Why Similar Jurisdictions Sometimes Make Dissimilar Policy Choices: First-mover Effects and the Location of Firms at Borders

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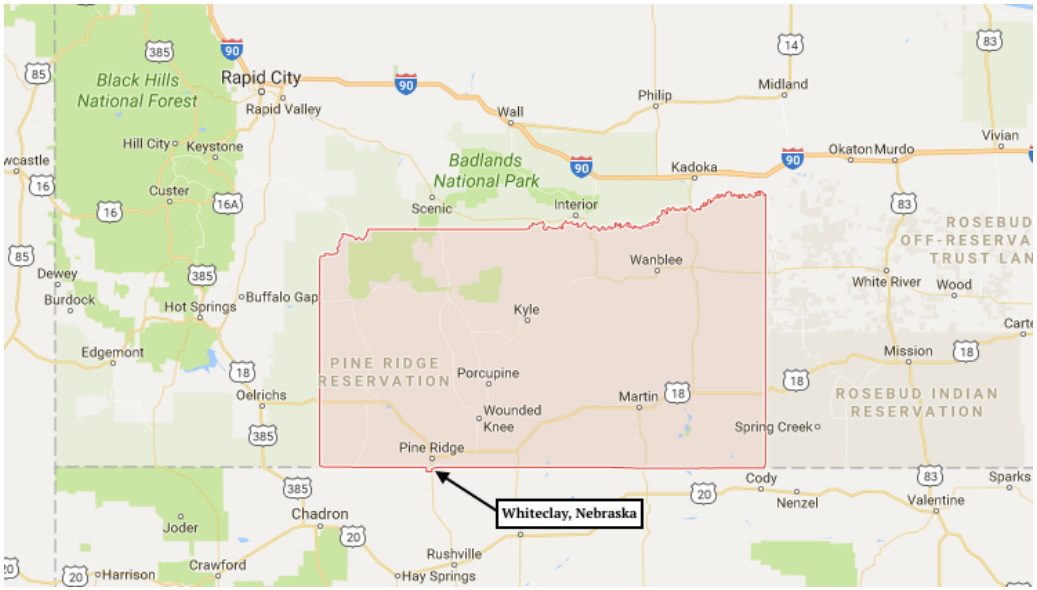
Research Question

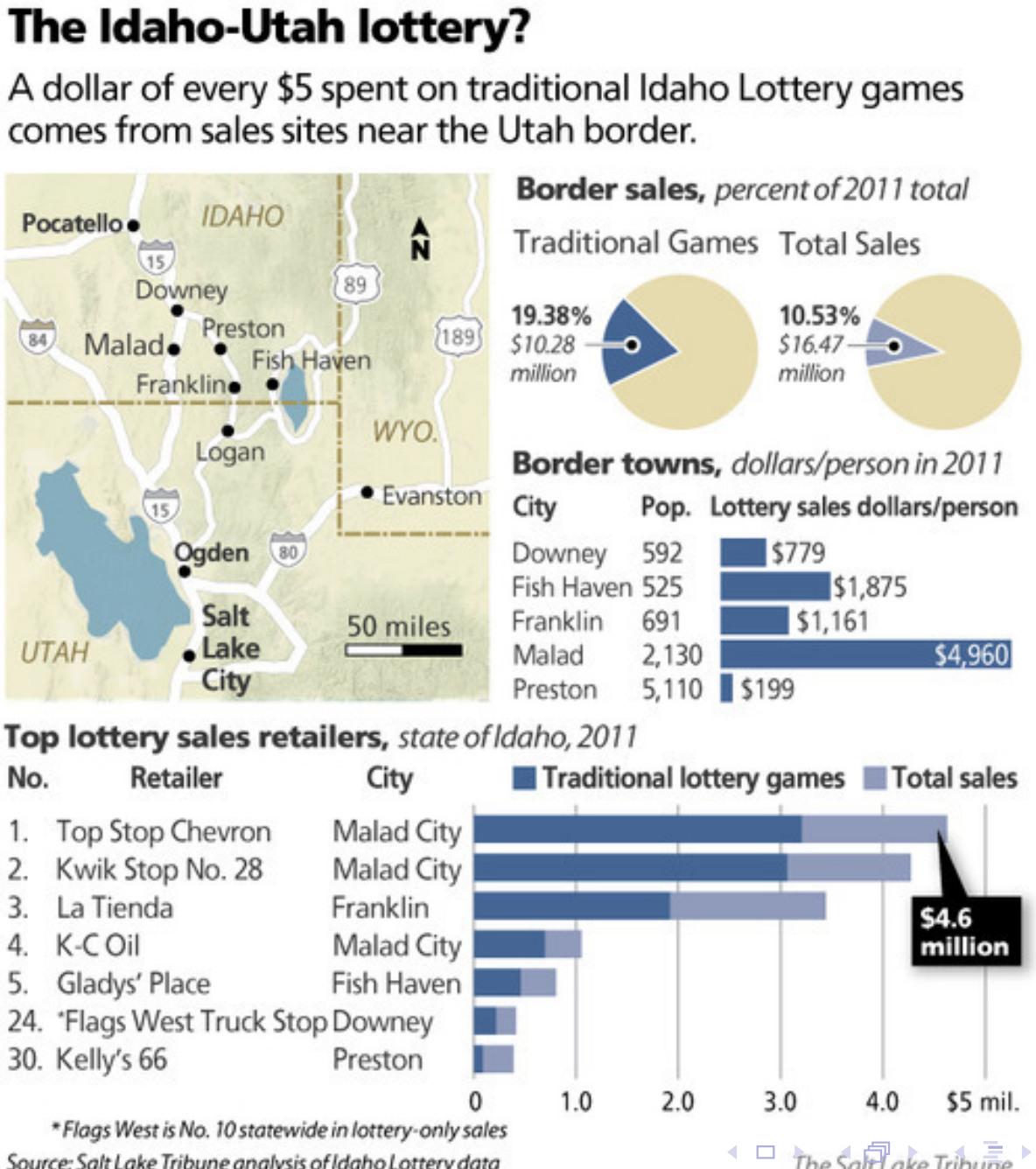
- Why do nearby jurisdictions that are otherwise similar set different regulatory policies – concerning the legalization or prohibition of a particular activity with an externality – on activities such as fireworks, casino gambling, or racetracks?
  - Prior literature suggests it is jurisdiction asymmetries such as size.
  - Cannot be entirely the reason because most jurisdictions set similar regulatory policies concerning lottery sales or alcohol purchases.
- In this paper: we focus on first-mover effects and the persistence of early policy choices – which induces bunching of firms within the first-mover's borders – on local policies today.

