Chaire LOGISTICS CITY

Theme 1.1 Warehouses location patterns

Locational patterns of warehouses in 78 cities around the world, a comparative meta-analysis

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October 2023

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Objectives of the research

- To identify relationships between the location of warehouses and urban forms
- To provide a comprehensive database related to warehouses in large metropolitan areas around the world
- To make comparative analyses regarding location factors related to warehouses
- To provide novel methodological elements in the study of locational patterns of warehouses in metropolitan areas
- To identify the status of freight in planning, land use and zoning policies

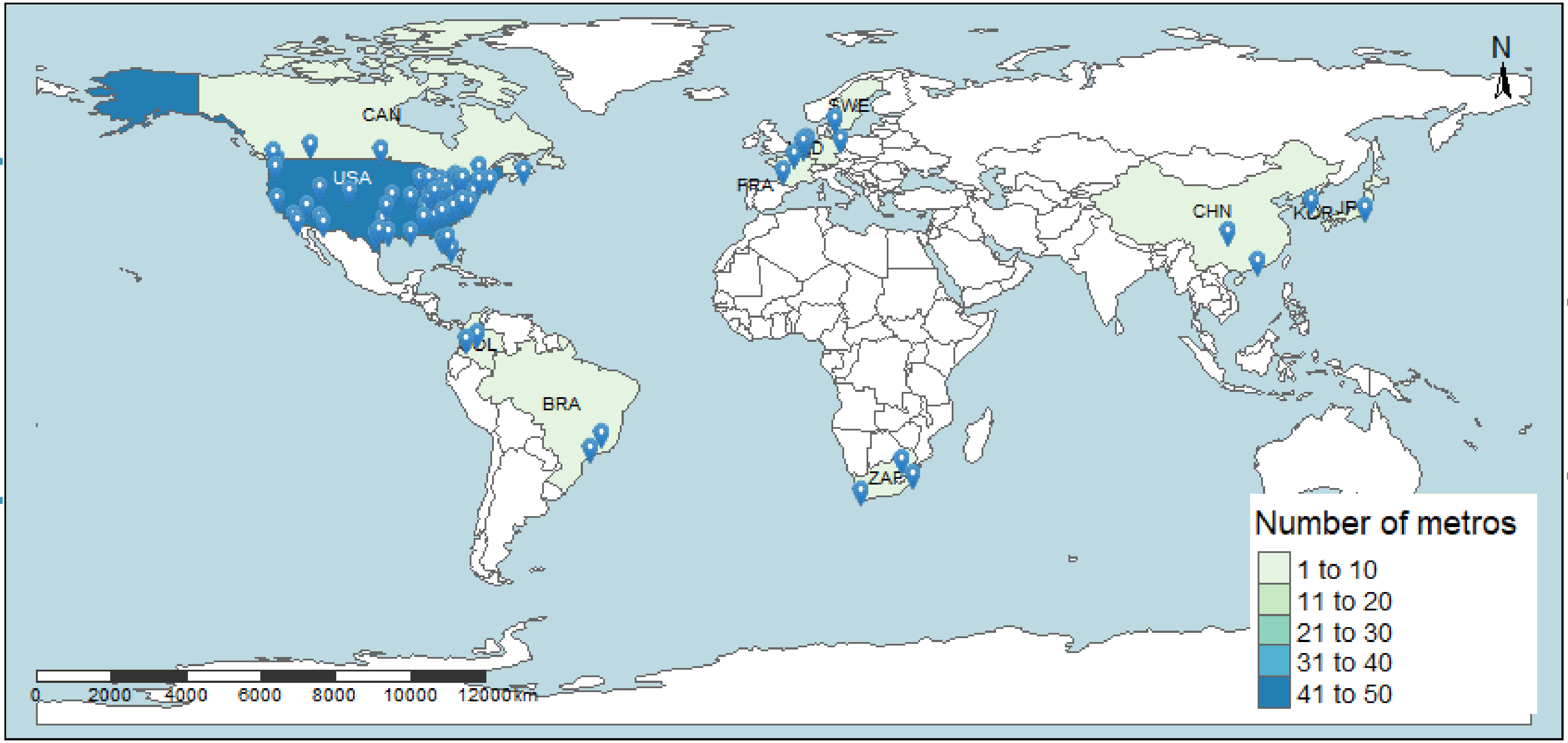
Case studies characterization

78 case studies

55 in North America (Andriankaja, 2014; Dablanc et al., 2014; Dablanc, Ross, 2012; Dubie et al., 2020; Kang, 2020; Woudsma et al., 2016; Woudsma, Jakubicek, 2020)

4 in South America (Guerin et al., 2021; Daraviña, Suescún, 2016; Oliveira et al., 2018)

12 in Europe (Heitz, Dablanc, 2015; Heitz et al., 2020; Heitz, 2017; Klauenberg et al., 2018; Strale, 2020)



4 in Asia (Li et al., 2020; Kang, 2022; Xiao, 2017; Yuan, Zhu, 2019)

3 in Africa (Trent, Joubert, 2022)

78 case studies

Name of studied metro area	Country
Albany MSA	USA
Atlanta metro area	USA
Austin MSA	USA
Belo Horizonte	Brazil
Berlin	Germany
Birmingham MSA	USA
Bogotá	Colombia
Bordeaux MA	France
Boston MSA	USA
Brussels	Belgium
Buffalo MSA	USA
Calgary	Canada
Cali	Colombia
Cape Town	South Africa
Charlotte MSA	USA
Chicago	USA
Chongqing	China
Cincinnati MSA	USA
Cleveland MSA	USA
Columbus MSA	USA
Dallas MSA	USA
Dayton MSA	USA
Denver MSA	USA
Detroit MSA	USA
eTahkwini	South Africa
Flevoland	Netherlands
Gauteng	South Africa

Name of studied metro area	Country
Gothenburg (MEA)	Sweden
Gothenburg (VGC region)	Sweden
Grand Rapids MSA	USA
Greensboro MSA	USA
Greenville MSA	USA
Halifax	Canada
Houston MSA	USA
Indianapolis MSA	USA
Kansas City MSA	USA
Las Vegas MSA	USA
Los Angeles	USA
Louisville MSA	USA
Miami MSA	USA
Milwaukee MSA	USA
Montreal	Canada
Nashville MSA	USA
New Orleans MSA	USA
New York MSA	USA
Noord Holland (Amsterdam)	Netherlands
Orlando MSA	USA
Paris (all WH) 2004 - 2012	France
Paris (parcel/express)	France
Philadelphia MSA	USA
Phoenix	USA
Pittsburgh MSA	USA
Portland MSA	USA

