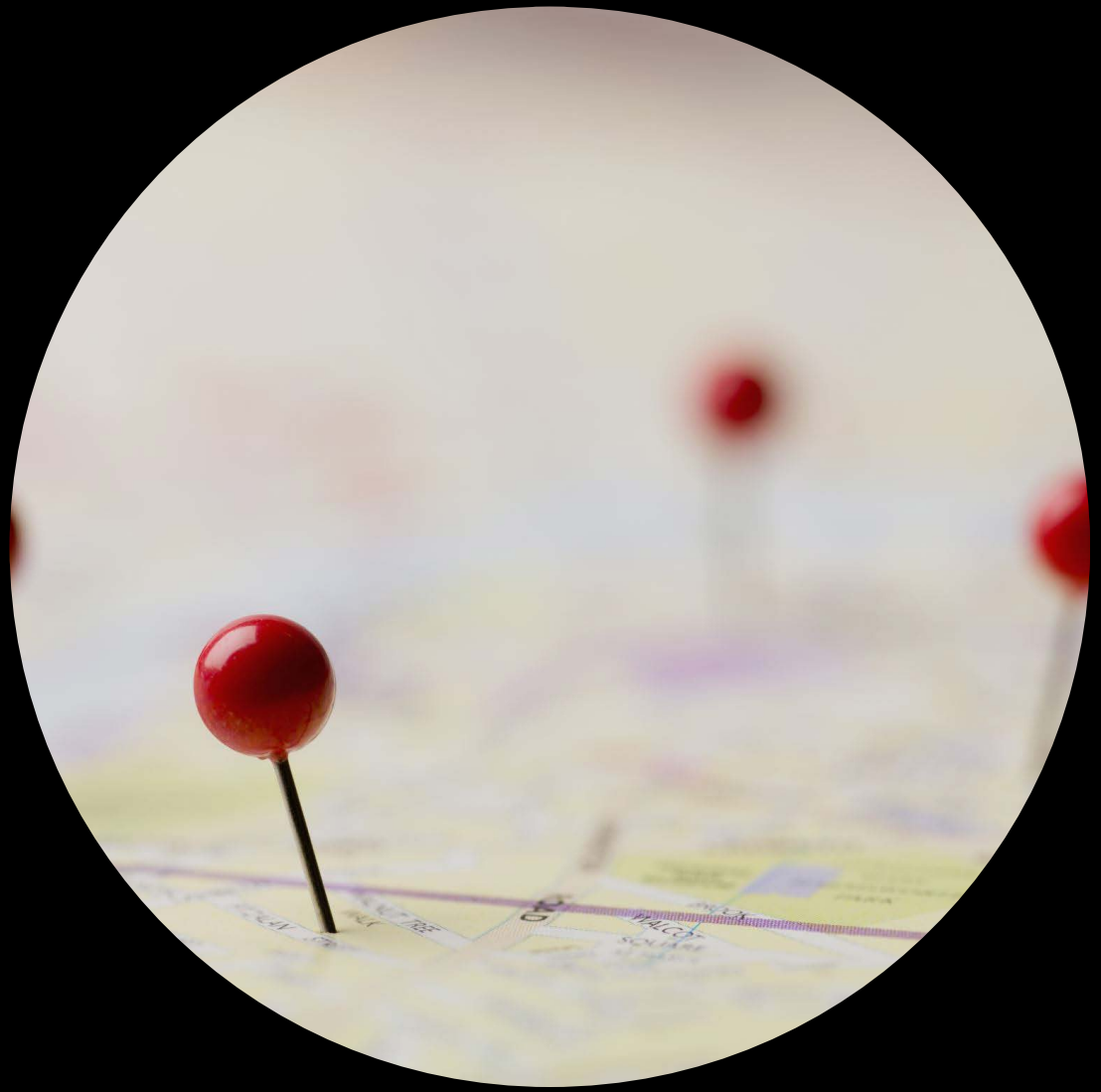


Address-Based Sales Tax Location in Oklahoma:

CSA's Reflections on 20 Years of State Partnership and Data.

OKSCAUG, September 26, 2023.

Leah Nash

Jim Anderson, GISP

University of Oklahoma Center for Spatial Analysis

We're CSA.

- The Center for Spatial Analysis at the University of Oklahoma supports Government, Private, University and Grant Research interests and partnerships by delivering **applied geospatial technology solutions and outreach.**
- CSA@OU is part of the Department of Geography and Environmental Sustainability in the College of Atmospheric and Geographic Sciences at OU.
- With CSA having assumed several forms since its inception in 1994, CSA in 2023 will celebrate its 20th year of service to the Oklahoma Tax Commission on the Streamlined Sales Tax project, our 28th year of service to OTC overall. We'll address CSA's tradition of **sales and use tax support** shortly.
- Since 2019, our staff has grown, our leadership has been refreshed, and our contractual engagements with Oklahoma State Agencies have become more numerous.

CSA's Partnership with OTC: Background to SSTUA

- Oklahoma is a full member State of the Streamlined Sales and Use Tax Agreement (SSTUA), as-administered by the Streamlined Sales Tax Governing Board (SSTGB).
- What? Why? What are the Benefits?
  - The *Commerce Clause*, Article 1, Section 8, Clause 3 of the US Constitution grants congress the power to regulate interstate commerce. **Effectively, States themselves cannot collect taxes on interstate commerce.**
  - ***National Bellas Hess v. Department of Revenue of Illinois***, 386 U.S. 753 (1967)
    - Shows that mail-order sales delivered from out-of-state are not subject to sales/use tax.
  - ***Quill Corp. v. North Dakota***, 504 U.S. 298 (1992)
    - Affirmed *Bellas Hess v. Illinois*, this time with respect to software purchased over the internet.
    - For example, Amazon.com then avoids collection of sales tax on interstate sales largely between 1995 and 2012. **This was an anticompetitive period that objectively hampered local governments and in-state business operations.**
  - ***South Dakota v. Wayfair, Inc.***, 585 U.S. ___ (2018)
    - A 5-4 Justice majority overturns *Quill v. ND* and *Bellas Hess v. Illinois* at-once.
    - June 21, 2018 – States can require online retailers to collect sales taxes on out-of-state sales.

CSA's Partnership with OTC: Background to SSTUA

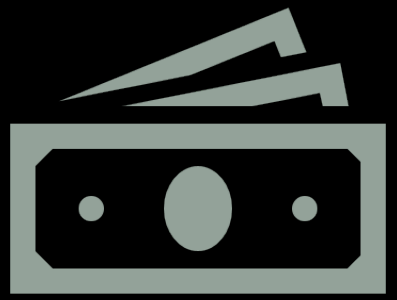
- Member States essentially agree to devolve some of their autonomy with respect to setting and collecting sales taxes, such that a simplified system **reducing the burden of compliance** can be established.
  - For example, only one tax rate may be applied per taxable jurisdiction; with the exception of the option to assess a separate rate for food and drugs. States also fund *Certified Service Providers* to act as tax processors for out-of-state businesses selling into a given SST state.
  - "Emerging Technologies" are central to supporting the SSTUA vision, particularly where - **One of the most difficult tax issues for a business is keeping up with the local taxes and knowing when a sale is inside or outside a local government jurisdiction.**
  - *States that have met the requirement of providing a Zip Code database may elect to certify* ***vendor provided address-based databases*** *for assigning tax rates and jurisdictions.*

- CSA serves as OTC's address-based database vendor for this purpose. Our goal is to associate a set of taxable jurisdictions to **every delivery address in Oklahoma.**

CSA's Partnership with OTC: Technical Assistance as *Certified Vendor of Address-Databases*

- Termed "SST Rate and Boundary Files", exports of these databases are publicly available:
  - https://www.streamlinedsalestax.org/Shared-Pages/rate-and-boundary-files
- The preparation of these data products is intensively spatial, in that a great deal of technical labor is invested in **tracking municipal boundary changes, and reflecting those changes in address-range records** at CSA.
  - While automation is very helpful throughout this process, **there is often no practical replacement** for interpretation of a given address-range's participation in a taxable jurisdiction, on-the-map.
- SST Deliverables (Rate and Boundary Files) are released to OTC quarterly. CSA maintains a website allowing the Public to perform searches across these data:
  - https://taxproject.csa.ou.edu/Rate_Locator/

Locating your Sales Tax Rate



Am I paying the correct rate?

https://taxproject.csa.ou.edu/Rate_Locator/

What search-related metadata does CSA Collect?

The *public IP* address of the client (the browser) sending the search request

The parameters of the search (varies by search type: *Street Names, Zip Codes, etc.* as-submitted by the User)

The *Lookup Number* associated with the search (for traceability and to provide the taxpayer with a means to identify their search, and therefore the result received at-the-time)

A Flag indicating *success or failure* of each search.