Example: Firework Vendors – This chain only on borders.

Example: Liquor – Town of 12 people has 4 stores.



Example: Lottery – Small border towns sell more than cities.



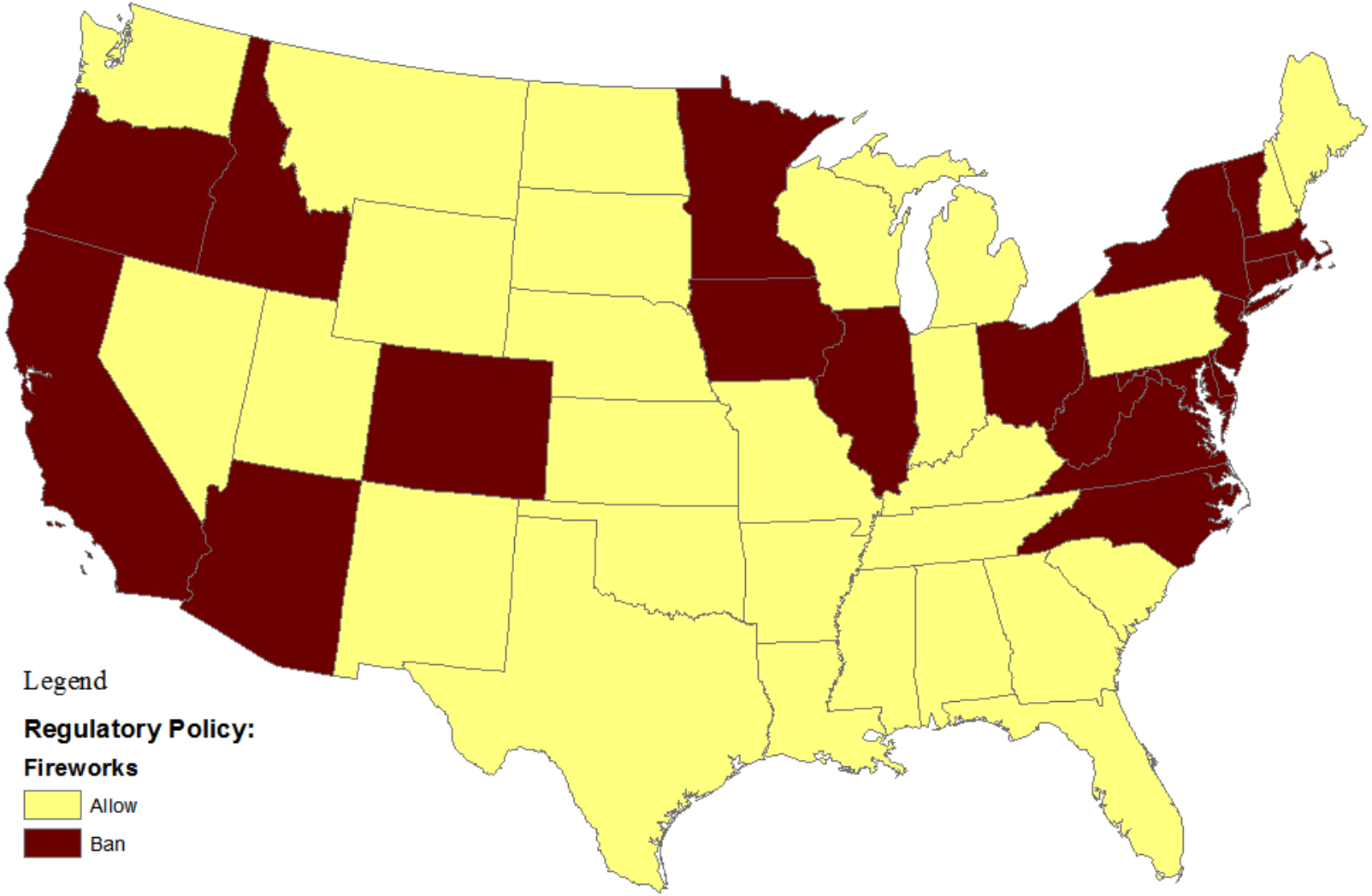
Example: Casinos – Of course, the IIPF last year...

