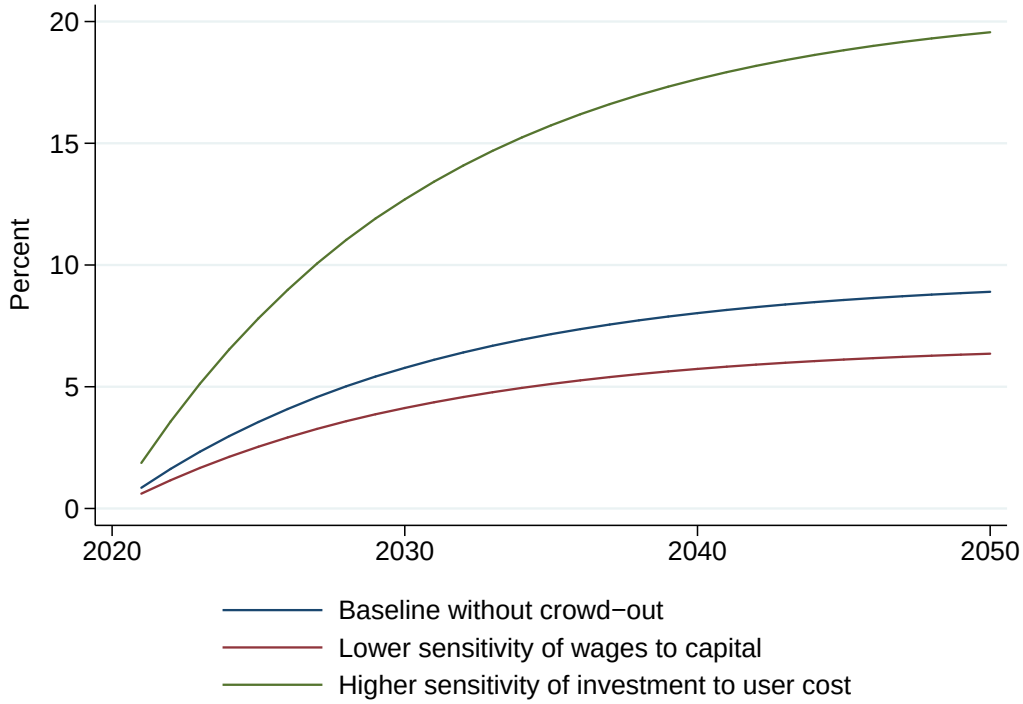



on debt has smaller short-run effects but larger long-run effects.

Figure 2 converts the estimated wage impacts into incidence shares. In the equity-financed effective marginal tax rate scenario, the long-run labor share of the tax cut is 15 percent. In the mixed financing scenario it is slightly less than 10 percent. With deficit-based crowd out, the labor share is near zero for the entire analysis period. With debt-based crowd out, the labor share is positive over the first 15 years, but ultimately decreases more substantially.

These scenarios differ according to the choice of effective marginal tax rate that is assumed to determine investment behavior and the presence or absence of crowd out. However, these possibilities cover only a few of the sources of potential variation. The incidence shares would also vary substantially as a result of changes in the various parameters of the wage equation itself. Assuming an elasticity of investment with respect to the cost of capital of 1.5 rather than the 0.7 used in the baseline would yield a labor incidence assumption for the mixed financing scenario without crowdout of about 20 percent after 30 years (Figure 3). On the other hand, if the elasticity of the wage with respect to the capital stock were 0.25 rather than 0.35, labor incidence would be less than 7 percent. Changes in other parameters of the pricing model, such as the ratio of capital affected by the changes in the business tax system to the capital determining equilibrium wages,

Figure 3: Implied Annual Labor Incidence Shares for Reducing the Corporate Rate from 21 to 15 Percent with Low and High Pass-through to Wages Assuming No Crowd-out