Name of studied metro area	Country
Raleigh MSA	USA
Richmond MSA	USA
Rochester MSA	USA
Salt Lake City MSA	USA
San Antonio MSA	USA
San Diego MSA	USA
San Francisco MSA	USA
Seatle	USA
Seoul MSA	South Korea
Shenzhen	China
St. Louis MSA	USA
Tampa MSA	USA
The Randstad Region	Netherlands
Tokio (TMA)	Japan
Torono GGH	Canada
Torono GTA	Canada
Tucson MSA	USA
Tulsa MSA	USA
Utrecht	Netherlands
Vancouver	Canada
Virginia Beach MSA	USA
Washington DC MSA	USA
Winnipeg	Canada
Zuid Holland (Rotterdam)	Netherlands

Key indicators

- Name of studied metro area
- Size of studied metro area (km2)
- Number of municipalities
- Type of metropolitan area: Polycentric or Monocentric
- Megaregion: Yes/Not
- Type of city/region: Gateway
- Type of land use control: Local/Metro/Regional
- Focused Study or general
- Surfaces area data availability: Yes/Not

- Name of warehouse data source
- Time period studied for logistics sprawl analysis
- Population (millions)
- Population density (inhabitants/km2)
- Number of warehouses
- Number of warehouses per million people
- Number of warehouses per 1000 km2
- Average size of warehouses (m2)
- Average distance of warehouses to centre of gravity (km)

- Change in population over the years (millions)
- % Change of the number of WH over the years
- Logistic sprawl: Change in average distance of WHs to centre of gravity (over the years) (km)
- Urban Rent Prices per year (EUR/m2)
- Suburban Rent Prices per year (EUR/m2)

Organization of the dataset

Urban key indicators

- Name of the metro
- Territorial area
- Number of municipalities
- Location in a megaregion
- Morphology (polycentric or monocentric)
- Classified as a gateway metro
- Population
- Population density (inhabitants/km^2)

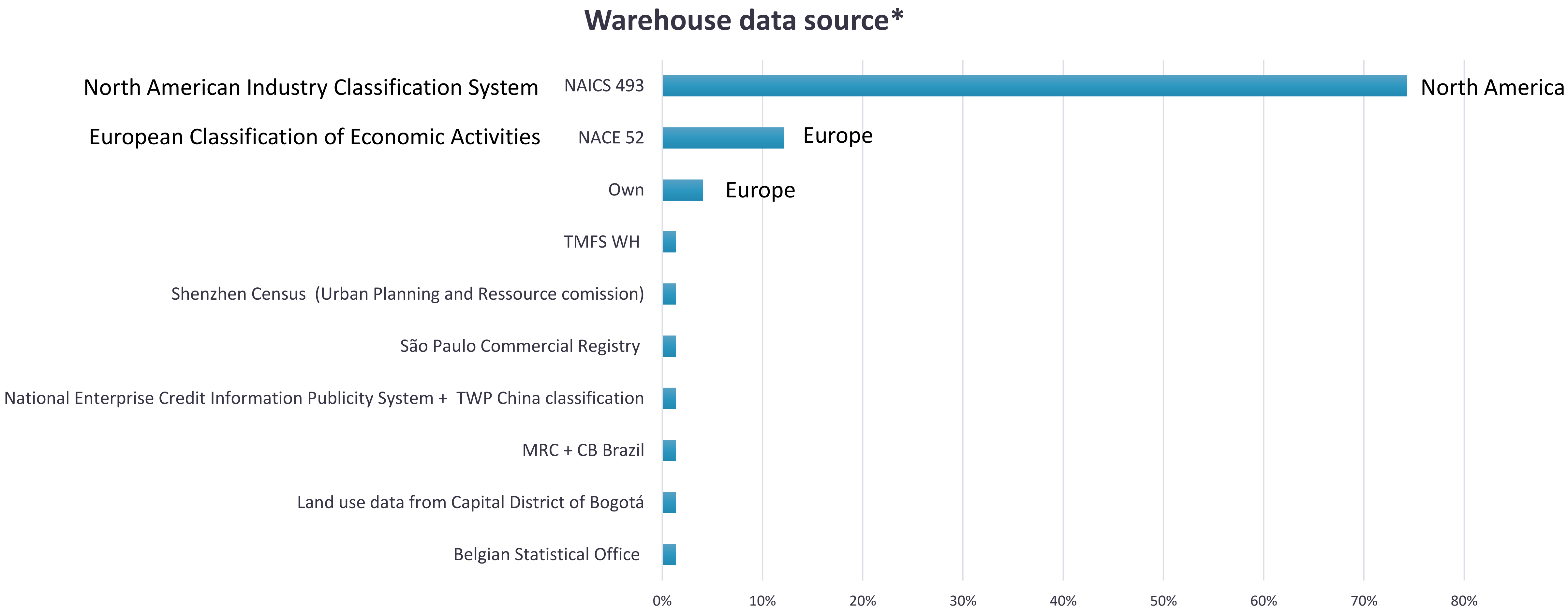
Logistics key indicators

- Name of the warehouse datasource
- Time period for logistics sprawl analysis
- Number of warehouses
- Number of warehouses per million people
- Number of warehouses per 1000 km^2
- Average distance of warehouses to gravity center (km)
- Logistic sprawl: Change in average distance of WHs to centre of gravity (over the years)
- Urban and suburban rent prices per year (EUR/m2)

First year (t0) → Last year (t1)