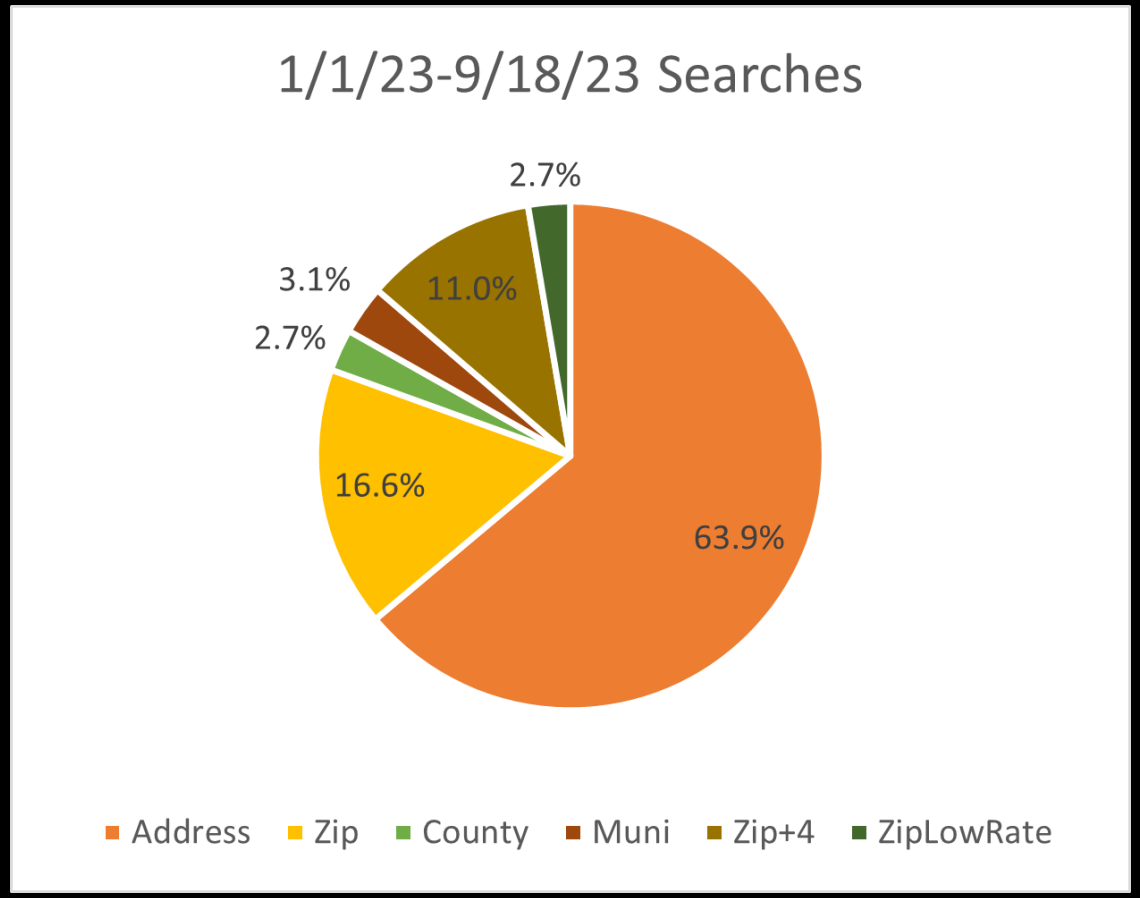
A *timestamp* capturing the submission time of the search

What can be drawn from this information?

- All manner of site usage statistics!
  - *Most searched for X*
  - *How many of X search type* in each of YYYY
  - *Trend in* success/failed searches over YYYY-YYYY
  - *Top X Users* by logged searches

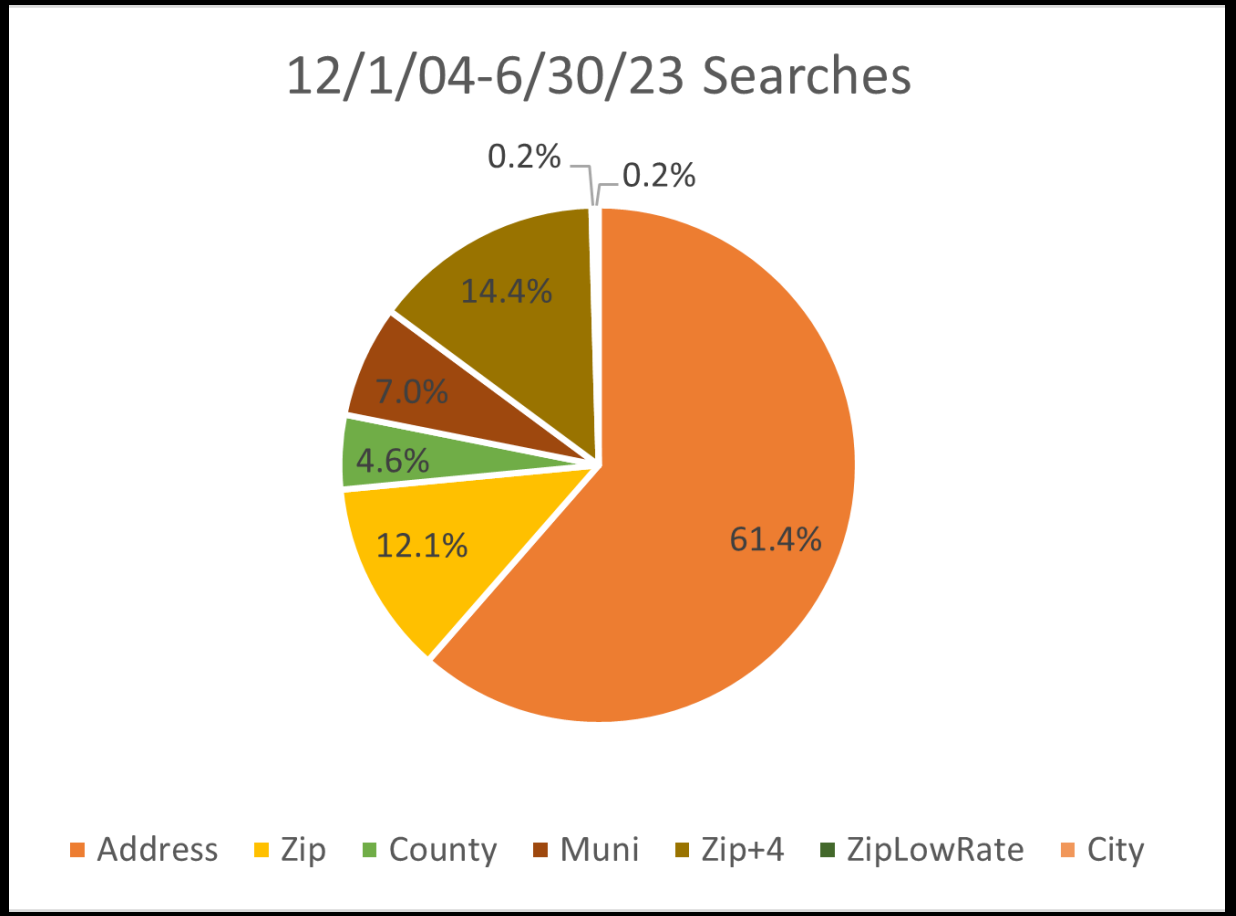
General Usage Stats for 2023 So Far

	1/1/23-9/18/23			
	Searches	Failed	% Failed	% of total searches
Address	116912	47737	40.8%	63.9%
Zip	30375	884	2.9%	16.6%
County	4894	0	0.0%	2.7%
Muni	5707	0	0.0%	3.1%
Zip+4	20183	3369	16.7%	11.0%
ZipLowRate	4885	0	0.0%	2.7%
Total	182956	51990	28.4%	

