Chaire LOGISTICS CITY

2022 I-NUF

9TH METRANS
International Urban Freight Conference
May 25-27, 2022 | Hyatt Regency Long Beach

Evolution of warehouse location from 2012 to 2019 in major U.S. metropolitan areas

Université Gustave Eiffel

Dr. Matthieu Schorung, Dr. Laetitia Dablanc (*presenter*)

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POSTE IMMO

Région îledeFrance

- Urban studies, geography and urban planning
- Macro spatial analyses to micro level studies
- Warehouses, innovations, new trends in consumption and impacts on city logistics

https://www.lvmt.fr/en/chaires/logistics-city/

Results available online, eg:

- E-book on warehouse geography in the US
- Observatory of ecommerce mobilities
- Survey reports on **gig workers for instant delivery platforms in Paris, 2016 to 2022**
- Logistics real estate and relationships with urban form, macro analyses

We are hiring: two long-term post-doc positions starting January 2023

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Logistics landscape in large US cities

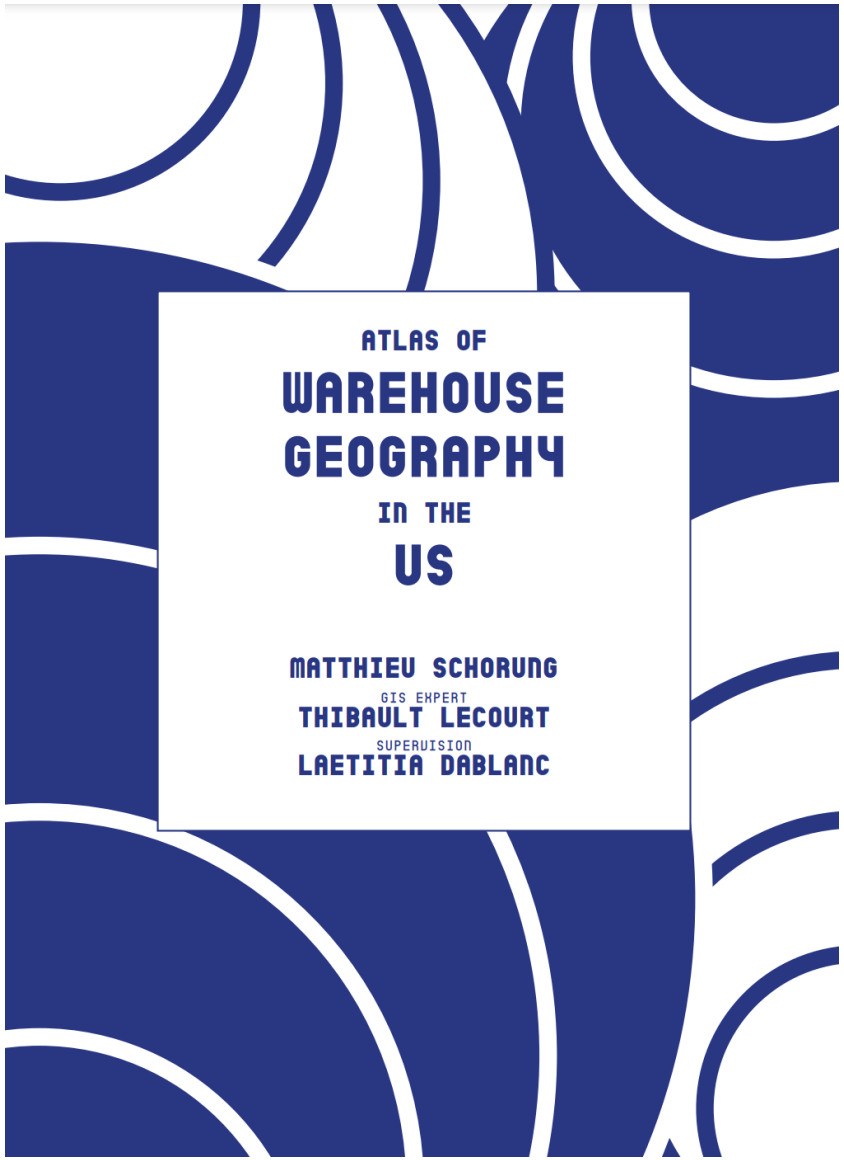
Changes in the location of logistics facilities reflect the broader transformation of warehousing and logistics as an economic sector

- XXL distribution centers and mega-fulfillment centers (over 50,000 sq m), historical trend of logistics clusters moving away from urban centers
- The search for space in dense areas to meet demand from e-commerce and parcel distribution

State of the art

- Recent studies have looked at the **location of warehouses** in metropolitan areas and how this has changed over time
- We have identified 74 case studies around the world by 2020 (Bowen, 2008, Cidell, 2010, Heitz and Dablanc, 2015, Giuliano et al., 2016, Kang, 2020)
- Includes numerous North American **case studies** in Atlanta, Los Angeles, Seattle, Toronto, all US (Kang, 2020), Chicago and Phoenix (Dubic et al., 2020)
- 86% of these studies have demonstrated a **shift in the location of warehouses and logistics facilities to peripheral areas**
- The location of logistics warehouses is based on **several criteria and a complex supply chain cost structure** (transportation, accessibility, structure of the regional economy, land and real estate, workforce, last mile)

E-book on warehouse geography in the United States (Schorung et al.)



- Mapping effort including latest county business patterns database available (2019)
- Overview at the national level: 45 US metropolitan areas (MSA / CSA) and eight US megaregions
- Historic comparison (from 2012 to 2019)
- Indicators (barycenters, ellipses, warehouse density)
- Different methods of map representation (grid, heatmaps)

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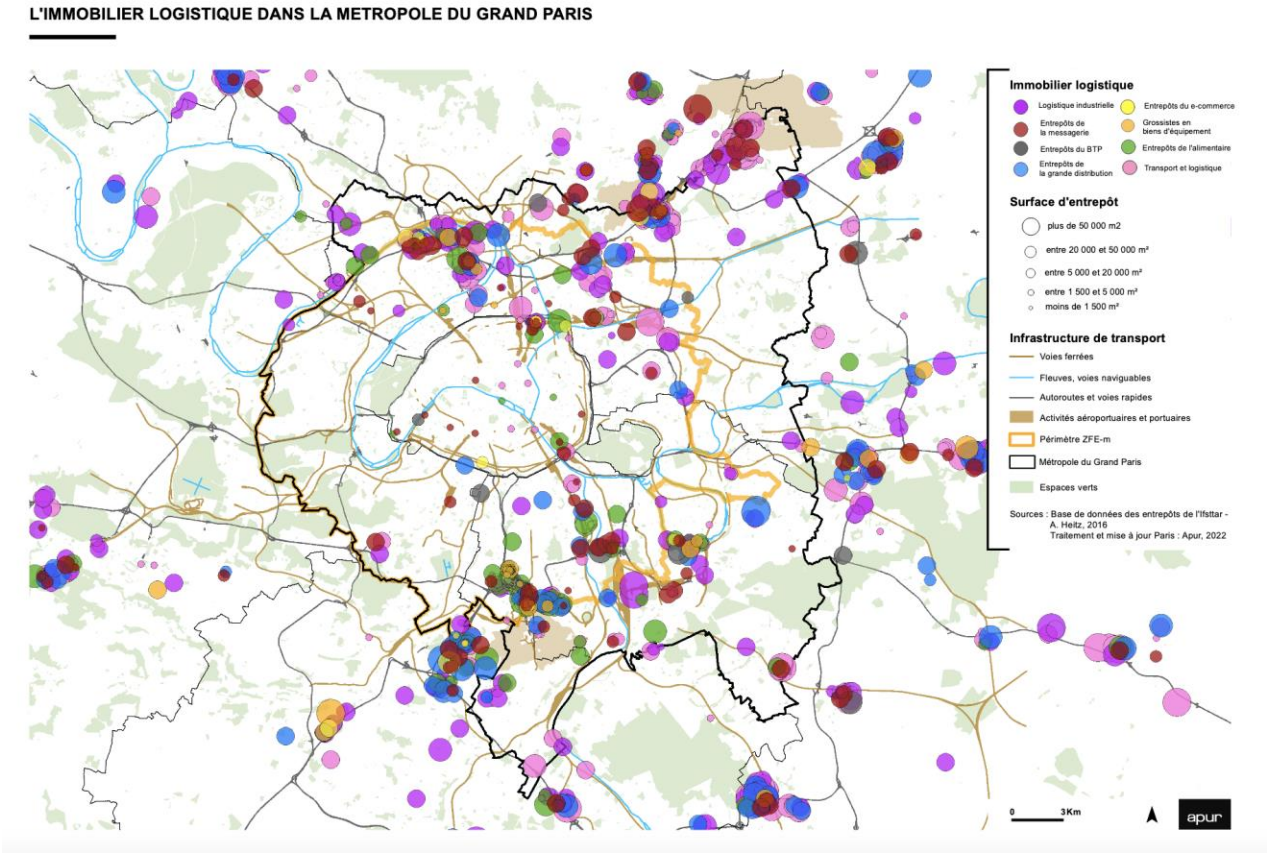
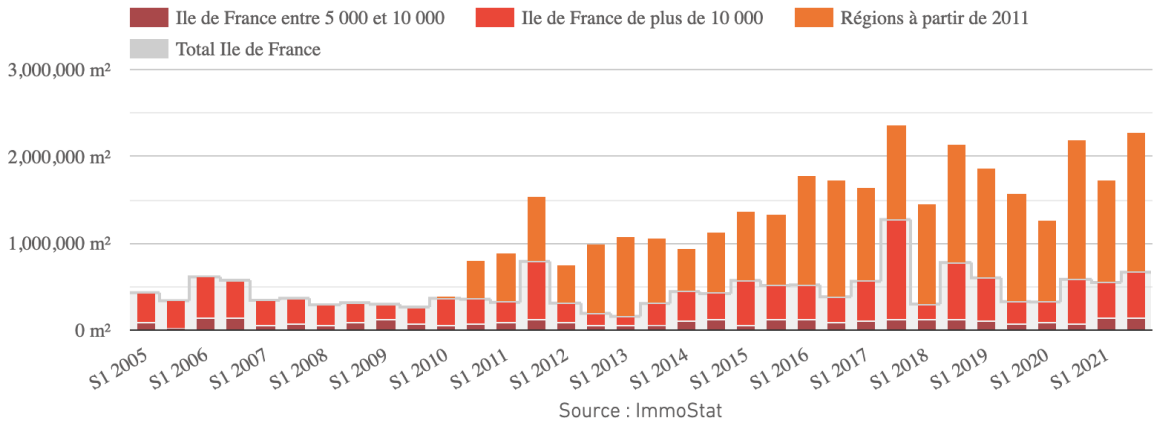
1000 warehouses in the Paris region



