An Essay on Potential Tax-Shifting Relevant to Washington State Tax Reform

by Douglas Conrad, PhD (Final Draft: <mark>November 9, 2021: 11:40am</mark>)

Introduction

This personal essay is offered to summarize my early conclusions from reviewing relevant literature in public finance and applied economic theory regarding the ultimate incidence after any tax shifting by the initial party targeted to pay a particular tax to other parties. I offer this <u>unsolicited</u> essay for my own benefit as a means of thinking through the issues and as an "input" for others on the Technical Advisory Group (TAG) and Washington State Department of Revenue (DOR) to compare with their own analyses of the "incidence" question.

My doctoral fields in business economics at the University of Chicago (PhD 1978) were in industrial organization and corporate finance. So, I approach this question as an applied microeconomist, not as a specialist in public finance, tax policy, or the economics of taxation *per se*. Others on the TAG and DOR staff specialists are undoubtedly better equipped than I to address the full range of tax incidence questions.

Scope of This Essay

As background for writing, I have drawn on the articles provided to the TAG by Valerie Torres, as well as other peer-reviewed articles that further informed my analysis. I have included full citations to those materials in the footnotes, and I have included a brief review of that specific literature. I will review the economic theory and evidence relevant to the ultimate incidence of various taxes <mark>(those highlighted below)</mark> under consideration in Washington State (including existing and possible new taxes):

- <mark>Sales taxes</mark>
- <mark>Personal income taxes</mark>
- Corporate income taxes
- <mark>Business and occupation (B&O) taxes</mark>
- Property taxes
- <mark>Value added taxes</mark>

With the exception of theory and evidence related to corporate income taxes and property taxes -- well covered by Richard Dadzie – <mark>I am attempting to address the</mark>

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Since I finished writing the first draft of this paper, the TSWG has also been considering a wealth tax and an employer compensation tax. An analysis of the economic incidence of these taxes is beyond the scope of this paper.

My motivation is to offer some preliminary ideas in response to the Washington state legislature's language in ESHB 1109 Section 137 E, which reads:
> " To the degree it is practicable, conduct tax incidence analysis of the various alternatives under consideration to account for the impacts of tax shifting, such as business taxes passed along to consumers and property taxes passed along to renters"

I have interpreted this language implicitly to include all six of the types of taxes listed above because all are included among one or more of the scenarios presented by the DOR and TAG to the Tax Structure Work Group in the report of December 2020.

Where available, I have relied primarily on peer-reviewed literature from public finance and the economics of taxation because all those contributions have been reviewed and critiqued prior to publication by experts in an objective (and generally "double-blinded") process requiring transparent and detailed revelation of the data, methods, and logic behind the paper's conclusions. In some cases, due to a paucity of peer-reviewed papers, I have drawn on public technical reports.

Selected Literature Review

<u>Theory</u>.
To oversimplify somewhat, the theory underlying estimates of the ultimate incidence of any tax requires that one specify the product elasticities of supply (seller side) elasticities of demand (buyer side), the respective factor shares of labor and capital in production, and the elasticities of substitution between labor and capital.

The incidence of a sales tax offers a simple example. Consider the attached diagram. In **Figure 1**, the sales tax is a **unit** tax, i.e., a **fixed dollar amount per unit of quantity** sold). I use this example to illustrate the change in quantity and

price induced by such a unit tax, to briefly discuss impacts in a competitive market, in the case where the tax is "paid" statutorily by the seller:

- Q0 is the original market equilibrium pre-tax units of quantity sold; Q1 is the new post-tax equilibrium units of quantity sold.
- P0 is the original market equilibrium pre-tax price; P1 is the new post-tax equilibrium price.
- The vertical distance AD equals the $ of tax per unit of the good or service sold. Notice that the original pre-tax supply curve (the aggregated marginal cost curves of all sellers) is shifted upward by exactly the amount of the unit tax.

Changing the statutory incidence of the sales tax would not change the ultimate economic incidence of that tax. If the buyer statutorily paid the tax instead of the seller, the demand curve (D0) in Figure 1 would shift downward by the amount of the tax per unit. The decline in quantity from Q0 to Q1 would be the same as the case in which the seller statutorily paid the tax. In the latter case the buyer pays the tax directly by statute and the price charged by the seller is unchanged. Either way, the effective tax-inclusive "price" paid by the buyer is the same[1].

This simple diagram illustrates several important tax-shifting points. Generally, "static" analyses that fail to consider behavioral responses by buyers and sellers in the marketplace will misestimate the effects on consumer welfare, producer surplus, tax collections, and the impacts of taxes on the quantity and price of the goods and services being exchanged:

- **Tax collections**: For example, in Figure 1 a static estimate of tax collections would assume that the post-tax quantity sold equals Q0 (the horizontal distance DC'); but, given the demand response by buyers to the higher post-tax price, the actual post-tax quantity sold would be Q1 (the horizontal distance DC). Whereas the static estimate of tax collections would equal the area of the rectangle ADC'B', the actual tax collections incorporating demand and supply behavioral responses would equal the area of the smaller rectangle ADCB. This implies a **static overestimate** of tax collections equal to the **rectangle BCC'B'**. In the real world such misestimates surely matter for public policy and the ability to fund public goods and services.

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[1] I thank Kriss Sjoblom for suggesting that this point be made explicit. Kriss Sjoblom also notes that the same point about equivalent economic incidence applies to the B&O tax in Washington state, in which case the seller statutorily pays the tax and includes that amount in the price charged the buyer.

- **Consumer welfare**: One illustrative measure of aggregate consumer welfare provided in a given market is **"consumer surplus".** This measure equals the aggregate willingness to pay for the good or service up to the equilibrium quantity sold <u>minus</u> the aggregate cost of delivering that service up to the quantity delivered at the equilibrium price. Simply put, what was the total market value of the good or service (measured by willingness to pay at each point on the demand curve up to the equilibrium quantity sold) minus the total cost of supplying that quantity? In Figure 1 the pre-tax consumer surplus equals the area of the triangle O"FH, whereas the smaller post-tax consumer surplus equals the area of triangle O"AB.[2]

- **Producer surplus:** This measure equals the aggregate amount of revenues collected in the market at the single equilibrium price over all sellers <u>minus</u> the aggregate cost of supplying those services over all sellers. In Figure 1, pre-tax producer surplus equals the area of the triangle OHF, whereas the smaller post-tax producer surplus equals the area O'AB.

- **Deadweight social cost (loss):** This concept denotes the total consumer surplus <u>and</u> producer surplus forgone due to the quantity of goods not sold because of the price increase induced by the unit tax. This forgone surplus is a social loss in the sense that neither buyers nor sellers capture the extra value that would have accrued to those parties if the good or service had been sold at the original (pre-tax) price. In that sense, this loss is a "deadweight cost" to society. Of course, on a more comprehensive view, this deadweight cost must be weighed against the benefits to society of the public goods and services funded by the tax, and the latter are beyond the scope of this essay. In Figure 1, this deadweight cost is measured by the area of the triangle BCH.

Role of Price Elasticities. The elasticities (price-sensitivities) of demand and supply affect each of these measures: (1) actual tax collections vs. estimated tax collections based on static assumptions, (2) changes in producer and consumer surplus due to the unit tax, and (3) the deadweight social cost. The current Figure 1

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[2] From a consumer standpoint, the key question is whether the services delivered for the taxes collected are more than offset the initial loss of welfare from the reduced quantity consumed of the taxed good or service due to its higher post-tax price. This brief analysis abstracts from that important concern because our focus is on tax efficiency and tax burden, not the separate question of how those taxes are deployed.

could be modified to illustrate the four cases below (i.e., with different demand and supply elasticities).

- In one extreme case, **if aggregate supply** of the goods and services subject to the tax were **perfectly inelastic** (i.e., not affected by price), the aggregate supply curve would be vertical and unchanged by the tax. **There would be no behavioral response (i.e., no change in equilibrium quantity), no changes to producer or consumer surplus, and actual tax collections therefore would be the same as in a "static" analysis.**

- In contrast, **if aggregate supply** were **perfectly elastic,** the aggregate supply curve would be horizontal and would shift upward by the full amount of the unit tax. **Equilibrium price would increase by the amount of the tax (as suppliers "pass-through" the unit tax to consumers). In response, consumers would reduce the quantity demanded. The higher the aggregate elasticity of demand, the greater would be the decline in quantity (and in tax collections compared to estimated collections in a static analysis**). The same logic implies that higher elasticity of demand would be accompanied by smaller declines in consumer surplus and larger declines in producer surplus.