Stylized Fact I

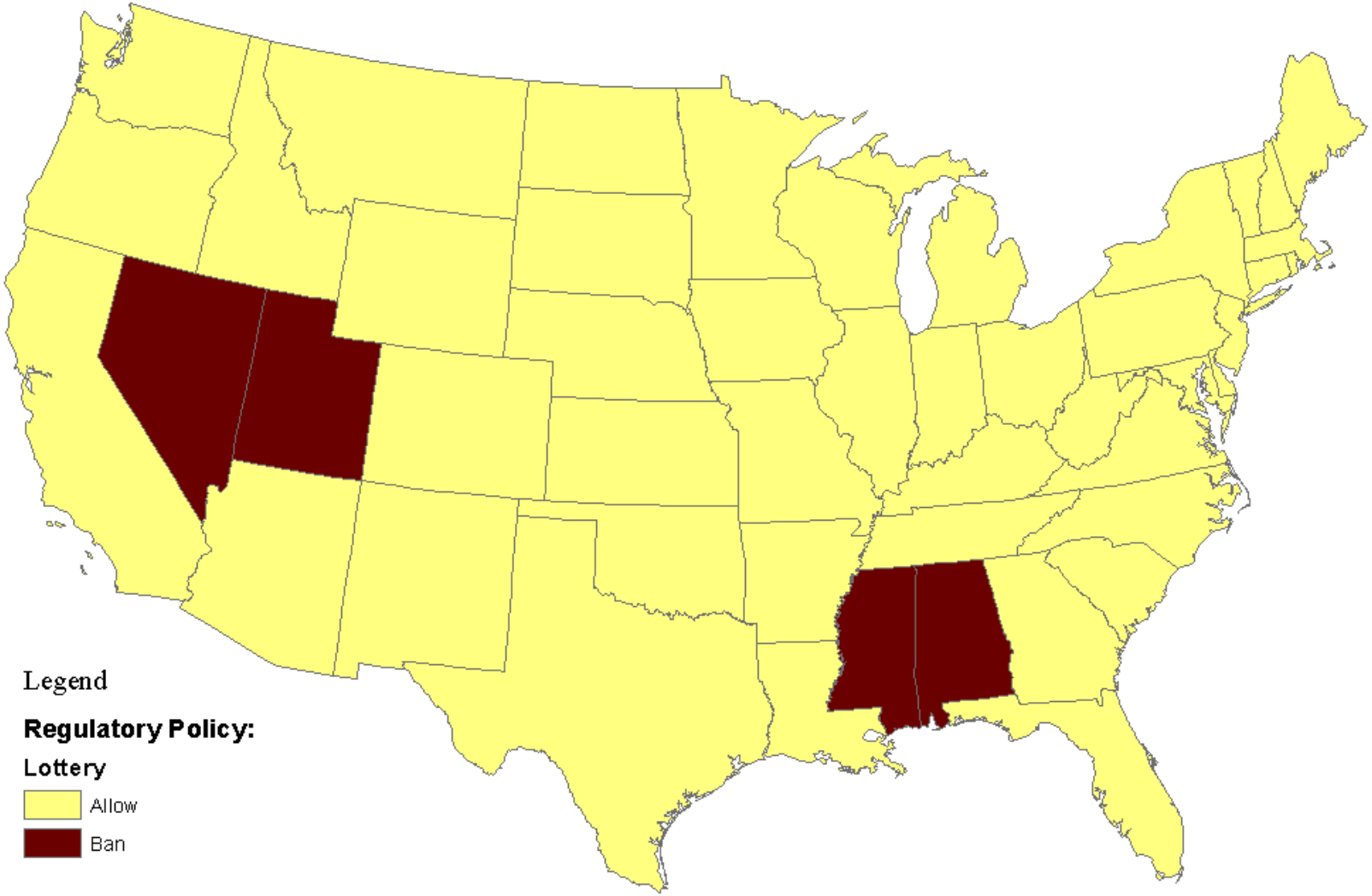
Fact

Unlike tax policies, which usually show positive spatial correlation, binary regulatory policies often times do not "match." When policies do not match, similar states set the opposite policy (one legalizes and one bans).

No Correlation of Regulatory Policy



A Positive Correlation Example



Formal Tests of Spatial Correlations

Moran's I test of spatial correlation

	Counties		States				
	Fireworks (WA)	Fireworks (NY)	Fireworks	Commercial Casino	Marijuana	Racetrack	Lottery
Moran's I	-0.206**	-0.093	.128	.062	-.001	.158*	.142*
	(.104)	(.084)	(.093)	(.092)	(.093)	(.093)	(.083)