New warehouse land areas over 5,000 sq m
In red: Paris region, In orange: rest of France



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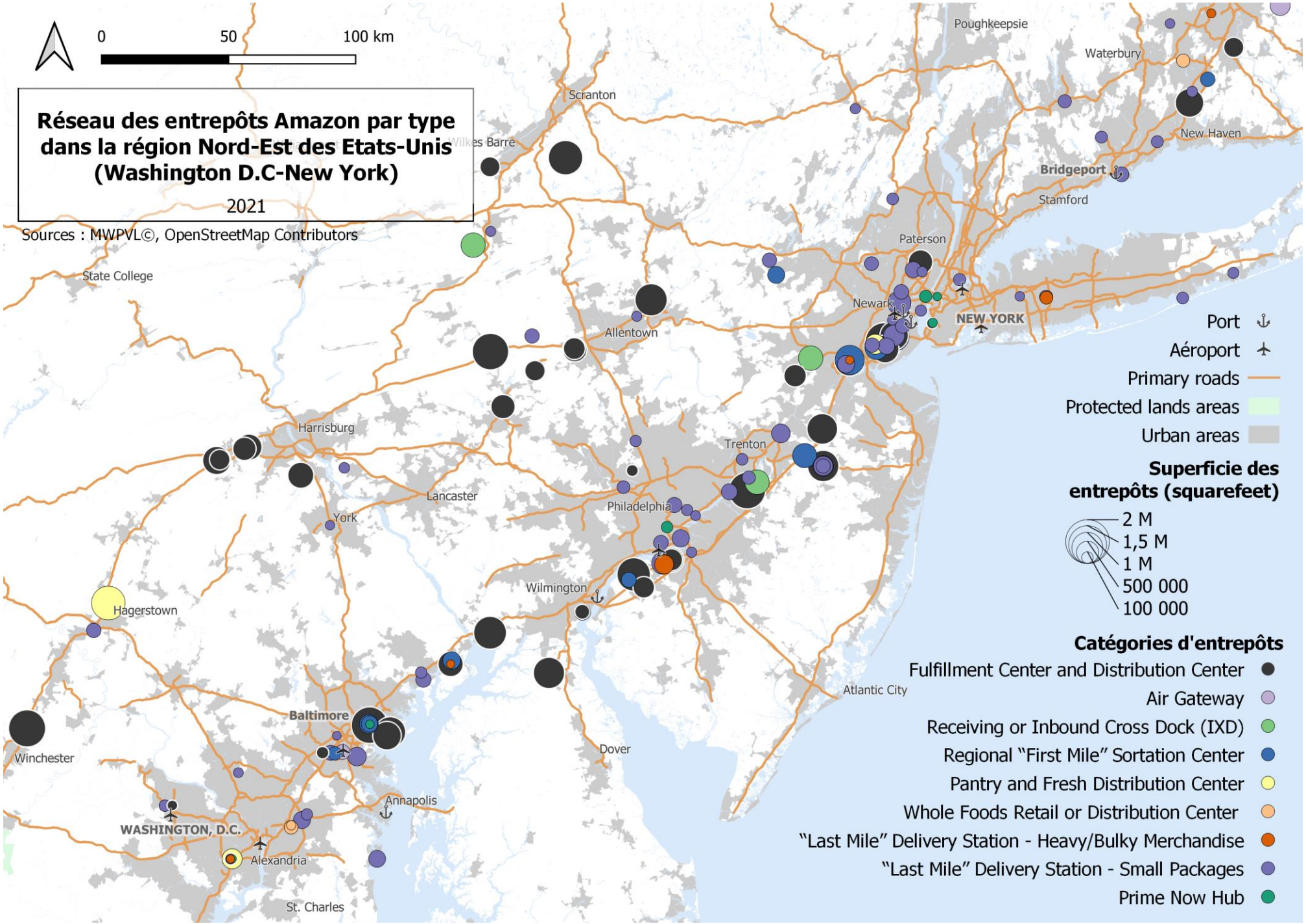

Amazon warehouses from Washington DC to NYC

Schorung, Lecourt, Logistics City Chair, 2021

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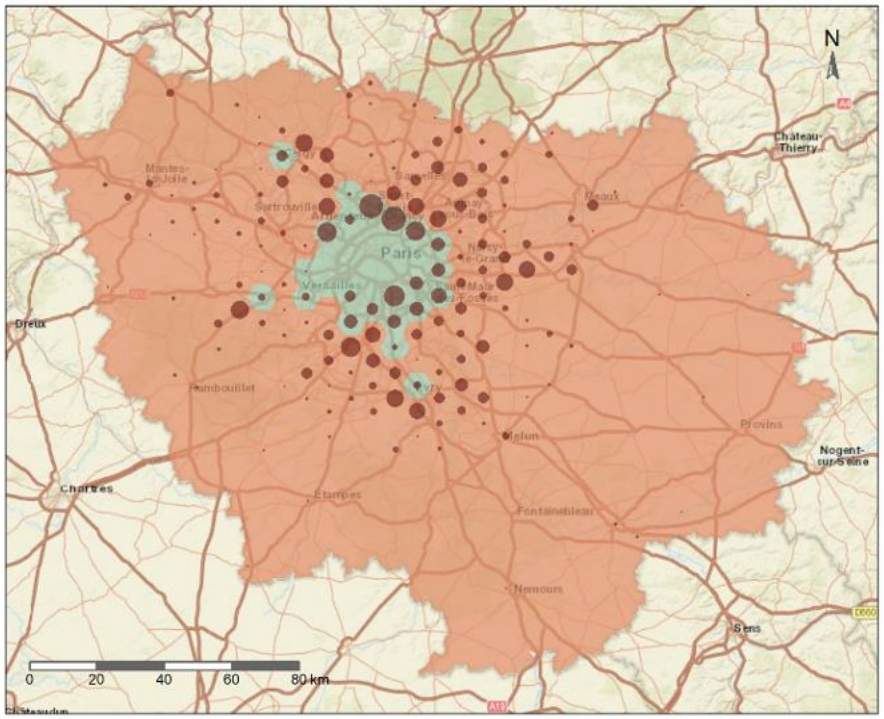
Automated data collection (Oliveira, Schorung, Dablanc, 2022)

- *Points of interest* from OpenStreetMap to identify urban v suburban areas
- Warehouse rental prices from real estate market sites

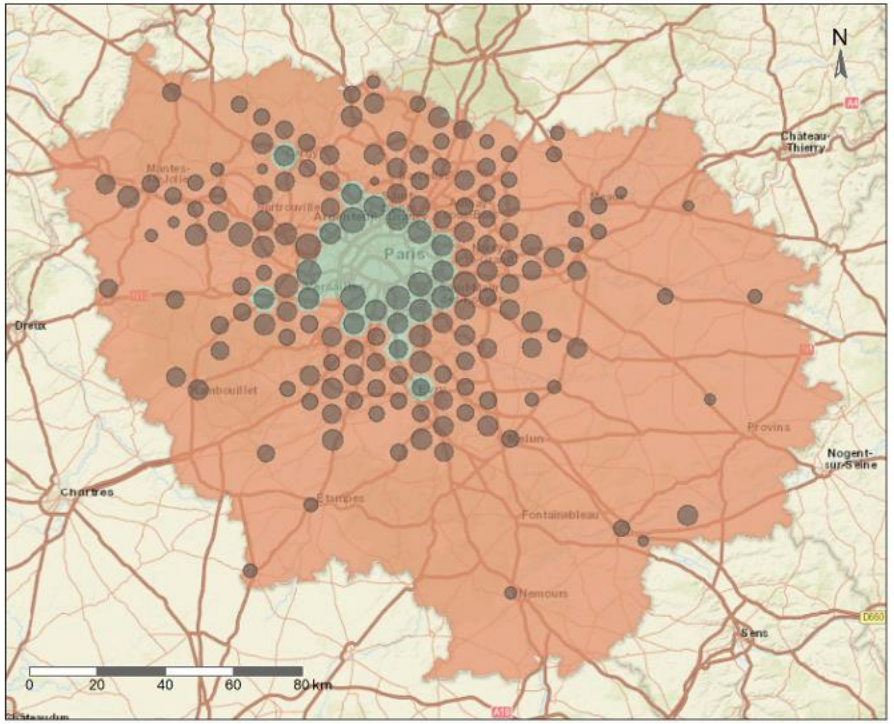


Number of warehouses

suburban
central

1 32 64 96 127

(A)

