

# Sales Taxes, Spatial Agglomeration, and the Internet

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“...the physical presence rule of *Quill* is unsound and incorrect. The Court’s decisions in *Quill Corp. v. North Dakota* and *National Bellas Hess, Inc. v. Department of Revenue of Ill.*, should be, and now are, overruled.” - *South Dakota v. Wayfair, Inc., et al.* (June 21, 2018)

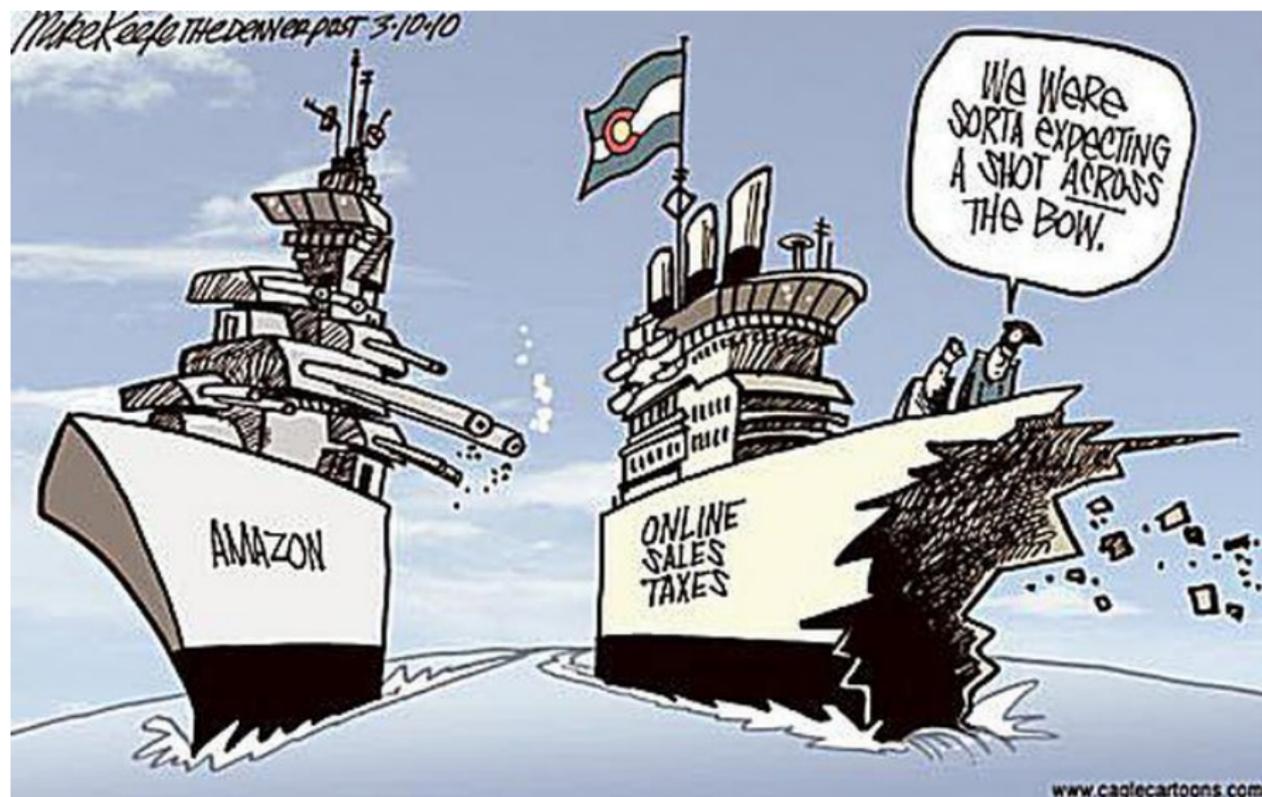
# Refrigeration and Automobiles.... Chain Stores in 1920s...



# Barcodes... The Walmart Economy....



# The Internet... Online Retail Vendors....



## Motivation: A New Direction

- The “standard” model of commodity tax competition (Nash non-cooperative equilibrium in sales tax rates with perfectly competitive firms under origin principle, Kanbur and Keen 1993, AER) needs updating.
  - ▶ Shopping patterns are very “lumpy” (**retail shopping centers**) and the standard model is better suited for competition between countries rather than localities.
  - ▶ **Internet commerce** – increasingly, and with no end in sight – presents new challenges for commodity taxation, and for agglomerations with 75% of rural customers shopping online.
  - ▶ With the average state having 66% of large online vendors remitting retail sales taxes – despite popular press – many online transactions are subject to tax and this will increase (*South Dakota v. Wayfair*) meaning the Internet is a technology to help enforce destination based taxation.

## Trends in Commodity Taxation by Jurisdiction Size



# Outline / Preview of Results

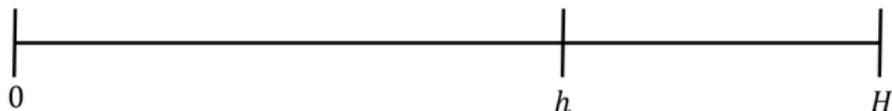
- Preview of results (subject to qualifications):
  - ▶ A) Increase in agglomeration: Big towns can “tax export” and capture “agglomeration rents,” but agglomeration also positively affects the tax rate (revenues) of the small town. Inter-jurisdictional rate & revenue differentials **widen** as a result of increases in retail agglomeration.
  - ▶ B) Decline in online costs: Big towns lower tax rates and lose revenue, but small jurisdictions raise tax rates and gain revenue as Internet costs fall. Inter-jurisdictional rate & revenue differentials **shrink!**
- Last point runs contrary to the “conventional wisdom” that online shopping lowers tax rates.
  - ▶ Taxes rise in the small jurisdiction, despite tax competition becoming more intense as a result of the Internet.

