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Who will gain from the South Dakota vs. Wayfair Inc. ruling?

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Abstract

The purpose of this paper is to consider which states will gain from the South Dakota vs. Wayfair Inc. (2018) Supreme Court ruling, which allowed US states to collect sales tax revenue on purchases from in-state consumers to out-of-state firms without a physical presence within the state. To do so, we develop a two-region trade model where firms are monopolistically competitive, and regions vary in their sales tax rates. We find that welfare for workers will rise if (1) regions have identical tax rates and transport costs are sufficiently high, (2) one region competes with another that does not utilize a sales tax and (3) if transport costs are sufficiently high and one region has a higher sales tax than its counterpart. If a region does not utilize a sales tax, then welfare for workers in that region unambiguously falls. Additionally, we consider how the policy change alters the Nash-equilibrium tax rates. Under both policies state governments choose a negative tax rate, however the rate is lower after the tax policy change. We find that the policy change is welfare improving, however the benefits decline with the elasticity of substitution between varieties.

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1 Introduction

In the summer of 2018, the US Supreme Court ruled in *South Dakota v. Wayfair, Inc* (2018) that US states could require out-of-state firms without a physical presence within the state to remit sales tax revenue from purchases made by in-state residents. The decision overturned an earlier ruling in *Quill Corp. v. North Dakota* (1992), which deemed that states could not impose a sales tax on goods from sellers who did not have a "physical nexus" in the state. The case stemmed from a decline in sales tax receipts, as reductions in transport costs coupled with increasing internet access allowed consumers to avoid local and state sales taxes by purchasing goods from out-of-state. This further eroded the sales tax base for states, which has been in decline since the late 1970's (see Agrawal and Fox (2017)).

US states and local jurisdictions have considerable freedom in setting their own fiscal policy. As such, there is a great deal of variation in sales tax rates across states. This regional variation in tax policy implies differences in (1) the degree to which state budgets were negatively impacted by the tax leakage from the *Quill Corp. v. North Dakota* decision, and (2) the benefits to states from being able to capture sales tax revenue from out-of-state purchases by in-state residents following *South Dakota v. Wayfair, Inc.*

The purpose of this paper is to provide preliminary results on whether workers in a region will benefit from the ability of state governments to collect the sales tax on purchases made to firms from other regions, when regions vary only in their tax rates. To do so, we develop an extension of the two-region trade model by Haufler and Pflüger (2004). Initially, we consider the case where regional governments are not able to collect the sales tax on purchases made by local consumers for goods from other regions. We then extend the model to allow regional governments to recover the tax revenue from such purchases. We use these results to compare the welfare changes in each region and show that welfare may rise or fall depending on a region's relative tax rates and the level of trade costs.

There are three key arguments in favor of allowing states to tax consumption from out-of-state online retailers. The first is to allow states to recover lost tax revenue from local consumers avoiding the state sales tax by purchasing from out-of-state retailers. The second is that under the previous policy regime, defined by *Quill Corp. v. North Dakota*, in-state firms were penalized by the local sales tax requirement, which artificially raised the price of local goods relative to out-of-state goods (see Baugh et al. (2018)). And this became increasingly onerous, as transport costs between regions declined and improved access to out-of-state goods for consumers. Thus, imposing a sales tax on all goods regardless of origin could increase the relative competitiveness of local retailers. The third issue is that the variation in state sales tax rates and the inability of state governments to impose a sales tax on out-of-state retailers could motivate firms to locate in states with low or no sales tax.

Relevant to our analysis is a set of literature found in public finance, international trade, and economic geography which emerged in response to the increasing market integration from the EU, and considered the relative benefits of an origin- or destination-based tax on consumption.[1] However, the limits to tax collection imposed by the *Quill Corp.* ruling differ from the debate surrounding the use of an origin- or destination-based tax.

[1] See Agrawal and Fox (2017) for a survey.