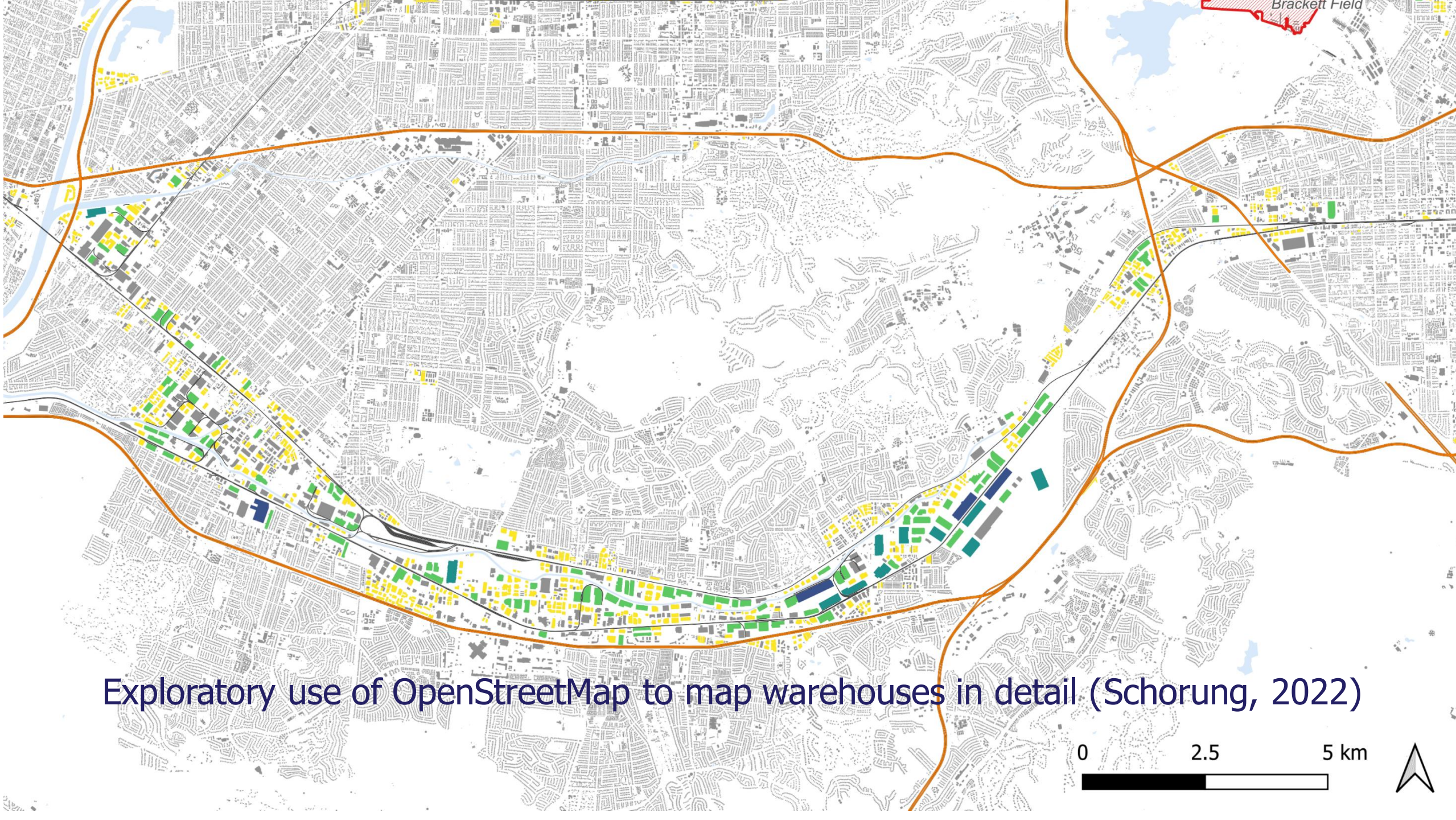


Warehouse average price

suburban
central

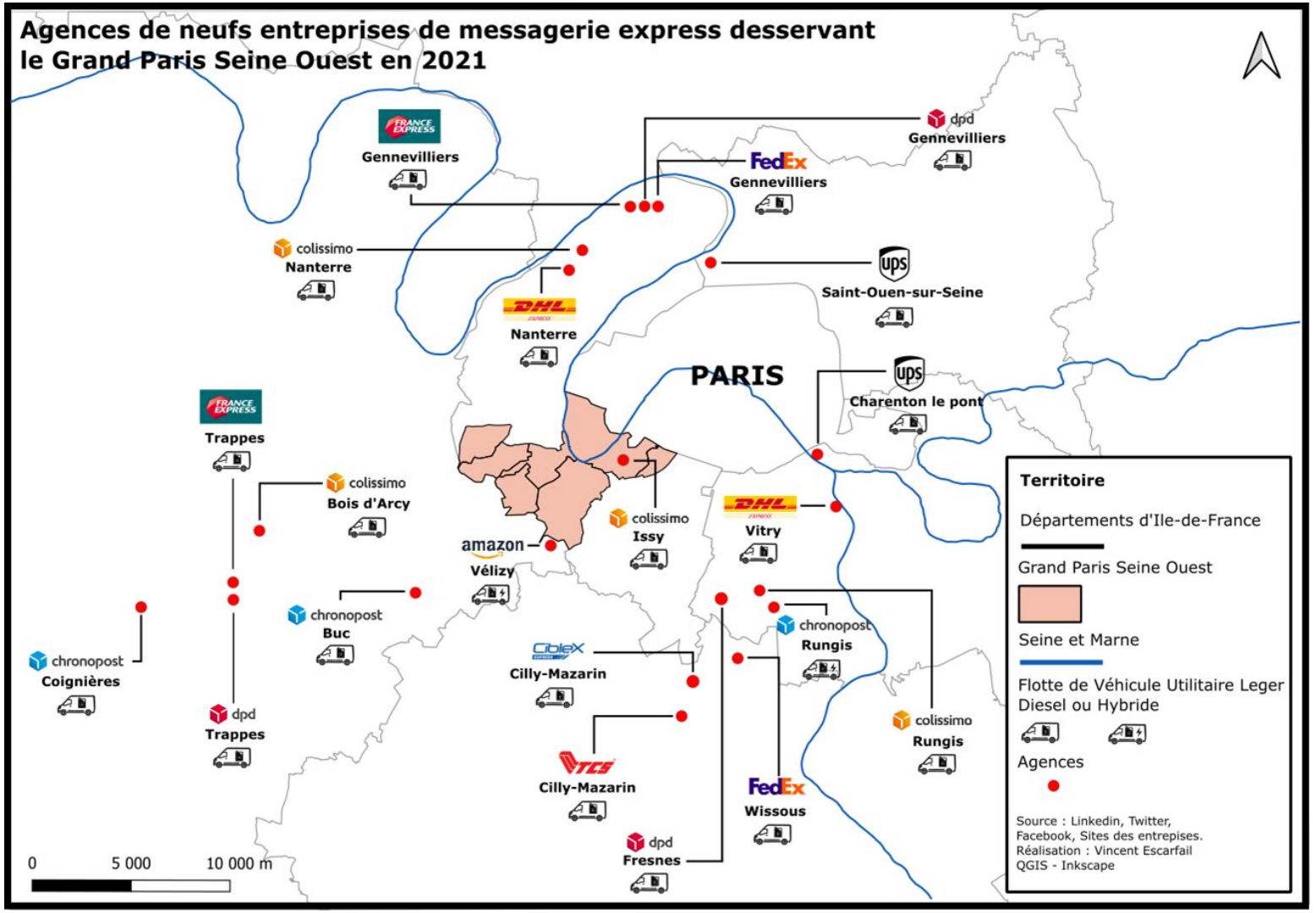
23.0 67.3 111.5 155.8 200.1

(B)



Exploratory use of OpenStreetMap to map warehouses in detail (Schorung, 2022)

Wealthy areas served by warehouses located elsewhere: example of Issy/Boulogne in the Paris metro area



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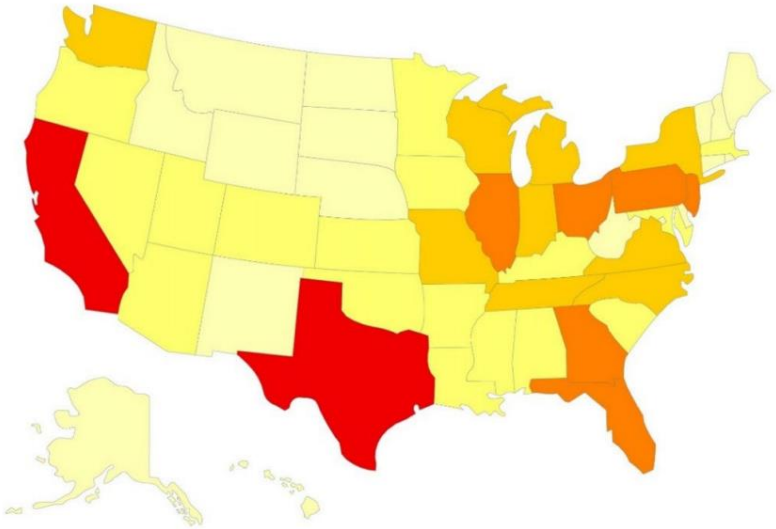
An evolving geography

Map 1.
Share of logistics establishments by state in 2019.