# Institutions

- ~~Firms are only required to remit sales taxes from consumers in a state where the firm has nexus (Quill Corp. v. North Dakota).~~
  - ▶ ~~If a firm has nexus in a state, it has nexus in every locality in state and must remit the appropriate local sales tax rate in the town/county of residence.~~
- New standard (June 21, 2018): “[S]uch a nexus is established when the taxpayer [or collector] ‘avails itself of the substantial privilege of carrying on business’ in that jurisdiction.”
  - ▶ “nexus is clearly sufficient based on both the economic and virtual contacts respondents have with the State.”
- Bruce, Fox and Luna (2016) purchase products from the 200 largest online retailers and find that 65% of transactions in the average state have tax remitted by seller.
  - ▶ And soon to be increasing given *South Dakota v. Wayfair!*

# The Model

- Standard models of commodity tax competition: Kanbur and Keen (1993), simplified in Nielsen (2001).
- Governments:
  - ▶ We focus on two towns that differ in size ( $h$  vs.  $H - h$ ) in a *monocentric area*. Solved as a Hotelling line segment assuming all transport is radial. The small number of neighbors  $\Rightarrow$  spatial strategic interactions are unavoidable.
  - ▶ The towns set tax rates  $T$  (big jurisdiction) and  $t$  (small jurisdiction).

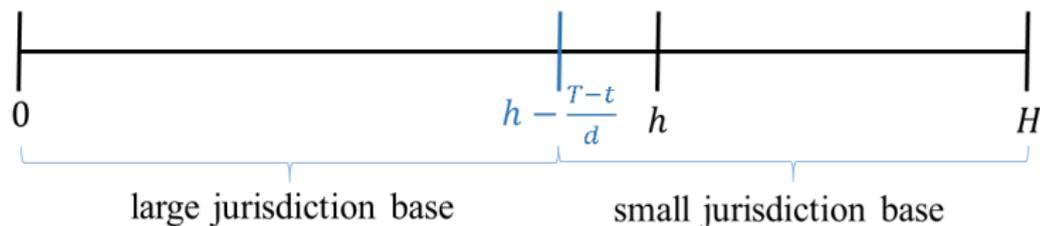


- Nash non-cooperative game in  $(T, t)$ .
  - ▶ Payoffs: each seeks to maximize revenues.
  - ▶ Our emphasis is on **constraints** implied by “transactions technology” (agglomeration and Internet).

# The Model: Non-specialized Good

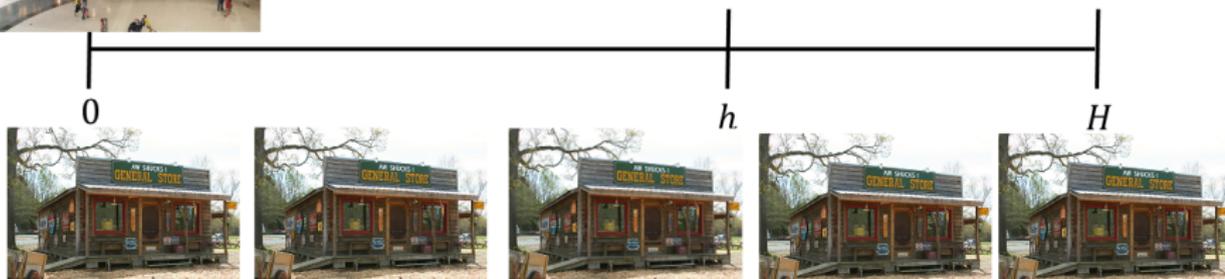
- Consumers with constant density:
  - ▶ Choice for households at a location  $x_N$  miles from the border is where to buy the non-specialized good, not how much of the good to buy.
  - ▶ Purchase the good abroad (incurring a trip cost of  $dx_N$ ) if:

$$x_N \leq x_N^* := \frac{T-t}{d} \text{ and } T \geq t. \quad (1)$$



# Adding Agglomeration

- **Specialized goods** (shopping mall purchases): consumers demand  $S$  units of the good if price is relatively low.
- The specialized good can only be purchased at a point of agglomeration / the city center / CBD (point 0).
  - ▶ Cost of driving to obtain good is  $D$  per mile.