Stylized Fact II

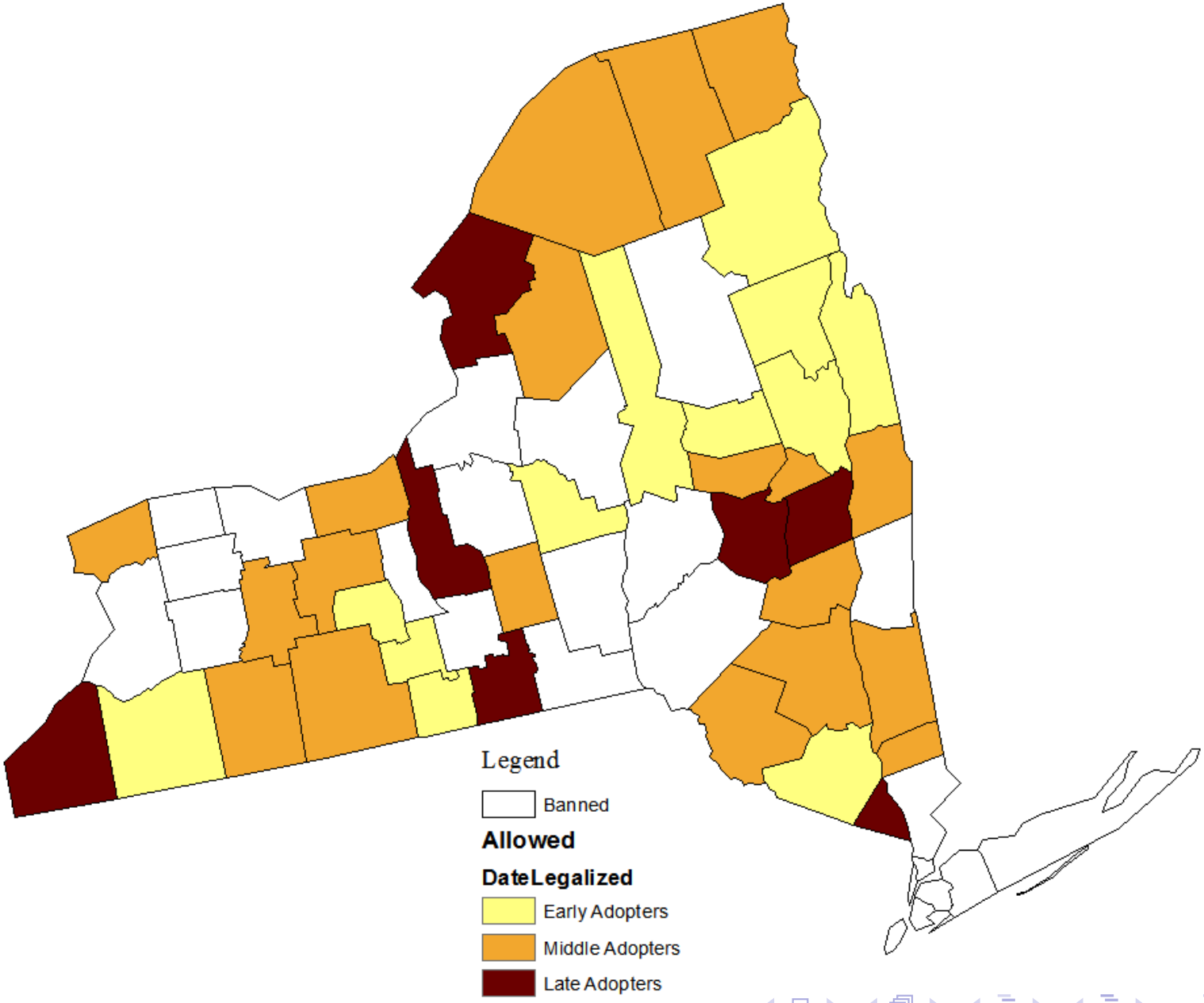
Fact

Jurisdictions that legalize first have more firms on their side of the border than latter-acting jurisdictions that legalize the activity later. In other words, there is an excess mass of firms that bunch just inside the first moving jurisdiction's boundaries.

Evidence

- A 2015 reform allowed New York counties to determine if they want to allow for the sale of fireworks.
- Fireworks are generally important for July 4 and New Year's, so the March law resulted in several counties legalizing in advance of July 4.
- Vendors quickly began to set up shop, which required permit applications from the state, which may prevent the firework market from being perfectly competitive.

County Legalizations



McCrary Test

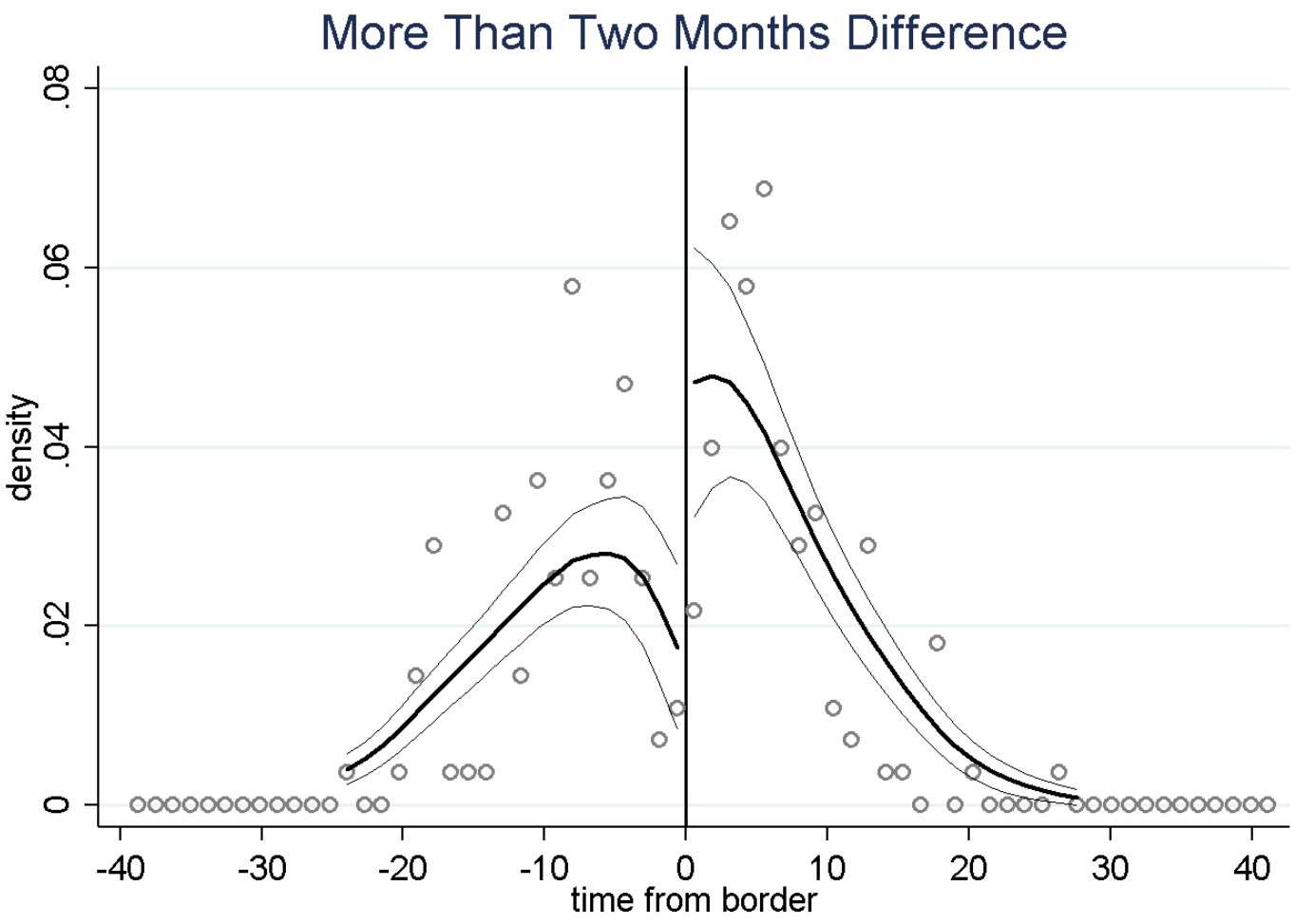
- We do not care about the number of firms within the county because this will be a function of the population, area, characteristics of the county, etc.
- Rather, we care about the number of firms near the border because absent the time to adoption, the firm should be indifferent between locating just over either side of the border.
  - It can serve exactly the same market; the only difference is if its 1 second inside the county border or 1 second outside the border.
  - Requires the time of legalization not to be correlated with other county level policies that may differ by county. Likely the case given the rapid passage of legalization prior to July 4.