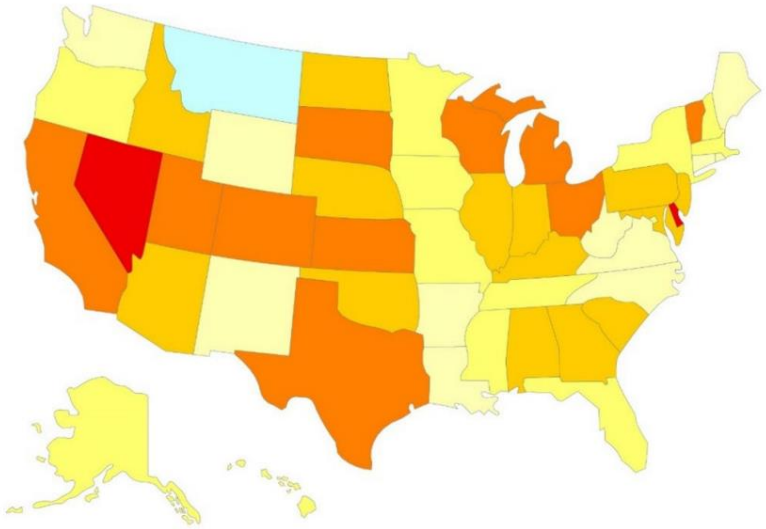


Fait avec Philcarto * 07/06/2021 14:33:56 * http://philcarto.free.fr

SOURCE
COUNTY BUSINESS PATTERNS, 2019

REALISATION: MATTHIEU SCHORUNG

Map 2.
Changes in the number of logistics facilities by state between 2012 and 2019.



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SOURCE
COUNTY BUSINESS PATTERNS, 2019

REALISATION: MATTHIEU SCHORUNG

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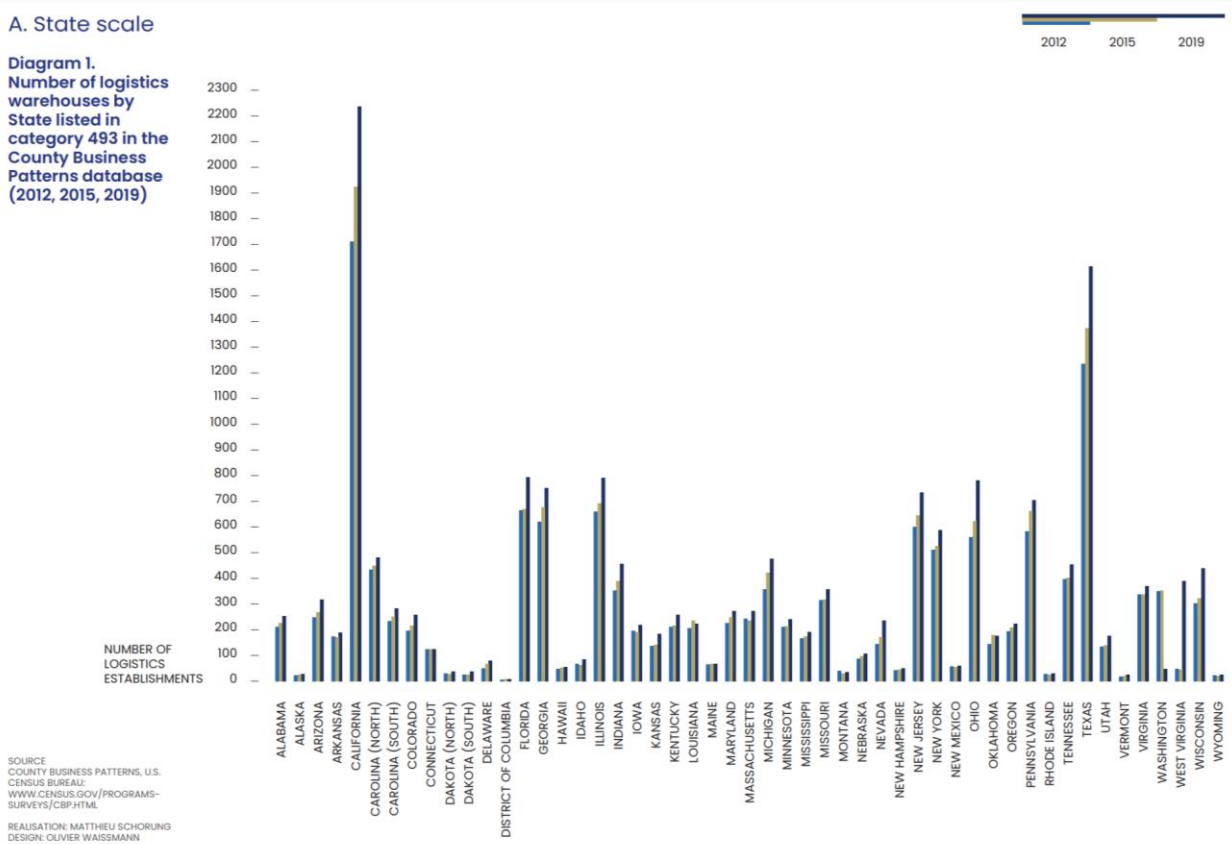
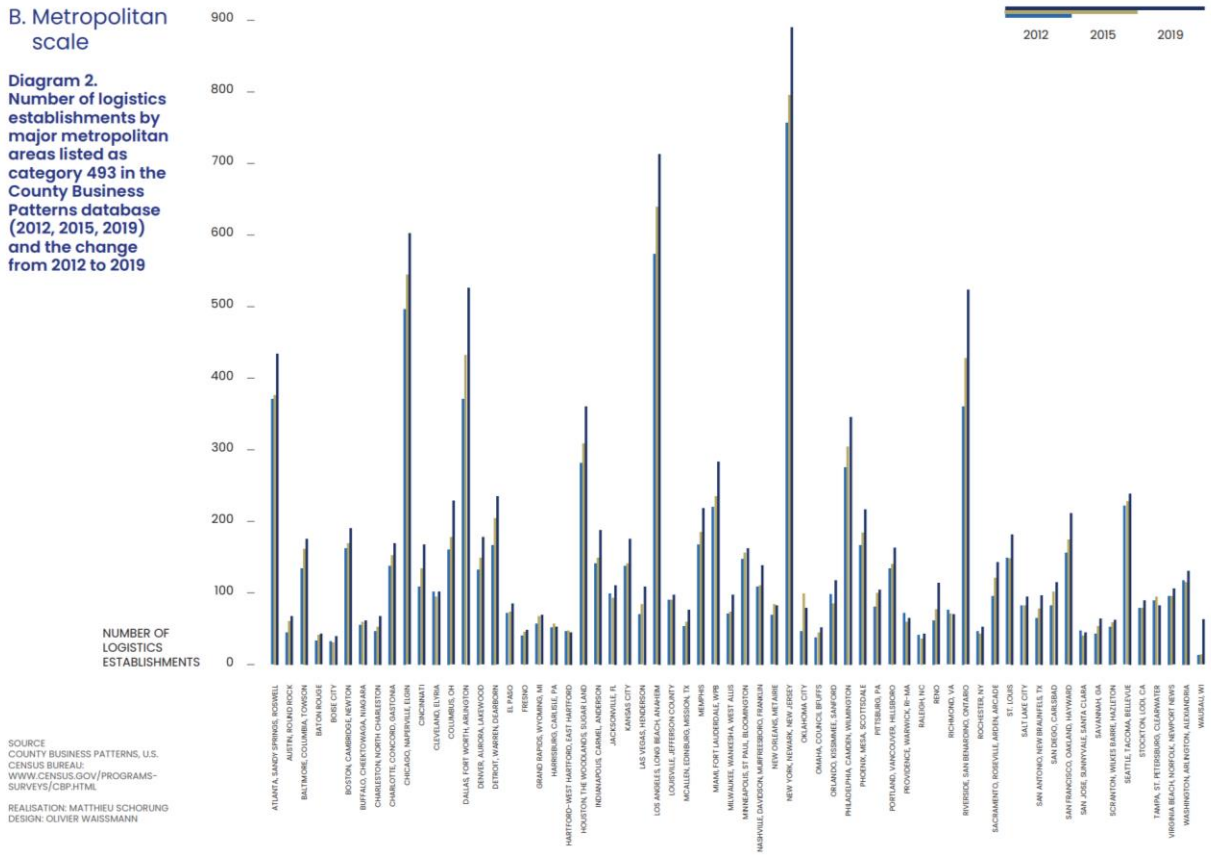
An uneven spatial distribution of logistics warehouses





- States with the most warehouses (2019): California, Texas, NY+NJ
- Metro areas with the most warehouses (2019): NY, LA+Riverside, Chicago, Dallas, Atlanta

- In 2019, only nine states had more than 500 logistics facilities (CBP 493): NY (589), Pennsylvania (706), NJ (736), Georgia (752), Ohio (781), Illinois (791), Florida (795), TX (1616) and Cal (2238)
- Eight metro areas had more than 300 logistics facilities in 2019
- The trend is for the main logistics clusters to become even bigger ('metropolization of logistics')