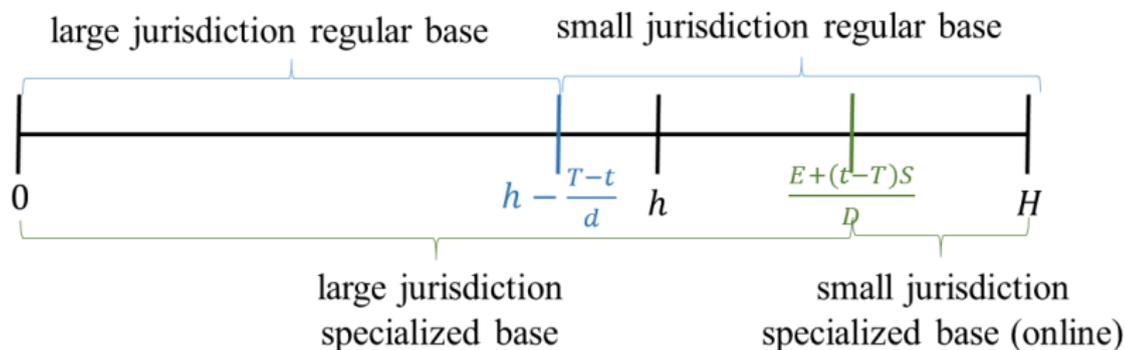
# Adding the Internet

- Theoretical models of taxation do not include online shopping.
  - ▶ Adding online shopping is valuable because the technology may have parasitic or revenue enhancing effects. And we want – in general – to know how “technological” shocks affect equilibrium policies – especially with strategic interactions.
- Our model is stylized in that we assume:
  - ▶ The Internet does not change the quantity demanded of goods or pre-tax prices.
  - ▶ Only the specialized good can be purchased online.
- All online transactions are taxed at destination (now likely post-*S.D. v. Wayfair*).
  - ▶ However, non-specialized good remains origin based, meaning tax system features destination & origin components.

## Consumer Decision With Online Shopping

- Online sales of specialized goods are taxable at the destination sales tax rate. **Perfect enforcement.**
- Consumers in the city pay a tax rate of  $T$  if they buy online or if they buy brick and mortar, so their decision can be ignored.
- Consumers in the hinterland buy online (with shopping cost  $E$ ) and pay  $t$  instead of  $T$  if:

$$(1+t)S + E \leq (1+T)S - Dx_S \implies x_S \leq x_S^* := \frac{E + (t-T)S}{D} \quad (2)$$



Assuming that  $T > t$  and  $E$  not too high relative to  $D$ .

# Three Possible Regimes: Endogenously Determined

- Revenue (large jurisdiction):

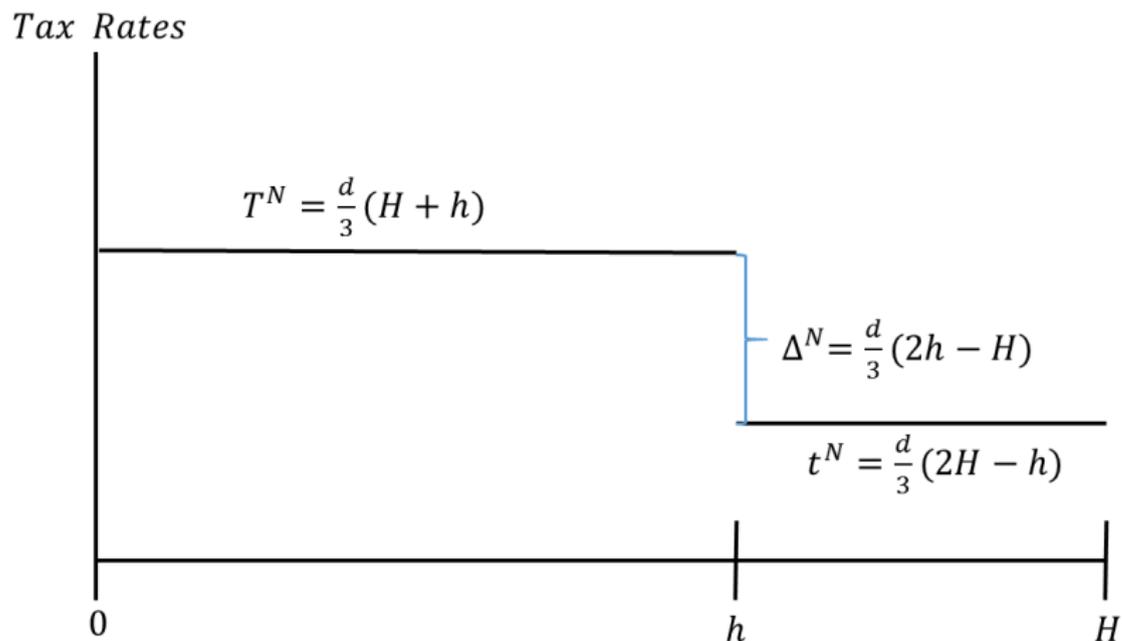
$$R(T, t) = T \left( h + \frac{t-T}{d} \right) + T \begin{cases} SH & \text{if } x_S^* \geq H & \text{I: "Past"} \\ S \left( \frac{E+(t-T)S}{D} \right) & \text{if } x_S^* \in [h, H] & \text{II: "Present"} \\ Sh & \text{if } x_S^* \leq h & \text{III: "Future"} \end{cases} \quad (3)$$

- Revenue (small jurisdiction):

$$r(t, T) = t \left( H - h + \frac{T-t}{d} \right) + t \begin{cases} 0 & \text{if } x_S^* \geq H & \text{I: "Past"} \\ SH - S \left( \frac{E+(t-T)S}{D} \right) & \text{if } x_S^* \in [h, H] & \text{II: "Present"} \\ S(H-h) & \text{if } x_S^* \leq h & \text{III: "Future"} \end{cases} \quad (4)$$

- Model invites (a) comparisons among regimes and (b) comp. statics analysis with respect to parameters. These constitute the main results of the paper, and I will focus the remaining limited time on the most important and sharpest results.