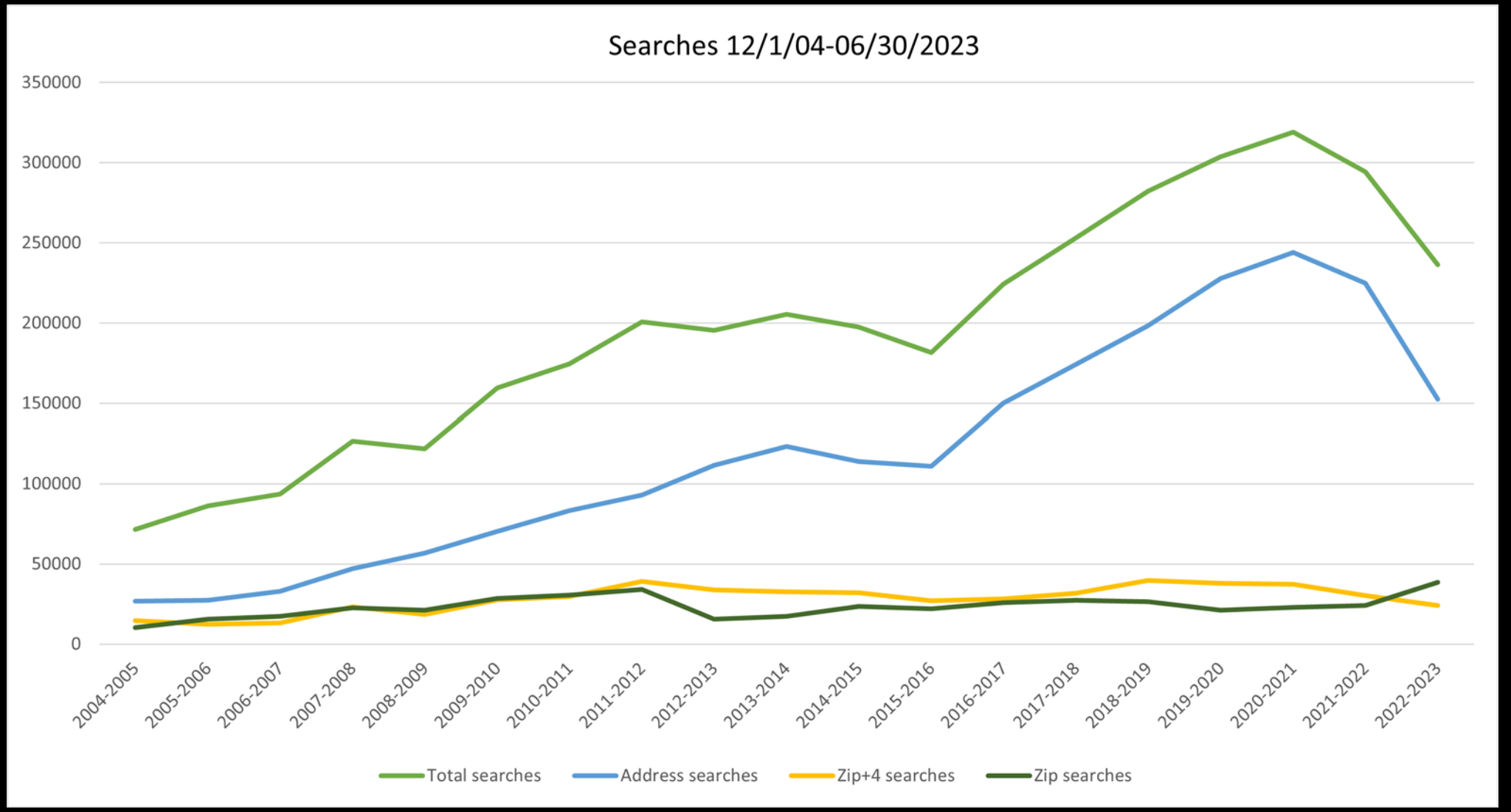


Historic usage data

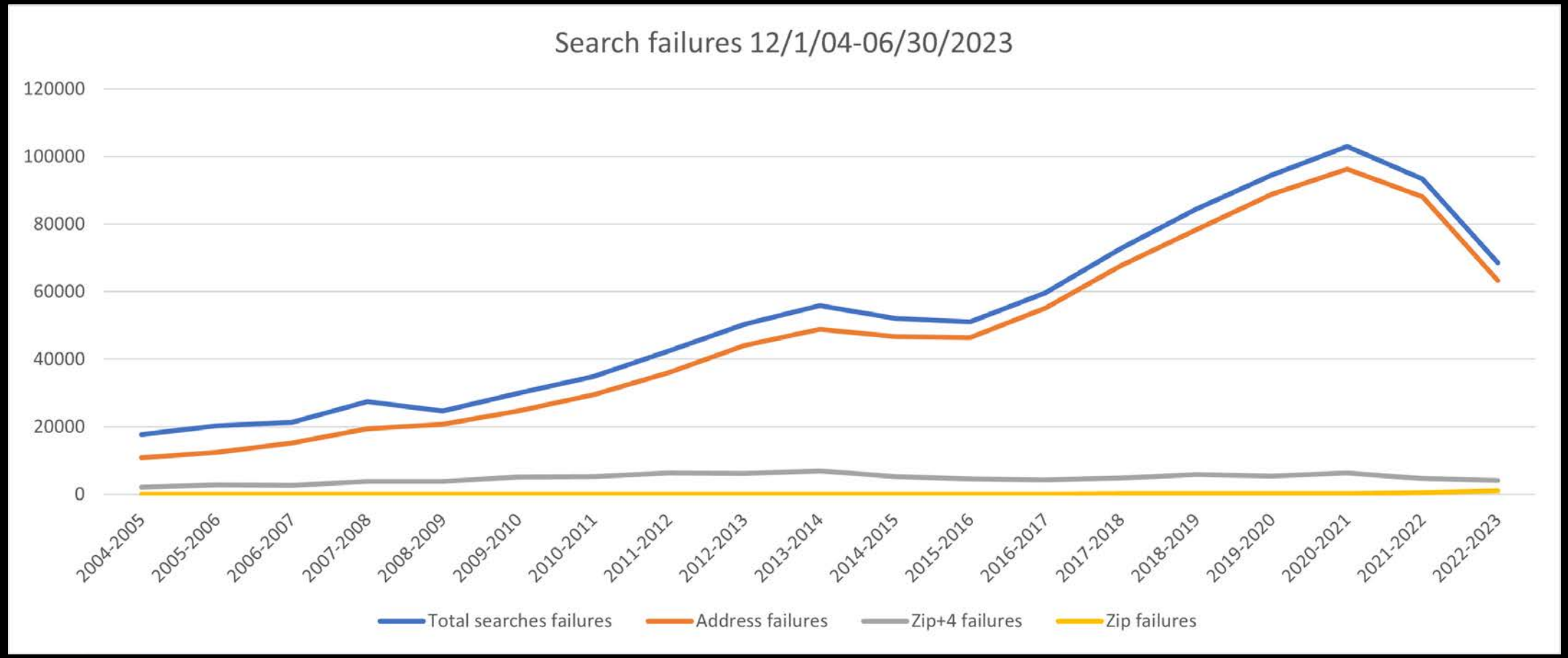
	12/1/04-6/30/23			
	Searches	Failed	% Failed	% of total searches
Address	2269161	892786	83.0%	61.4%
Zip	445578	90671	8.4%	12.1%
County	171258	465	0.0%	4.6%
Muni	258109	670	0.1%	7.0%
Zip+4	533412	90671	8.4%	14.4%
ZipLowRate	8590	0	0.0%	0.2%
City	7735	11	0.0%	0.2%
Total	3693843	1075274	29.1%	



Historic usage data



Historic usage data

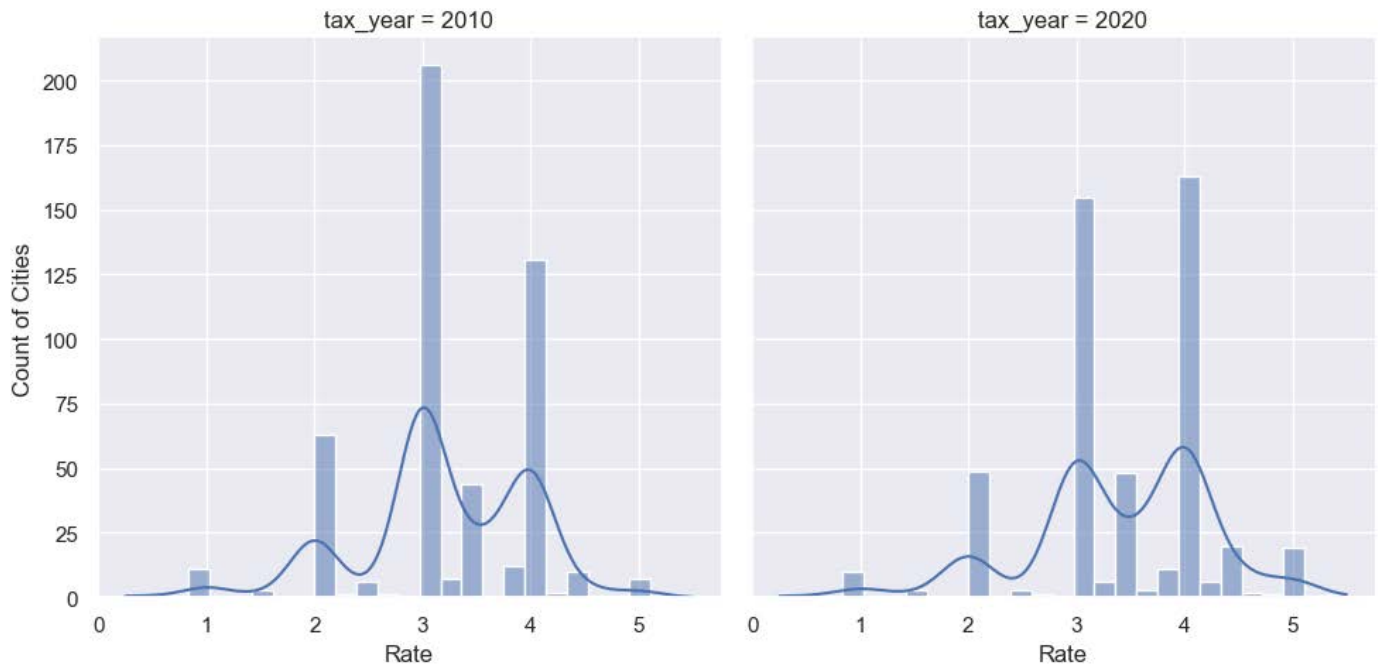


Top 5 Application Users in 2023

- WHOIS IP lookups for the top 5 **individual** IP addresses appearing in the web searches/hits data in 2023 (so far) are shown below. Assuming the IP addresses assigned to users are generally static (don't change on renewal), then we know we may have some particularly interested users.
- While a WHOIS lookup doesn't identify an individual user directly, it does identify the range of IP's from which the IP came – IP ranges per WHOIS report the entities responsible for the range in questions, and can be thought of as Users' internet service providers (ISP):
- **1** – 6,038 hits - ***AT&T***
  - *One ATT user (by IP) has logged 6,038 searches in 2023. Thank you for your business.*
- **2** – 3,848 hits - ***Dobson Fiber***
- **3** – 2,982 hits - ***TierPoint, LLC***
- **4** – 2,802 hits - ***State of Oklahoma (OMES)***
- **5** – 1,805 hits - ***Cox Communications, LLC***