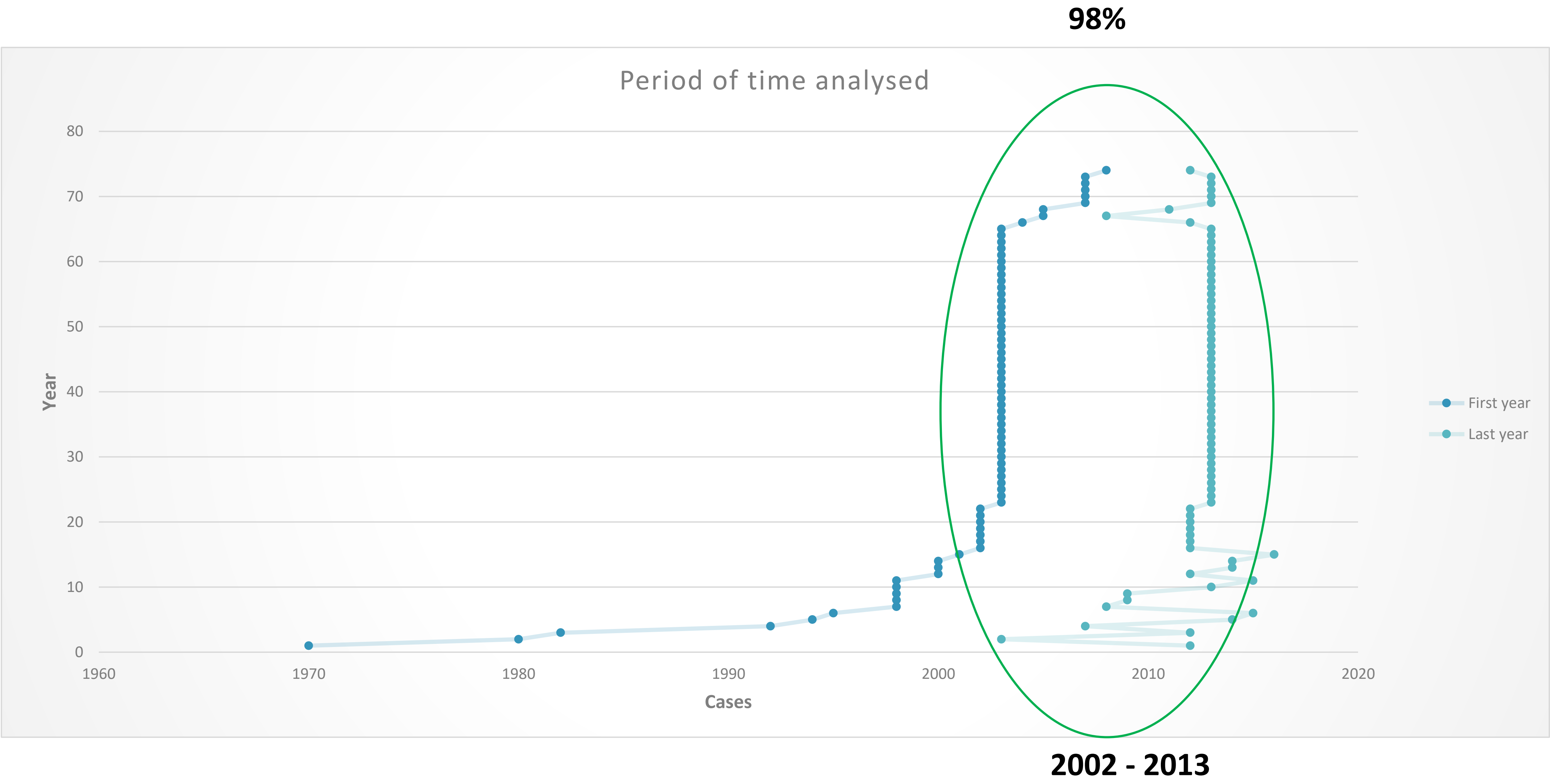
Variable Name	Description
metro	The name of the metropolitan area.
mega_region	The name of the mega-region to which the metropolitan area belongs.
country	The name of the country of the metropolitan area is located.
continent	The name of the continent in which the metropolitan area is located.
data_sources	The sources of data used to compile this dataset.
area (km2)	The total area of the metropolitan area in square kilometers.
number_mun	The number of municipalities included in the metropolitan area.
size	The size of the metropolitan area (small, medium, or large).
urban_centrality	Categories for urban morphology (polycentricity or monocentricity) of the metropolitan area.
gateway	Whether the metropolitan area is considered a gateway city.
time_period_start	The start year of the period covered by the dataset.
time_period_end	The end year of the period covered by the dataset.
years_data	The number of years covered by the dataset.
population_t0	The population of the metropolitan area at the start of the period covered by the dataset.
number_ware_t0	The number of warehouses in the metropolitan area at the start of the period covered by the dataset.
gravity_t0	Centrographic measure of the metropolitan area at the start of the period covered by the dataset.
population_t1	The population of the metropolitan area at the end of the period covered by the dataset.
number_ware_t1	The number of warehouses in the metropolitan area at the end of the period covered by the dataset.
gravity_t1	Centrographic measure of the metropolitan area at the end of the period covered by the dataset.
log_sprawl	Binary variable for logistics sprawl.
log_sprawl_measure	Logistics sprawl measure in the metropolitan area.
avg_price	The average price of logistics real estate in the metropolitan area.
central	Whether the observation is in the central area of the metropolitan area.
suburban	Whether the observation is in the suburban area of the metropolitan area.
diff	The difference between the average price of real estate in central and suburban areas of the metropolitan area.
sprawl_year	Logistics sprawl per year.
quad	A categorical variable indicates the metropolitan area's quadrant based on its yearly sprawl level and differential warehouse rental prices.

Warehouse data source



* For the 3 case studies in South Africa, Trent and Joubert (2022) use dataset of commercial vehicle movements from Global Positioning System (GPS) traces.

Years under study



Methodology and data issues

- Working on the previous data collection performed by the Logistics City Chair (2019-2020) concerning metropolitan areas where logistics sprawl was investigated by different research teams and published in scientific journals. This previous dataset and the meta-analysis (Dablanc et al., 2020) considered 74 case studies (metropolitan regions studied in the literature on warehouse locations).
- Updating the dataset with 4 new case studies: 3 in South Africa [Cape Town, Gauteng, eThekwini] (Trent & Joubert, 2022) and 1 in South Korea [Seoul] (Kang, 2022) for a total of 78 metropolitan regions whose logistics sprawl measures were calculated.
- Reviewing the scientific papers considered in this study in order to build an updated meta-analysis.
- Performing statistical tests to investigate each hypothesis and presenting the results in this global report on this research conducted from 2019 to 2023.
- Data issues :
  - Databases are different: Ex. NAICS vs NACE codes (Type of logistic facilities → 3PL or warehouses insourced).
  - Periods of time analysed are different.
  - Regional areas into examination can be different.
  - Insufficient data regarding location factors (ex. land prices) → necessity to bypass the lack of data (not existent or not available in open access).