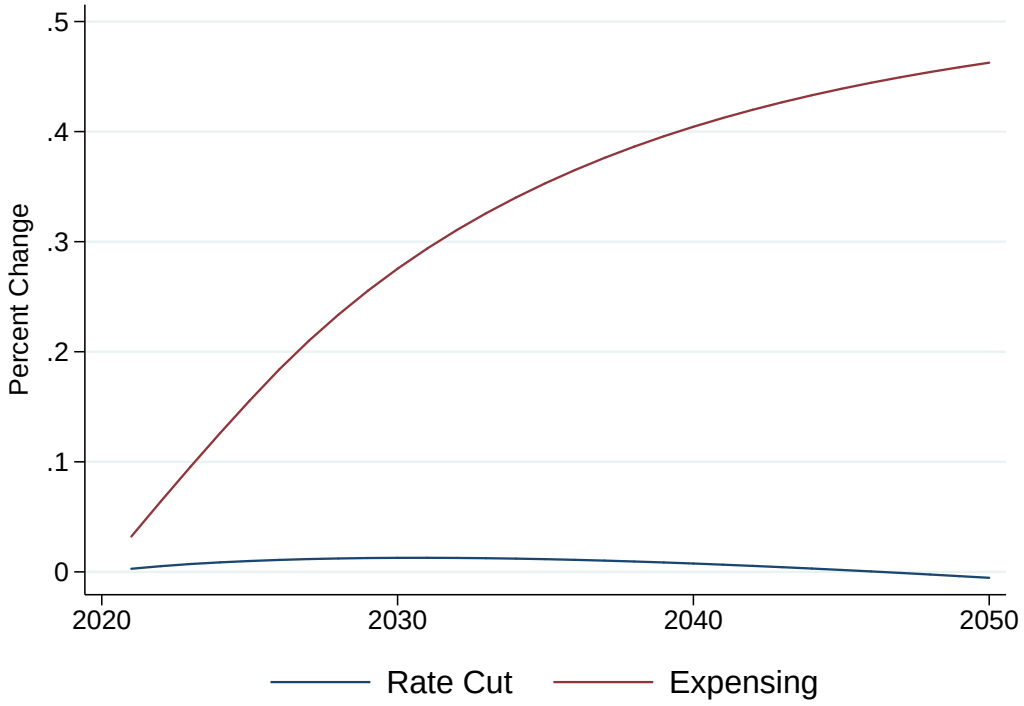

would have corresponding effects on the results. The price-based approach to distribution analysis clarifies the role of economic assumptions in the analysis. Analysts can apply the price-based approach with widely varying economic assumptions that would yield very different results.

### 3.3.3 Distributing corporate tax changes that affect the tax base

The price-based approach offers significant advantages over current approaches to distributing taxes on business income in evaluating changes in the business tax base. Consider two proposals to reduce taxes on business income: a statutory corporate rate cut and expensing of new investment. Assume that decisions are made according to a weighted average of tax rates on debt and equity and that higher deficits increase interest rates. As above, the reduction in the statutory rate cut would have little effect on wages (Figure 4). However, expensing would generate sustained increases in the wage.

The differences in the magnitude and profile of the wage impacts are reflected in the labor incidence shares (Figure 5). Corporate rate changes have negligible labor incidence while expensing has a higher degree of labor incidence, especially after more time has passed. Under the parameterizations used here, however, workers receive only a modest share of the benefit of the tax cut in present value as the incidence

Figure 4: Effects of a Reduction in the Corporate Rate from 21 to 15 Percent and Expensing of Corporate Investment on Wages

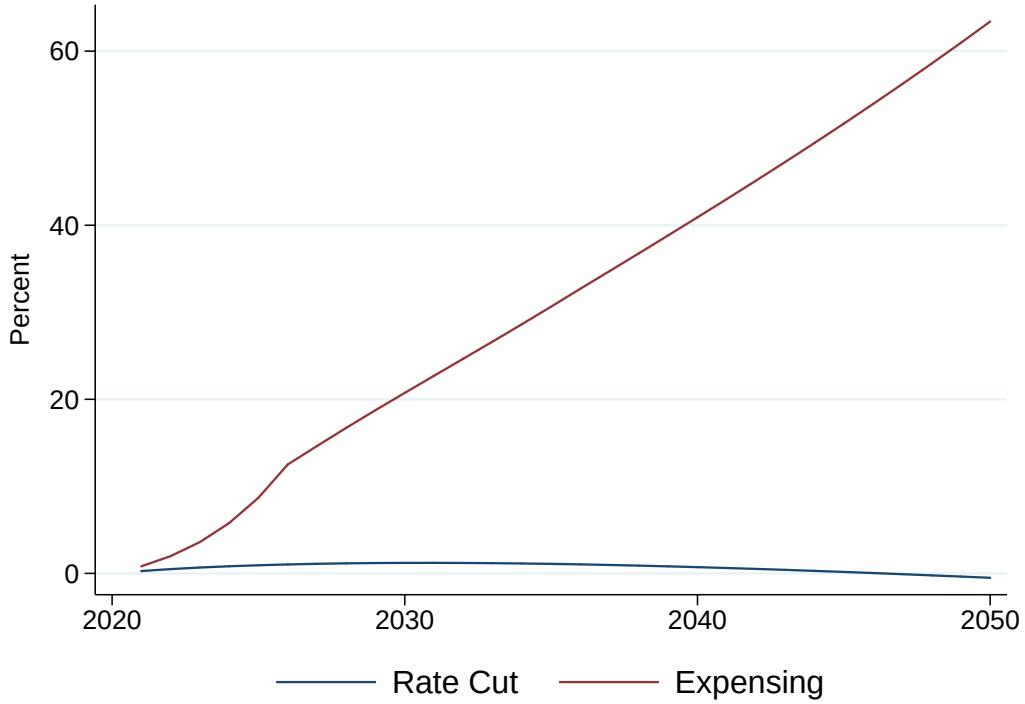



shares rise in part because the cost of the proposal declines relative to the size of the economy over time.