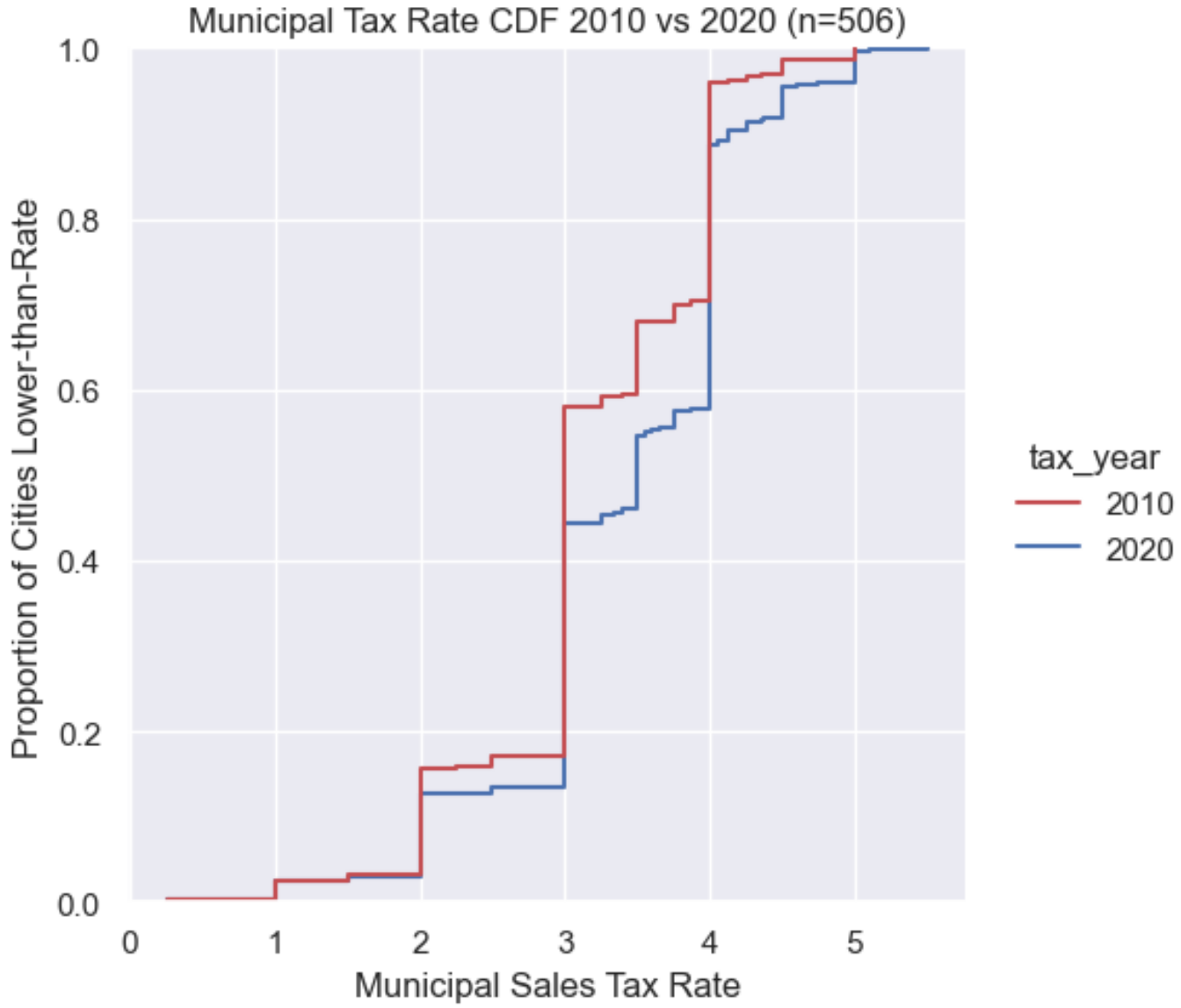
Other Questions, Additional Project Data: How Have Municipal Sales Tax Rates Changed?

- Between 2010 and 2020, have ***municipal*** sales tax rates changed overall?
- Can we account for population? Between 2010 and 2020, has ***municipal*** sales tax "intensities" changed overall?
  - What's ***intensity?***
  - We made it up.
  - This weights tax rates by populations affected for a given point in time (2010 and 2020, respectively). More population is assumed to associate with greater sales activity, more tax dollars collected:
    - $Intensity_m = \log_e(population_m) \times sales\ tax\ rate_m$
    - For each Oklahoma municipality $\forall m \in M$ where m is collecting a nonzero sales tax in both 2010 and 2020 (April 1st).



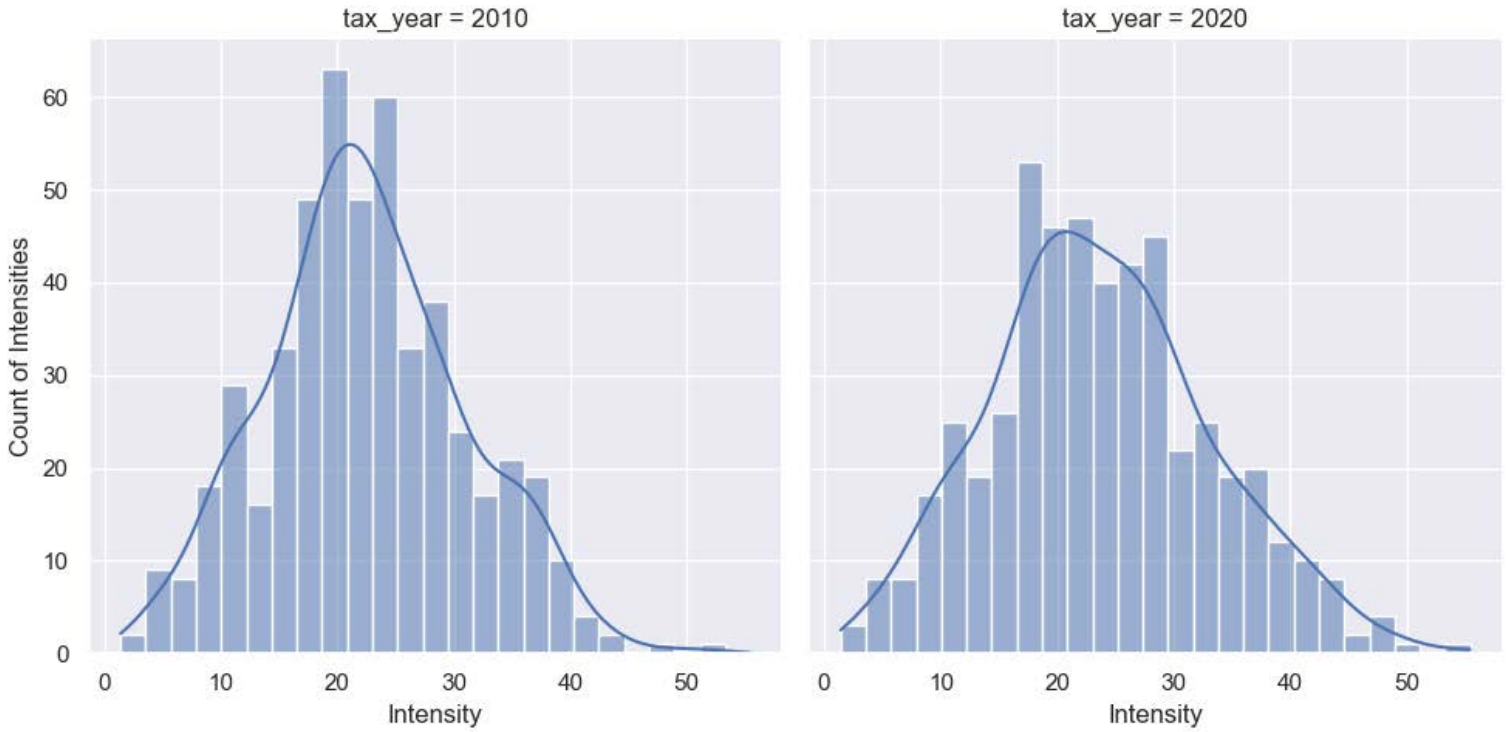
In histograms of municipal rates, a shift appears.

(On April 1, of Tax Year)