- In another extreme case, **if aggregate demand** were **perfectly inelastic**, the aggregate demand curve would be vertical, and the **supply curve would shift upward by the amount of the unit tax. In this scenario, there would be no behavioral response. The equilibrium price would change by the full amount of the unit tax; but quantity would not change, and actual tax collections would be the same as in a static analysis.**

- If **aggregate demand** were **perfectly elastic,** the demand curve would be horizontal, and imposing the unit tax would lead to an upward shift in the supply curve equal to the amount of the unit tax. **In that case, the entire behavioral response would be a decline in equilibrium quantity – with no change in equilibrium price. Actual tax collections, as compared to static estimates, would drop in direct proportion to the decline in equilibrium quantity (as would producer and consumer surplus**).

While qualitative, rather than quantitative, I hope that the diagrammatic analysis and discussion of the incidence of a unit sales tax in **Figure 1** provides useful insights into behavioral responses and their effects on actual tax collection (especially in comparison to static analyses that do not account for those demand

> **Commented [d1]:** A **general** discrete linear approximation for the deadweight cost (excess burden, or "EB") of a tax is the area of the "Harberger triangle":
>
> $EB = (1/2) \, \Delta T \Delta Q$ (**not very useful,** since the key unknown ΔQ can't be input prospectively without an estimate of price elasticities of supply and demand)
>
> For small (literally, infinitesimal) changes in the neighborhood of the original (pre-tax) equilibrium, this EB can be expressed in terms of price elasticities of supply (Es) and demand (Ed):
>
> $EB = (\frac{1}{2}[EsEd/(Es- Ed)](dT/P)(QdT)$, which simplifies to:
>
> $EB = \frac{1}{2}[EsEd/(Es- Ed)](Q/P)(dT)^2$
> where P=original price and Q = original quantity
> This is the "square rule," which expresses the excess burden as the square of the tax dT, given the elasticities of demand and supply, Ed and Es, and the ratio of initial quantity and price, (Q/P). The formula is a linear approximation and assumes that the tax dT is small (actually infinitesimal), so calculus can be applied,

and supply side adjustments). The reader will note that Figure 1 models a **unit sales tax** (i.e., **fixed dollar** tax imposed on the seller for each unit of quantity sold). In reality, our Washington sales taxes are **ad valorem (fixed percentage of the sales price).**

For simplicity, the model of the incidence of a unit sales tax in Figure 1 assumes that sellers do not alter quality in response to the tax, which follows the modeling in the Joint Committee on Taxation report on measuring the incidence and burdens of different forms of taxation[3].

Yoram Barzel (1976)[4] -- in a seminal paper on the incidence of taxation (and subsidies) --showed that the incidence of an ad valorem tax (relative to a per unit tax) on quantity, quality, and price would be different in the presence of "quality" attributes of the good or service. Specifically, Barzel noted the following:

"Provided both that the appropriate tax rates are imposed and that quality is held constant, when a commodity is taxed the subsequent resource allocation and tax revenue will be the same regardless whether the tax is constant per unit or ad valorem. But when quality is not fully controlled, the effects of the two types of taxes differ radically. The excise tax induces a substitution of quality for quantity, resulting in a greater increase in the price per unit than predicted by the constant-quality model. The ad valorem tax induces a reduction in quality and a lower after-tax price than predicted." (Barzel, p. 1185)

Following Barzel's reasoning, Figure **1A** illustrates the effect of a unit sales tax on the equilibrium quantity, quality per unit of output, and price when quality is variable. Similarly, **Figure 2** depicts the effect of an ad valorem sales tax on equilibrium quantity, quality per unit of output, and price[5]. To definitively establish the expected direction of the tax-induced change in equilibrium price, quality per unit, and quantity, would require specific assumptions about demand and supply (cost) elasticities of quality and quantity. Instead, as in Barzel's paper, I've focused on depicting graphically the **comparative** directional effects of a unit sales tax

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[3] See, for example, Figure 3 in: Joint Committee on Taxation. Methodology and Issues in Measuring Changes in the Distribution of Tax Burdens. Washington, DC: US Government Printing Office, June 14, 1993, p.24.
[4] Barzel Y. "An Alternative Approach to the Analysis of Taxation." Journal of Political Economy. (1976). 84(6): 1177-1197.
[5] In constructing these stylized figures, I assume – for **both** the unit and ad valorem taxes – that the leftward supply curve shift due to either tax (i.e., the "post-tax" increase in marginal cost of the quantity supplied to the market in the aggregate) is greater than the shift in the demand curve due to any tax-induced change in quality per unit. This construction, in turn, reflects the underlying assumption that suppliers (and consumers) are optimizing. Thus, if suppliers could have gained additional demand for their product by improving quality at less than the marginal cost of doing so, they already would have done that before the tax was imposed.

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versus an ad valorem sales tax on those variables. As drawn in Figures 1A for the unit sales tax and Figure 2 for the ad valorem tax, one observes the following equilibrium results:

- The unit sales tax induces an increase in quality per unit, a reduction in quantity, and an increase in price.
- The ad valorem tax induces a decline in quality per unit, a reduction in quantity, and an increase in price (but less than the increase in price with a unit tax).

There are many factors at work besides tax rates that will affect the mix, quality, and price of gas offered on the market, so mine is no definite prediction of what would happen -- i.e., other things aren't necessarily equal. However, Barzel's reasoning – with which I agree – suggests that over time, and under an <u>ad valorem</u> tax, gas suppliers would tend to raise the price of high quality (high octane) gas more and offer less of it than under a <u>unit</u> sales tax – again, other things equal.

With sufficient information and a well-specified estimation model, and if quality per unit of quantity were controlled (i.e., specified and controlled as part of the sale), an "appropriate" tax rate could be determined that would yield the same price, quantity, quality, welfare results (producer and consumer surpluses and deadweight social cost), and tax revenues under either type of sales tax. In each regime, as Barzel remarks, the motivation for the marginal adjustments is to minimize the sum of the total tax paid and the dollar value of the deadweight costs attributable to imposition of the tax.

Complications. The preceding analysis examines the example of a **perfectly competitive market** for the relevant goods and services subject to a unit excise tax. The main purpose of this analysis is conceptual and directional: (a) to illustrate the likely magnitude and direction of behavioral responses to taxation and (b) to characterize the directional effects of those responses on consumer and producer welfare (surplus) and on actual tax collections vs. static estimates of those tax collections.

Alternatively, if the relevant markets were imperfectly competitive, the supply side and demand side responses to the unit tax would depend on the details of market imperfections: extent of market power on the supply side (e.g., monopoly, oligopoly, worker bargaining power in the labor market) and demand side (e.g., collective consumer bargaining power). Government regulation (e.g., in the form of price controls, subsidies, and quantity or quality constraints) also complicates the analysis. It is beyond the scope of this brief essay to examine those

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complications, so I focus next on reviewing the relevant economic and public finance literature (primarily peer-reviewed papers) on the economic incidence of taxation.

Theory of Behavioral Responses to Sales Taxes. For taxes in Washington state, the preceding excise tax theoretical analysis is directly relevant to the sales tax. Even though the alternatives under consideration by TAG, DOR, and the Tax Structure Work Group (TSWG) include five other types of tax, given the heavy reliance of public revenues in this state on sales taxes, I chose to introduce this paper with the example of the unit sales tax in Figure 1. The excise tax illustrates general principles of the behavioral responses to taxation, as well as the important differences between tax collection estimates based on static assumptions and those that take behavioral responses into account.

Theory of Behavioral Responses to Personal Income Taxes. One of the options for Washington state's tax structure is the introduction of a personal income tax. Both a flat tax and graduated tax are being considered in the current work of the TAG, DOR, and TSWG.

The "labor/leisure" tradeoff offers a useful starting point for assessing the behavioral responses to personal income taxes. First, when one decides to enter the paid labor force, one compares the monetary compensation for work with the value of leisure (more generally, the equivalent, significant value of non-paid "household production")[6]. Other things equal, a state (or federal) tax on compensation reduces the after-tax dollar value of paid work relative to non-paid household production – thus reducing the incentive to participate in the labor force and also reducing the marginal return to paid hours worked and to additional effort that could lead to increased total compensation. A flat rate income tax exerts these effects[7], and a graduated income tax exacerbates these paid work disincentive effects by increasing the marginal rate of tax.