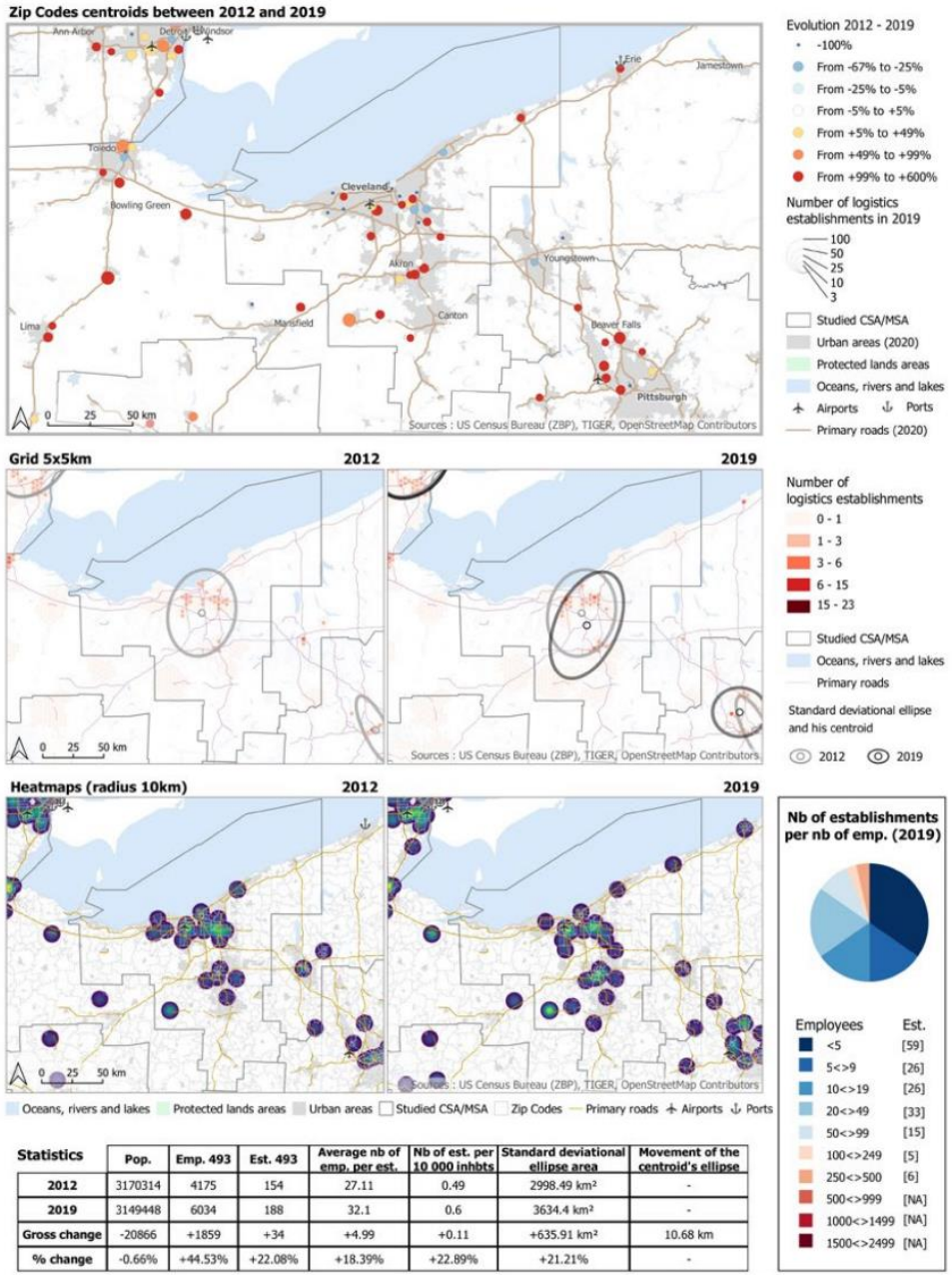
Tab. 1. Number of logistics establishments per major metropolitan areas listed as category 493 in the County Business Pattern database (2012, 2015, 2018, 2019) and the change between 2012 and 2019.

MSA	2012	2015	2018	2019	Evolution 2012-2018 (%)
Atlanta, Sandy Springs, Roswell	371	376	419	434	16.9
Chicago, Naperville, Elgin	496	544	580	602	21.3
Dallas, Fort Worth, Arlington	371	432	505	526	41.7
Houston, The Woodlands, Sugar Land	281	308	362	360	28.1
Los Angeles, Long Beach, Anaheim	573	639	707	713	24.4
New York, Newark, New Jersey	757	795	861	890	17.5
Philadelphia, Camden, Wilmington	275	304	339	345	25.4
Riverside, San Bernardino, Ontario	360	428	496	523	45.2

(Source : U.S. Census Bureau, 2012, 2015, 2018, 2019)

Examples of map boards in the e-book

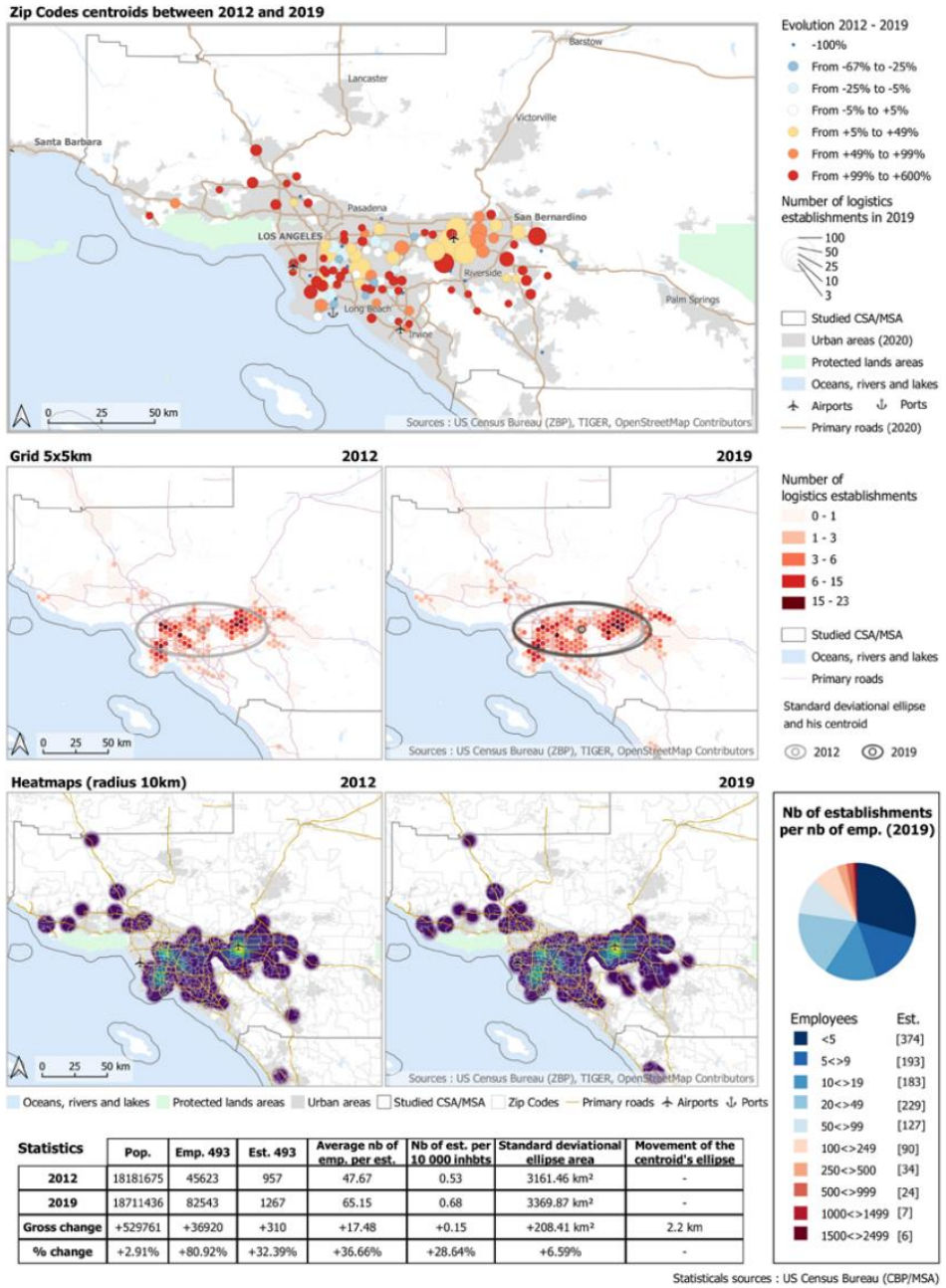
[CSA] Cleveland-Akron-Canton, OH



Statistics	Pop.	Emp. 493	Est. 493	Average nb of emp. per est.	Nb of est. per 10 000 inhbts	Standard deviational ellipse area	Movement of the centroid's ellipse
2012	3170314	4175	154	27.11	0.49	2998.49 km²	-
2019	3149448	6034	188	32.1	0.6	3634.4 km²	-
Gross change	-20866	+1859	+34	+4.99	+0.11	+635.91 km²	10.68 km
% change	-0.66%	+44.53%	+22.08%	+18.39%	+22.89%	+21.21%	-

Statisticals sources : US Census Bureau (CBP/MSA)

[CSA] Los Angeles-Long Beach, CA



Statistics	Pop.	Emp. 493	Est. 493	Average nb of emp. per est.	Nb of est. per 10 000 inhbts	Standard deviational ellipse area	Movement of the centroid's ellipse
2012	18181675	45623	957	47.67	0.53	3161.46 km²	-
2019	18711436	82543	1267	65.15	0.68	3369.87 km²	-
Gross change	+529761	+36920	+310	+17.48	+0.15	+208.41 km²	2.2 km
% change	+2.91%	+80.92%	+32.39%	+36.66%	+28.64%	+6.59%	-