Hypotheses linking urban forms and the spatial distribution of warehouses

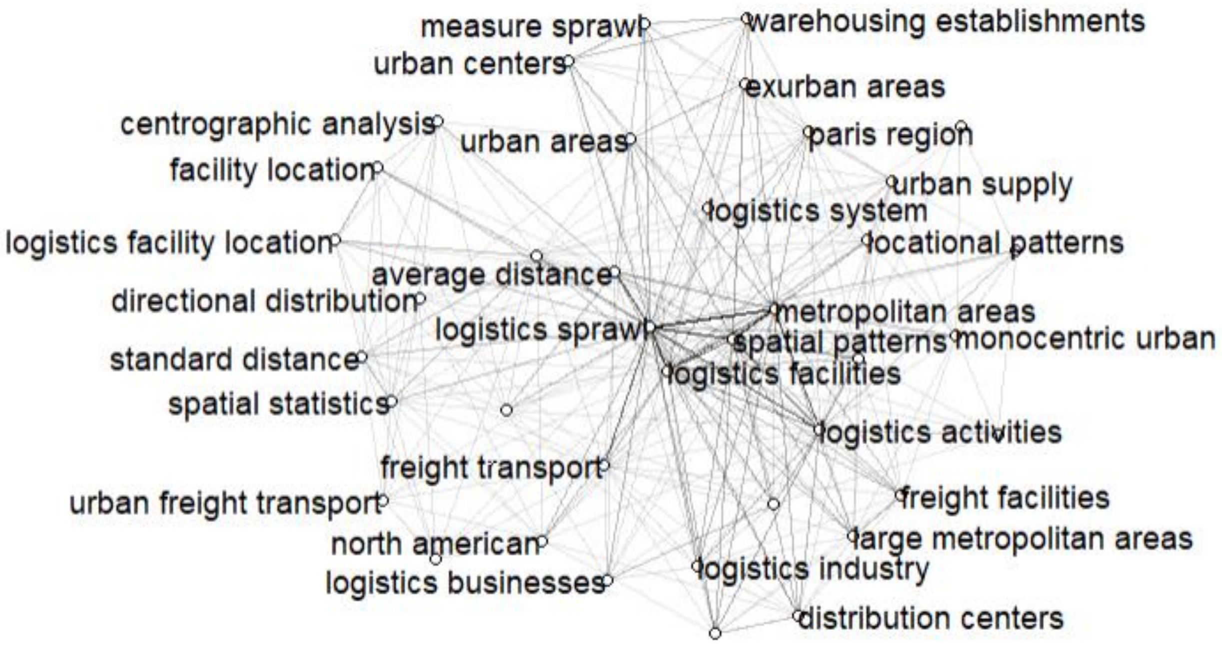
	Hypotheses
H1	There are more warehouses/pop in large and medium metropolitan regions than in smaller ones.
H2	There are more warehouses in global hub metropolitan regions (or Gateways) than in regular ones.
H3	There are more warehouses in metropolitan regions belonging to mega-regions than in « regular » ones.
H4	The increase in the number of warehouses over time is more significant in medium and large metropolitan regions than in smaller ones.
H5	The increase in the number of logistics facilities over time is positively related to the importance of the role of global logistics hub (or Gateways) played by an urban area.
H6	Logistics sprawl is positively related to the differential in land/rent values for logistics land uses between suburban and central areas in an urban region.
H7	Logistics sprawl is negatively related to the degree of regional logistics land-use control.