In addition to real resource effects of personal income taxation on paid labor effort, such taxes also encourage tax avoidance strategies (legal actions, as opposed to

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[6] See, for example, Becker, Gary. "A Theory of the Allocation of Time." Economic Journal 75 (September 1965): 493–517.
[7] Here I've implicitly taken the perspective of introducing a flat rate state income tax in a setting where previously there was no such tax. **I've also focused exclusively on the "substitution" effects on incentives to work (and therefore to gain income).** "Income" effects on incentives are relevant, too, and cut in the other direction (e.g., as individuals increase their work effort to "earn back" at least some of the net income lost due to the tax. I appreciate **my TAG colleague, Katie Baird, reminding me to acknowledge these issues,** and additionally, for highlighting that the strength of the marginal incentive to work is not necessarily the same throughout the income distribution.

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illegal tax "evasion"), including changes in investments and compensation arrangements, realization of capital gains, increase in the use of itemized tax deductions, and tax shelters (e.g., real estate partnerships)[8].

Theory of Behavioral Responses to the Business and Occupation (B&O) Tax. Since the B&O tax is structured as a percentage tax on business revenues, for any given business sector subject to the B&O tax, it acts like an **ad valorem tax** on the firm's **revenues**. As such, it is a "gross receipts" tax on selected sectors of the state economy. This ad valorem tax on business revenues will evoke a more complex response than the ad valorem tax on sales price that Barzel (1976) analyzed because the tax is imposed on the multiple of two market variables: price and quantity.

Moreover, the individual state's apportionment rules and application of the tax to selected business sectors will affect the economic incidence of the B&O or an equivalent gross receipts tax[9]. I am not sure of any clear directional predictions of how apportionment rules and differential application among business sectors of a gross receipts tax might affect economic incidence of a B&O tax like Washington state's.

- One differential effect on economic incidence might occur if different sectors faced different levels of competition and thus different pressures on product prices and quality. Those sectors facing greater competition within or across other states might make larger downward adjustments in price and face greater pressures to maintain quality than those facing less competition – either from other firms within the state or from other states.

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[8] Long JE. "The Impact of Marginal Tax Rates on Taxable Income: Evidence from State Income Tax Differentials." Southern Economic Journal 5 (April 1999): 855-869.

[9] I owe this point to Kriss Sjoblom, who informed me that -- in Washington state (presumably with a "nexus" in Washington state) – the B&O tax applies to all revenues for **in-state manufacturing** businesses. In contrast, **for service, wholesaling, and retail** businesses, the B&O applies only to in-state consumers (i.e., is "destination-based").

- Following up, I identified the following information: The **Washington B&O tax is a gross receipts tax applied on property and services sourced to Washington, most comparable to the Ohio or Oregon Corporate Activity Tax (CAT).** The B&O offers very few deductions, and those allowable are often within narrowly defined industry sectors. B&O also does not consider income or loss, and offers no deduction for cost of goods sold, is in addition to Washington's sales and use tax, and cannot be directly invoiced or collected from a customer like sales tax.

See: Holman, M. "Doing Business in Washington: Know How the B) Tax Could Impact You." (July 29, 2021). Cohen & Co. https://www.cohencpa.com/insights/articles/how-the-b-o-tax-in-washington-could-impact-you Accessed October 31, 2021.

As in the cases of the unit sales tax and the ad valorem sales tax, the B&O tax on total revenues will induce behavioral responses on price, quantity, and quality. For the general case, I have not worked out the expected <u>direction</u> of the equilibrium changes in quantity, quality, and price (i.e., the comparative statics) in response to the B&O tax. However, in the special case of infinitely elastic aggregate supply (a horizontal aggregate supply curve), one would expect the following responses (**See the Figure 3 at the end this paper**):

(1) Absent any quality or quantity adjustments, post-tax equilibrium price would rise in proportion to the percentage tax on total revenues.
(2) However, to mitigate the price rise due to the tax per unit of revenue (reflected in the initial vertical shift in the aggregate supply curve from SO to S1), suppliers would be expected to reduce quality per unit of output – thus leading to a downward shift from S1 to S2 due to lower after-tax marginal costs of production.
(3) The aforementioned decline in quality supplied would lead buyers (the demand side) to demand less of the (lower quality) good or service. The supplier's quality adjustment, would lead to a decline in marginal cost, which would – through cost-induced reduction in price – lead to a modest recovery in demand and thus a modest increase in equilibrium quantity (from Q1 to Q2 in Figure 3). Compared to the initial pre-tax equilibrium, however, quantity would be lower (comparing Q2 to QO).

The equilibrium post-tax values of price, quantity, and quality would depend ultimately on the following parameters: the aggregate cost elasticity of quality (i.e., the proportionate change in aggregate marginal cost for a proportionate change in quality per unit of output), the aggregate demand elasticity of quality, and the elasticity of the quantity demanded with respect to price. In the post-tax market equilibrium, the values of price, quantity, and quality would satisfy the following condition: minimize the sum of the tax paid by the suppliers and the deadweight losses to producers and suppliers as a whole.[10]

In the stylized example of Figure 3, I have diagrammed responses that illustrate the adjustment process described above. The reader will notice that I have drawn the shifts in the post-tax aggregate supply curve and the post-tax aggregate demand curve to reconcile with the three equilibrating steps outlined above. Specifically, in addition to the starting assumption of infinitely elastic supply, the comparative

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[10] I acknowledge that this verbal argument needs to be translated to an algebraic optimization statement based on profit maximization subject to the tax, cost elasticity with respect to quantity and quality, and demand elasticity with respect to price and quality. That is a next step for any others who want to tackle it.

post-tax shifts in aggregate demand and aggregate supply reflect an arbitrary assumption that the absolute value of the quality elasticity of cost is greater than the quality elasticity of demand (diagrammed as a greater downward shift in cost due to the decline in quality in post-tax supply, as compared to the analogous downward shift in post-tax aggregate demand) . The multi-variable equilibrium would depend crucially on each of these parameters, and empirical testing would be required to validate the directional changes resulting from imposition of the B&O tax.

Theory of Responses to the Value-Added Tax. I focus this discussion on the **state-based** value-added tax. The general principles applicable to a national value-added tax are mostly relevant to the state case, but certain factors in a national value added tax do not apply in the state case, e.g., the role of national monetary policy in accommodating tax effects on nominal prices and international (versus interstate) mobility of capital and labor. Also, concentrating on the value-added tax being considered in Washington state allows one to analyze behavioral responses more specific to this state's situation, while still taking advantage of the significant body of theory that examines the incidence of national value-added taxes (VAT).

The Tax Policy Center (TPC) of the Brookings Institution and Urban Institute has examined the VAT, and I quote their introductory discussion here[11]:

 "A VAT is a broad-based tax on households' consumption of goods and services, equivalent to a retail sales tax with the same broad base and same rate".

One important qualifier to the above statement regarding the VAT as a consumption tax, is that this conclusion is drawn from analysis of a national VAT[12]. Grinberg (2010), for example, observes that, whereas national currency exchange rates or national price level adjustments are available to mitigate an origin-based state VAT. Unlike a retail sales tax, which is collected only at the final retail level on sales, a VAT is collected incrementally at each stage of the production and distribution of goods and services. Every business charges VAT on

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[11] Toder E, Nunns J, and Rosenberg J. "Methodology for Distributing a VAT." Prepared by the Urban-Brookings Tax Policy Center for the Pew Charitable Trusts. Washington, DC: April 2011,

[12] I owe this observation to Kriss Sjoblom. In my view correctly, Mr. Sjoblom notes that tax-induced changes in output prices and wages would "shift the burden away from consumption." After reviewing several sources, I have not been able to determine whether the state-based VAT being modeled by DOR is origin-based or destination-based or some combination of the two.

its sales but is allowed a credit for the VAT it pays as a part of its purchases from other businesses[13,14,15].