Specifically, in a two-region setting, under the destination principle, consumers face a single tax, which is the prevailing tax rate where they reside. Under the origin principle, there are two tax rates: one rate for the purchase of local goods and one rate for the purchase of foreign goods, both of which consumers will face. However, in our model there are three tax rates, the prevailing rate in each region as well as the tax rate on out-of-state purchases, which is simply zero, and creates a tax leakage as no tax revenue is collected on purchases made from out-of-state firms. Therefore, as in the destination-based structure, consumers do not face the tax rate prevailing in the other region; however, as in the origin-based structure, consumers face different tax rates for foreign purchases relative to local purchases. Thus, in our analysis, internet sales can be viewed as a tax haven as in Agrawal (2021).

The paper proceeds as follows. In Section 2, we develop the model for the two tax regimes and consider the short-run change in the regional welfare level. In Section 3, we consider the impact of the tax policy change on the Nash-equilibrium tax rates. In Section 4, we conclude and suggest extensions that could enrich our results.

2 The Model

Consider an economy with two regions indexed by $i, j = 1, 2$, with an equal supply of N immobile workers. Each region imposes a sales tax, t_i, with all tax revenue returned as a lump-sum transfer, T_i^l, to residents within each region. We consider two policy regimes indexed by the superscript $l = 1, 2$, which are briefly summarized below:

Regime 1: Limited tax collection

Regional governments collect sales tax revenue for purchases of goods produced and consumed within the region. Sales from one region to another are untaxed.

Regime 2: Full tax collection

Regional governments collect sales tax revenue on all taxable goods regardless of origin. In this section, tax rates are assumed to be exogenous to focus on the initial impact of the policy switch.[2] In the following section, we consider Nash-equilibrium tax rates.

Workers have preferences over a numeraire homogeneous good, h_i^l, and a CES aggregate, M_i^l, over the set, ω_i, of horizontally differentiated varieties of manufactured goods with measure K_i^l, respectively. We denote by $m_i^l(\omega_i)$ as the demand for a distinct variety of a manufactured good, with $p_{ij}^l(\omega_i)$ the price of a variety produced in j and consumed in i. Workers receive wages y_i^l and face the regional sales tax on some or all manufactured varieties, depending on the policy regime.

All residents are assumed to have the same quasilinear preferences given by

$$h_i^l + \beta ln\, M_i^l, \quad M_i^l = \left(\int_{\omega_i \in K_i^l} (m_i^l(\omega_i))^{\frac{\sigma-1}{\sigma}} d\omega_i + \int_{\omega_j \in K_j^l} (m_j^l(\omega_j))^{\frac{\sigma-1}{\sigma}} d\omega_j \right)^{\frac{\sigma}{\sigma-1}}, \quad (1)$$

where M_i^l is a CES aggregate over manufactured varieties, and $\sigma > 1$ is the elasticity of substitution between varieties. These preferences imply a "love-of-variety" by consumers

[2] In the short- to medium-run, this assumption seems reasonable – particularly, as a number of states face various restrictions in adjusting tax rates (see Lav and Williams (2010)). For example, in Colorado, any tax increase must be approved through a ballot measure (McGuire and Rueben (2006)). Similarly, Andersson and Forslid (2003) consider the role of exogenous differences in income tax rates across regions on the location choice of mobile workers.

over manufactured goods, such that there is an external benefit from a larger number of firms. The parameter β represents workers' intensity of preferences for the consumption of manufactured varieties.

2.1 Regime 1

Under regime 1, consumers in region i have access to the K_i^1 local varieties which face the sales tax, and K_j^1 imported varieties that do not. The budget constraint can then be written as

$$y_i^1 + T_i^1 = h_i^1 + \underbrace{\int_{\omega_i \in K_i^l} (1+t_i) p_{ii}^1 m_{ii}^1}_{\text{Taxed Local Varieties}} + \underbrace{\int_{\omega_i \in K_j^l} p_{ij}^1 m_{ij}^1}_{\substack{\text{Untaxed Imported} \\ \text{Varieties}}} . \tag{2}$$

Demand functions are then given by

$$h_i^1 = y_i^1 + T_i^1 - \beta, \quad m_{ii}^1 = \frac{\beta((1+t_i)p_{ii}^1)^{-\sigma}}{(P_i^1)^{1-\sigma}}, \quad m_{ij}^1 = \frac{\beta(p_{ij}^1)^{-\sigma}}{(P_i^1)^{1-\sigma}}, \quad M_i^1 = \frac{\beta}{P_i^1}, \tag{3}$$

where

$$P_i^1 = \left(\int_{\omega_i \in K_i^1} ((1+t_i)p_{ii}^1)^{1-\sigma} + \int_{\omega_i \in K_j^1} (p_{ij}^1)^{1-\sigma} \right)^{\frac{1}{1-\sigma}} , \tag{4}$$

is the price index for manufactured varieties, which takes into account the different tax treatment of local and foreign varieties.