The price-based approach offers further advantages in dealing with complex policies that combine multiple offsetting proposals that have different degrees of labor incidence. Take, for example, repealing interest deductibility and providing expensing. In isolation, expensing has the effects shown above. Little labor incidence in the short run that grows over time. Repealing interest deductibility would have a similar pattern of effects with the opposite sign and more modest in size.

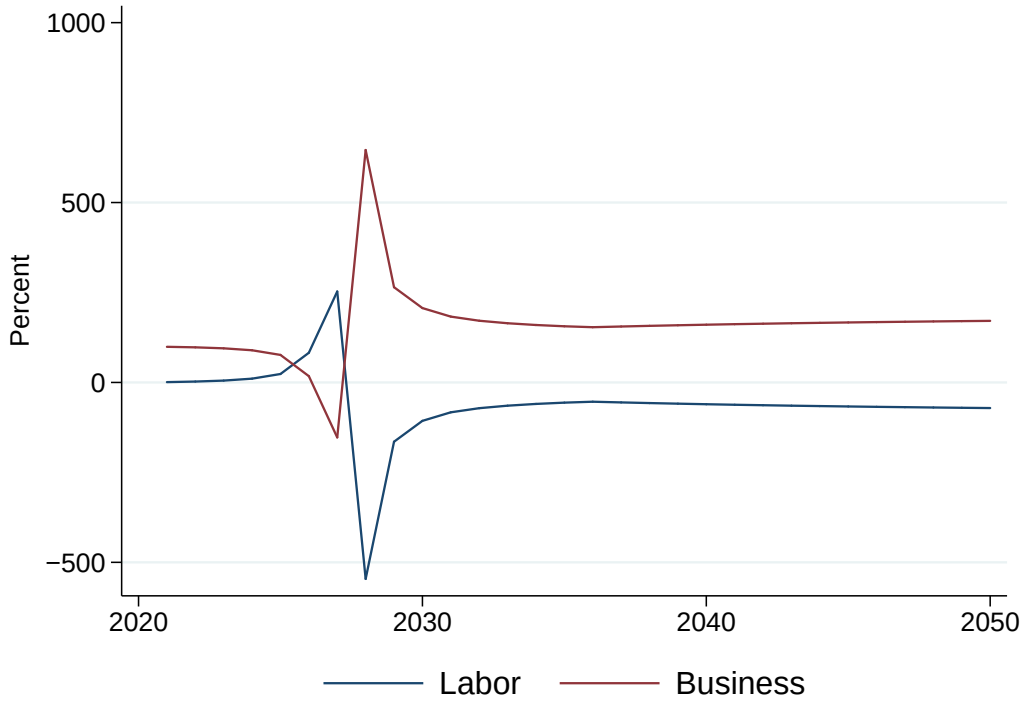
Combining the two proposals generates a policy for which constant incidence shares offer a very poor approximation of the economic effects and that has labor incidence below zero or above 100 percent in various years (Figure 6). As with most changes to business taxation, in the short-term, the incidence lies primarily on the business side and labor incidence is quite low. However, by the middle of the next decade, labor incidence exceeds capital incidence. This reflects the gradual accumulation of capital and decline in pre-tax returns even as firms also lose the ability to deduct interest. In the late 2020s, the implied annual incidence shares spike and then reverse in sign. This transition reflects the point at which the fixed-quantities change in tax for the proposal decreases to near-zero and then falls below zero. The change in the sign of the change in tax causes the implied labor incidence to fall below zero: taxes are up and wages are up. For the same

Figure 5: Implied Annual Labor Incidence Shares for a Reduction in the Corporate Rate from 21 to 15 Percent and Expensing of Corporate Investment




reason, the capital incidence exceeds 100 percent. Taxes are up and returns have fallen by more than the amount of the tax increase.

Figure 6: Implied Annual Incidence Shares for Repealing Interest Deductibility and Providing Expensing