# Solution $S = 0$ : Kanbur and Keen (1993) & Nielsen (2001)

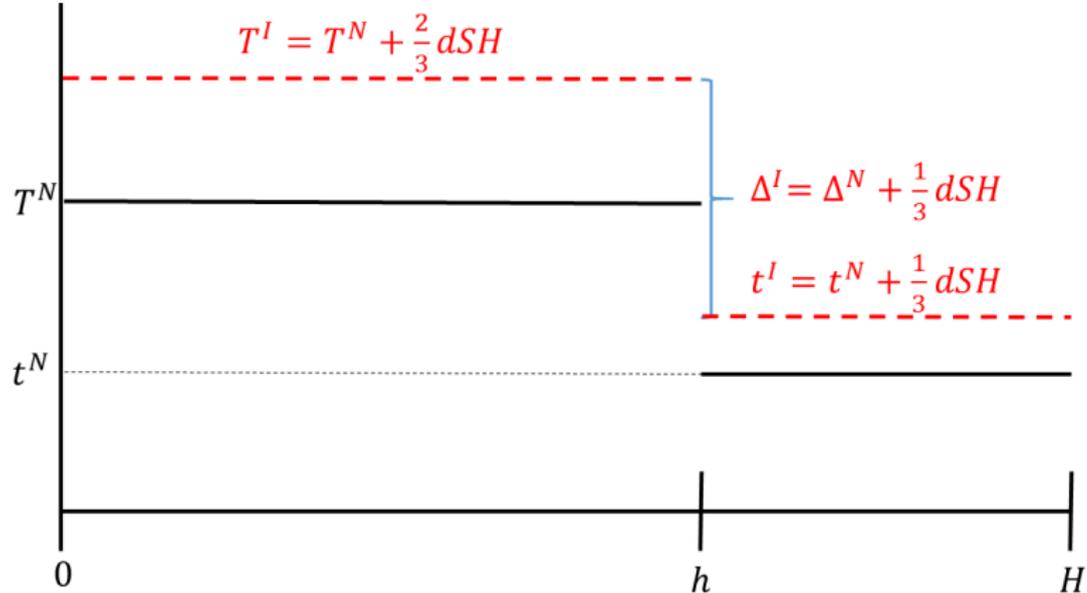


Nash tax rates as  $(T^N, t^N)$  in the model with only non-specialized good consumption.

# Regime I: "Past": Nobody Buying Online (High E)

[Discussion]

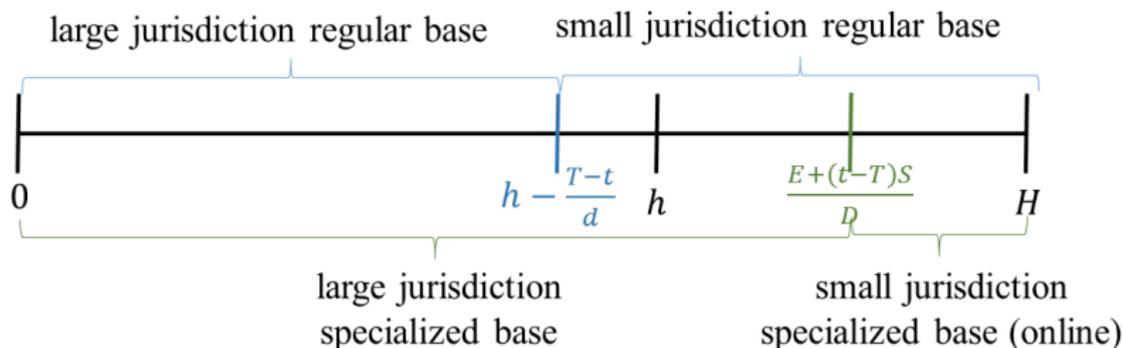
Tax Rates



Nash tax rates as  $(T^I, t^I)$  in the model when  $E$  is sufficiently high to always deter online shopping.

## The Present Regime: Some (But Not All) Buy Online

- Of special interest is the current regime where some residents of the small jurisdiction buy the specialized good online.



- Possible changes in the current regime include:
  - ▶ Easier access to high speed Internet.
  - ▶ Declines in costs of obtaining goods online (Amazon enters many markets so consumers get products quicker). Drone delivery to reduce wait times?
  - ▶ Added transparency of online seller ratings.
  - ▶ Possible shift towards more specialized consumption.

# Equilibrium With Online Shopping

[More]

- The Nash tax rates  $(T'', t'')$  with some online shopping are able to be decomposed into two effects:

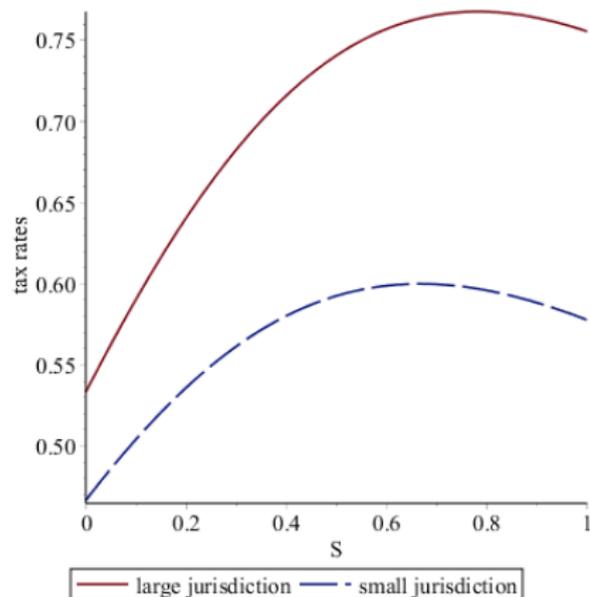
$$\begin{aligned} T'' &= \underbrace{\frac{dD}{(dS^2 + D)}}_{1/\text{base externality}} \times \underbrace{\left[ \frac{T'}{d} + \frac{1}{3}S \left( \frac{E}{D} - H \right) \right]}_{\text{equilibrium size}} \\ t'' &= \underbrace{\frac{dD}{(dS^2 + D)}}_{1/\text{base externality}} \times \underbrace{\left[ \frac{t'}{d} + \frac{1}{3}S \left( H - \frac{E}{D} \right) \right]}_{\text{equilibrium size}} \end{aligned} \quad (5)$$

- And the tax differential is:

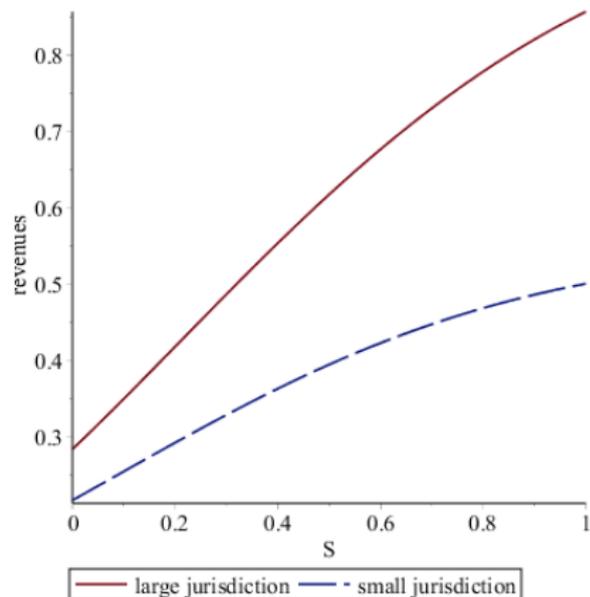
$$\Delta'' = \frac{D}{(dS^2 + D)} \left[ \Delta' + \frac{2}{3}dS \left( \frac{E}{D} - H \right) \right] \quad (6)$$

# Equilibrium

## Tax Rates



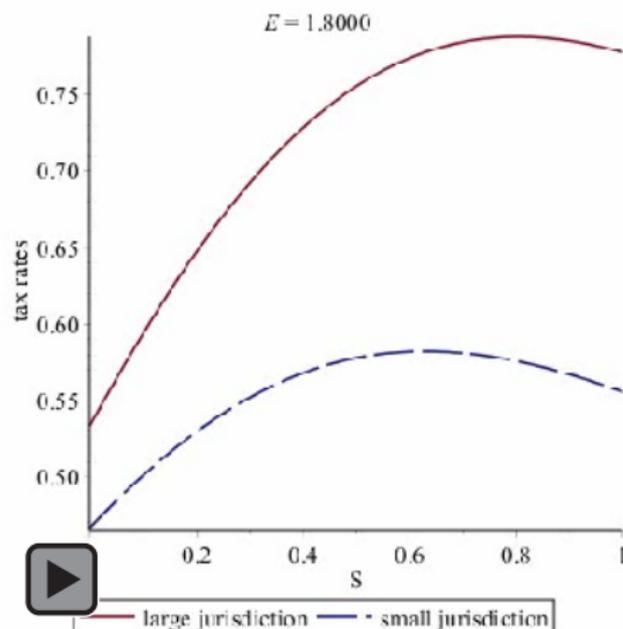
## Tax Revenue



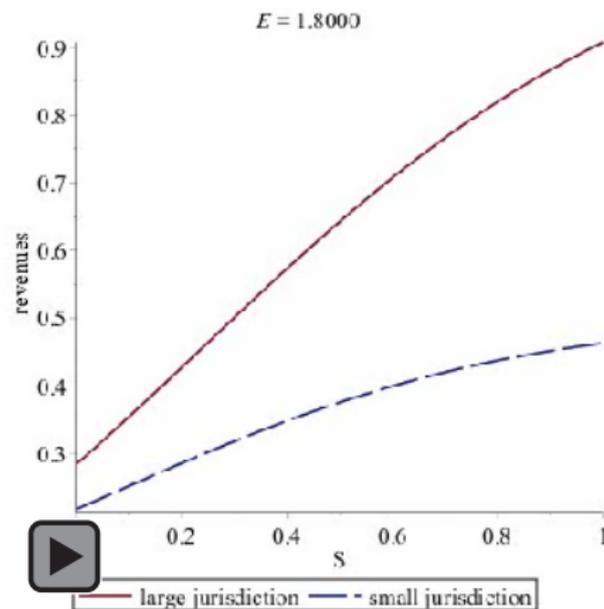
# Comparative Statics: Decline in $E$

[Figure]

## Tax Rates



## Tax Revenue



## Comparative Statics: Decline in $E$

- What happens to tax rates?

$$-\frac{\partial T^H}{\partial E} < 0 \quad -\frac{\partial t^H}{\partial E} > 0$$

- What happens to tax revenue?

$$-\frac{\partial R^L}{\partial E} < 0 \quad -\frac{\partial r^O}{\partial E} > 0$$

- What happens to combined tax revenue?

$$-\frac{\partial(R^O + r^O)}{\partial E} < 0$$

- This does not improve global revenue because online shopping shifts some of the specialized tax base from a high-tax to a low-tax jurisdiction.