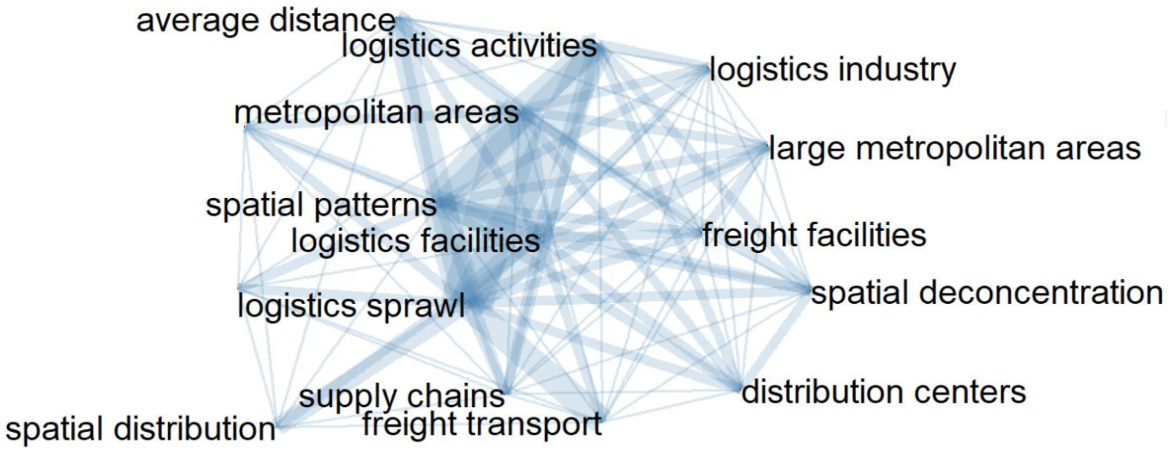
L. Dablanc

Meta-analysis: selected papers

Andriankaja, D.	Le desserrement logistique, quelle responsabilite dans l'augmentation des emissions de CO2 des activites de messagerie?	2014	[Phdthesis]. University of Paris-East.	**Paris**
Dablanc, L., Ogilvie, S., & Goodchild, A.	Logistics Sprawl: Differential Warehousing Development Patterns in Los Angeles, California, and Seattle, Washington.	2014	Transportation Research Record: Journal of the Transportation Research Board, 2410(1), 105–112.	**Los Angeles, Seattle**
Dablanc, L., & Ross, C.	Atlanta: A mega logistics center in the Piedmont Atlantic Megaregion (PAM).	2012	Journal of Transport Geography, 24, 432–442.	**Atlanta**
Daraviña, P. A. C., & Suescún, J. P. B.	Logistic sprawl and polarization in Colombian urban areas.	2016	Proceedings WCTR.	**Colombia urban areas**
Dubie, M., Kuo, K. C., Giron-Valderrama, G., & Goodchild, A.	An evaluation of logistics sprawl in Chicago and Phoenix.	2020	Journal of Transport Geography, 88, 102298.	**Chicago, Phoenix**
Guerin, L., Vieira, J. G. V., de Oliveira, R., de Oliveira, L., Vieira, H. E. de M., & Dablanc, L.	The geography of warehouses in the São Paulo Metropolitan Region and contributing factors to this spatial distribution.	2021	Journal of Transport Geography, 91, 102976	**Sao Paulo**
Heitz, A., & Dablanc, L.	Logistics Spatial Patterns in Paris: Rise of Paris Basin as Logistics Megaregion	2015	Transportation Research Record: Journal of the Transportation Research Board, 2477(1), 76–84.	**Paris**
Heitz, A., Dablanc, L., Olsson, J., Sanchez-Diaz, I., & Woxenius, J.	Spatial patterns of logistics facilities in Gothenburg, Sweden.	2020	Journal of Transport Geography, 88, 102191.	**Gothenburg**
Heitz, A., Dablanc, L., & Tavasszy, L. A.	Logistics sprawl in monocentric and polycentric metropolitan areas: The cases of Paris, France, and the Randstad, the Netherlands.	2017	Region, 4(1), 93.	**Paris, Randstad (Netherlands)**
Kang, Sanggyun.	Exploring the contextual factors behind various phases in logistics sprawl: The case of Seoul Metropolitan Area, South Korea.	2022	Journal of Transport Geography.	**Seoul**
Kang, Sanggyun	Relative logistics sprawl: Measuring changes in the relative distribution from warehouses to logistics businesses and the general population.	2020	Journal of Transport Geography 83, 102636.	**US urban areas**
Klauenberg, J., Elsner, L. A., & Knischewski, C.	Dynamics of the spatial distribution of hubs in groupage networks – The case of Berlin.	2018	Journal of Transport Geography, May 2017, 102280.	**Berlin**
Li, G., Sun, W., Yuan, Q., & Liu, S.	Planning versus the market: Logistics establishments and logistics parks in Chongqing, China.	2020	Journal of Transport Geography, 82, 102599.	**Chongqing**
Oliveira, L., Santos, O., Oliveira, R., & Nóbrega, R.	Is the Location of Warehouses Changing in the Belo Horizonte Metropolitan Area (Brazil)? A Logistics Sprawl Analysis in a Latin American Context.	2018	Urban Science, 2(2), 43.	**Belo Horizonte**
Strale, M.	Logistics sprawl in the Brussels metropolitan area: Toward a socio-geographic typology.	2020	Journal of Transport Geography, 88, 102372.	**Brussels**
Trent, N. M., & Joubert, J. W.	Logistics sprawl and the change in freight transport activity: A comparison of three measurement methodologies.	2022	Journal of Transport Geography, 101, 103350.	**South African urban areas**
Woudsma, C., & Jakubicek, P.	Logistics land use patterns in metropolitan Canada.	2020	Journal of Transport Geography, 88, 102381.	**Canada urban areas**
Woudsma, C., Jakubicek, P., & Dablanc, L.	Logistics sprawl in North America: Methodological issues and a case study in toronto.	2016	Transportation Research Procedia, 12, 474–488.	**Toronto**
Xiao, Z.	Remarking urban logistics space: E-tailing and supply chain revolution in the case of Shenzhen, China	2017	[Phdthesis]. The University of Hong Kong.	**Shenzhen**
Yuan, Q., & Zhu, J.	Logistics sprawl in Chinese metropolises: Evidence from Wuhan.	2019	Journal of Transport Geography, 74, 242–252.	**Wuhan**