The <mark>net amount of VAT paid</mark> by the business is therefore the tax on the difference between its sales and its purchases from other businesses. **This difference is 'value added,' the amount that a business pays to labor and owners of capital**. The value added by businesses at every stage of production and distribution through the retail level is the entire value of the good or service sold, its retail value." (Toder et al. 2011: p6)

The same Urban-Brookings paper includes the identity equation for sources and uses of income:

(Eq 1) Labor Income + Capital Income + Transfers – Taxes = Consumption + Saving

Translating this equation into the "consumption identity" yields:

(Eq 2) Labor Income + Capital Income + Transfers – Taxes – Saving = Consumption

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[13] This description is of a "credit-invoice" VAT, the type of VAT used in all countries except Japan. All VATs in place internationally are "destination based," which means they only apply where consumption occurs. Therefore the VAT rate on exports is zero, and exporters receive a refund of VAT paid on their purchases while imports are taxed at the time of importation or on subsequent sale (because VAT would apply to the sale and there would be no VAT at the time of import). The discussion abstracts from border adjustments, which generally have no effect on the distributional analysis.

[14] <mark>It is noteworthy that the VAT under consideration in Washington state is a "subtraction method" version</mark>. Grinberg (2010) states:
"Credit-invoice method VATs calculate VAT due by multiplying the value of taxable sales by the relevant tax rate and subtracting VAT paid on inputs from the tentative tax due on sales. Subtraction-method VATs subtract the amount paid for inputs from taxable sales and multiply by the relevant tax rate. The key perceived difference between the credit-invoice method VAT and the subtraction-method VAT is that the former is generally conceived as a tax on specific transactions, whereas the latter is generally thought to be a tax on an entity. <mark>The key **substantive difference** (emphasis mine) between most subtraction-method VAT proposals and extant credit invoice method VATs is that subtraction-method VAT proposals generally do not impose an invoice requirement.</mark> An invoice requirement achieves two ends: It limits the VAT credits provided for tax paid with respect to inputs purchased by entities subject to the VAT ("registered traders") to purchases from other registered traders, and it ensures that the VAT credit obtained by the purchaser is equal to the VAT paid on the input." Cited from: Grinberg I. "Where Credit is Due: Advantages of the Credit-Invoice Method for a Partial Replacement VAT." Tax Law Review. 2010. 63(10): 309-358. (p 310).
<mark>I therefore conclude that the economic incidence of the VAT would be equivalent for the two versions, except for the potential for the credit-invoice method to economize on deadweight costs due to compliance costs.</mark>

[15] <mark>It is important to note that the VAT under consideration in Washington state is **not** being viewed as a replacement for the sales tax. Instead, the revenue-generating potential of the VAT (and the margins tax) is being analyzed in comparison to Washington state's current B&O tax. The VAT's economic incidence (not its statutory incidence) is primarily on consumption.</mark>

This consumption identity clarifies the potential economic incidence of a **national** VAT, a broad-based consumption tax[16]. Logically, the combination of private and public ("behavioral") responses would include:

    (a) changes in income earned through labor and capital,
    (b) changes in transfers,
    (c) changes in other (non-VAT) taxes, and
    (d) changes in savings.

Since the VAT is assessed on consumption, retail prices would rise by the amount of the VAT at all stages of intermediate goods and services, and nominal incomes (comprised of payments to labor and capital) would fall by the amount of the VAT. This change represents the "wedge" between the higher price paid by consumers (inclusive of the VAT) and the lower price received by producers (exclusive of the VAT).

I cannot improve on the TPC researchers' (Toder et al. 2011) summary of the incidence of the VAT, so I quote their statements as follows:

Overall: "This means that payments to labor and capital would have to fall by the amount of the VAT, but the burden on capital would fall entirely on owners of equities because owners of bonds receiving payments that are contractually fixed in nominal value would have unchanged real returns. As discussed more fully below, lower factor payments would reduce government revenues from other taxes and also reduce the nominal level of government spending required to hold real spending constant. Spending on cash transfer payments that are based directly or indirectly on wages would also fall over time as benefits for new beneficiaries reflected the fall in nominal wages." (pp 5-6)

Incidence on labor income: "Under the standard assumption for distributional analysis that the economic effects of taxes are fully phased in, the burden of a VAT is applied across all employees and all forms of employee compensation." (p7)[17]

Incidence on capital income: "Once a VAT is fully phased in, with all old capital consumed, there is no VAT burden on the normal return to capital. Bond holders

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[16] The caveat previously noted in footnote 12 applies to the economic incidence of an origin-based **state** VAT, which would be borne in part by output and wages.

[17] Note that this statement refers to the **long run** incidence of the VAT, whereas adjustments in the short run (during which physical capital is fixed) would fall primarily on variable labor inputs and returns on existing "old" capital.

generally earn only the normal return, but **equity owners may also earn ‘supernormal’ returns to capital -- returns to successful risk taking, inframarginal returns and economic rent.”** (pp7-8)

Incidence on transfer payments: “So, when fully phased in, a VAT will impose a burden on all cash transfer payments that are directly or indirectly based on wages.” (p9)

Having described the theory of tax incidence in the preceding section, I now proceed to a brief summary of the empirical evidence on economic incidence of the four types of taxes considered in this paper: (1) sales, (2) personal income, (3) B&O, and (4) VAT.

Methods for Estimating Economic Incidence of Taxes.

In general, empirical methods for estimating the incidence of taxation fall into two categories: (1) partial equilibrium models (as described by Richard Dadzie of the Washington State Department of Revenue)[18] and (2) general equilibrium models (best exemplified by Arnold Harberger's classic 1962 paper)[19].

    Partial Equilibrium Estimating Models. The partial equilibrium models utilize multiple regression to estimate the incidence of taxes on wages, returns to total capital, and on “supranormal[20]” returns to equity (owner/shareholder) capital, and other economic variables – generally considering effects of exogenous factors (including tax rates and controlling for effects of non-tax factors) on these dependent variables one at a time. As Dadzie (2021; p4) notes and Gravelle (2011)[21] highlights, these empirical (partial equilibrium) models generally seek

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[18] Richard B. Dadzie. “Corporate Tax Shifting and Tax Incidence: A Review of the Literature”. Draft Paper prepared for the Washington State Technical Advisory Group for the Department of Revenue: related to ESSB 5092 Section 137(2). August 2021.

[19] Harberger A. “The Incidence of the Corporate Income Tax,” Journal of Political Economy. (1962): Vol. LXX(3): 215-240.

[20] “**Supranormal” refers to returns in excess of the investors' expected (normal) return on risk-free investments**. (Nunns 2012). These supranormal returns reflect **compensation for** the systematic risk of investments tied to variations in returns on the economywide market portfolio, the leverage (debt-financed portion) of those investments, and any “rents” to the investor due to superior information relative to investors in the aggregate. See, for example: James R. Nunns. Interestingly, the **conclusion of the TPC analysis** is that the **burden of the corporate income tax is borne by market participants** in the following proportions: **60% to supranormal returns to corporate equity** (shareholders), **20% to normal returns to all capital**, and **20% to labor**. Nunns JR. “How TPC Distributes the Corporate Income Tax.” Tax Policy Center: Urban Institute and Brookings Institution. September 13, 2021.
https://www.taxpolicycenter.org/publications/how-tpc-distributes-corporate-income-tax
Accessed June 17, 2021

[21] Gravelle, JC. “Corporate Tax Incidence: A Review of Empirical Estimates and Analysis.” Congressional Budget Office (2011).

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econometrically to identify tax incidence through variation at the cross-country, cross-state, and across corporations.

General Equilibrium Estimating Models. In contrast, general equilibrium models estimate tax effects on those variables by taking into account how the effects of a given tax on one economic variable (e.g., returns to capital) might ripple through the market to affect other variables. For example, by directly lowering the after-tax return to equity shareholders, the corporate income tax would indirectly lead to reduced equity capital investment, which – in turn – would lower the marginal productivity of labor that requires capital as a complement in production. On this logic, wages (which are significantly influenced by the marginal productivity of labor) would fall as an indirect effect of corporate taxation. These general equilibrium models can be used to examine the total effects (direct and indirect) of taxation on labor markets, capital markets, intermediate goods markets, through to final product markets for goods and services.

The incidence of state-level corporate income taxes on capital versus labor depends on such state-level parameters as overall market size, capital mobility, labor mobility, substitutability in consumption among different products, substitutability of capital and labor in product markets, and the relative capital intensity of taxed vs untaxed sectors of the state economy. Table 1 in Dadzie (2021; p4) provides a useful summary of the relative effects of corporate taxation on capital vs. labor of the above factors. Dadzie develops this qualitative summary of corporate tax incidence under the assumption of an open international economy and general equilibrium.