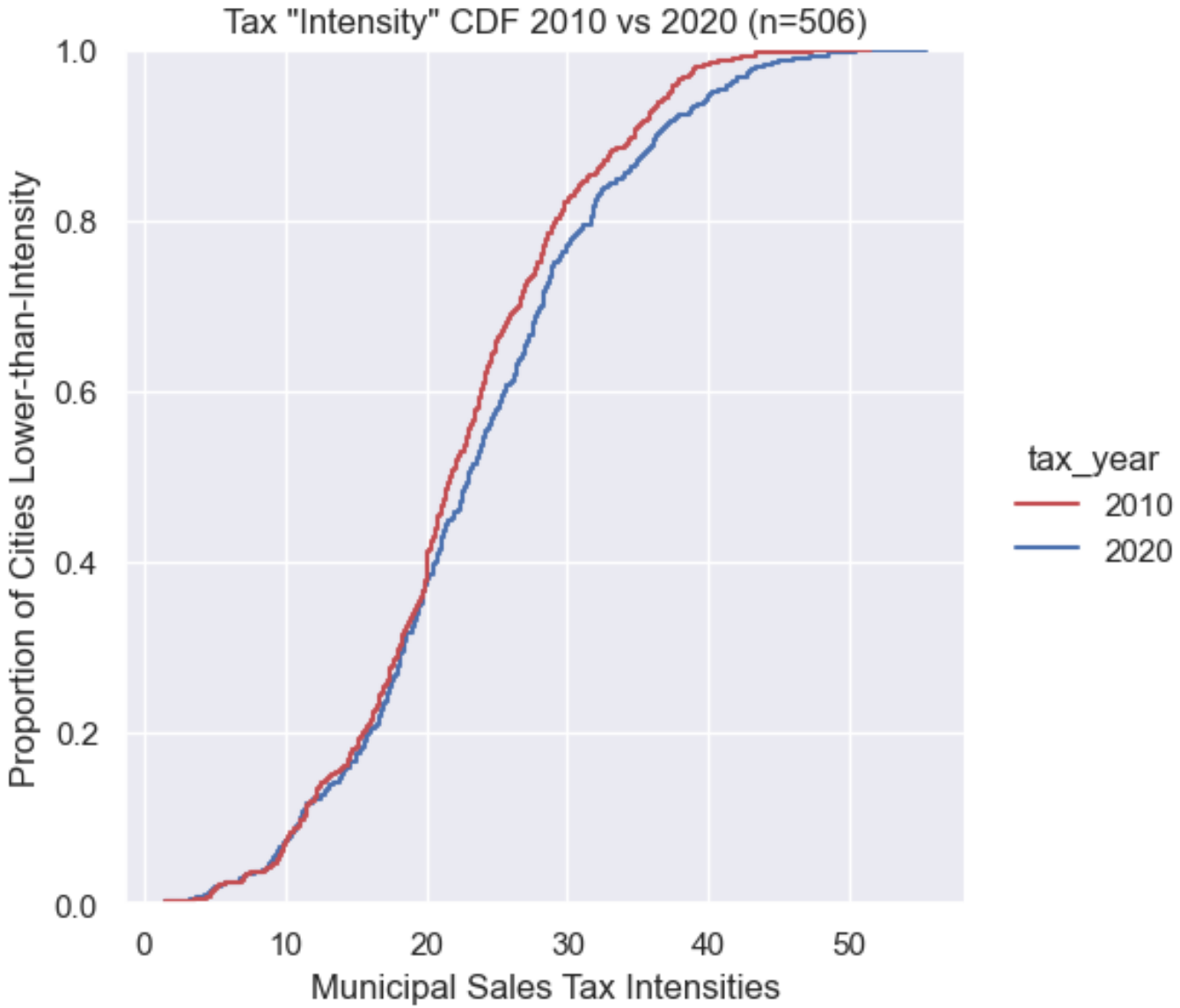
What's the probability a random in-town sale will pay less than X tax?

(On April 1, of Tax Year)



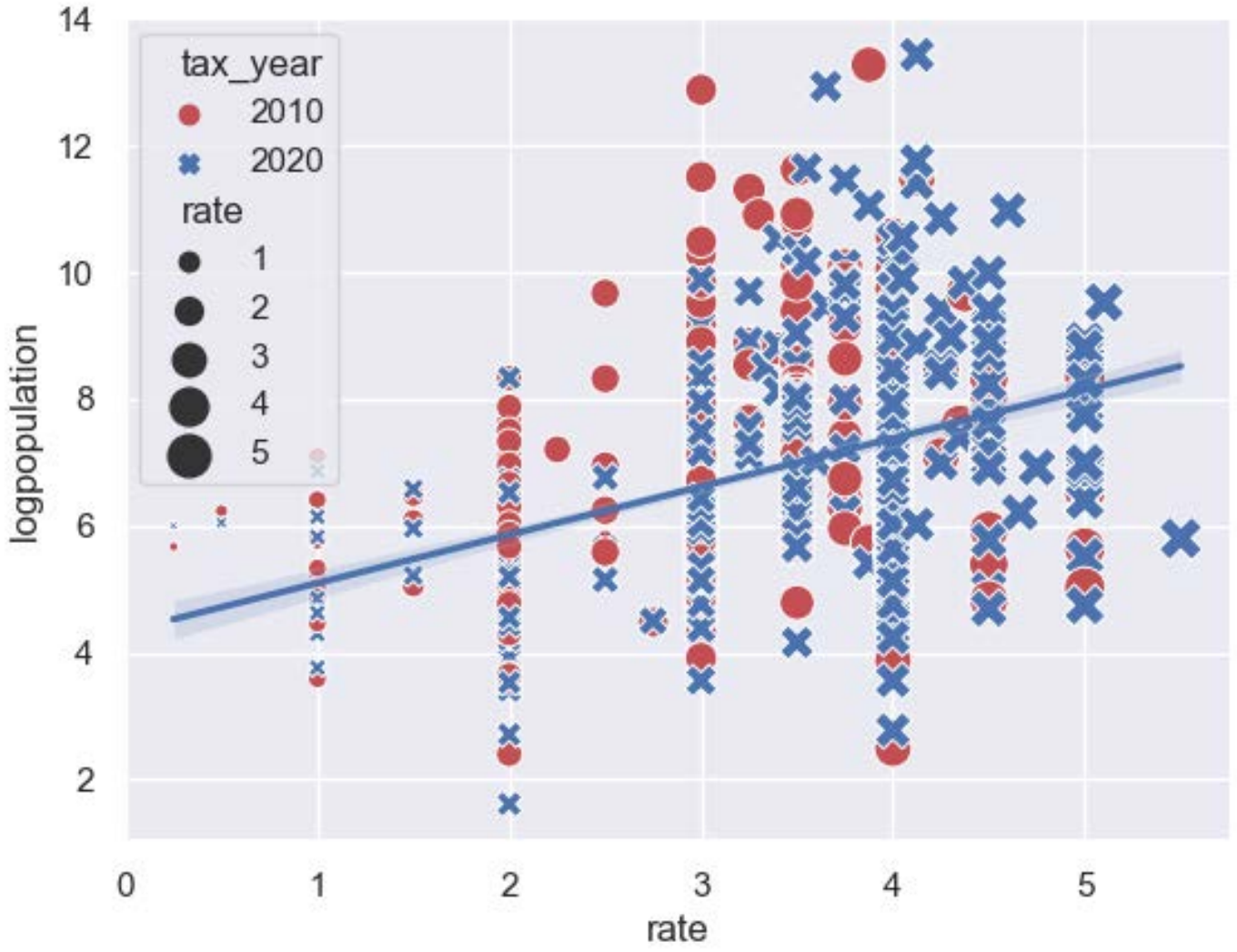
In histograms of municipal rates accounting for population, a different shift appears.

(On April 1, of Tax Year)



What does this relation look like when incorporating municipal populations?

(On April 1, of Tax Year)

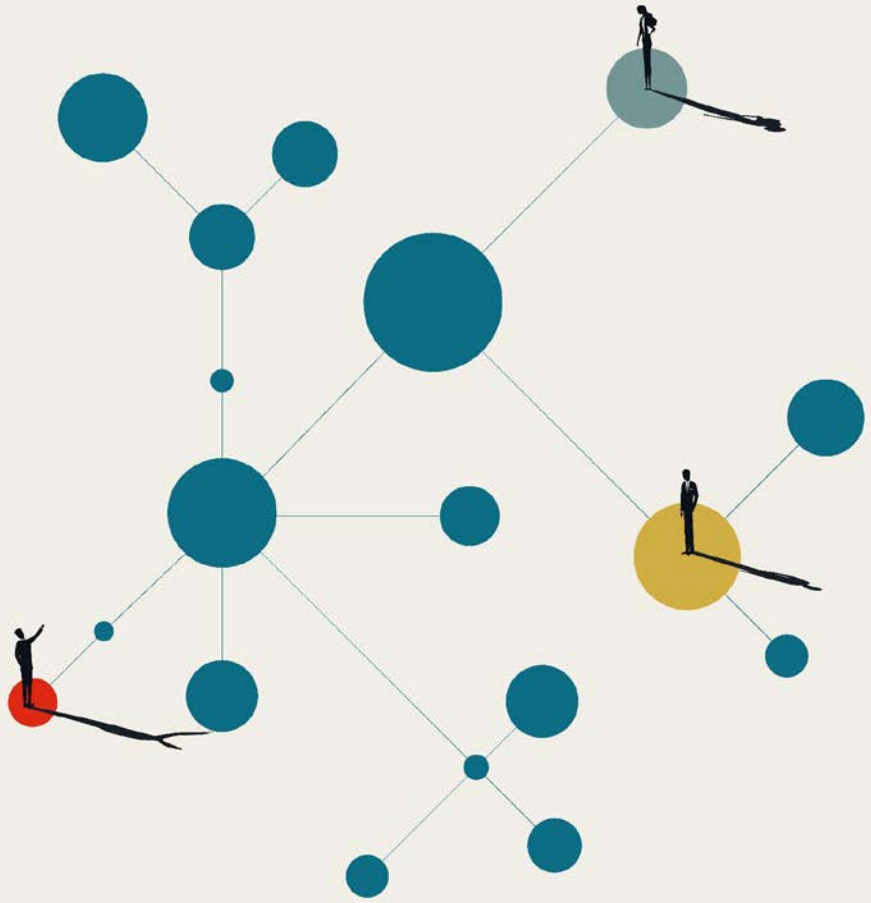


Higher Sales Tax Rates appear associated with larger cities overall.

(On April 1, of Tax Year)

A Significant Change in Oklahoma Tax Rates?