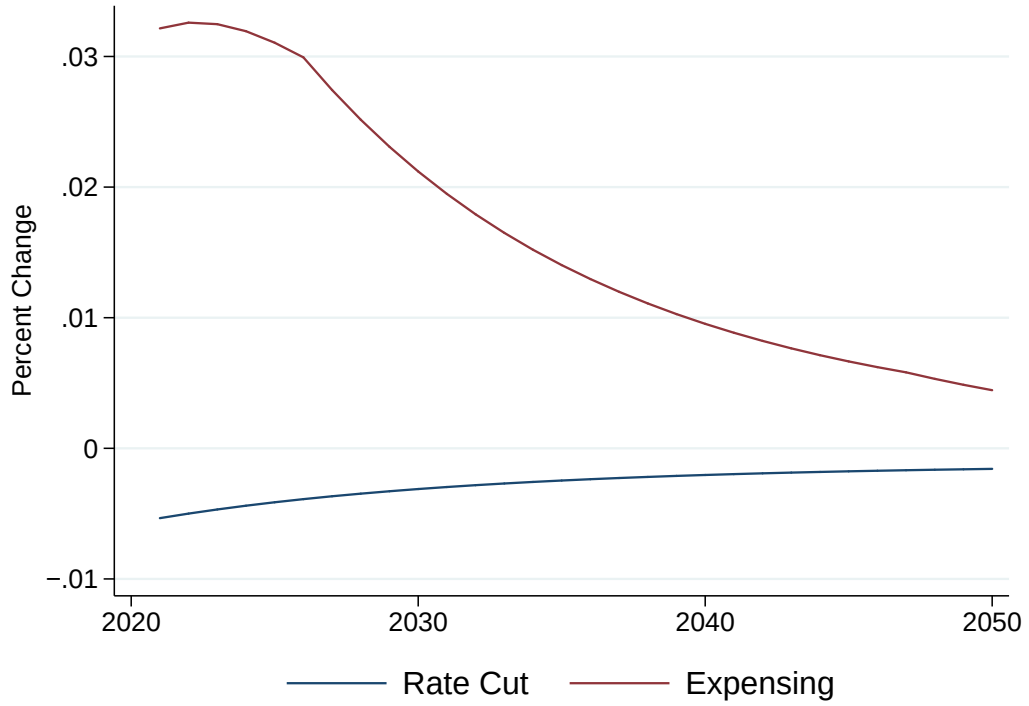

### 3.3.4 Distributing expiring corporate tax changes

An approach based on explicit modeling of prices also offers advantages for dealing with temporary policies. Consider one year of expensing and a one-year corporate rate cut. In the expensing scenario, the proposal reduces the cost of capital for one year, which generates a temporary bump in wages and reduction in capital returns that persists even after the policy has expired (Figure 7). On the other hand, a one-year reduction in the corporate rate has only negligible effects on the forward-looking cost of capital so there are no positive effects on wages. Instead, there are only negative effects from higher deficits. (The effects of these temporary policies are much smaller than the permanent policies considered in the previous section. The axes are expanded to show the effects.)

These wage effects imply starkly different patterns for the implied incidence assumptions. The rate cut has no fixed-quantities cost in years other than the year it is in effect, but the wage impacts resulting from increased borrowing do exist in other years. Thus, there is essentially zero labor incidence in the one year it is in effect and the incidence shares in other years are undefined.[19] Temporary expensing has a u-shaped

[19] As discussed in the development of the conceptual framework, the fixed-quantities cost estimate includes the impact of price changes on the tax base. Thus, to the extent that the higher interest rate resulting from crowd-out induces a change in revenues because of differences in the tax rate on capital income and labor income, that revenue impact would be included and would have the effect of making incidence shares no longer undefined for the one-year rate cut. However, this illustration abstracts from this effect. If reflected, the incidence shares would largely be a function of the size of the government's debt

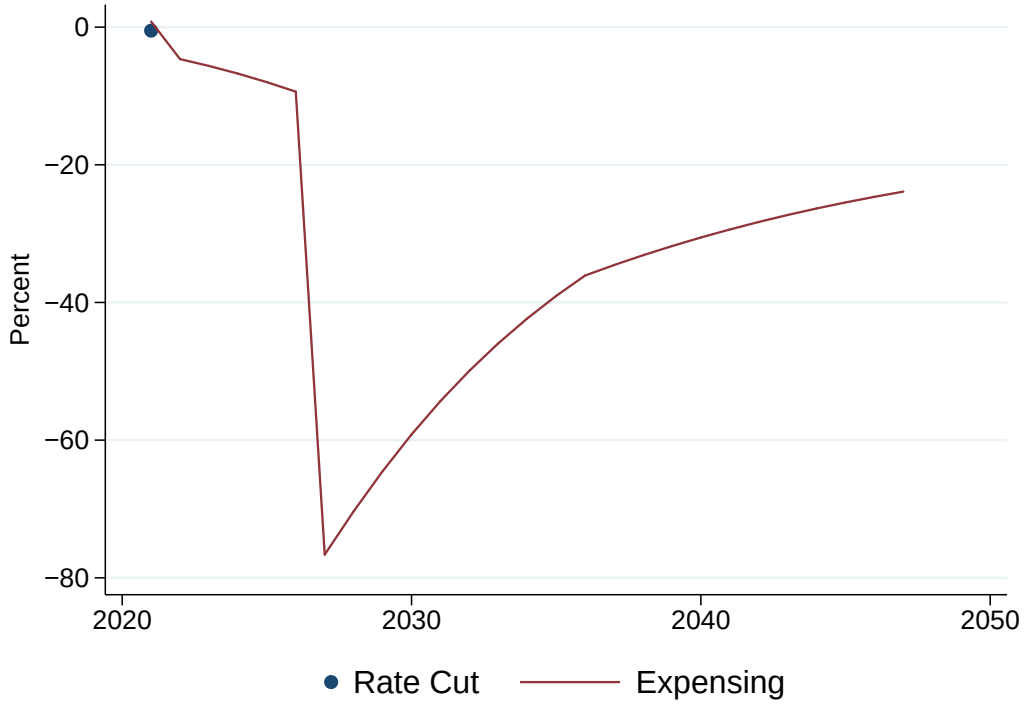
Figure 7: Effects of a One-year Corporate Rate Cut and One Year of Expensing on Wages




pattern of implied incidence shares. Expensing has near zero labor incidence in the first year (when a reduction in tax delivers a slight increase in wages) and then negative incidence in subsequent years (when an apparent increase in taxes delivers an increase in wages). The particular shape of the u is driven by the shape of the revenue estimate, which is simplified as discussed above and has no economic interpretation.

outstanding.