2.2 Production

The only input in the economy is labor. A homogenous good, h_i, is freely traded across regions and produced under a constant returns to scale technology. This good is chosen as the numeraire. Each worker produces one unit of output of the homogenous good, implying that the wage, y_i^l, in each region is equal to 1, which we assume to hold throughout the paper.

The manufacturing sector is monopolistically competitive, using only labor in production with total costs given by $TC_i^l = x_i^l + F$, where x_i^l is variable outputs and F are the fixed labor requirements needed for production. There are transport costs, measured in terms of the manufactured good, to ship goods from one region to another. Specifically, we follow Haufler and Pflüger (2004) and assume that for 1 unit of a manufactured variety produced in i and consumed in j, $d > 1$ units must be shipped with the remaining units, $d-1$, used in the transportation of the good. There are assumed to be no transport costs for varieties within a region. Profit maximization by firms yields the local and foreign prices for a variety produced in i as $p_{ii} = \frac{\sigma}{(\sigma-1)}$, and $p_{ji} = \frac{d\sigma}{(\sigma-1)}$. The zero profit condition pins down the level of output and total cost faced by each firm with $x_i = (\sigma-1)F$ and $TC_i = \sigma F$. As these terms are constant, we have dropped the superscript. The price index for manufactured varieties can then be written as

$$P_i^1 = \left(\left((1+t_i) \left(\frac{\sigma}{\sigma - 1} \right) \right)^{1-\sigma} K_i^1 + \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} K_j^1 \right)^{1/(1-\sigma)} . \tag{5}$$

We assume a balanced-budget constraint by the regional government such that aggregate transfers must equal the aggregate revenue from the sales tax,

$$T_i^1 N = t_i p_{ii} m_{ii} K_i^1 N \implies T_i^1 = t_i p_{ii} m_{ii} K_i^1, \tag{6}$$

where (6) takes into account that revenue is collected solely from purchases made by local consumers from local firms.

The equilibrium condition that firm revenue in region i equals expenditure by consumers in both regions is given by

$$\sigma F = \beta \left(\frac{\sigma}{\sigma - 1}\right)^{1-\sigma} \left(\frac{(1+t_1)^{-\sigma} N}{(P_i^1)^{1-\sigma}} + \frac{d^{1-\sigma} N}{(P_j^1)^{1-\sigma}}\right). \tag{7}$$

Given that revenue per firm is equal across regions, we use (7) and take the difference between a firm in region i and j to generate the relationship

$$((1+t_1)^{-\sigma} - \phi)\frac{N}{(P_1^1)^{1-\sigma}} = ((1+t_2)^{-\sigma} - \phi)\frac{N}{(P_2^1)^{1-\sigma}}, \tag{8}$$

where $\phi \equiv d^{1-\sigma}$ is a measure of freeness of trade, with trade costless when $\phi = 1$. We will assume that $\phi < min[(1+t_1)^{-\sigma}, (1+t_2)^{-\sigma}]$, such that the terms in brackets in (8) are positive.[3]

Inserting (8) into (7), we can write the price indices in each region as

$$(P_i^1)^{1-\sigma} = \frac{\beta}{\sigma F}\left(\frac{\sigma}{\sigma - 1}\right)^{1-\sigma} \left(\frac{(1+t_i)^{-\sigma}(1+t_j)^{-\sigma} - \phi^2}{(1+t_j)^{-\sigma} - \phi}\right) N. \tag{9}$$

Combining (9) with (5) provides two equations in two unknowns to solve for K_1^1 and K_2^1 yielding,

$$K_i^1 = \frac{\beta}{\sigma F}\left(\frac{(1+t_i)^{-\sigma}(1+t_j)^{-\sigma} - \phi^2}{(1+t_i)^{1-\sigma}(1+t_j)^{1-\sigma} - \phi^2}\right)\left(\frac{(1+t_j)^{1-\sigma}}{(1+t_j)^{-\sigma} - \phi} - \frac{\phi}{(1+t_i)^{-\sigma} - \phi}\right) N. \tag{10}$$