# Intuition

- **Surprising result:** taxable online transactions act create “downward” pressures in agglomerated jurisdictions create “upward” pressures in small jurisdictions.
- Intuition: the Internet expands the tax base of the hinterland and facilitates the collection of taxes based on the destination principle.
  - ▶ “**Conventional wisdom**”: Online shopping threatens destination taxation. **We find:** Taxable online transactions raise tax rates for some; reduces tax differentials.
  - ▶ The Internet effectively lowers the cost of raising revenue through the sales tax in small (non-agglomeration) jurisdictions.
  - ▶ In the USA, the median town has just over 1 thousand people (lacks shopping centers). The Internet delivers windfall gains to such towns by creating a possible new tax base.
- However, for the big jurisdictions, even though tax rates are strategic complements, tax rates fall.
  - ▶ **First order effect:** tax base of city falls.
  - ▶ Agglomeration is now “less taxable”.

## Conclusion: Agglomeration

- Agglomeration yields taxable rents that allow a jurisdiction with a retail center to raise its local sales tax rate substantially and widen interjurisdictional tax rate and revenue differences.
  - ▶ If the increase in tax revenues in the city is simply a result of political rent capture, this may be an unwelcome development from a welfare viewpoint.
  - ▶ The increased capacity of central cities to raise revenues occurs partially at the expense of non-resident households (tax exporting).
  - ▶ Although tax exporting can sometimes be viewed as problematic, such as when cities “take advantage” of surrounding regions, it could alternatively be viewed as a form of compensation for the services provided at some cost by the city.
- Increases in agglomeration result in the outlying regions benefiting from higher tax rates and revenues: in this case, tax competition is not necessarily a zero-sum game.

## Conclusion: e-Commerce

- Increases in the propensity to conduct taxable transactions online (due to declines in the cost of online shopping) following *Wayfair* decrease tax rates in large agglomerated jurisdictions but raise tax rates in small jurisdictions, contributing to tax rate convergence.
  - ▶ Even though revenues rise in smaller jurisdictions, aggregate revenue for both jurisdictions declines because the city tax rate falls, but not enough to prevent shifting of the specialized good to a lower-tax neighboring jurisdiction.
  - ▶ In this sense, falling costs of online commerce turn tax competition into a negative-sum game.
- This hinges on online vendors remitting taxes at destination, allowing the Internet to facilitate tax collection.
  - ▶ Likely the case even post-*Wayfair*.
  - ▶ Many believed Internet technologies would eventually “destroy” the retail sales tax, but *Wayfair* suggests the Internet may be a way to enforce compliance with destination taxation “redistributing” revenue and generating entirely new fiscal equilibria.

Thank you Joel and Jim, and Congratulations OTPR!



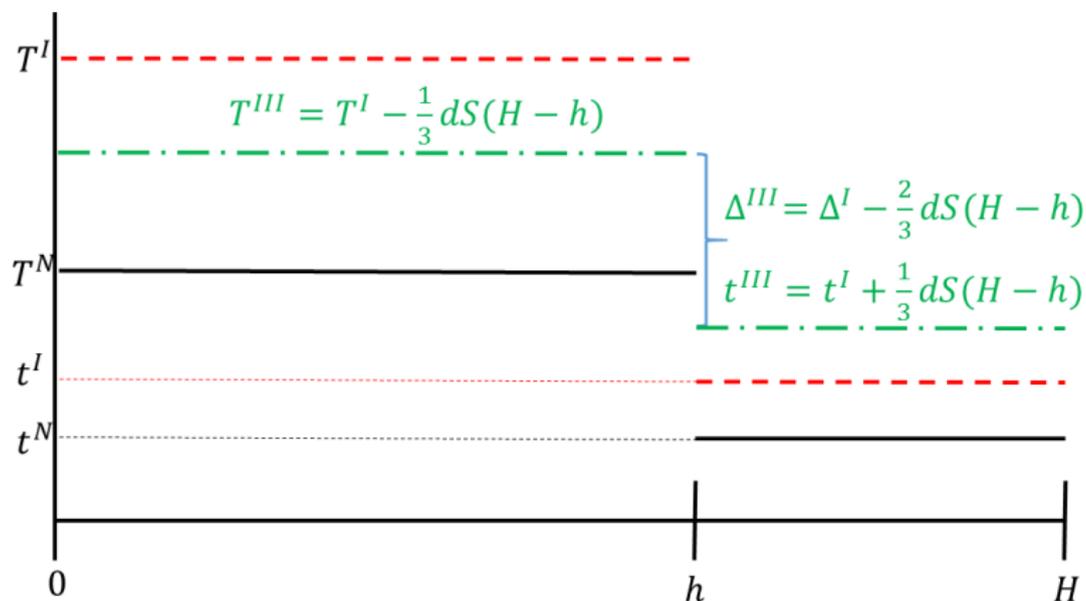
# Intuition: Adding Agglomeration

[Figure]

- Result: taxes (and revenues) are increasing in  $S$  for both jurisdictions.
- Intuition:
  - ▶ The agglomeration in the city gives it an added size advantage which puts upward pressure on its tax rates.
  - ▶ The competitive pressures in the game allow the small jurisdiction to also raise its tax rate, but not as much.
- Starting from the Nielsen (2001) tax rates, the elasticity in the city is now substantially less than one.
  - ▶ This lower elasticity – at the Nielsen (2001) tax rate – implies an increase in the city tax rate.
- Result: Big towns can “tax export” and capture “agglomeration rents,” but agglomeration affects the tax rate (revenues) of the small town and shopping patterns for Firm I goods (more shopping in small town).
  - ▶ However, it does increase disparities in revenues and tax rates across these jurisdictions.