Figure 8: Implied Annual Labor Incidence Shares for a One-year Corporate Rate Cut and One-year of Expensing




### 3.4 An application in which wages depend on the effective marginal tax rate on new investment and the statutory tax rate

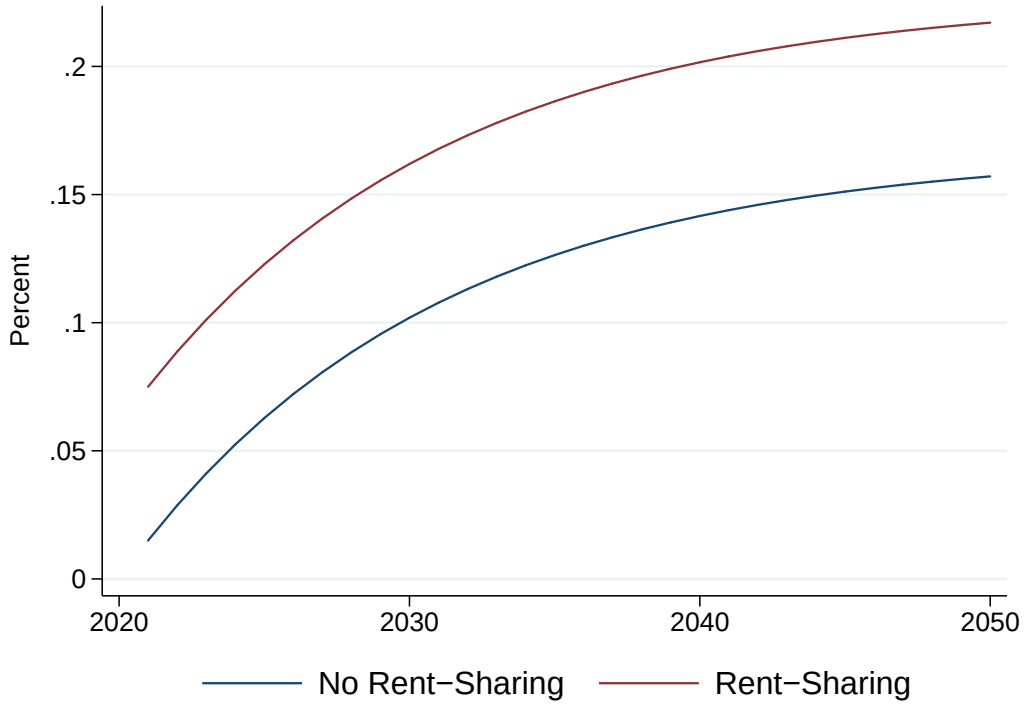
The prior section presented an application of the price-based approach in which wages depended on the parameters of the tax system only through the cost of capital, which depends on the effective marginal tax rate. However, the method is not limited to this approach. Consider a model in which the effective marginal tax rate affects the wage rate, but wages are also affected by changes in the statutory corporate tax rate as a result of bargaining over rents. Concretely, assume wages are determined by

$$\%\Delta w_t = \eta_w \sum_{j=1}^{\infty} \lambda^{t-j} \%\Delta \rho_j + \eta_{rents} \left(\Delta \tau_{corp}\right) \tag{3.4}$$

where $\eta_w = -0.013$ and $\lambda = 0.91$ as above and $\eta_{rents} = 0.01$. The latter could be motivated by an estimate of the quantity of pre-tax rents and a fraction paid to workers as a result of the tax cut, though for purposes of this analysis it is intended to be solely illustrative.

Figures 9 and 10 show labor incidence results in the presence of rent-sharing compared with incidence results without these rent-sharing mechanisms from the previous section, ignoring crowd out. As expected, a

Figure 9: Wage Effects of Reducing Corporate Rate from 21 to 15 Percent with and without Rent-Sharing




bargaining channel increases labor incidence and changes the timing of the wage increases over time. Relative to the prior scenario, the increase in wages occurs more rapidly because it partly reflects rents rather than capital accumulation and those are (by assumption) immediate. The decline in returns (not shown) is also larger because a portion of the direct reduction in taxes is now passed onto labor directly in addition to higher wages resulting from capital accumulation.

This example illustrates the flexibility of an approach based on modeling prices, which allows analysts who wish to make different economic assumptions to do so in a coherent framework that carries those assumptions over into their distribution analysis. However, an important challenge in evaluating complex policy packages that mix several different provisions is determining how different changes in policy interact. The price-based method does not solve the problem of determining what these interactions are. Instead, it provides a means of implementing the analysis once the necessary assumptions have been made. The specification of the price model is, among other things, a set of assumptions about these interactions.