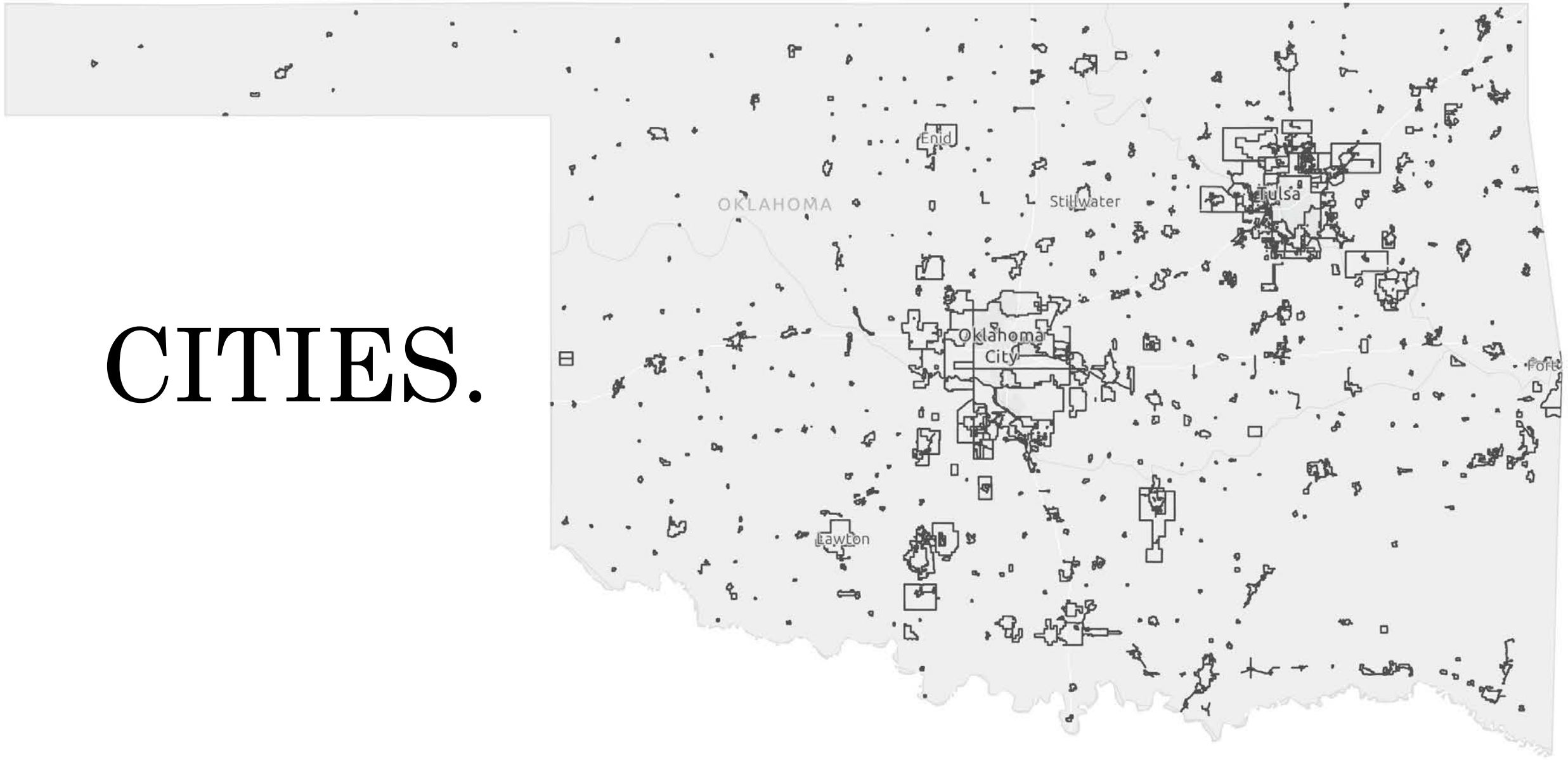
- A one-tailed T-test for difference in mean tax rate where the alternative hypothesis suggests the mean value **has increased** (not accounting for population) **was significant** at P = 0.00022899530774924445.
  - The chance of randomly observing a mean municipal sales tax rate as-extreme as 2020's, taken from permutations of the overall dataset, are circa *2-Thousandths-of-a-Percent* in this comparison.
  - *However*, the raw municipal rates themselves don't distribute normally as a group.
- Moving Forward, an identical test on the *intensity* measure discussed earlier is **still significant** at P = 0.014733278005017456 or "99%".
- These results apply only to **municipal sales tax rates among municipalities collecting a tax in Oklahoma between 2010 and 2020.** If sales tax pressure is increasing, it's entirely possible other types of taxation are decreasing – this may or may not reflect any manner of actionable finding for Oklahoma shoppers.



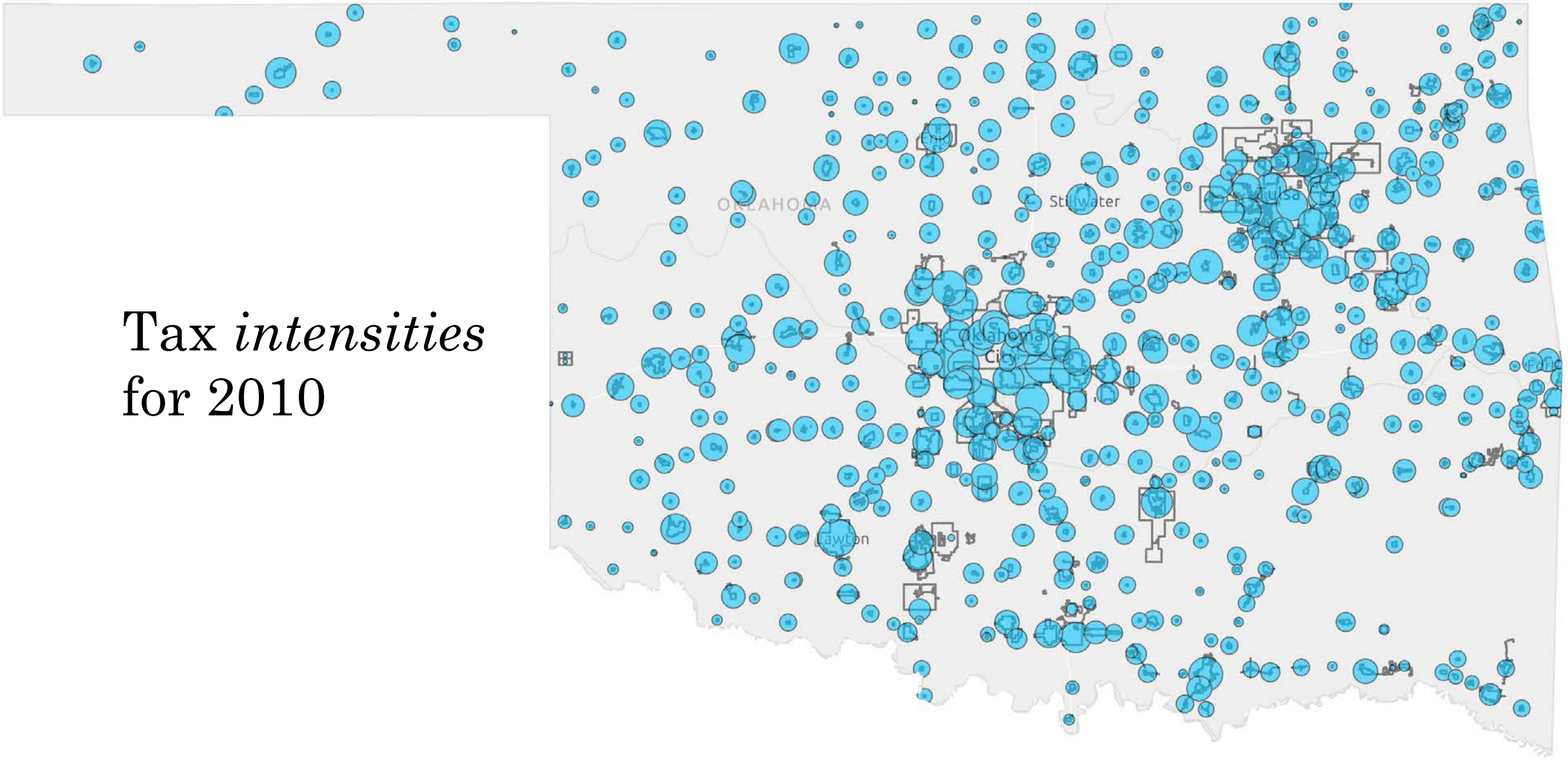
Any Notable Spatial Change in this Process?

- Does the spatial expression of these tax intensities show any pattern?
  - Comparing the mean center of tax *intensities* at 2010 and 2020, respectively.
  - Comparing the standard deviational ellipses of *intensities* at 2010 and 2020.
- Is the expressed pattern in intensities random overall?
  - Absolutely not, but we can confirm this.
- In a rough assessment, do similar intensities occur together? Is there **some regionalization to tax intensity** in the State of Oklahoma?