Empirical Evidence.

Richard Dadzie (2021)[22] has provided an excellent review of these models for the TAG as they relate to corporate and property taxation, so generally I will not recap his references or discussion. Instead, I will complement his work by reviewing additional sources and stating what I believe are the implications for the work of the TAG and DOR. In the interest of brevity, what I offer below is a "sketch" of the evidence regarding the economic incidence of the four taxes not directly considered in Dadzie's paper: (1) taxes on sales, (2) personal income, (3) B&O, and (4) value added.

Economic Incidence of State Sales Taxes. I am basing this summary on the results of two internet searches using specific phrases (i.e., "Evidence of the

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[22] See previous footnote 2.

economic incidence of state sales taxes" and "Efficiency of state sales taxes"). I found three relevant empirical studies,[23] and searched the abstracts and conclusions of each of those three studies to identify further sources. It is likely that a more exhaustive search process and set of search terms would have uncovered additional studies, but I stuck with these three in the interest of brevity and my own time.

The first set of findings (Russo 2005) was based on computer simulation. Russo outlines the structure and assumptions of the analytical model in some detail (Russo pp. 445-449), and – while not an empirical study using original data for the express purpose of determining long run effects of sales tax reform – Russo tapped estimates from original empirical studies to calibrate his model[24]. The long-run simulation estimates led to the following implications:

"(i) Broadening sales tax bases could increase economic efficiency.
 (ii) Moving to a consumption tax dominates base broadening.
 (iii) Replacing sales taxes with higher income taxes could produce large efficiency losses.
 (iv) Base broadening could generate efficiency gains even if untaxed remote sales become a sizable fraction of total sales.
 (v) Even partial base broadening could produce sizable efficiency improvements." (p 457)

While not directly addressing economic incidence, these findings nonetheless offer some guidance as Washington state policymakers consider alternative structures for taxation.

The second study (Poterba 1996) examined whether state and local retail sales taxes are fully shifted to consumers. He used city-specific clothing price indices for eight cities during 1947 – 1977 and fourteen cities during 1925-1939. The results for the 1947-77 period suggested approximately full shifting of the sales tax to consumers. For the 1925-1939 period (which includes the Depression),

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[23] Russo B. "An Efficiency Analysis of Proposed State and Local Tax Reforms." Southern Economic Journal 2005. 72(2): 443-462.
Poterba JM. "Retail Price Reactions to Changes in State and Local Sales Taxes." National Tax Journal (June 1996). 49(2): 165-176.
Ring, Jr. RJ. "Consumers' Share and Producers' Share of the General Sales Tax." National Tax Journal (March 1999). 52(1): 79-90.
[24] See Appendix B of Russo (pp. 460-461). Key simulation model parameter values were: the rate of time preference, labor's share of final output, historical rate of growth in output per worker, population growth rate, level of debt-financed capital, share of output produced in the non-corporate sector, the elasticity of substitution between goods and services, and the fraction of sales tax revenue from taxation of business inputs.

approximately two-thirds of the tax is forward-shifted to retail prices. Poterba notes that prior empirical studies also show mixed results.[25]

Poterba also explains that, in imperfectly competitive markets, the extent of forward-shifting depends on the representative firm's expectations of how other firms adjust to changes in output of other firms (e.g., due to a change in another firm's price). Weighing the relevance of these findings for state tax reform in today's market environment, context surely matters. In particular, the **rapid growth of e-commerce since the late 1970's(e.g., Amazon, Google) nationally and regionally, plus evolving views on antitrust policy and enforcement, are shaping market competition in new ways (Salop 2017)** – thus heightening the potential relevance of "**imperfect competition**" for the economic incidence of alternative state tax structures[26].

Recognizing the mixed results of previous empirical studies, **Poterba** offers the following conclusions:

"This paper presents evidence that broadly supports the view that retail sales taxes are fully forward shifted, raising consumer prices by the amount of the tax increase." (p. 173)

" The results in the present study support the often-maintained assumption that retail sales are fully shifted into retail prices. Yet the differences between the present findings and those in other studies are disturbing and should provide a warrant for further research." (p. 173)

The last sentence of the second Poterba quote reinforces the imprecision of available peer-reviewed evidence for informing tax policy with respect to the incidence of state sales taxes.

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[25] In a perfectly competitive market (as demonstrated in Figure 1 of this paper), the full amount of the sales tax would be shifted forward to retail prices. Imperfect competition complicates the picture. Poterba (1996) remarks that several studies find less than full forward-shifting in imperfectly competitive product markets. Poterba (1996, p168) shows that -- in a simple model with N firms producing at constant cost in an imperfectly competitive market – the price adjustment depends on the firm's **conjectural variation** (i.e., the amount by which the firm expects all other firms' output to change for a one-unit change in its own output). Poterba's model seems to use assumptions akin to the Bertrand homogeneous goods case.

[26] I appreciate Katie Baird suggesting that these implications for imperfect competition are important for economic incidence of taxation. This highlights the need for new theoretical and empirical work. In particular, consider the important research of Steven Salop at the Georgetown University Law Center regarding "raising rivals' costs" as an anti-competitive strategy: Salop S. "The Raising Rivals' Cost Foreclosure Paradigm, Conditional Pricing Practices, and The Flawed Incremental Price-Cost Test." Antitrust Law Journal. (2017). 81: 371-421. In this article Salop addresses how vertical strategies that attempt to foreclose competitors' access to critical factors of production (thus raising those competitors' cost of production) and horizontally to reduce competition in the product markets. He also discusses the implications of these strategies for effective antitrust enforcement.

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Commented [d4]: A quick summary of oligopoly models of imperfect competition:
(1)The **Cournot model** of oligopoly applies where (a) the firms produce homogeneous goods, (b) **they compete simultaneously on output and market share**, and (c) they expect their rivals to not change their output in response to any change that the make.

Cournot equilibrium is the output level at which each firm in the oligopoly maximizes its profit given the output level of all other firms. No firm can gain from changing its output level away from Cournot equilibrium because the response of other firms will wipe out any additional profit.

(2)A **Stackelberg oligopoly** is one in which one firm is a leader and other firms are followers. This model applies where: (a) the firms sell homogeneous products, (b) **competition is based on output, and (c) firms choose their output sequentially and not simultaneously**. Since other firms must set their output decision given the leader's output decision, the leader in a Stackelberg oligopoly typically has a bigger market share and higher profit than other firms in the oligopoly.

(3) There are **two versions of Bertrand model** depending on whether the products are homogeneous or differentiated.
(a) **Homogeneous case:** The **output and price level in a Bertrand oligopoly is the same as in perfect competition**.
(b) **Differentiated case: The Bertrand model concludes that if one firm increases it price, the other firms in a differentiated oligopoly should also increase theirs** because this will increase its profit.(assumes consumers perceive the differentiation and value it).

Commented [d5]: Important observation

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The third study (Ring 1999) conducted a state-by-state analysis of the **direct** incidence of general sales taxes, using 1989 data from the Consumer Expenditure Survey (CES) that allowed differentiation of sales taxes on purchases by resident consumers (CP) and other sales tax revenue (BP) – the latter primarily capturing business purchases. Based on that data, certain adjustments, and information on how each state defined its tax base, Ring calculated the consumer share of the general sales tax as: SHARE = CP/(CP + BP). Significantly, Ring's purpose was not to determine the ultimate economic incidence of the general sales tax, but rather to estimate the share of the tax effectively imposed on consumers versus (mostly) producers as a result of how the taxable base for the general sales tax was defined in each state.[27] While not directly estimating income incidence, Ring's study offers an initial step to examining economic incidence by more precisely differentiating the <u>legislated</u> statutory tax rate intended for consumer purchases and the actual tax rate effectively imposed on consumers vs. producers[28]. The author estimated (Table 1, p 81) that the average consumer share (CP) across states was 59%. Washington state's specific share was 49% in 1989, and the estimated state CPs ranged from 28% to 89%.

<u>Economic Incidence of Personal Income Taxes</u>[29]. A 1999 cross-state study by James Long is germane for purposes of our TAG's work.[30] Long compared incomes of individual taxpayers across states with different income tax rates. He

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[27] The major differences in CP across states were driven by differences in exemptions for certain categories of purchase (i.e., food at home, clothing, utilities, gasoline, four different types of utilities, alcohol, tobacco, prescription drugs, and non-prescription drugs.