Using the fact that in equilibrium zero profits are made such that total revenue goes to wages in the manufacturing sector, we can write $K_i^1 \sigma F$ as the number of workers in the manufacturing sector in region i. An interior equilibrium in which both regions are active in both sectors will hold, provided that this value is strictly less than N. We assume that the parameters are such that this holds throughout the analysis. Combining (10) with (6) yields the transfer payment

$$T_i^1 = \beta t_i (1+t_i)^{-\sigma} \left(\frac{(1+t_j)^{1-\sigma} - \phi\frac{(1+t_j)^{-\sigma} - \phi}{(1+t_i)^{-\sigma} - \phi}}{(1+t_i)^{1-\sigma}(1+t_j)^{1-\sigma} - \phi^2}\right). \tag{11}$$

Inserting (3), (9), and (11) into (1) yields the indirect utility of a worker in region i as

$$V_i^1 = 1 + \beta t_i (1+t_i)^{-\sigma} \left(\frac{(1+t_j)^{1-\sigma} - \phi\frac{(1+t_j)^{-\sigma} - \phi}{(1+t_i)^{-\sigma} - \phi}}{(1+t_i)^{1-\sigma}(1+t_j)^{1-\sigma} - \phi^2}\right) + \frac{\beta}{\sigma - 1} ln \frac{(1+t_i)^{-\sigma}(1+t_j)^{-\sigma} - \phi^2}{(1+t_j)^{-\sigma} - \phi} + \kappa, \tag{12}$$

where $\kappa \equiv -\beta - \beta ln \frac{\beta}{\sigma F}(\frac{\sigma}{\sigma - 1})^{1-\sigma} N$ is a collection of constant terms independent of tax rates and trade costs.

[3] This is consistent with evidence suggesting consumers favor local over foreign varieties (see Ellison and Ellison (2009) and Hortaçsu and Syverson (2015)).

2.3 Regime 2

We now consider the case when each region is able to collect sales taxes on manufactured goods independent of origin. The changes work through two channels: the manufacturing price index and the transfer to workers within the region. The price for each variety remains the same. The budget constraint is now given by

$$1 + T_i^2 = h_i^2 + (1 + t_i) \left(p_{ii} m_{ii}^2 K_i^2 + p_{ij} m_{ij}^2 K_j^2 \right), \tag{13}$$

where all manufactured varieties are taxed. The demand for a manufactured variety from each region and the corresponding price index can be written as

$$m_{ii}^2 = \frac{\beta p_{ii}^{-\sigma}}{(1+t_i)(P_{mi}^2)^{1-\sigma}}, \quad m_{ij}^2 = \frac{\beta p_{ij}^{-\sigma}}{(1+t_i)(P_i^2)^{1-\sigma}}, \quad P_i^2 = \frac{\sigma}{\sigma - 1} \left(K_i^2 + \phi_i K_j^2 \right)^{1/(1-\sigma)}. \tag{14}$$

The lump-sum transfer is now

$$T_i^2 = \beta \frac{t_i}{1 + t_i}. \tag{15}$$

Using the same method as above, we can write the manufacturing price index as

$$(P_i^2)^{1-\sigma} = \frac{\beta}{\sigma F} \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} (1 + \phi) \frac{N}{1 + t_i}. \tag{16}$$

Combining (16) with the manufacturing price index in (14) yields the number of manufactured varieties produced in region i:

$$K_i^2 = \frac{\beta}{\sigma F} \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} \left(\frac{1}{1 - \phi} \right) \left(\frac{1}{1 + t_i} - \frac{\phi}{1 + t_j} \right) N. \tag{17}$$

Finally, the indirect utility function is now written as

$$V_i^2 = 1 + \beta \frac{t_i}{1 + t_i} - \frac{\beta}{\sigma - 1} ln\,(1 + t_i) + \frac{\beta}{\sigma - 1} ln\,(1 + \phi) + \kappa. \tag{18}$$