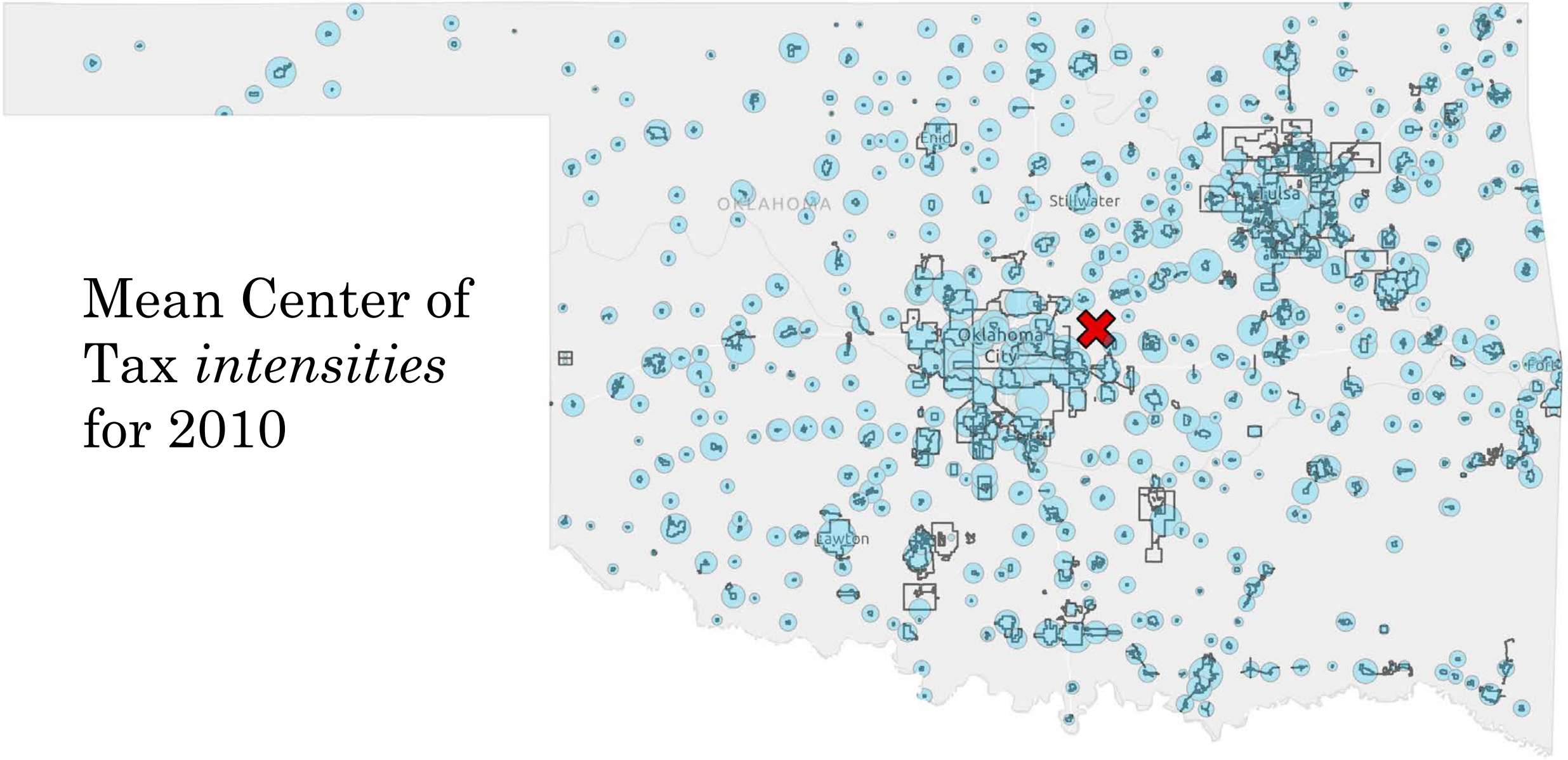
CITIES.



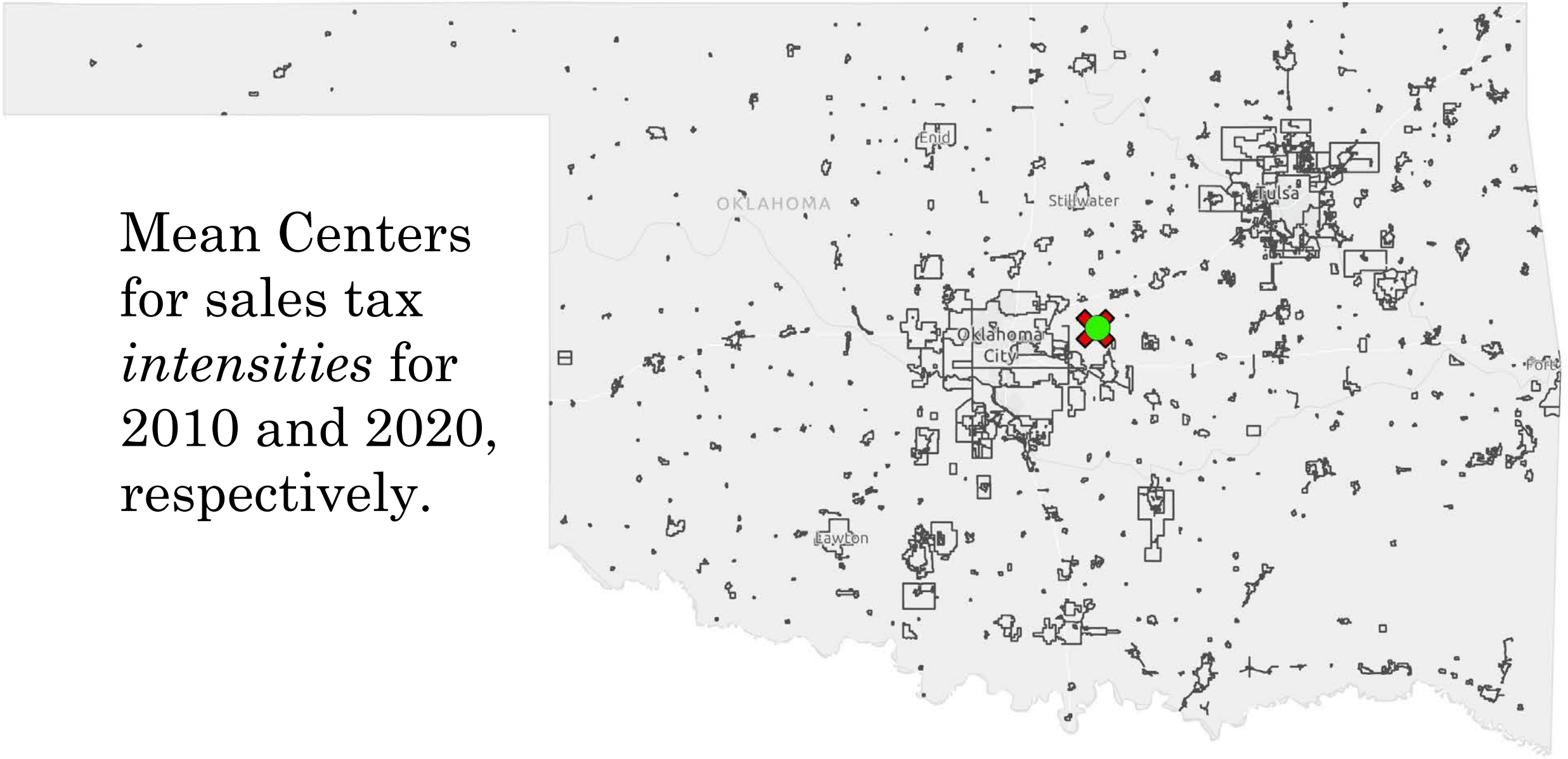
Tax *intensities* for 2010



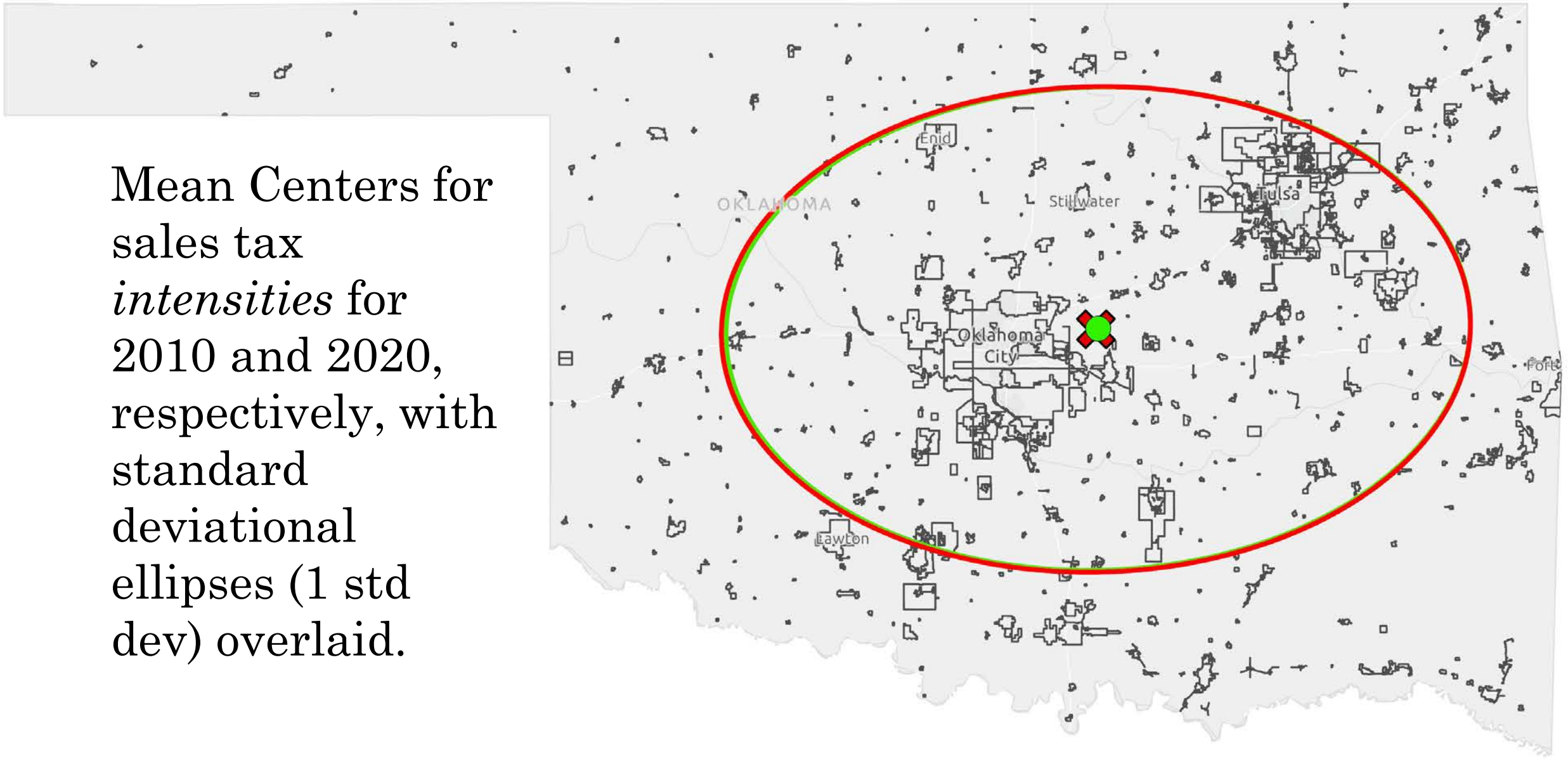
Mean Center of Tax *intensities* for 2010



Mean Centers for sales tax *intensities* for 2010 and 2020, respectively.