[28] Ring's purpose in the 1999 paper was not to address the ultimate economic incidence of the states' sales taxes.

[29] Kriss Sjoblom has raised an interesting point – beyond the scope of this essay, but significant for its potential impact on total tax collections and its salience for the economic incidence of personal and corporate income taxes. He references a study showing the rising share of business income taxed as personal rather than corporate income since 1980 (Cooper et al. 2015).

Two of the conclusions of Cooper and co-authors seem particularly relevant for this essay (regarding tax collections and incidence):

(1) "… recent evidence indicates that business owners bear a substantial share of burden of business taxation, rather than it being passed on to workers or other capital owners (Suarez-Serrato and Zidar, 2014). **We show that pass-through business income accrues much more disproportionately to high-earners than C-corporate income, suggesting that the rise of pass-throughs has significantly lowered the business tax burden for high-earners."** (p 5) (2) We estimate that if 2011 business income had instead been earned along 1980 sector income shares, the average tax rate on U.S. business income would have been 28.0%. Total business income in 2011 was $2.6 trillion in income, so an additional 3.8 percentage points would have generated an additional $100 billion in tax revenue." (p 4)

See: Cooper M, McClelland J, Pearce J, et al. "Business in the Unites States: Who Owns It and How Much Tax Do they Pay?" NBER Working Paper 21651. (October 2015). See: https://www.nber.org/system/files/working_papers/w21651/w21651.pdf Accessed October 30, 2021.

[30] Long JE. "The Impact of Marginal Tax Rates on Taxable Income: Evidence from State Income Tax Differentials." Southern Economic Journal. 1999. 65(4): 855-869.

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noted that previous studies had found taxable income inversely related to the state's marginal income tax rate, and he sought to independently investigate that question. Long's 1999 cross-sectional study used federal tax return data for 1991 (when all married taxpayers with incomes above approximately $80,000 faced the same federal marginal tax rate) to identify the effect of state income tax variation on state taxable variation, after controlling for individual taxpayer gross income and demographic characteristics. Long found that increases in marginal tax rates reduce taxable income mainly because taxpayers claim higher deductions, and high-income taxpayers are more responsive to these changes.

Because Long's estimating models controlled for gross income, his results do not capture the marginal state tax rate effects on taxable income due to underlying changes in labor supply, compensation arrangements, capital gains, or tax-shelter investments. Long's summary and comparison of his empirical results to those of other studies are particularly informative. I quote two paragraphs of his summary at length below:

"Both the Feldstein (1995)[31] and Auten and Carroll (1995)[32] studies incorporate a full range of adjustments to tax rate changes, including ones like changes in labor supply and the form of employee compensation and the timing of capital gains realizations, which alter the level of total income reported by individuals. Furthermore, the samples analyzed by these researchers include the truly high-income taxpayers, who have the most incentive as well as ability to manipulate taxable income in response to higher tax rates. **In contrast, the taxable income elasticities in the present (Long) study capture the impact of a much more limited set of behavioral responses to tax rate changes**, and the **estimated elasticities do not incorporate the expected greater responsiveness on the part of taxpayers with incomes above $200,000.** Consequently, the relatively smaller net-of-tax rate elasticities reported in the present study are not unanticipated. Interestingly, most of the net-of-tax rate elasticities shown in Table 4 are comparable in size to Auten and Carroll's best estimate of the elasticity,[33] a value

[31] Feldstein MS. "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act." Journal of Political Economy 1995. 103: 551-572.
[32] Auten G and Carroll R. Behavior of the Affluent and the 1986 Tax Reform Act. (1995) In Proceedings of the Eighty-Sixth Annual Conference, National Tax Association. Columbus, OH: National Tax Association.
[33] The net-of-tax rate (NTMR) elasticity of taxable income measures the % change in taxable income for a 1% change in the marginal tax rate (MTR). By subtracting the NTMR elasticity from 1.0, one recovers an estimate of the percentage share of taxable income foregone due to behavioral adjustments.

of around 2/3 (Goolsbee 1998)[34]. **Therefore, one important implication that can be drawn from the present study is that changes in deductible expenditures are more important than the combined effects of other avoidance responses and real responses, such as factor supply changes, that alter taxable income.** In fact, adjustments to deductible expenditures may be the only long-run behavioral response that alters taxable income when tax rates are changed. This viewpoint is consistent with Auten and Carroll's (1995) finding that in some regression specifications, tax rate changes are statistically related to taxable income but not adjusted gross income. A tax rate increase would not affect adjusted gross income if individuals did not alter labor supply, compensation arrangements, capital gains, or tax shelter investments, but a tax-induced increase in deductible expenditures would reduce taxable income. That itemized deductions are the major transmission route for taxpayers to respond to tax rate changes is perhaps the most significant finding of the current study and **one that warrants confirmation through additional research." (p 867)**

"The empirical results presented here are consistent with those of previous studies that **have found high-income taxpayers to be more responsive to tax rate changes than low- and middle-income individuals**. For example, the elasticity of taxable income with respect to the marginal tax rate was estimated to be no greater than about **-0.20 for taxpayers with incomes under $50,000** versus around **-0.40 for taxpayers with incomes above $150,000 in 1991**. The latter elasticity implies that revenue losses due to a reduction in the tax base would offset a substantial portion of the tax revenue gains due to higher marginal tax rates. **Therefore, it is not surprising that the upper-income tax rate increases legislated in 1993 raised far less revenue than would have been generated had there been no behavioral responses by taxpayers to the higher rates**. Nor should one be surprised if an across-the-broad cut in marginal tax rates produces a much smaller loss in tax revenue than static projections indicated, especially if taxpayers respond on a full set of margins rather than the limited ones included in this study." (p 868)

Economic Incidence of the B&O Tax. I used two literature search strategies to identify empirical evidence on the economic incidence of the B&O tax:
- One used the straightforward search phrase, " Impact of State Business Gross Receipts Taxes on Business Gross Receipts."
- The other used the phrase, "Impact of State Business and Occupation (B&O) Taxes on Total Taxable Business Revenues."

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[34] Goolsbee A. (1998) It's not about money: Why natural experiments don't work on the rich. Working Paper No. 7. Ann Arbor, MI: Office of Tax Policy Research, University of Michigan.

On that simple strategy I found **no** peer-reviewed papers. Perhaps a more nuanced and robust search process would have discovered at least some peer-reviewed empirical evidence on impacts of state gross receipts taxes.

I did find <mark>two reports of some relevance.[35,36] **The first one (Watson and Kaeding 2019) compared the impact on Oregon's economy of a proposed Business Activity Tax (a form of value-added tax) with a second proposed tax, a Commercial Activities Tax, on gross receipts**</mark>. Both tax proposals were structured to raise approximately $1 billion in annual revenue and incorporated identical reductions in Oregon's personal income tax rates.

Oregon's Legislative Revenue Office (LRO) estimated two simulation models:
- (1) a short-run model that projects results five years after the tax is enacted, which the authors interpret as "… the best baseline to understand how each tax would affect Oregon's economy, separate from the effects of Oregon's government spending."
- (2) a long-run model, the estimates from which include the effects of Oregon's government spending

In summary, the Oregon Commercial Activities Tax (on gross receipts, akin to a B&O tax) is <mark>**projected**</mark> to:

> **Commented [d7]:** <mark>Again ,based on a simulation model</mark>

- Reduce household income by 0.3% (more than the value-added Business Activity Tax's projected 0.2% reduction)
- Reduce employment (full-time equivalent positions) by 0.31% (slightly more than the proposed value-added tax's 0.28% reduction)
- **Reduce investment by 0.06%,** which would translate to a reduction of $11.72 million (<mark>substantially less than the projected reduction in investment of 0.22% under the value- added tax, equivalent to **a $41.07 million reduction**</mark>)

> **Commented [d8]:** Only case where the B&O compares favorably with the state VAT (although the % differences are modest across the board).

> **Commented [d9]:** Note: A typo in the previous version, which estimated a reduction of $0.22 million, is now corrected in this version.

- Increase price levels by 0.40% (greater than the projected increase of 0.35% under the value-added tax)

Watson and Kaeding (2019) state that the somewhat greater increase in price levels under the Commercial Activities (gross receipts tax) is probably the result of "tax

[35] Watson G and Kaeding N. "Oregon's Proposed Gross Receipts Tax Is More Damaging Than Proposed Value-Added Tax." Tax Foundation (March 13, 2019). https://taxfoundation.org/oregons-gross-receipts-tax-proposal-vat/ Accessed August 28, 2021.