Statisticals sources : US Census Bureau (CBP/MSA)

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An analysis of warehousing development patterns in four metropolitan areas

Texas Triangle megaregion

- Dallas-Fort Worth-Arlington MSA
- Houston-The Woodlands-Sugar Lands MSA

Northeast megaregion

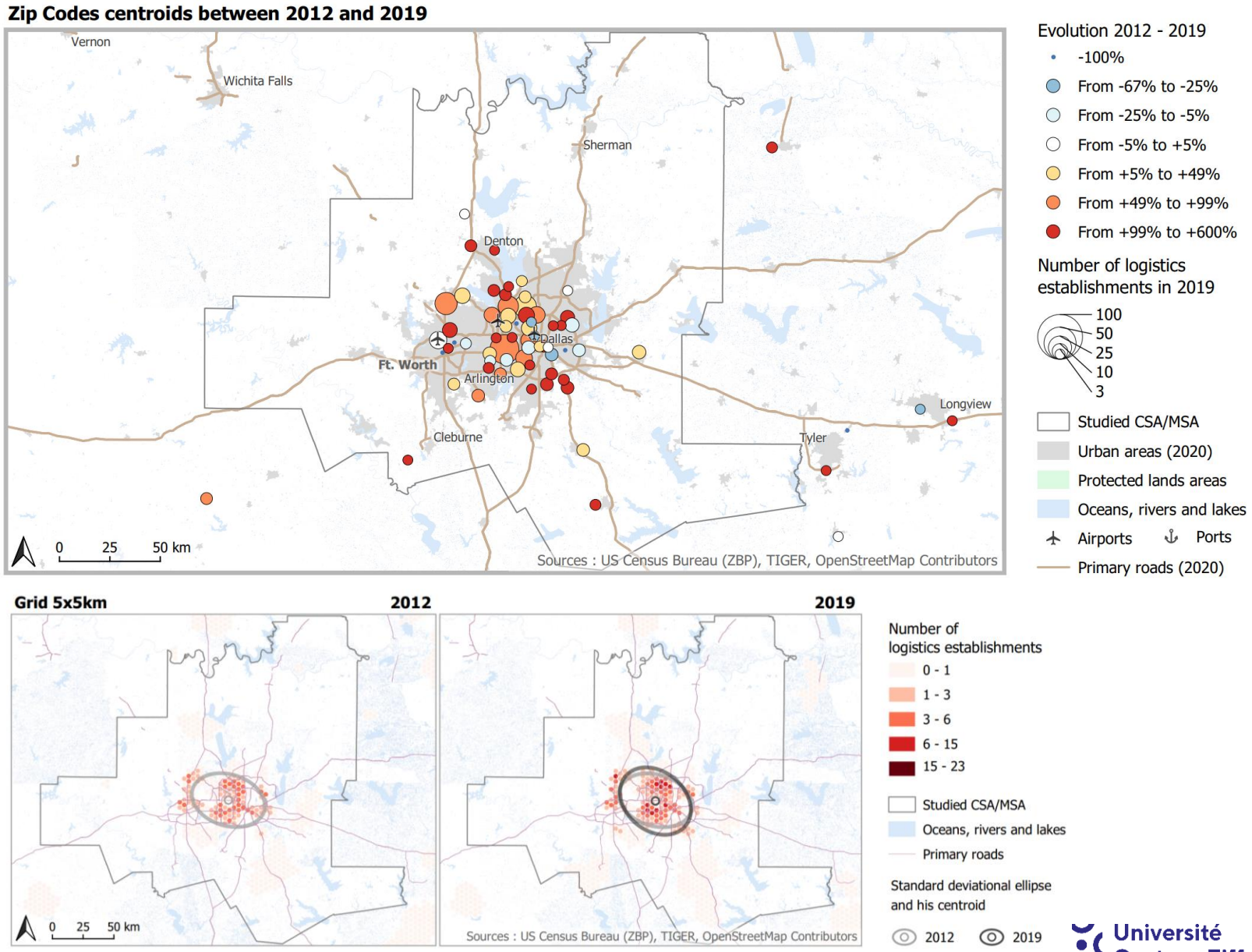
- New York-Newark-New Jersey MSA
- Philadelphia-Camden-Wilmington MSA (south of the Northeast corridor)

Methodology

- Warehousing development patterns in four U.S. metropolitan areas based on the **County Business Patterns database** (U.S. Census Bureau) for 2012 and 2019 data at zip codes granularity
- The same data period (2012-2019) was defined to ensure consistency in the analysis
    - Warehouse = establishment classified in subsector **493** ("Warehousing and Storage") of the North American Industry Classification System
    - '**Establishments engaged in operating merchandise warehousing and storage facilities**'
- This research used R to compile, aggregate the data and the QGIS software was used to map establishments and provide spatial analysis and barycenters

DALLAS-FORT WORTH-ARLINGTON MSA

- 376 warehouses in 2012 and 533 in 2019 (+42%)
- Northeast, southeast, and the southwest near Arlington
- Dual pattern of development: more logistics facilities in the first ring around Dallas and at the same time rapid development on the edges of the metro area
- The standard deviational ellipse area from the barycenter increased by 20% (2324 km² in 2019)



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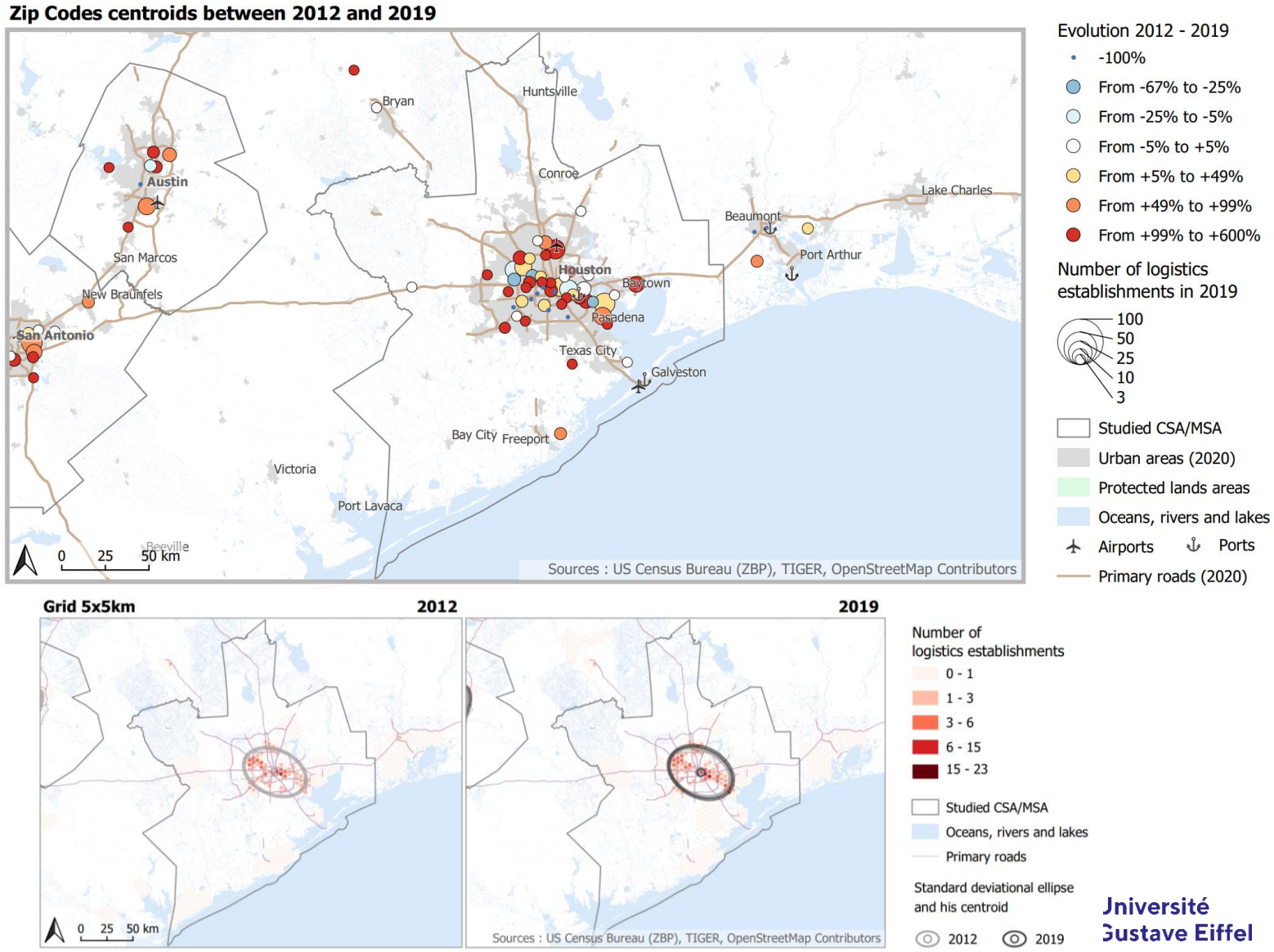
HOUSTON-THE WOODLANDS-SUGAR LANDS MSA