Figure 10: Implied Annual Labor Incidence Shares Reducing Corporate Rate from 35 to 20 Percent with and without Rent-Sharing


# 4 Discussion

The previous section illustrated the application of a price-based approach to distributing taxes on business income. This section compares the price-based approach to current methods and identifies directions for additional research.

## 4.1 Comparison to current methods

The price-based approach offers several advantages over current approaches. First, by relying on a richer specification of the underlying policy change, it allows for more informative comparisons between potential policy changes that differ in subtle ways. The price-based approach effectively eliminates the assumption that the incidence of a tax change on each factor is proportional to the overall fixed-quantities change in tax. Consider an increase in inframarginal taxes on business income and a reduction in marginal taxes on business income. Such a change could have zero net revenue impact evaluated at fixed quantities, even as it has non-zero incidence on both capital and labor separately. As a result, analysis that assumes a proportional relationship between the incidence on each factor and the overall fixed-quantities tax change will perform poorly. For similar reasons, the price-based approach has advantages when dealing with international tax

changes. By specifying a model for domestic wages that reflects summary measures of tax policy relevant for domestic economic behavior, the approach will naturally lead to different incidence conclusions for policies that have different incentives for domestic and foreign behavior. For example, if changes in U.S. tax policy do not have a substantial effect on foreign wages or pre-tax returns but changes in U.S. tax policy do affect the taxes paid to the U.S. government by firms operating abroad, a price-based approach would show that changes in the taxation of foreign earnings are largely incident on capital.

Second, the proposed approach provides a tractable means of generating different economic effects for permanent and temporary versions of the same policy. For example, a single-year reduction in the statutory corporate tax rate would likely have little effect on prices and thus the incidence of the tax cut would likely fall entirely on capital. A permanent reduction in the corporate rate, however, likely would generate changes in prices, and thus the incidence of a permanent rate cut would likely fall on a mix of capital and labor with different impacts over time. A method that treats all changes in the corporate rate the same regardless of permanence or that considers only a transition to a new, permanent policy environment will struggle to deal with these comparisons.

Third, the price-based approach generates more meaningful estimates for policies that induce large changes in the timing of revenues, such as providing expensing for a limited period of time. In these cases, the incidence of the tax change on each factor can vary widely from year to year in a way that is specific to the timing of the policy change proposed. The price-based approach, which relies on estimates of price impacts that are also specific to the policy proposed, better accommodates this type of tax change than does an approach based on incidence shares.

Finally, the price-based approach clarifies the role of economic assumptions in driving conclusions about tax incidence. For example, analysts who believe that the tax exemption for debt has little effect on capital might conclude that the incidence of repealing interest deductibility will lie on corporate shareholders and come out of rents, while analysts who take the opposite stance will conclude the opposite. It also provides a natural way of incorporating the role of deficits into the analysis. The role of deficits is particularly important in the case of tax changes on business income, as the channel by which incidence is shifted from capital to labor is precisely the same channel by which modeling often assumes that deficits have an impact (with the opposite sign).

A primary disadvantage of the proposed approach is that it requires more analysis to implement for each proposal. For example, even if the wage and return are determined exclusively by the cost of capital, analysts must conduct an analysis of the impact of a proposal on the effective marginal tax rate on new investment and (at least) a back-of-the-envelope revenue estimate to estimate the distribution of the corporate provisions in the proposal.

An additional challenge is that there is limited empirical literature to guide the selection of the parameters involved in specifying a model for prices. Under current approaches to distributing taxes on business income, analysts can summarize a wide-ranging literature in the choice of a small number of parameters (incidence shares on particular factors). However, the price-based approach relies on more explicit choices about which mechanisms are operational and which mechanisms are not operational, and the magnitudes of each effect. Of course, it is precisely this choice of mechanisms that allows the price-based approach to provide more informative comparisons across different types of policies. For example, evidence that rent-sharing is an important mechanism in understanding corporate tax incidence in Europe is growing (Arulampalam, Devereux and Maffini 2012; Fuest, Peichl and Siegloch 2018), but the applicability of these results to the United States is an open question. A price-based approach requires an explicit stance on this issue. Similarly, the price-based approach requires an explicit assumption about whether the effective average tax rates of Devereux and Griffith (1998; 2003) affect wages and, if so, how that effect interacts with effects transmitted through the effective marginal tax rate. Even within the confines of an approach based on the effective marginal tax rate, significant questions still arise. The simulations of the prior sections assumed that investor-level taxes matter in distributing taxes on business income, consistent with the approach of Congressional Budget Office (2018*a*). However, it is plausible that these taxes should be substantially deemphasized (Leiserson 2017). Notably, the need for explicit stances on these more nuanced economic questions is no different in kind than the need for nuanced assumptions about microeconomic behavioral responses in a conventional revenue estimate. Moreover, the level of detail or aggregation at which they are done remains a choice for the analysts.