Meta-analysis : cord diagrams

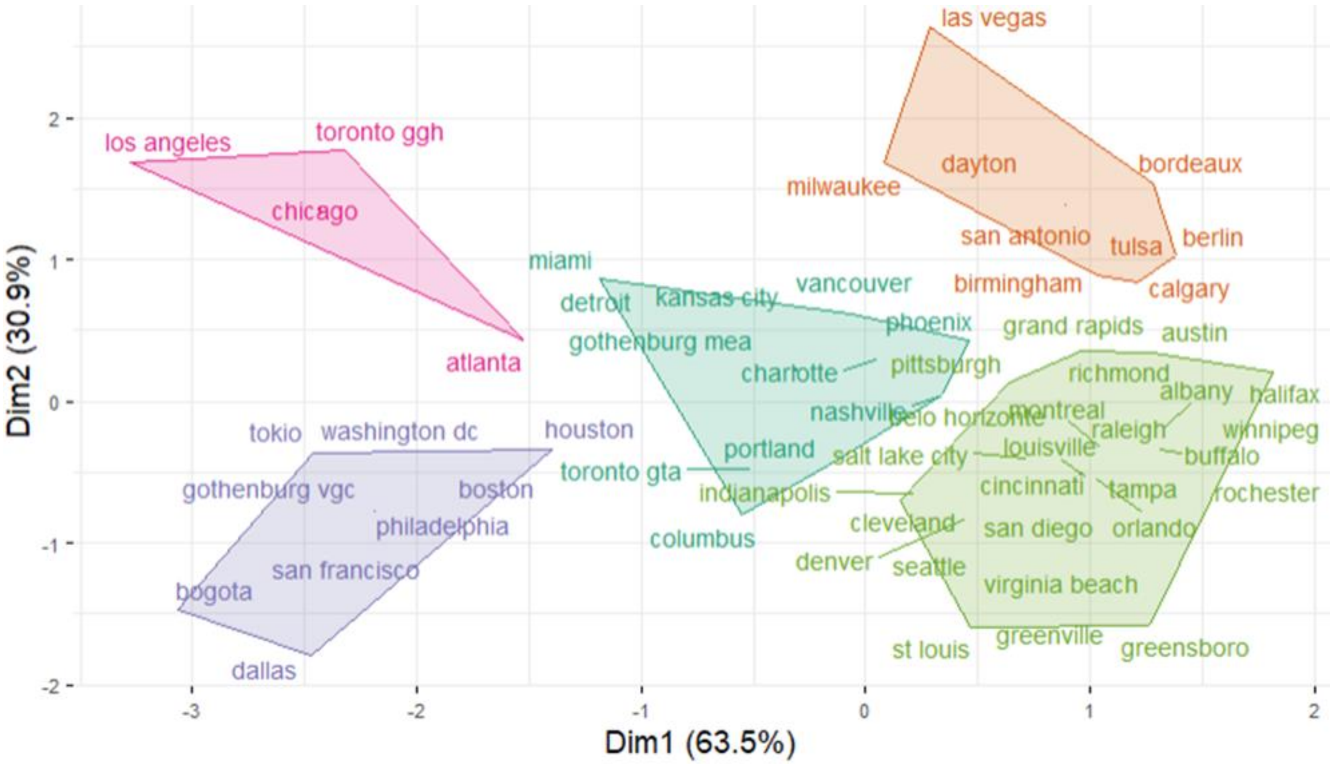




Which key terms appear in the scientific papers on logistics spatial patterns?
By exploring key terms in the selected papers of the meta-analysis: 39 main terms.
The terms "logistics activities", "spatial patterns", "logistics facilities", "logistics sprawl", "average distance", and "metropolitan areas" are the ones that present the most robust connections.

Meta-analysis : clustering analysis

An additional attempt was made to synthesize the results of studies that measured logistics sprawl quantitatively. This section explores the data published in previous studies. As techniques considered for the meta-analysis, we used: descriptive statistics and cluster analysis (k-means).