[36] Washington State Tax Structure Study Committee. Chapter 8: Improving the Current Tax System – Incremental Alternatives. in Tax Structure Final Report: Tax Alternatives for Washington State. November 2002, https://dor.wa.gov/sites/default/files/legacy/Content/AboutUs/StatisticsAndReports/WAtaxstudy/Chapter_8.pdf Accessed August 28, 2021

pyramiding," in which the gross receipts tax at earlier (input) stages in the vertical supply chain overlaps with the gross receipts tax applied at later stages in the supply chain.

Interestingly, the report of the Washington State Tax Structure Study Committee (2002) also discussed "non-neutralities" associated with such pyramiding in their report. The Committee went on to explain:

"Analysis shows that the B&O tax pyramids 2.5 times on average. However, the pyramiding varies considerably between industries. B&O for many services pyramids about 1.5 times. B&O for some types of manufacturers pyramids over five or six times. Although differing B&O rates ameliorate the differences in pyramiding somewhat, pyramiding still causes the effective B&O rate on value added to be much greater in some industries compared to others. Preliminary studies show the rate varies from less than 1 percent for trade and some services, to over 3 percent for some types of manufacturing (see page 106 in Chapter 9 for more details about pyramiding). Since value added is the fundamental measure of economic activity, the difference in effective B&O rates on value added indicate non-neutralities and inequities between industries. The pyramiding also gives firms an incentive to vertically integrate because firms that vertically integrate are able to escape the pyramiding of the B&O tax. One alternative to address the pyramiding of the B&O tax allows partial credits for B&O tax paid 'upstream.' For example, a credit against the manufacturing line could be taken for any B&O paid on components." (p.87)[37]

Economic Incidence of a State Value-Added Tax. I conclude the empirical section of this essay by analyzing the one peer-reviewed study of a state value-added tax produced by my literature search.[38] The portion of that paper (Cline and Wilson 1995) of direct interest for this essay estimates the potential distributional effects by income decile of replacing the Minnesota state general sales tax with a state-level value-added tax. Cline and Wilson argue that the incidence of a state destination-based value-added tax would be borne by consumers as increased prices for the final product, as would be expected under a "broad-based retail sales tax." (p. 231)

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[37] The Committee noted (p.88) that the alternative of allowing partial credits for B&O tax paid "upstream" – while not approved by the majority of Committee members – was worthy of consideration.
[38] Cline R and Wilson P. "Consumption Tax Incidence: A State Perspective." in Proceedings of the Annual Conference on Taxation Held under the Auspices of the National Tax Association-Tax Institute of America. (1995). National Tax Association. 88: 225-235.

A state-level VAT apportioned 100% by sales in the state would be borne as increased retail prices by consumers in that state. Alternatively, if, as Cline and Wilson illustrate, the VAT were apportioned 70% according to sales and 30% (the residual portion) to in-state production, 30% of the tax would be borne by labor and land, and 70% by consumers.

A unique contribution of the Cline and Wilson paper is to compare the incidence of the prevailing (1992) Minnesota state sales tax by income decile to a revenue-neutral value-added tax, showing incidence under different apportionment weights for the VAT. Table 2 in the paper (p. 232) presents those results, and is reproduced below. Cline and Wilson observe that **the regressivity of the consumer tax may be overstated by use of the Consumer Expenditure Survey, which tends to show higher consumption at low incomes and lower consumption at high incomes compared to other surveys.**[39]

Table 2: Incidence of State Sales Tax and Revenue-Neutral VAT Alternatives
(Effective Tax Rates, Minnesota Residents, 1992)

Population Decile	Income Range	Current Sales Tax	Apportioned Value-Added Tax		
			100% Sales	70% Sales 30% Production	100% Production
1	$ 5,542 & Under	7.7%	9.5%	7.4%	2.7%
2	5,543 - $ 9,092	5.4	6.6	5.2	1.8
3	9,093 - 13,332	4.8	5.6	4.7	2.6
4	13,333 - 17,879	4.5	4.9	4.3	2.9
5	17,880 - 23,335	4.2	4.4	4.0	3.2
6	23,336 - 30,079	3.9	4.0	3.8	3.3
7	30,080 - 38,290	3.7	3.7	3.7	3.6
8	38,291 - 48,819	3.4	3.5	3.6	3.8
9	48,820 - 66,630	3.2	3.2	3.4	3.9
10	66,631 & Over	2.2	2.3	2.5	3.2
All Taxpayers		3.2%	3.3%	3.3%	3.4%
Top 5%	$ 86,725 & Over	1.9%	2.0%	2.3%	2.9%
Top 1%	$188,099 & Over	1.3%	1.5%	1.7%	2.3%
	Suits Index	-0.157	-0.175	-0.120	+0.009

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[39] Cline and Wilson (1995) in their Endnote 2 refer to a paper by Sabelhaus, who makes the same point, See Sabelhaus (1993) for further exposition: Sabelhaus J. "What is the Distributional Burden of Taxing Consumption?" National Tax Journal. (September 1993). 46 (3): 331- 344.

Two main take-away messages emerge from Table 2:

- The 1992 revenue-neutral VAT tax rate required to match the Minnesota revenues raised by the 1992 prevailing sales tax rate would be somewhat higher if the VAT were 100% apportioned by sales (i.e., "destination-based"). A 100% sales-apportioned VAT would be considerably more regressive than the prevailing state sales tax, particularly in the lower income deciles.
- Increasing the apportionment weight on in-state production substantially reduces the regressivity of the revenue-neutral state-level VAT. **In fact, a 100% production weight (i.e., an "origin-based" VAT) switches the income-related distributional impacts of the VAT from highly regressive to approximately neutral.**

I have not found a comparable empirical study that actually estimates the effects on output, prices, and quality of state-based value-added taxes. Such a study would be a very informative source for the work of our TAG, DOR, and the TSWG.

Conclusions

This essay has sought to provide a sketch of the theory and empirical evidence pertinent to the economic (in contrast to the statutory or "static") incidence of four of the six taxes included in the scenarios for alternative tax structures in Washington state: **the retail sales tax, personal income tax, business and occupation (B&O) tax (a form of gross receipts tax), and value-added tax**. The other two forms of state tax relevant to our TAG work are the corporate income tax and the property tax[40]. The incidence of those two tax forms has been analyzed carefully by Richard Dadzie (August 2021), so those are not included in this essay.

In summary, I interpret the preceding findings on economic incidence as follows:

- **(State-level sales taxes)** Both theory and the extant, but somewhat limited, empirical evidence on state retail sales taxes imply that sales taxes on consumer purchases are approximately fully shifted forward to consumers. More precise and data-based modeling of aggregate supply and demand elasticities would be required to accurately estimate the actual effects of Washington state sales taxes on such key policy outcomes as prices, output, quality, and sales tax collections.

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[40] Analysis of the "margins tax" (similar to the franchise tax" in Texas was beyond the scope of this analysis.

- (**State-level personal state income taxes**) The economic theory in this domain is very well-developed and clarifies the kinds of individual-level and collective (market-level) behavioral responses empirical work on personal income taxes is largely based on the literature regarding federal income taxes, but -- with that important qualification – the theoretical literature provides a good guide to the income tax-driven adjustments in labor supply, capital investment and expected returns, tax avoidance through tax-shelters, and claimed income tax deductions that one might expect. Given the extant empirical evidence, it is **likely that the strongest responses to a personal income tax would be increased use of itemized tax deductions, increased use of tax shelters, and with smaller adjustments on the margin in labor supply and other real resources.** However, cross-state differences in the mobility of labor and capital and in the nature of state tax laws suggest the need to take account of varying market conditions.