The price-based approach parallels existing methods more closely in determining the quantity of tax to distribute, as most public and private organizations estimate a version of the fixed-quantities change in tax when constructing distribution estimates for tax proposals. However, organizations that distribute the conventional revenue estimate for business tax changes—as do both the congressional Joint Committee on Taxation and the Tax Policy Center—should instead distribute the fixed-quantities change in tax, which excludes microeconomic behavior included in a conventional revenue estimate, as a default.[20]

The price-based approach is a more substantial change in practice when it comes to allocating the change in tax to different actors. Currently, as discussed in section 2, most organizations allocate a share of a corporate tax change to labor and a share to one or more types of capital. The congressional Joint Committee on Taxation uses a parallel method for taxes on the income of pass-through businesses, while most other organizations assign the incidence of these taxes to the owners of the pass-through businesses.

[20] As with any analysis, judgment is often required in practice. Behavior should be included when the conditions of the envelope theorem do not apply such as may occur when legislation creates new avoidance opportunities.

The price-based approach replaces these assumed incidence shares with implied incidence shares computed using an underlying model for prices. An advantage of current methods is that they are simple to implement and easy to describe to the public and the press. A disadvantage is that they can generate inaccurate results for certain policies and they tend to compress the differences across policies by treating policies with different effects in the same manner.

Current approaches to distributing taxes on business income that assign a share of the corporate income tax to corporate equity or measures of excess returns typically motivate this approach on the basis of assumed rents in the corporate tax base (Cronin et al. 2012; Nunns 2012; Joint Committee on Taxation 2013). However, estimating the value of rents in the corporate tax base is difficult. The price-based approach does not explicitly estimate rents, but rents are reflected in the estimated incidence shares as a residual depending on the parameter values chosen. To the extent that wages rise less than taxes are cut in response to a corporate tax cut, there will be a residual tax cut allocated to capital. In the short-run, for example, this residual partially reflects the windfall to old capital that typically results from a corporate rate cut—a form of rent. In the longer-run, the residual will reflect rents attributable to labor income, market power, or other sources that are included in the corporate tax base and thus cause the revenue loss from the corporate rate cut to exceed the increase in the fixed-quantities wage bill.

Importantly, the price-based approach to distributing taxes can be used for some taxes alongside more traditional approaches to distribution analysis for other taxes as current approaches are merely implicit assumptions about price changes. The assumption that 100 percent of the income tax is incident on payers, for example, amounts to the assumption that there are no price changes. Current methods could thus be used with little change for non-business taxes alongside the price-based approach for taxes on business income.

## 4.2 Directions for further research

While the price-based approach to distributing taxes on business income proposed in this paper improves on existing methods, it raises several questions for further research. Indeed, the price-based approach usefully highlights the importance of implicit assumptions on subtle economic points that are embedded in current approaches to distribution analysis.

Perhaps the most important conceptual challenge in distributing changes in business taxes is the relationship between the pass-through sector and the corporate sector. Existing analyses show that there is meaningful substitution between pass-through and corporate form and that this substitution is responsive to changes in the relative tax advantages of the two organizational forms (Mackie-Mason and Gordon 1997; Prisinzano and Pearce 2018; Smith et al. 2019; Page, Rohaly and Matheson 2020). However, a full under-

standing of when and why organizations shift between forms and what the implications of this shifting are for outcomes remains elusive. Our limited understanding of this issue poses a challenge for specifying an appropriate model of wages for purposes of distribution analysis. A related challenge is determining whether changes in wages and returns should be identical in all sectors or should vary across sectors. Do changes in corporate taxation affect the wages of workers employed by pass-through businesses? Workers employed by the government?

A second issue is determining the incidence of business taxes imposed on the financial sector. The financial sector accounts for a substantial share of national income and of corporate tax payments, but the transmission of taxes on the income of financial institutions to other entities in the economy is complex (Goodspeed and Havrylchyk 2015). Does corporate taxation of financial institutions raise the cost of equity capital for non-financial businesses? Increase consumer borrowing rates? Does it affect wages through these or other channels?

A third area for further research is the response of foreign governments to changes in U.S. taxation of business income. While analyses produced by the congressional Joint Committee on Taxation and the Congressional Budget Office for the legislative process assume that the future policies of the U.S. federal government do not change, such analyses should, at least in principle, project changes in the policies of other governments. To the extent these policies affect the responsiveness of prices in the United States to the enactment of tax legislation, they matter for distributing tax changes. However, forecasting the response of foreign governments to U.S. policy changes is highly uncertain.