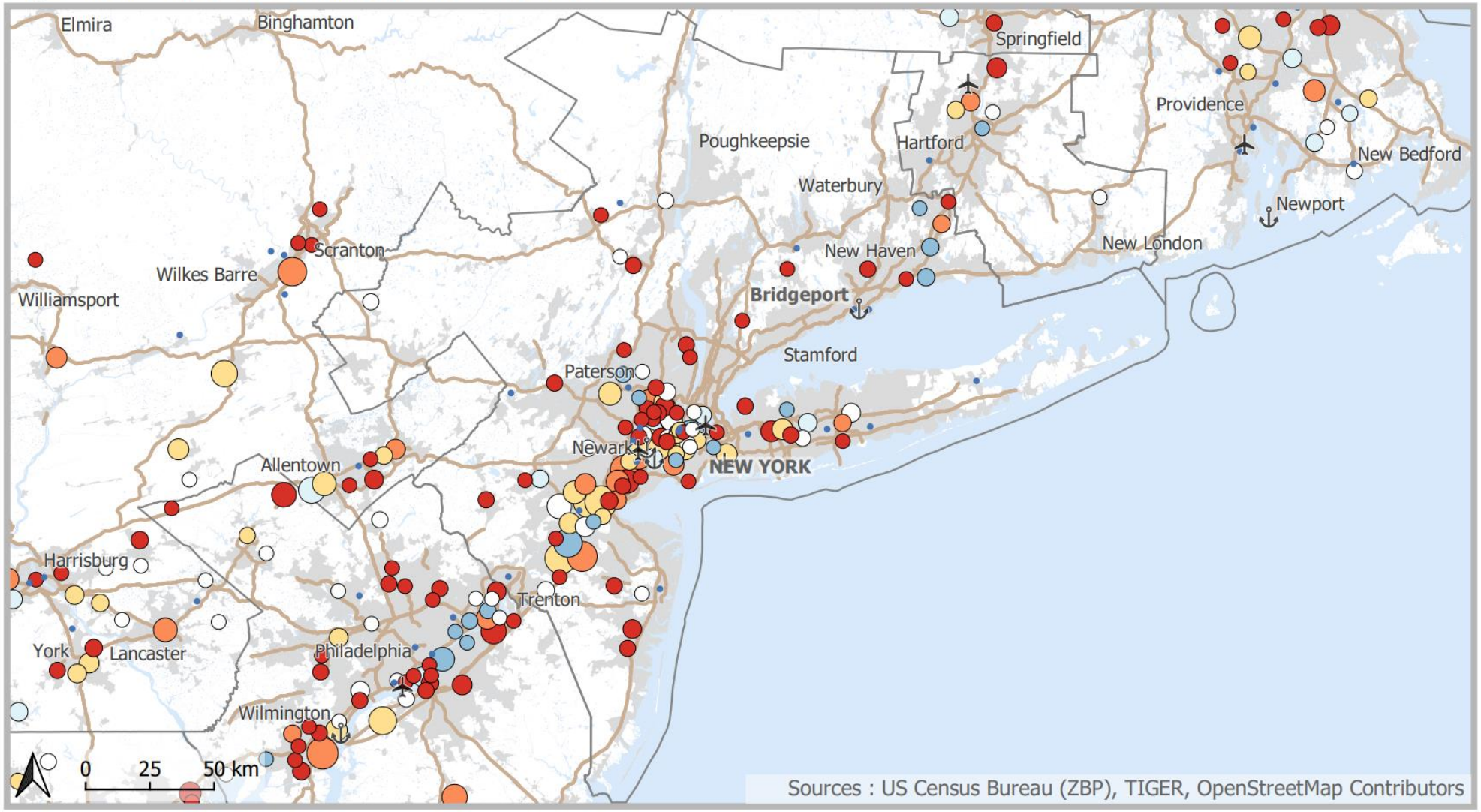
- A fast-growing logistics hub: increase of 29% from 281 to 363 warehouses
- Sunbelt cities: strong demographic and economic growth, urban sprawl
- Three main logistics clusters: around the Port of Houston to the southeast; around the airport to the north; and a west/northwest axis from downtown (I10, Washington Avenue, I610, Hempstead Road)
- The standard deviational ellipse area from the barycenter increased by 14% (2328 km² in 2019)



New York-Newark-New Jersey CSA

- Major warehousing hub in the US: from 844 to 993 warehouses (+18%)
- Continues to grow, confirming the metro area's role as an international and domestic gateway
- High concentration of logistics establishments, making the map harder to read than in the other case studies
- A distinctive form, essentially confined to the megacity's urban corridor
- Why? Major transportation infrastructures (Port of New York-New Jersey, Interstates, Newark and La Guardia airports) & the limited number of available land parcels in a highly urbanized region
- The standard deviational ellipse area (from the barycenter) was 4907 km² in 2019 (a decrease of 7% between 2012 and 2019)

Zip Codes centroids between 2012 and 2019



Evolution 2012 - 2019

- -100%
- From -67% to -25%
- From -25% to -5%
- From -5% to +5%
- From +5% to +49%
- From +49% to +99%
- From +99% to +600%

Number of logistics establishments in 2019

100
50
25
10
3

- Studied CSA/MSA
- Urban areas (2020)
- Protected lands areas
- Oceans, rivers and lakes
- Airports
- Ports
- Primary roads (2020)

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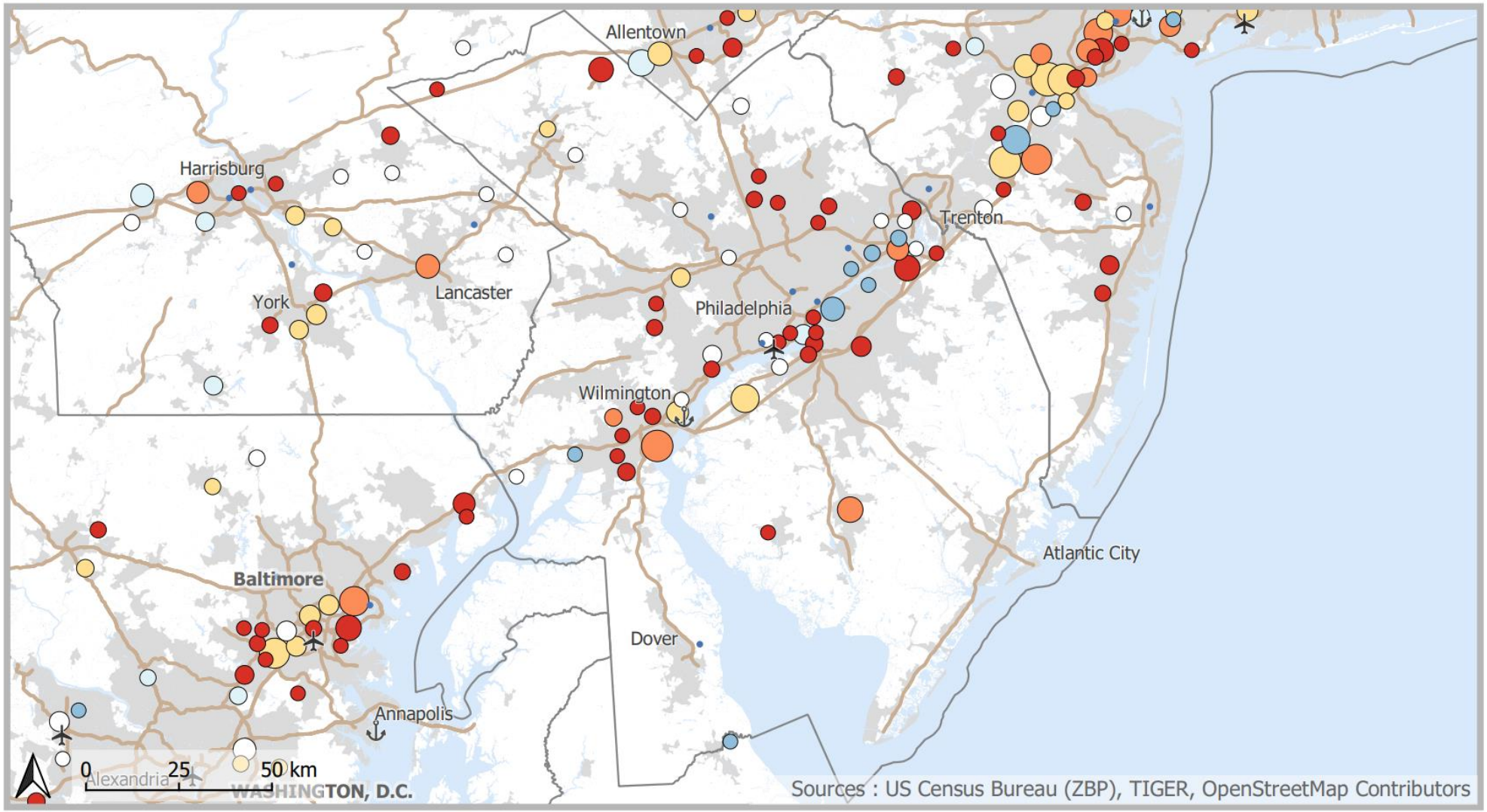
PHILADELPHIA-CAMDEN-WILMINGTON CSA

- The number of warehouses grew significantly from 324 in 2012 to 395 in 2019 (+22%)
- The number of warehouses per 10,000 residents increased by 20% from 0.45/10,000 to 0.55/10,000
- Most warehouses follow the metropolitan corridor along a longitudinal northeast/southeast axis that concentrate major highway and rail transportation infrastructure as well as major ports and airports
- Confirms the major trends in the logistics real estate market (periphery and center)
- Standard deviational ellipse area (from the barycenter) increased by 17%
  - in 2012 it was 4764 km²
  - in 2019 it was 5568 km²

Zip Codes centroids between 2012 and 2019



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- Ports
- Primary roads (2020)