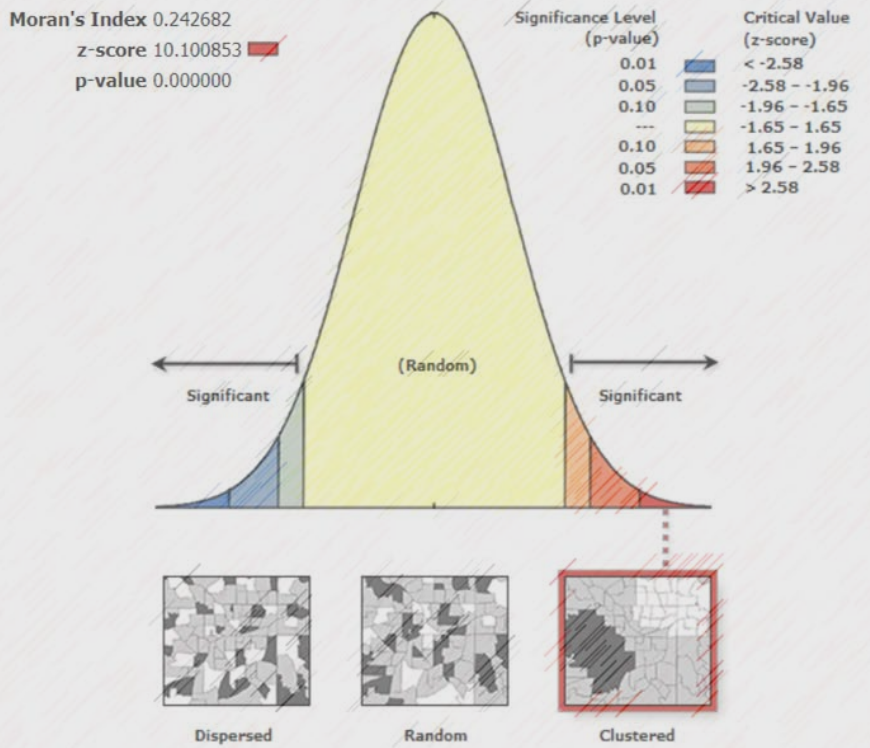


Mean Centers for sales tax *intensities* for 2010 and 2020, respectively, with standard deviational ellipses (1 std dev) overlaid.



While slight, the displacement in mean centers shows 2010-2020 mean center *intensities* have a vector; the center has moved.

Spatial Autocorrelation Report



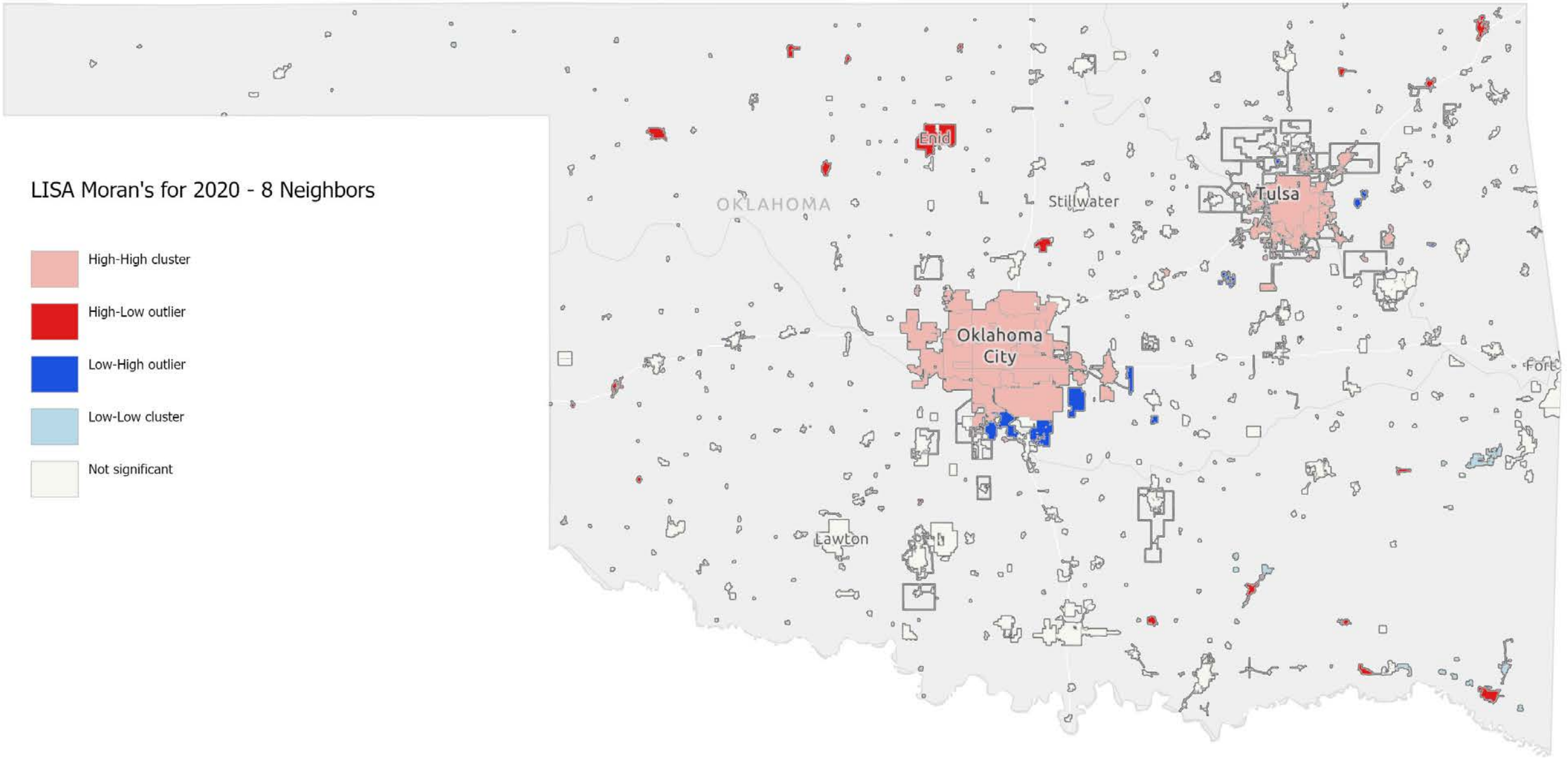
Given the z-score of 10.100853, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Global Moran's I Summary

Moran's Index	0.242682
Expected Index	-0.001828
Variance	0.000586
z-score	10.100853
p-value	0.000000

Dataset Information

- Just to be Sure, the Global Moran's I statistic returned for *intensities* in 2010 and 2020, respectively, are both significantly clustered, under K-nearest (8) neighbors and weighted as a function of inverse distance among cities, respectively.
- Sort of an obvious confirmation – cities and their populations can't reconfigure themselves much over the course of 10 years – save for some manner of environmental catastrophe or invasion, etc. The more variable component here are tax rates.


LISA Moran's for 2020 - 8 Neighbors
High-High cluster
High-Low outlier
Low-High outlier
Low-Low cluster
Not significant
OKLAHOMA
Enid
Stillwater
Tulsa
Oklahoma City
Lawton
Fort

What Other Activities is CSA Engaged In?

- CSA staff and academic leadership represent a great deal of technical and scientific expertise in GIS.
- CSA hosts, populates and maintains turn-key GIS infrastructure.
- CSA consults on the implementation and enculturation of GIS within spatially-concerned organizations.
- CSA may consult on a temporary or hourly basis for smaller needs and can provide commensurate temporary hosting and software up to delivery of any data product.

CSA's Prior Art in Oklahoma

- The CSA Story Map (A Brochure):
  - https://csagis.csa.ou.edu/portal/apps/storymaps/stories/7cafc103edb9407e953d552f235ca47b
- The CSA Data Warehouse (Open Data)
  - https://csagis-uok.opendata.arcgis.com/
- The Oklahoma Water Resources Board
  - https://www.owrb.csa.ou.edu/portal
- The Oklahoma Boll Weevil Eradication Association
  - https://obweo.org/portal/apps/sites/#/obweo

Questions?

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  - www.csa.ou.edu

- Happy to Help.