Finally, the illustrations of section 3 report longer-term incidence shares to illustrate the role that assumptions about deficits and debt play in the analysis. However, the modeling of debt dynamics over extended horizons is an issue on which little empirical guidance is available. More fundamentally, there is little reason to think potential crowding out from deficits and debt is the most relevant consideration for policies that affect deficits and debt in the longer term. Rather, crowding out is merely the only means by which changes in deficits and debt affect the analysis produced for the legislative process at present and thus has taken on an outsized importance in this process. So, while long-term debt dynamics are an intriguing research question in their own right and directly relevant for those conducting distribution analysis, there is likely also value in developing frameworks for evaluating proposed legislation that are not as sensitive to this issue.

# 5 Conclusion

This paper proposes a new approach to distributing taxes on business income based on modeling prices. This price-based approach offers three main advantages relative to current approaches. First, by allowing for

a richer specification of the underlying policies, it provides more informative comparisons between different potential reforms. Second, and for the same reason, it provides more accurate estimates when a proposal would have important effects on the timing of tax revenues. Lastly, it provides a natural framework for incorporating the effects of deficits into distribution analysis. The proposed approach can be applied to both the taxation of corporate income under the corporate income tax and the taxation of income from pass-through businesses under the individual income tax. The primary cost of the proposed approach is an increase in the complexity of the analysis required to develop estimates for each proposal.

While a substantial improvement over the status quo, the proposed approach also highlights the many open questions in public finance that matter for estimating the incidence of tax changes and thus conducting distribution analysis for the policy process. A richer understanding of the choice between corporate and pass-through form matters not just for estimating the revenues that result from changes in business taxation, but also for estimating the incidence of business tax changes. Likewise, the financial industry accounts for a substantial share of corporate tax payments, and thus the incidence of taxes on these institutions matters for the distribution of the corporate tax. Additional research on these and other questions would allow for further improvement in the distribution analyses produced by public and private organizations.

Finally, a richer understanding of distribution analysis helps clarify the tradeoffs in tax policy. Though the fundamental tradeoff in public finance is between taxes and spending or between one set of taxes and another set of taxes, policymakers frequently enact tax legislation that increases or decreases the deficit and thus does not reflect this underlying tradeoff. When they do so, the immediate tradeoff is between revenues and burden. Policymakers can raise revenues by imposing additional burden or they can reduce burden at the expense of revenues. However, discussion of business taxes often focuses on changes in behavior that are only indirectly informative about changes in revenues and burden. By facilitating a more robust distribution analysis of taxes on business income, the price-based approach proposed in this paper helps ground changes in business taxation more fully in a revenues and burden framework.

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# A Additional tables

Table A.1: Parameters for the cost of capital model

| Parameter | Value |
|---|---|
| Inflation | 0.020 |
| Nominal interest rate | 0.050 |
| Real return on equity | 0.050 |
| Marginal tax rate on corporate income | 0.210 |
| Marginal tax rate on pass-through income | 0.310 |
| Marginal tax rate on interest income | 0.275 |
| Marginal tax rate on investor-level equity returns | 0.200 |
| Fraction of real equity return subject to tax | 0.600 |
| Fraction of corporate interest subject to tax | 0.600 |
| Fraction of pass-through interest subject to tax | 0.800 |
| Fraction of investment financed by debt | 0.300 |

Table A.2: Effective marginal tax rates used in simulations

| Asset type and ownership | Mixed Financing | | | Equity Financing | |
|---|---|---|---|---|---|
| | Modified Baseline | 15% Corporate Rate | Expensing | Modified Baseline | 15% Corporate Rate |
| All Private Business | | | | | |
| All | 0.204 | 0.190 | 0.120 | 0.233 | 0.210 |
| Corporate | | | | | |
| All | 0.196 | 0.171 | 0.152 | 0.228 | 0.186 |
| Equipment | 0.216 | 0.195 | 0.152 | 0.243 | 0.206 |
| Intangibles | -0.077 | -0.073 | 0.152 | -0.004 | -0.025 |
| Inventories | 0.310 | 0.264 | 0.152 | 0.329 | 0.271 |
| Structures | 0.238 | 0.210 | 0.152 | 0.266 | 0.222 |
| Pass-through | | | | | |
| All | 0.214 | 0.214 | 0.075 | 0.238 | 0.238 |
| Equipment | 0.192 | 0.192 | 0.075 | 0.213 | 0.213 |
| Intangibles | -0.184 | -0.184 | 0.075 | -0.103 | -0.103 |
| Inventories | 0.333 | 0.333 | 0.075 | 0.344 | 0.344 |
| Structures | 0.223 | 0.223 | 0.075 | 0.249 | 0.249 |

Note: The modified baseline reflects current law as of January 2020 with two major changes: (1) TCJA provisions allowing accelerated depreciation of capital investment and requiring amortization of research and development have been repealed and (2) expiring provisions of current law have already expired and deferred business tax increases enacted by the TCJA are already in effect. The EMTR on intangibles rises under expensing as the assumption is that under current law firms exploit the negative tax rate on intangibles by using it to offset tax on other more highly-taxed investments, but under expensing firms are unable to exploit the negative overall rates. An alternative assumption would be that firms use the negative rate on marginal investments to offset taxes on inframarginal investments, and thus the marginal investment is subsidized.