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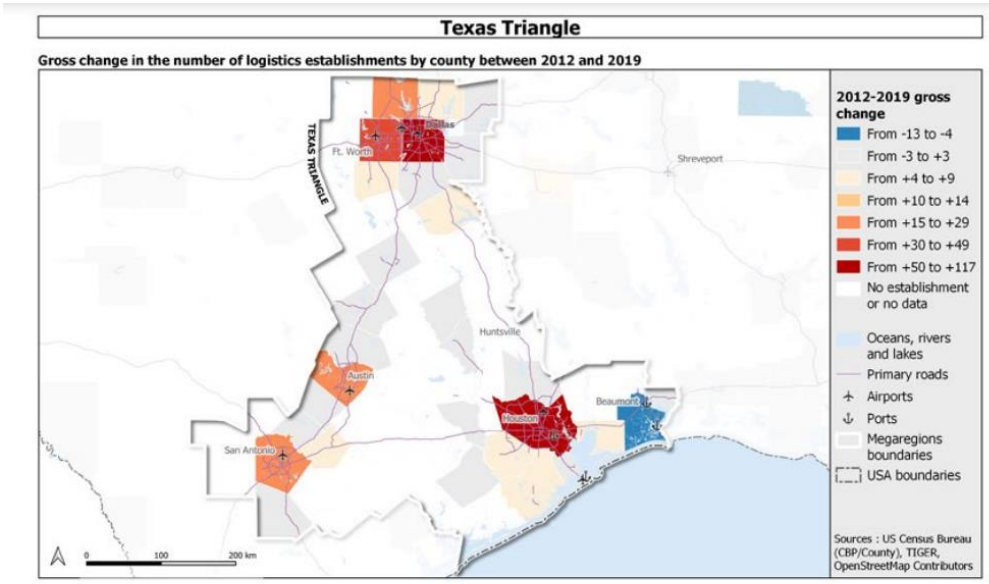
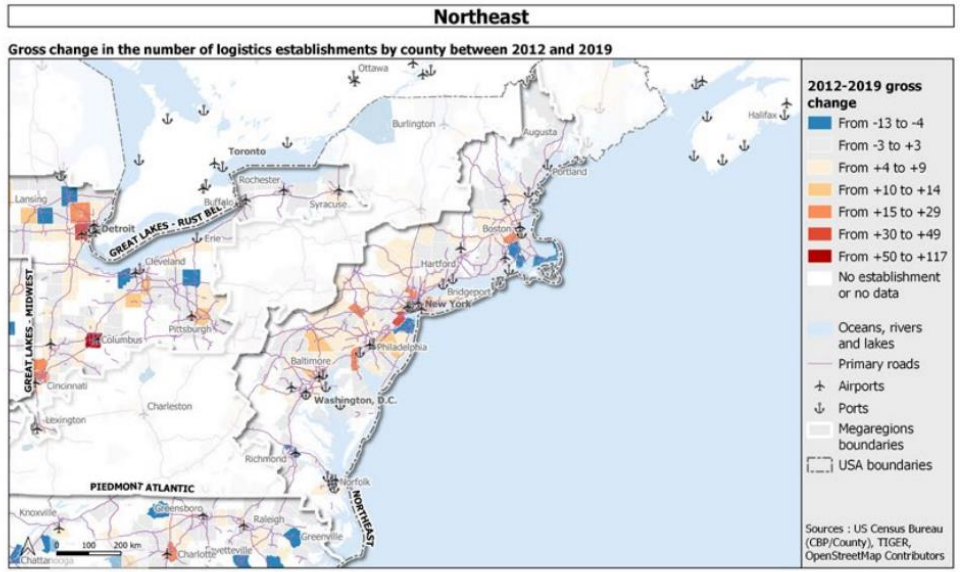
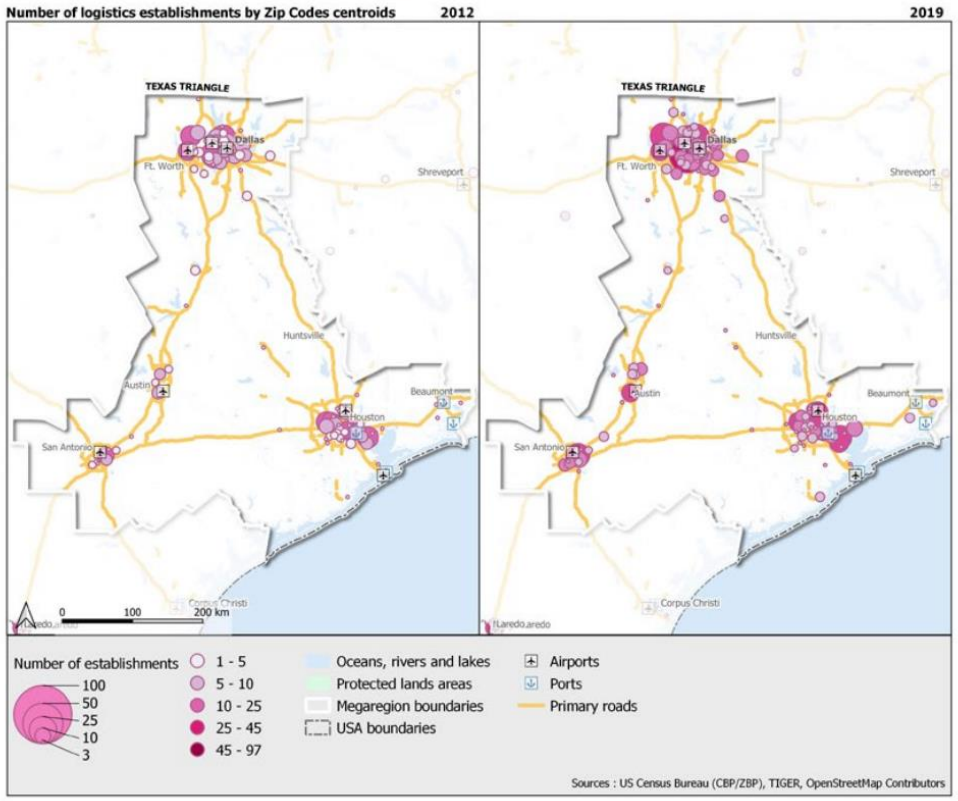
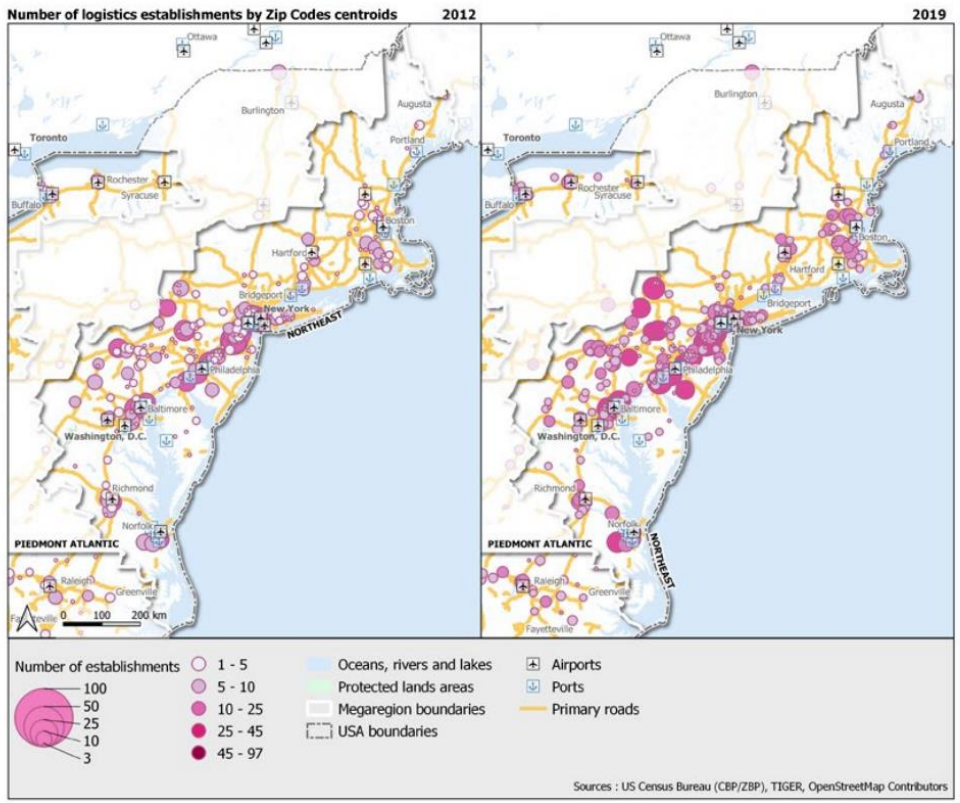
A look at the megaregion scale: logistics clusters









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Conclusions and discussions

- The number of warehouses in the four metropolitan areas grew rapidly between 2012 and 2019
- The Dallas area is archetypical of a booming warehousing cluster (+42% between 2012 and 2019) and sprawling metropolitan area
- Houston has also experienced strong growth in numbers of warehouses (+29%) but with less urban sprawl overall than Dallas
- Warehouses cluster along major infrastructures (Port of Houston, Houston International Airport) and interstate highways
- The two other case studies (Philadelphia and New York) have different trajectories
- Especially, the New York-Newark-New Jersey area has experienced moderate growth in the number of logistics establishments (+18%) as this growth occurred in an already mature and well-developed logistics market
- The New York case shows an increase in urban/first ring locations for logistics facilities

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