2.4 Comparison of the Two Tax Regimes

We now consider under which conditions the workers in a region will gain from the transition in tax regimes. We denote by $\Delta V_i = V_i^2 - V_i^1$ as the difference in welfare between Regime 2 and Regime 1. Given that the demand for the homogenous good is only impacted through the change in transfer payments, it is straightforward to verify that

$$\Delta V_i = (T_i^2 - T_i^1) - \beta ln \frac{P_i^2}{P_i^1}. \tag{19}$$

Thus, (19) indicates that welfare will rise if the increase in transfer payments is sufficiently high to offset an increase in the price index. We use (12), and (18) to rewrite (19) as

$$\Delta V_i = \beta \frac{t_i}{1 + t_i} \left(1 - (1 + t_i)^{1-\sigma} \left(\frac{(1 + t_j)^{1-\sigma} - \phi \frac{(1+t_j)^{-\sigma} - \phi}{(1+t_i)^{-\sigma} - \phi}}{(1 + t_i)^{1-\sigma} (1 + t_j)^{1-\sigma} - \phi^2} \right) \right) + \frac{\beta}{\sigma - 1} ln \frac{\frac{1+\phi}{1+t_i}}{\left(\frac{(1+t_i)^{-\sigma}(1+t_j)^{-\sigma} - \phi^2}{(1+t_j)^{-\sigma} - \phi} \right)}. \tag{20}$$

This is a complicated nonlinear function with two tax parameters. To gain intuition, we focus initially on three extreme examples. To begin, suppose that both regions have identical tax rates. In this case, (20) collapses to

$$\Delta V_i|_{t_i=t} = \beta\frac{t}{1+t}\left(1-\left(\frac{(1+t)^{1-\sigma}}{(1+t)^{1-\sigma}+\phi}\right)\right)+\frac{\beta}{\sigma-1}ln\frac{\frac{1+\phi}{1+t}}{(1+t)^{-\sigma}+\phi}. \tag{21}$$

One can verify that the first term on the RHS of (21) is positive, while the second term will be positive when $\phi < (1-(1+t)^{1-\sigma})/t$. Thus, workers will gain from the tax regime change if transport costs are sufficiently high. This is a somewhat surprising result, as it suggests that the additional tax payments actually reduce the manufacturing price index. The intuition stems from the assumption that transport costs on imported goods are high relative to taxes paid on local goods. Given that the elasticity of substitution over varieties is greater than one, imposing the sales tax on foreign goods leads to a more than proportional substitution towards local goods. This effect generates a net savings for workers by avoiding transport costs, which lowers the price index, in turn.

Now suppose that region i does not employ a sales tax. Then (20) reduces to

$$\Delta V_i|_{t_i=0} = \frac{\beta}{\sigma-1}ln\frac{(1+\phi)((1+t_j)^{-\sigma}-\phi)}{(1+t_j)^{-\sigma}-\phi^2} < 0. \tag{22}$$

The intuition for this result is straightforward. When region i does not employ a sales tax, no additional revenue is generated from the change in the tax regime. However, given that additional taxes are charged in other regions, there is a decline in aggregate demand which reduces the number of available varieties and thus raises the price index in region i. Therefore, regions that utilize a sales tax impose a negative externality on regions that do not through a reduction in varieties of manufactured goods.

We now consider the case where $t_j = 0$. Eq. (20) can be written after some manipulation as

$$\Delta V_i|_{t_j=0} = \beta\phi\frac{t_i}{1+t_i}\left(\underbrace{\frac{(1-\phi)(1+t_i)^{1-\sigma}-\phi(1+t_i)^{-\sigma}+\phi^2}{((1+t_i)^{-\sigma}-\phi)((1+t_i)^{1-\sigma}-\phi^2)}}_{(+)}\right)+\frac{\beta}{\sigma-1}ln\underbrace{\frac{(1-\phi^2)}{(1+t_i)\left((1+t_i)^{-\sigma}-\phi^2\right)}}_{(+)} > 0. \tag{23}$$

In this scenario, there are two effects.[4] First, the change in tax policy raises additional tax revenue which, in turn, increases transfers to workers in the region. Second, the increase in the effective price of goods from region j from the additional tax payments leads to substitution towards goods in region i, which are free of transport costs. This substitution lowers the manufacturing price index for workers in region i.