Data

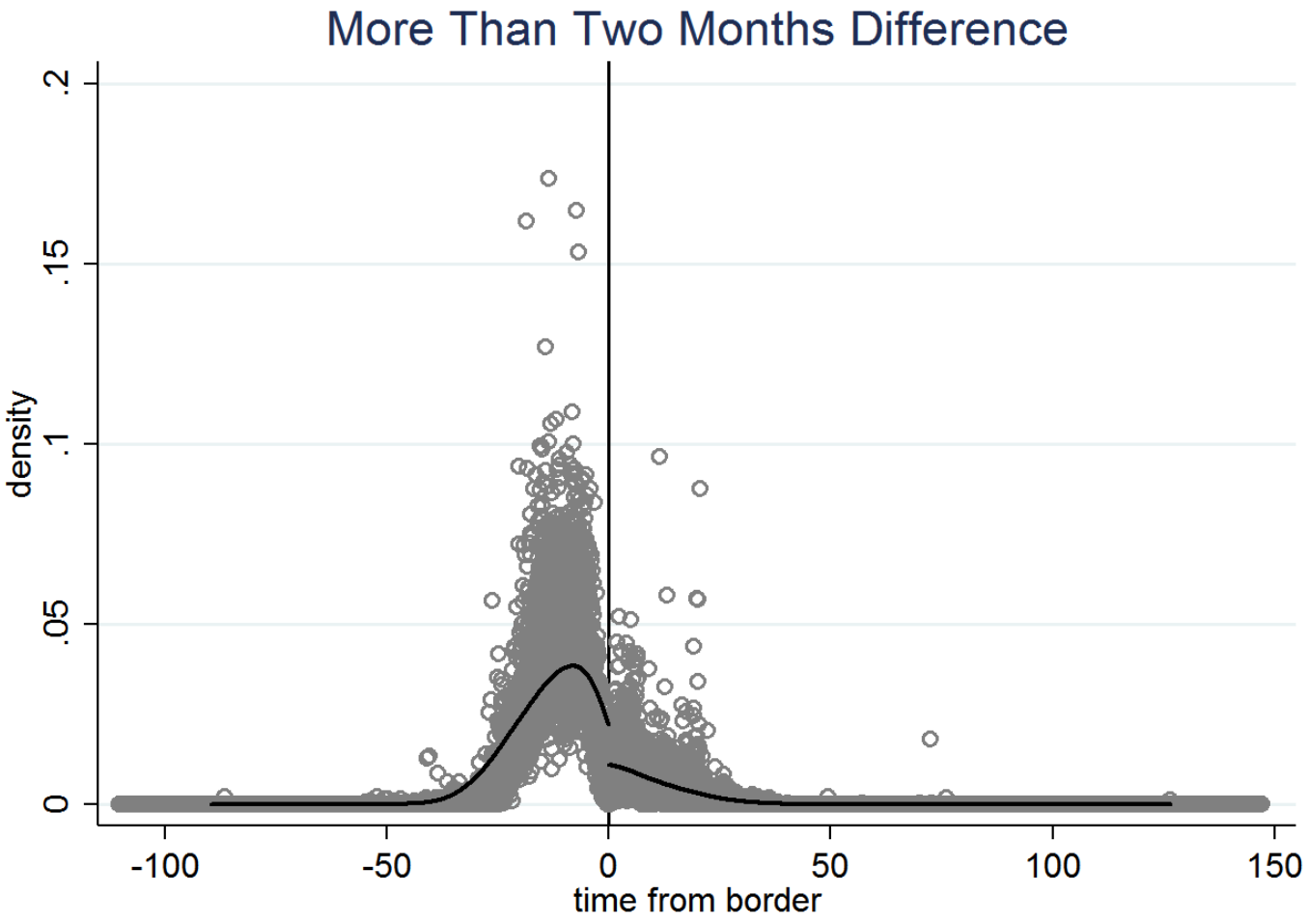
- We collect the data of legalization for each county in New York over the last two years.
- We then scrape the firework vendors license database and geocode all of the addresses.
- Using the address, we optimize the shortest driving time to the *nearest* county border crossing (defined as an intersection where a major road crosses a county border).
  - We only use the nearest because we do not care about the within county distribution, but rather the distribution only near the border.