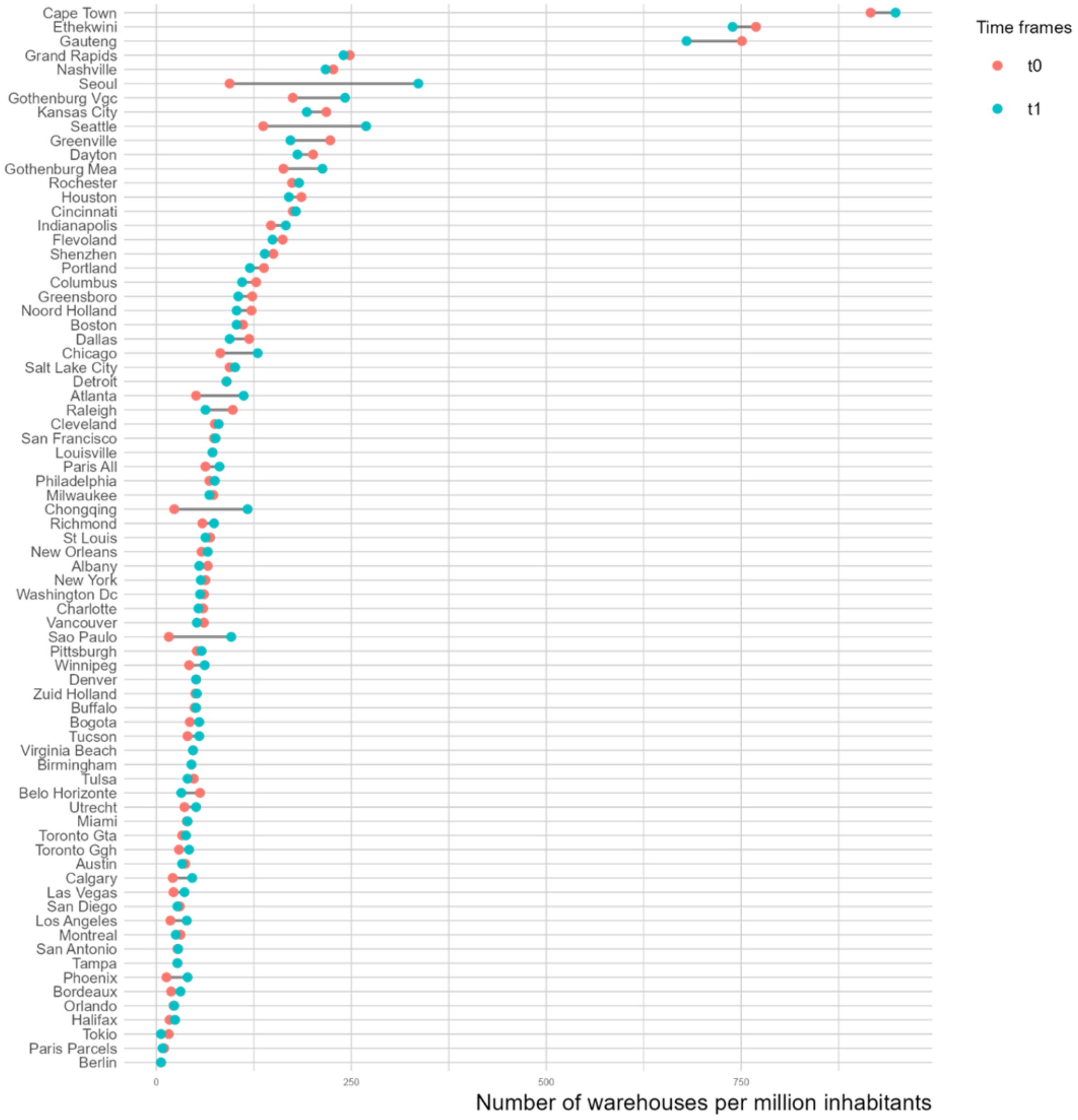


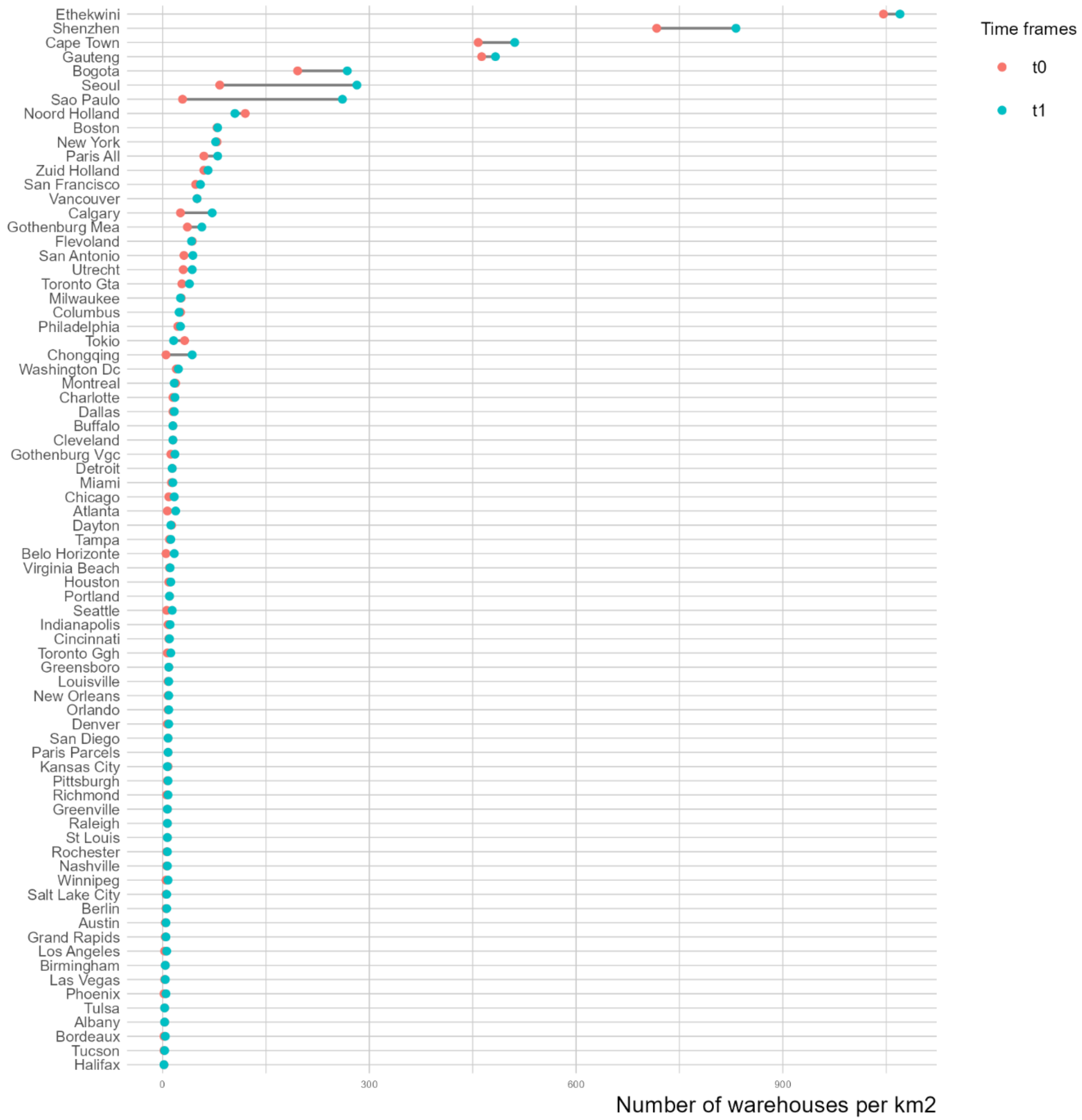
Groups	Color	Number of warehouses in the first year	Number of warehouses in the last year	Logistics sprawl
1	Pink	0.46	0.81	0.88
2	Orange	0.09	0.09	0.68
3	Light Green	0.18	0.18	0.26
4	Purple	0.73	0.66	0.43
5	Dark green	0.34	0.34	0.51

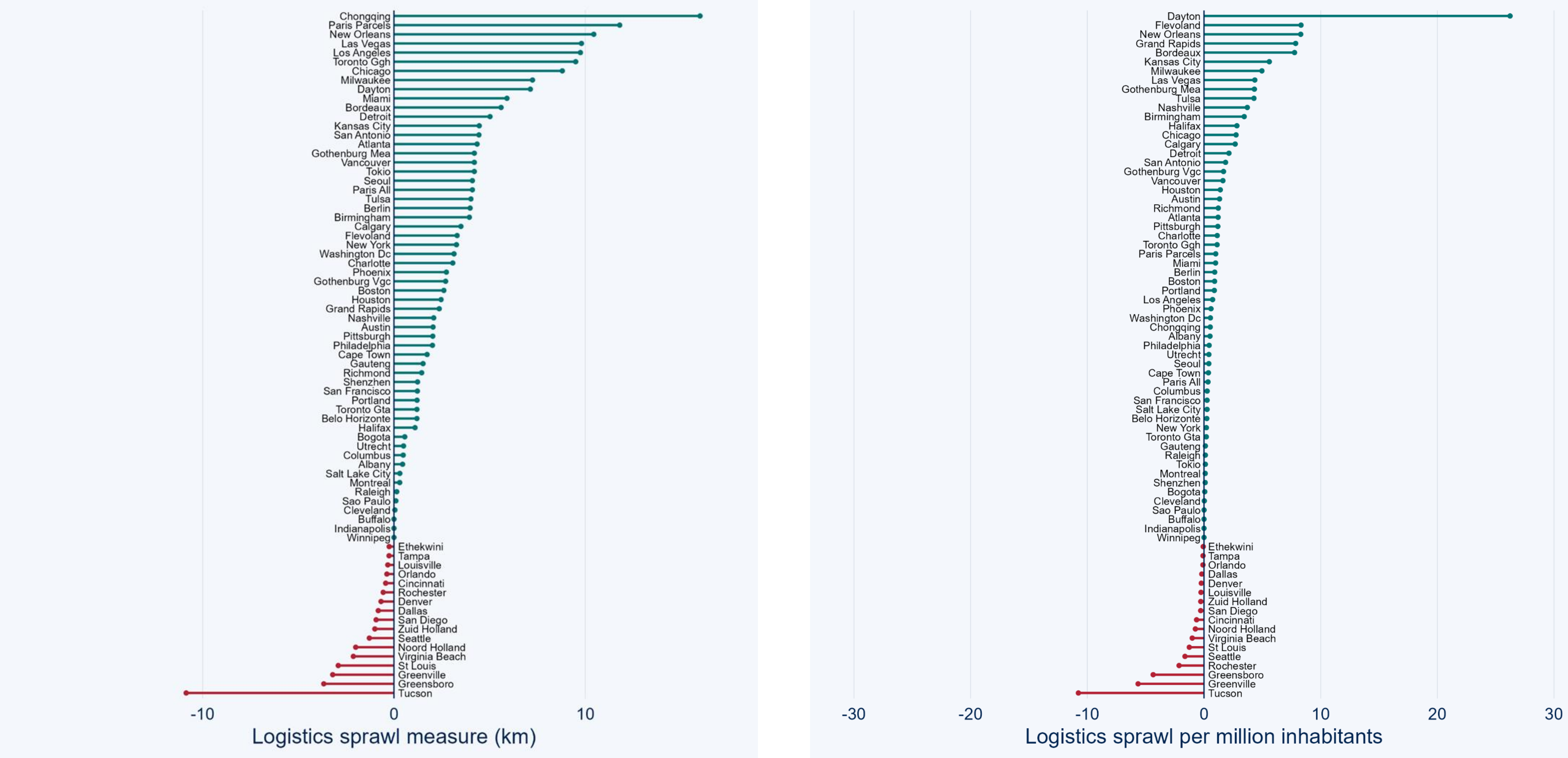
Group 1 (pink) : metros with the highest average logistics sprawl, the highest number of warehouses in the last year and the second highest in the first year.
Group 2 (orange) : metros with the lowest score for the number of warehouses in both timeframes and the second highest for logistics sprawl.
Groupe 3 (light green) : metros with a low number of warehouses' average score and the lowest average logistics sprawl.
Groupe 4 (purple) : metros with the highest score for the number of warehouses in the first year, the second largest average score for the number of warehouses in the last one, and the second lowest average score for logistics sprawl.
Groupe 5 (dark green) : the metros with intermediary scores for all variables.