## Regime III: "Future": Everyone Buying Online

Tax Rates



Nash tax rates as  $(T^III, t^III)$  in the model when  $E$  is sufficiently low to always have online shopping.

# Intuition: Full Coverage of Online Shopping

[Figure]

- “Full” coverage of online shopping: at least all residents of the small jurisdiction buy the specialized good online.
- Internet penetration in the presence of taxable online sales reduces inter-jurisdictional tax differentials of the past.
  - ▶ Part of this reduction occurs by the city lowering its tax rate. The presence of online sales lowers the city’s “comparative advantage” in the tax competition game – making it the relative loser as it can no longer exploit hinterland residents that must buy goods at its retail shopping center.
  - ▶ But the city still keeps some advantages: even if all of its residents buy online the tax revenue from those sales go to the city.
  - ▶ Despite the loss of revenue from residents of the small jurisdiction, the city still collects more tax revenue than the hinterland. This is because the city tax rate remains higher than the small jurisdiction and because its specialized tax base is larger because of its geographic size advantage.

# Some Interesting Observations

[Text]

- Mechanisms at work (consider the small jurisdiction):
  - ▶ (1) **tax base expands** relative to the past regime  $\implies$  upward pressure on tax rates.
  - ▶ (2) **tax competition** become more intense relative to the past regime  $\implies$  downward pressure on tax rates.

$$\frac{\partial R}{\partial t} = \underbrace{\frac{T}{d}}_{\text{non-specialized base}} + \underbrace{\frac{TS^2}{D}}_{\text{specialized base}} = T\left(\frac{dS^2 + D}{dD}\right) \quad (7)$$

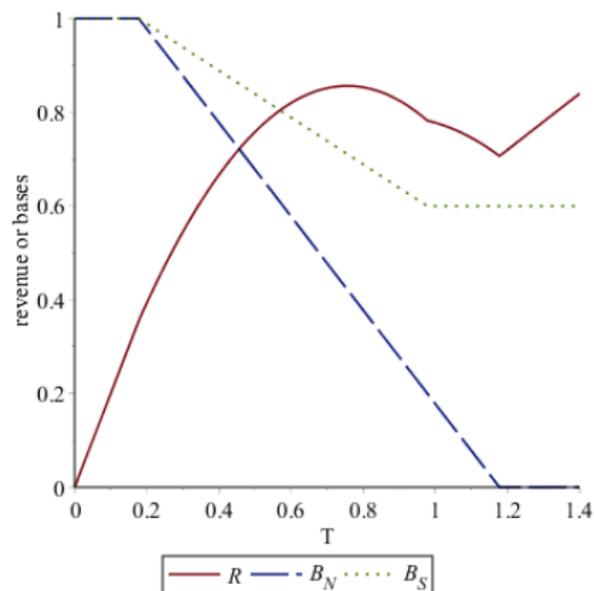
# Some Interesting Observations, Term: $t' + \frac{1}{3}dS \left( H - \frac{E}{D} \right)$

[Text]

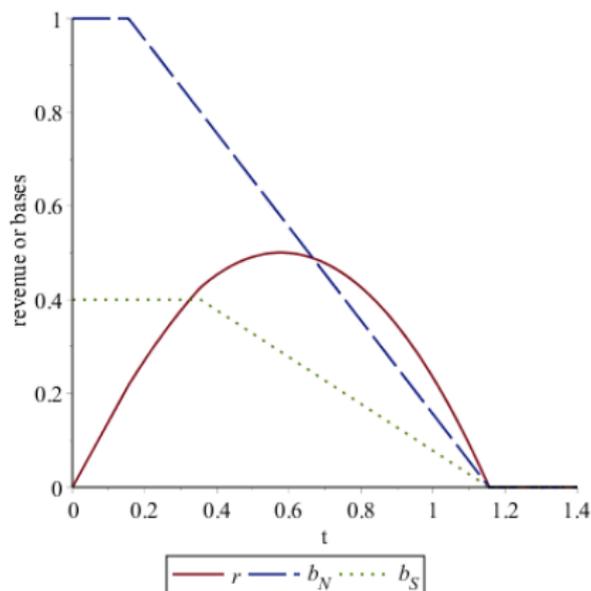
- As  $\frac{E}{D} \rightarrow H$ , then  $t''$  is simply proportional to  $t'$ , where the factor of proportionality is less than one so we know  $t'' < t'$ .
  - ▶ Tax competition become more intense.
- As  $\frac{E}{D} \rightarrow h$ , the term  $t''$  is simply proportional to  $t'''$ .
  - ▶ But relationship to  $t'$  is ambiguous. For these lower values of  $E$ : (1) **tax base expands** relative to the past regime but (2) **tax competition** become more intense.