$$\theta = \ln lim_{r\downarrow 0}\, g(r) - \ln lim_{r\uparrow 0}\, g(r) \equiv \ln g^{+} - \ln g^{-}$$

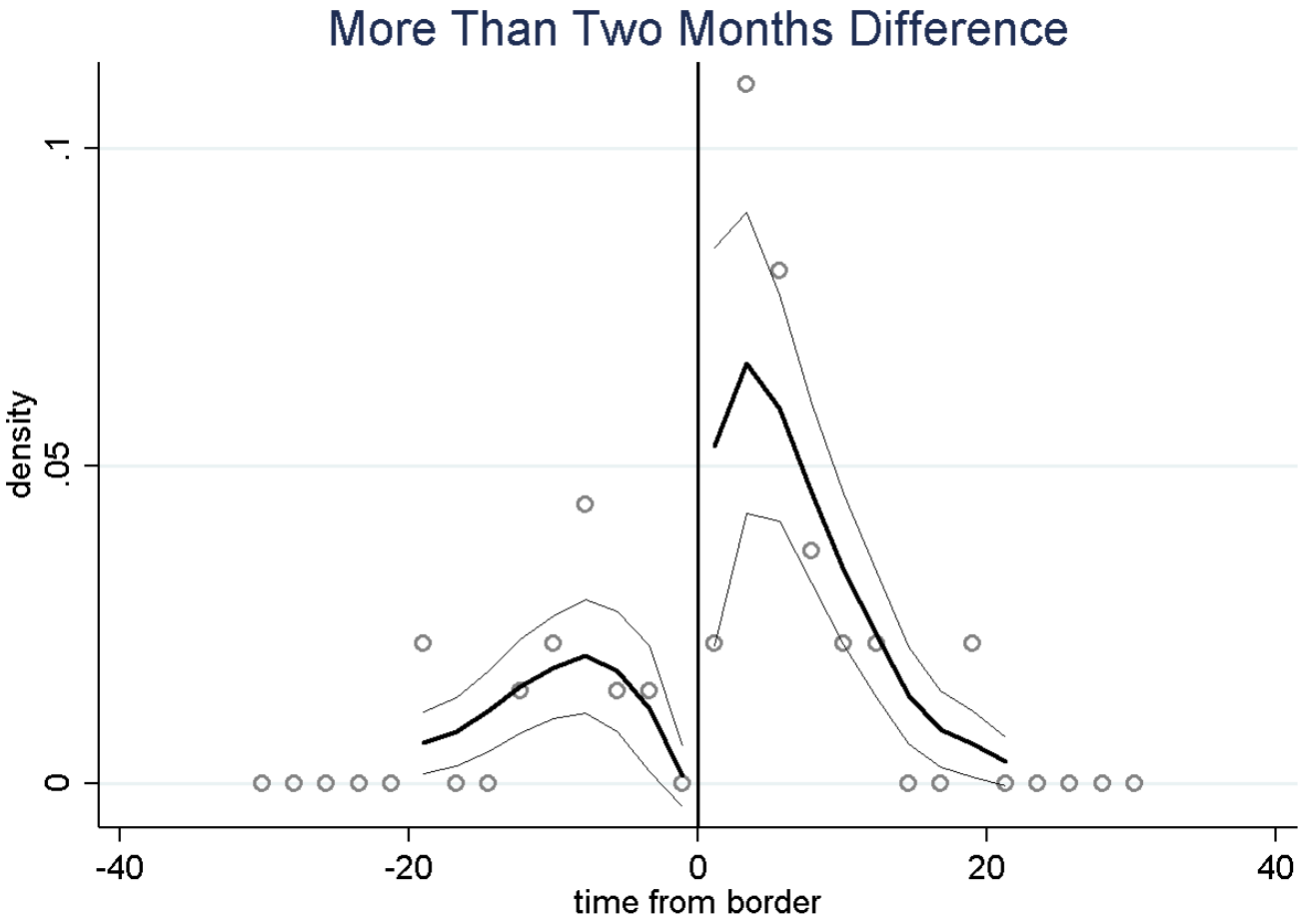
Distribution of Firework Vendors (Early Adopters on Right)



Population Distribution: Early Adopters on Right



Firms ONLY Selling Fireworks: Early Adopters on Right



Model

- We proceed with two variants of the theoretical model:
  - Only perfectly competitive vendors.
  - Vendors with market power.

Setup with Perfect Competition

- Consumers are arranged with uniform density along an infinite line segment, which is divided into jurisdictions of equal size.
  - Each jurisdiction decides whether or not to allow the sale of a good.
  - If legalized, sales of that good within a jurisdiction are subject to the same sales tax t that is imposed on all other transactions.
- The use of a good creates a uniform negative externality e; this externality affects the jurisdiction in which the consumer resides.
- Firms are located everywhere along the line segment and sell the product in a perfectly competitive market at its marginal cost c.
- Consumer buys if the reservation value is greater than the tax-inclusive price: $v > c + t$.