In order to consider a more general setting, we study the impact of the change in the policy regime numerically by setting (20) equal to 0 and simulating the threshold tax rates in region i, for a given tax rate in t_j, that will keep welfare constant for workers in the region after the change in the policy regime. Figure 1 provides the results for various values of σ. What is evident from the figure is that workers in region i will tend to benefit from the policy change if region i has a relatively higher sales tax rate than region

[4] The sign of the first term in (23) stems from the fact that the numerator is monotonically decreasing in ϕ and positive at $\phi = 0$ and $\phi = 1$, implying that the term will be positive for any $\phi < (1+t_i)^{-\sigma}$, which holds by assumption.

j. Additionally, as σ rises, the threshold value of t_i falls, as workers receive less benefit from variety and thus more readily substitute goods from region i for those from region j to avoid transport costs. However, as σ rises further, the threshold in region i begins to rise. Intuitively, as the benefits from variety fall with an increase in σ, the negative impact of the tax rates on the price index begin to rise and become more pronounced the higher the tax rates.

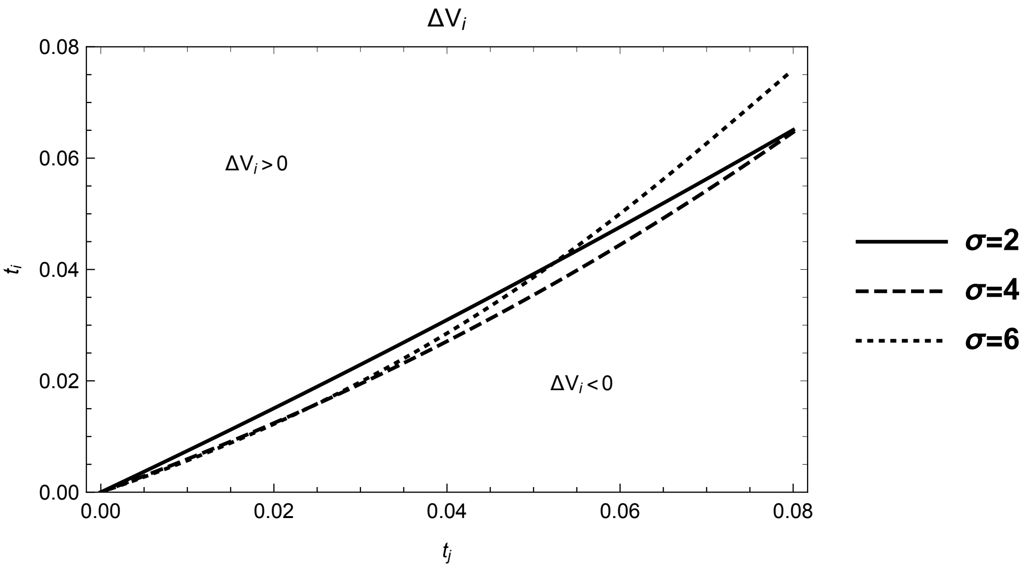


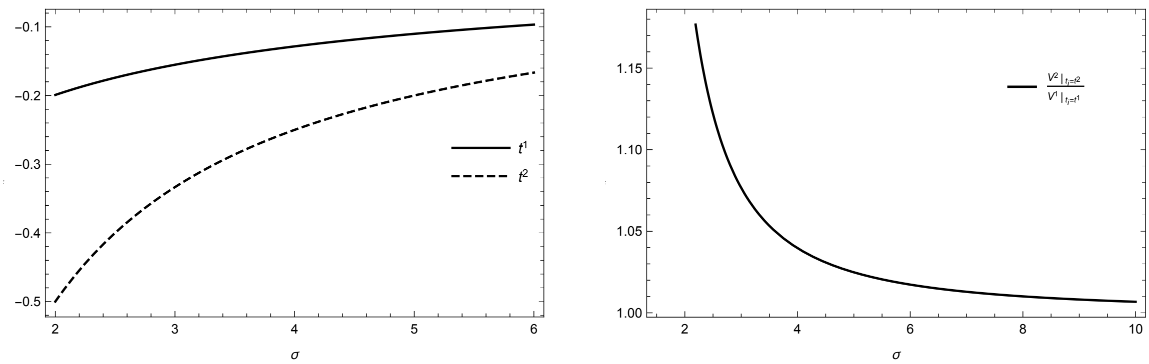
Figure 1: Threshold values of t_i for given values of t_j such that workers in region i receive the same level of welfare under both tax regimes. Thresholds are calculated for various values of σ. For values above the threshold, workers in region i see an increase in welfare in the transition from Regime 1 to Regime 2, while for values below the threshold welfare for workers declines. Note: Parameter values used in the figure are $\beta = .3$, $\tau = 1.25$.