# Existence: Example of No Global Deviations

## Large Jurisdiction



## Small Jurisdiction



## Comparative Statics II: Change in $S$

[Animation]

- We are interested at how an increase in the importance of the specialized good in the presence of some online shopping changes the equilibrium. Effects depend on the parameters. Two limiting cases:
- For small specialized good consumption ( $S \rightarrow 0$ ), we find tax rates increase in  $S$  as do revenues:

$$\frac{\partial T^I}{\partial S} = \frac{d}{3} \frac{DH + E}{D} = \frac{d}{3} \left( H + \frac{E}{D} \right) > 0$$

$$\frac{\partial t^I}{\partial S} = \frac{d}{3} \frac{2DH - E}{D} = \frac{d}{3} \left( 2H - \frac{E}{D} \right) > 0$$

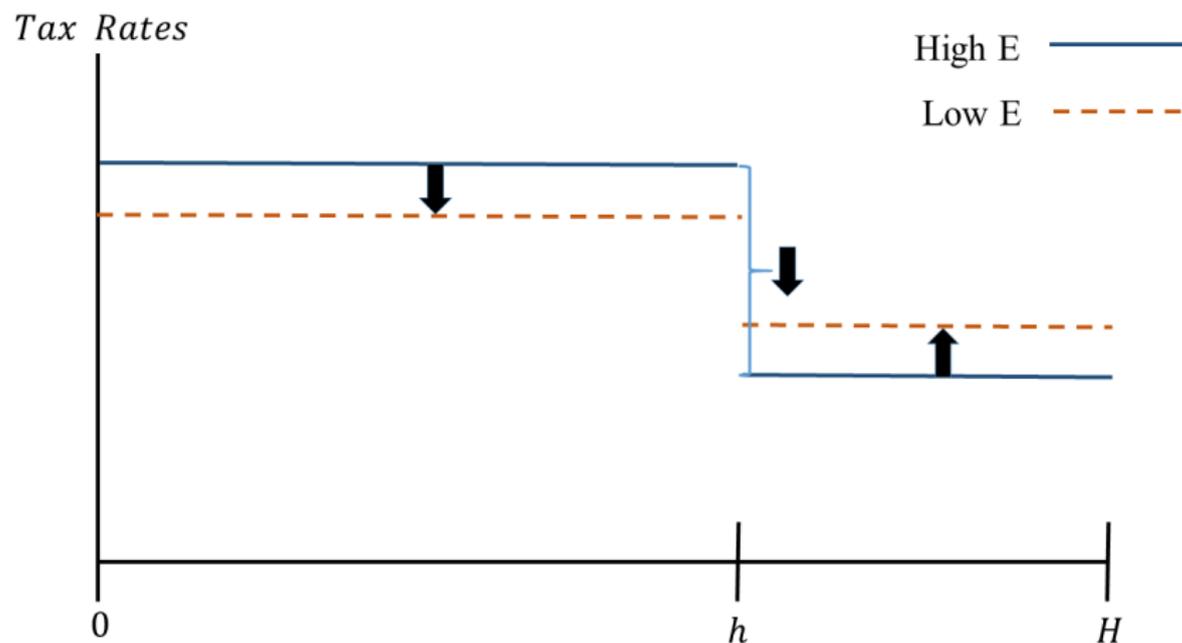
- But for  $S \rightarrow 1$  and  $D = d$ , then  $\frac{\partial T^I}{\partial S} < 0$  and  $\frac{\partial t^I}{\partial S} < 0$ .

# Intuition

- For smaller values of  $S$ , an increase in the importance of  $S$  puts upward pressure on tax rates but does so more intensely in the larger jurisdiction.
  - ▶ This is because the changes in the sizes of the tax base dominate the added fiscal competition that occurs.
  - ▶ Even with online shopping, the agglomeration effects increase the city's “ability” to impose a higher tax rate than the nearby hinterland.
- For larger values of  $S$ , the fiscal externality effect is more likely to dominate.

# Comparative Statics I: Decline in $E$

[Back]

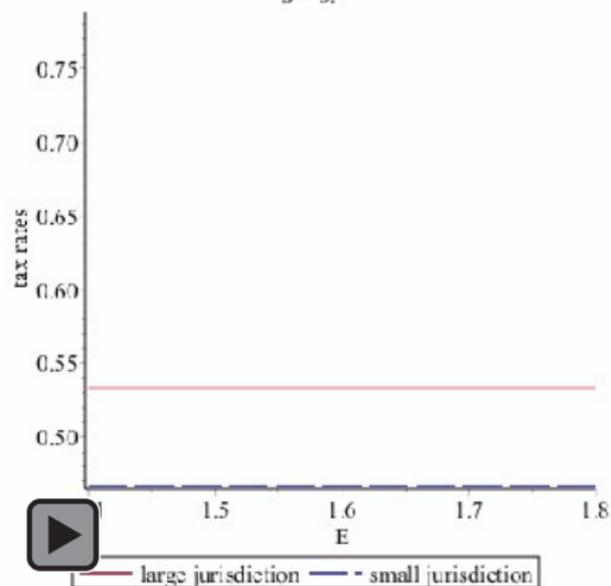


# Animation: Increase in S

[Back]

## Tax Rates

$S = 0$



## Tax Revenue

$S = 0$