Welfare Maximizing Government

- Assuming that
  - v is sufficiently high such that all n consumers participate in the activity
  - tax revenue and consumer surplus are valued equally
  - and borders are closed
- Then, if no cross-border shopping occurs, welfare is given by

$$W = n\left[\underbrace{v-c-t}_{\text{consumer surplus}} + \underbrace{t}_{\text{tax revenue}} + \underbrace{0}_{\text{profits}} - \underbrace{e}_{\text{externality}}\right]$$
$$= n[v-c-e]$$

- We consider the case where the externality is large enough such that $v-c-e<0$ and a welfare maximizing government would *never* legalize if borders were closed.

Open Borders: First Movers

- Consider a first moving jurisdiction. When will it legalize first?
- Assuming a travel cost of k per mile, the last consumer to cross border shop if $v - c - t - \left|\bar{b}\right| k = 0 \Rightarrow \left|\bar{b}\right| = (v - c - t)/k$
- Then welfare of a first moving jurisdiction will only legalize if

$$W_f = n\left[\underbrace{v-c-t}_{\text{consumer surplus}} - \underbrace{e}_{\text{externality}} + \underbrace{0}_{\text{profits}}\right] + \underbrace{nt + 2t\left|\bar{b}\right|}_{\text{tax revenue}}$$

$$= n\left[\underbrace{v-c-e}_{<0}\right] + \underbrace{2t\left|\bar{b}\right|}_{>0} > 0$$

Open Borders: Later Movers

- Consider a second moving jurisdiction where both neighbors have legalized (stack the deck against it legalizing). Will It legalize?
- If it does not legalize, it obtains:

$$W_n = 2\left|\bar{b}\right| \left[\underbrace{(v-c-t)}_{\text{CS without transport}} - \underbrace{\left(\frac{v-c-t}{2}\right)}_{\text{transport cost}} - \underbrace{e}_{\text{externality}} \right]$$

$$= 2\left|\bar{b}\right|(v-c-t-e) - \frac{(v-c-t)^2}{k}$$

- Legalize if

$$n(v-c-e) > 2\left|\bar{b}\right|(v-c-t-e) - \frac{(v-c-t)^2}{k}$$

Open Borders: Later Movers

- A later moving jurisdiction will legalize if

$$\underbrace{-2\left|\bar{b}\right|(v-c-e)}_{>0}+\underbrace{n(v-c-e)+2t\left|\bar{b}\right|}_{>0 \text{ if first legalize}}+\frac{(v-c-t)^2}{k}>0$$

Proposition

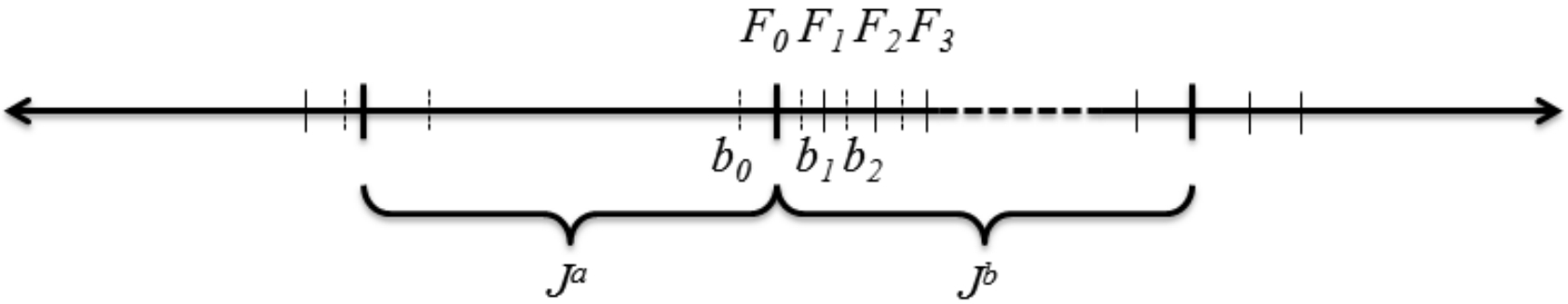
When the good is sold at all locations, and when first-moving jurisdictions gain by legalizing, then later-moving jurisdictions will also gain by legalizing. Regulatory policies match and are consistent – all jurisdictions adopt the same policy.

Open Borders, Perfectly Competitive Firms: Intuition

- Intuitively, when firms are located everywhere, all jurisdictions are identical with respect to their role in the game.
- The symmetry of jurisdictions and presence of firms everywhere means that the gains to legalization (or banning) are identical for all jurisdictions: they realize the same sized externality, obtain the same profits (none) from firms and raise the same tax revenues.
- Decisions about whether or not to legalize have the characteristics of a prisoners' dilemma but regulatory policies should be observed to have perfect (and positive) spatial correlation despite the prisoners' dilemma nature of the game.

Setup with Market Power

- Firms locate at every integer but each integer only supports one firm.
  - Firms set prices to maximize profit knowing they may lose some customers to the next firm on the line segment.
- When one jurisdiction legalizes before its neighbor, a firm locates (effectively) on the border, just inside the legalizing jurisdiction.
- A later moving jurisdiction will not have a firm at this border, so consistent with the stylized facts, there is a discontinuity at the density right at the border.