- (**State-level B&O taxes**) This tax form has been challenging to model theoretically, but the price increases, FTE labor reductions, and investment reductions observed in Oregon seem consistent with the predictions of Barzel's (1976) incidence framework, which posits that the market will adjust to an (ad valorem type) gross receipts tax by minimizing tax paid, marginal reductions in quantity and quality and deadweight losses. Simulation modeling (perhaps using Monte Carlo approaches) might improve predictions, especially given the paucity of evidence on the relevant elasticities of supply and demand,

- (**State-level value added taxes**) Given the small number of states actually having implemented value added taxes[41], there is limited available information on the impacts of state value-added taxes on the factor inputs of

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[41] My best assessment of the status of state-based VATs is that only New Hampshire currently has a state "value added-like" tax (termed the "Business Enterprise Tax" (BET), which has been in place since 1993. For an earlier paper examining this tax see: Kenyon DA. "A New State VAT: Lessons from New Hampshire." National Tax Journal.(September 1996). 49(3): 381-399. Kenyon (p 384) notes that law enacting the tax did not name it a VAT and that accounting and law firms have not referred to the BET as a VAT. In fact, Kenyon states, "Because the BET levies a single tax rate with no personal deductions, it can be considered a flat tax of the income type." (p384)

The only other state tax that had a tax akin to a VAT in recent times was Michigan's modified "addition method" VAT (the "Single Business Tax") enacted in 1976 and eliminated by legislative enactment of petition-initiated legislation in 2006, effective for tax years beginning after December 31, 2007. Source: Citizen's Research Council of Michigan. "Outline of Michigan Tax System." (April 2014) https://web.archive.org/web/20141205140805/http://www.crcmich.org/TaxOutline/TaxOutline.pdf Accessed October 17, 2021.

labor, land, and capital. The Minnesota study is one example of how the regressivity of income-related differences in sales tax rates and destination-based value added rates could be reversed by origin-based, production-weighted value-added taxes. However, that study did not shed light on market adjustments to value-added taxes on the margins of price, quantity, and quality.

This review of the theory and empirical evidence concerning the economic incidence of four types of taxes is ultimately incomplete and ambiguous in its implications for tax structure policy.[42] In my view, the theory and empirical research seem to narrow the band of uncertainty around the expected direction of tax effects on prices, output, quality, and their income-related distributional impacts. However, **absent a number of cross-validated, general equilibrium studies that model the short and long run behavioral responses (main effects) and interactions with each other of all six forms of state taxation currently being considered in Washington state**, policymakers would be well advised to provide a broad confidence interval around any point estimates of economic incidence.

Commented [d10]: This is not to deny the value of carefully controlled partial equilibrium studies – for example, those which take advantage of **"natural experiments"** (say, in comparable states with similar market conditions), **using "difference in difference" (DID) designs** or comparable study designs. These studies can shed valuable knowledge on behavioral responses to alternative tax structures.

Concluding Questions for Our TAG and DOR and the TSWG

(1) To what extent can estimates from cross-country or cross-corporation (interfirm-level) data inform Washington state-level analysis regarding the expected effects and incidence of various state taxes?

(2) Does existing, high-quality empirical evidence provide sufficient information to build Washington state economic models that:
   (a) would accurately estimate the incidence and directional effects of different tax structures in our state, or
   (b) at least would offer credible qualitative guidance on incidence?"

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[42] One type of tax alternative being considered by the TSWG, DOR, and the TAG is the "margins tax" -- like the one in Texas. I have not examined the incidence of that particular tax alternative in this essay.

FIGURE 1: INCIDENCE OF UNIT SALES TAX ON QUANTITY & PRICE (Constant Quality/Unit)

$/# of good or service

O''

S!: Post-tax Supply (with no quality adjustment)

A   B   B'

P1

P0   S0: Pre-tax Supply

F   G   H

D   C   C'

O'   D0: Demand

# of good or service

O   Q1   Q0
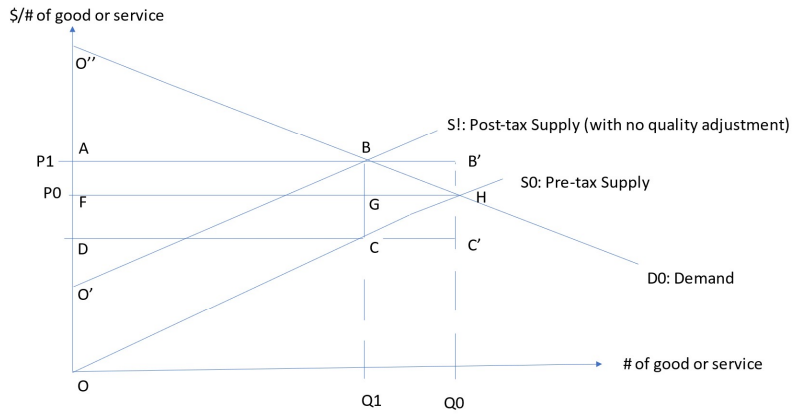
FIGURE 1A: INCIDENCE OF UNIT SALES TAX ON QUANTITY & PRICE (Variable Quality/Unit)

$/# of good or service

O''

S2: Post-Tax Supply with quality adjustment

E2

S1: Post-Tax Supply without quality adjustment

P2

P1   E1   S0: Pre-Tax Supply

P0   E0

D(2): Post-Tax Demand with
quality adjustment

O'

D0: Pre-Tax Demand

# of good or service

O

Q2 Q1   Q0
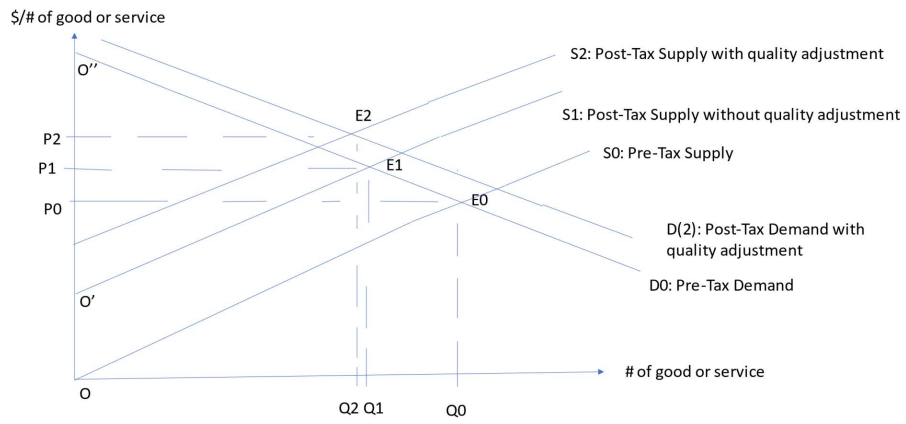
FIGURE 2: INCIDENCE OF AD VALOREM SALES TAX ON QUANTITY, PRICE, AND   QUALITY (Variable Quality/Unit)

$/# of good or service

S1: Post-Tax Supply (w/o quality adjustment)

S2: Post-Tax Supply (after downward quality adjustment)

S0: Pre-Tax Supply (no quality adjustment)

E1

E2

E0

P1

P2

P0

D0: Pre-Tax Demand (before downward quality adjustment)

D2: Post-Tax Demand (after downward quality adjustment)

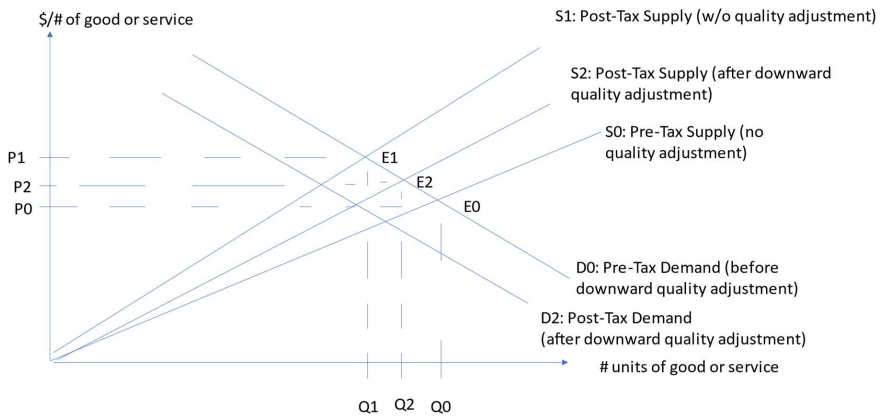# units of good or service

Q1   Q2   Q0

FIGURE 3: INCIDENCE OF B&O TAX ON QUANTITY, QUALITY, AND PRICE (Variable Quantity /Unit)

$/# of good or service

D2: Post-Tax
Demand (after
quality adjustment)

D0: Pre-Tax Demand

E1

P1

Post-Tax Supply (before
quality adjustment)

P2

E2

Post-Tax Supply (after quality adjustment)

PO

E0

S0: Pre-Tax Supply

units of good or service

O

Q1   Q2   QO