3 Nash Equilibrium Tax Rates

In the above analysis, we focused on the short-run impact of a policy change wherein tax rates are held fixed. However, in the long-run, policymakers would likely adjust tax rates in response to the policy change. In this section, we consider how the Nash-equilibrium tax rates vary under each policy and whether the transition from Regime 1 to Regime 2 is welfare improving for workers. We assume that regional governments choose the tax rate by maximizing the welfare of local workers. Specifically, they choose tax rates to maximize (12) under Regime 1 and (18) under Regime 2. Given that both regions are *ex-ante* identical, the Nash-equilibrium tax rates will be the same for both. We denote by t^l as the tax rate chosen by the regional government under each policy regime.

A standard result in tax competition models with positive consumption externalities is that tax rates should be negative to subsidize additional consumption (see for Lockwood (2003) and Haufler and Pflüger (2004)), and this continues to hold in our model. In Supplementary Appendix A, we show that under Regime 2, the regional governments maximization problem yields simple, closed-form solutions with $t^2 = -1/\sigma$. Thus, the regional government chooses a negative tax rate, such that the after-tax price of each variety is equal to marginal cost. Unfortunately, under Regime 1, a closed-form solution is out of reach and we must proceed numerically. In Fig. 2a, we plot both t^1 and t^2 as functions of σ. It is evident that the subsidy under Regime 1 is always strictly lower than under Regime 2, and both subsidies are declining in σ as the benefit from consumption externalities declines.[5]

Using the above results, we then consider whether the policy switch from Regime 1 to 2 – and the corresponding adjustment in Nash Equilibrium tax rates – leads to a welfare improvement for workers. Fig. 2b plots the welfare level of workers under Regime 1 relative to Regime 2 under the Nash-equilibrium tax rates, $(V^2|_{t_i=t_j=t^2})/(V^1|_{t_i=t_j=t^1})$. It is clear from the figure that the regime change is welfare improving; however, the magnitude of the gains decline with σ, as the benefit from a more expansive set of varieties diminishes.



(a) (b)

Figure 2: Panel (a) shows Nash equilibrium tax rates under Regime 1 and Regime 2. Panel (b) shows the relative welfare for workers in region i between Regime 2 and Regime 1 when evaluated at the corresponding Nash equilibrium tax rates. Note: Parameter values used in the figure are $\beta = .3$, $\tau = 1.25$.

4 Conclusion

This paper developed a regional trade model to consider the conditions under which a region would benefit from the *South Dakota v. Wayfair, Inc* (2018) ruling, which allowed state government to collect the state sales tax on purchases made by local residents from out-of-state firms. Our preliminary results suggest that when transport costs are sufficiently high and regions differ only on their tax rates, workers in regions with higher relative sales tax rates tend to benefit. We then considered how the tax policy changes would alter the Nash-equilibrium tax rates. In both cases, the regional government sets a negative sales tax that is funded through a flat tax, however, the tax is lower under Regime 2. The policy change is welfare improving, but the benefits are declining in the elasticity of substitution between varieties.

[5] Our results are not contingent on the assumption that all tax revenue is transferred back to households. In Supplemental Appendix B, we show that if tax revenue is used to fund a public good and the regional government has both a flat tax and a proportional sales tax available, then the flat tax will fund both the public good and the subsidy on consumption through a negative sales tax.

Our analysis provides a snapshot of the first-order effect of the tax policy change when regions vary only in their tax instruments. However, an expansion of the model that takes other empirical differences into account would provide a richer set of results. Of particular interest would be considering regional differences in market size or worker productivity, as well as the possibility of corner solutions. These changes would, in turn, alter the Nash-equilibrium tax rates.

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