Solution to Firm Problem

- Similar to Braid (1987), if no firms are located to the left of point 0, the equilibrium price at any integer $i \geq 0$ is given by

$$p_i^* = \alpha_i \left(\frac{v - t + c}{2} \right) + (1 - \alpha_i)(c + k), \quad \text{where} \quad \alpha_i = \frac{4}{4 + \sqrt{3}} \left(2 - \sqrt{3} \right)^i$$

- If firms locate at every integer because all jurisdictions legalize then, the equilibrium price is

$$\hat{p} = c + k$$

Welfare of a First Mover

- A first mover will legalize if they have positive welfare:

$$W_F = n\left[\underbrace{(v - p_i^* - t - \frac{k}{4})}_{\text{consumer surplus}} - \underbrace{e}_{\text{ext.}}\right] + \underbrace{nt + 2t\,|b_0|}_{\text{tax revenue}} + \underbrace{n(p_i^* - c) + 2\,|b_0|\,(p_0^* - c)}_{\text{profits}}$$

$$= n\left(v - c - e - \frac{k}{4}\right) + 2\,|b_0|\,(p_0 - c + t) > 0$$

Welfare of a Second Mover

- Consider a second mover where both of its neighbors have legalized.
- If it does not legalize:

$$W_N = 2|b_0| \left[\underbrace{(v - p_0 - t)}_{\text{consumer surplus}} - \underbrace{(v - p_0 - t)/2}_{\text{travel costs}} - \underbrace{e}_{\text{ext.}} \right] + \underbrace{0}_{\text{tax revenue}} + \underbrace{0}_{\text{profits}}$$
$$= |b_0|(v - p_0 - t - 2e) > 0$$

- If it legalizes:

$$W_L = n \left[\underbrace{(v - \hat{p} - t - \frac{k}{4})}_{\text{consumer surplus}} - \underbrace{e}_{\text{ext.}} \right] + \underbrace{(n-1)t}_{\text{tax revenue}} + \underbrace{(n-1)(\hat{p} - c)}_{\text{profits}}$$
$$= n(v - c - e - \frac{k}{4}) - (\hat{p} - c + t) > 0$$

Policies Do Not Match If:

- Recall that: A first mover legalizes:

$$W_F = n\left(v - c - e - \frac{k}{4}\right) + 2\,|b_0|\,(p_0 - c + t) > 0 \tag{1}$$

- A second mover does not legalize:

$$W_N - W_L = -\,|b_0|\,(v - p_0 - t - 2e) - \left[n\left(v - c - e - \frac{k}{4}\right) - (\hat{p} - c + t)\right] > 0 \tag{2}$$

Proposition

When the good is not sold at all locations and expressions (1) and (2) hold, if both neighboring jurisdictions legalize first, a later moving jurisdiction will not legalize. Then, regulatory policies will not match and jurisdictions adopt different policies despite being ex ante identical.

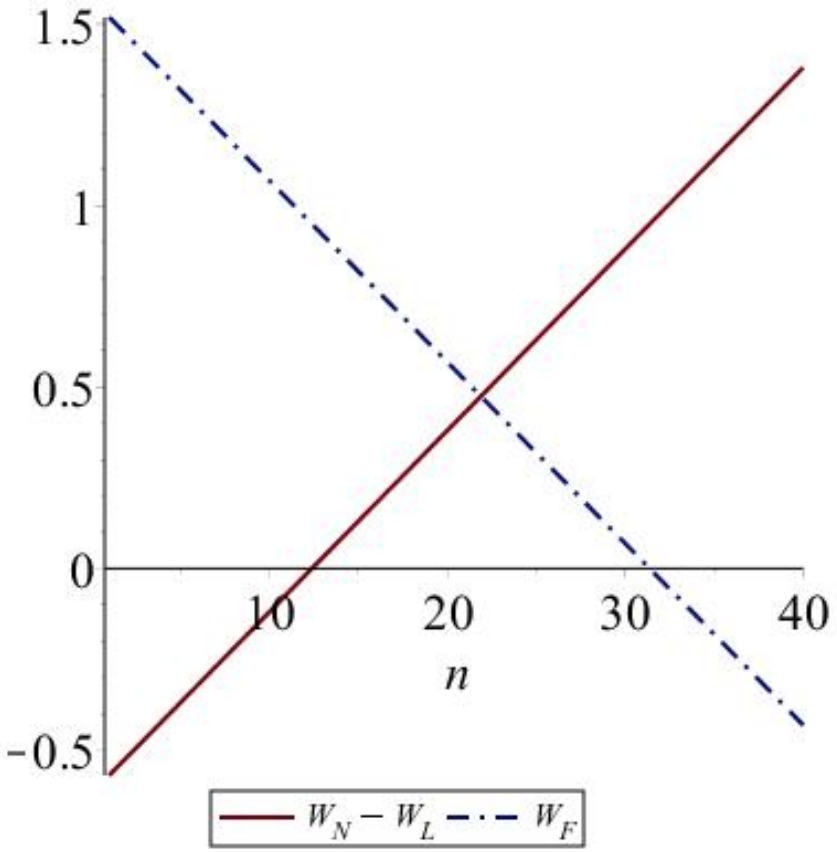
Intuition: Similar to Oligopoly Models with Entry

- Suppose there are two potential firms and they need to bear certain fixed costs when entering a market.
- If one firm is already in the market, the other firm may not enter if operating profits are not sufficiently large to cover the fixed costs.
- If no firm is in the market, one firm will enter and choose the production level that can prevent the other firm from entering.
- This intuition can be generalized to the model in this paper where a jurisdiction corresponds to a firm, discrete policy choices correspond to entry decisions, tax revenues correspond to operating profits, and the negative consumption externality corresponds to entry costs.

When Are Policies Not Likely To Match?

Proposition

Policies are less likely to match if, jurisdictions are of intermediate size, if externalities are of intermediate size or if taxes are not too high.



Conclusion

- We use a spatial model to consider whether otherwise identical jurisdictions may act in differing ways based entirely on the order in which policy decisions are made.
- With perfect competition, regulatory policies will match.
- With market power, the first jurisdiction to legalize an activity gains a lasting advantage in firm location so government policies may differ.
- May explain policy convergence on lotteries and alcohol (more likely perfectly competitive) than fireworks or casinos.