Hypotheses investigation

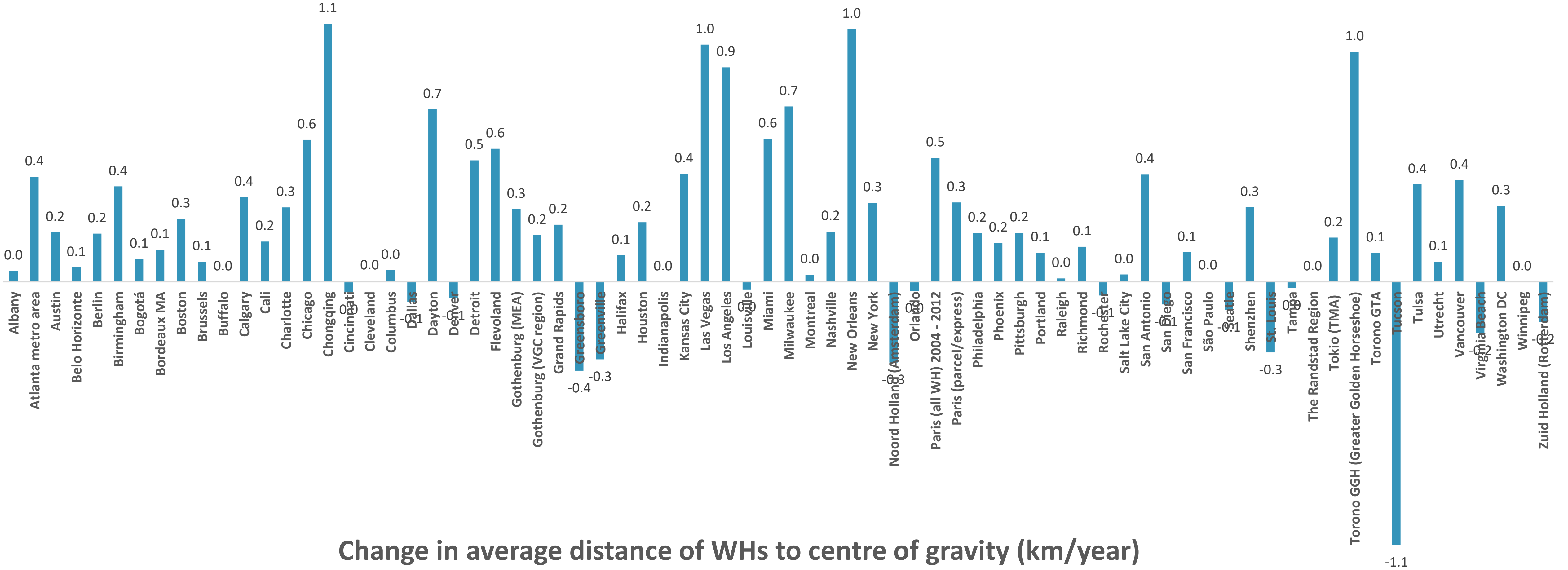
Exploratory data analysis






Chongqing
Paris Parcels
New Orleans
Las Vegas
Los Angeles
Toronto Ggh
Chicago
Milwaukee
Dayton
Miami
Bordeaux
Detroit
Kansas City
San Antonio
Atlanta
Gothenburg Mea
Vancouver
Tokio
Seoul
Paris All
Tulsa
Berlin
Birmingham
Calgary
Flevoland
New York
Washington Dc
Charlotte
Phoenix
Gothenburg Vgc
Boston
Houston
Grand Rapids
Nashville
Austin
Pittsburgh
Philadelphia
Cape Town
Gauteng
Richmond
Shenzhen
San Francisco
Portland
Toronto Gta
Belo Horizonte
Halifax
Bogota
Utrecht
Columbus
Albany
Salt Lake City
Montreal
Raleigh
Sao Paulo
Cleveland
Buffalo
Indianapolis
Winnipeg
Ethekwini
Tampa
Louisville
Orlando
Cincinnati
Rochester
Denver
Dallas
San Diego
Zuid Holland
Seattle
Noord Holland
Virginia Beach
St Louis
Greenville
Greensboro
Tucson
-10
0
10
Logistics sprawl measure (km)
Dayton
Flevoland
New Orleans
Grand Rapids
Bordeaux
Kansas City
Milwaukee
Las Vegas
Gothenburg Mea
Tulsa
Nashville
Birmingham
Halifax
Chicago
Calgary
Detroit
San Antonio
Gothenburg Vgc
Vancouver
Houston
Austin
Richmond
Atlanta
Pittsburgh
Charlotte
Toronto Ggh
Paris Parcels
Miami
Berlin
Boston
Portland
Los Angeles
Phoenix
Washington Dc
Chongqing
Albany
Philadelphia
Utrecht
Seoul
Cape Town
Paris All
Columbus
San Francisco
Salt Lake City
Belo Horizonte
New York
Toronto Gta
Gauteng
Raleigh
Tokio
Montreal
Shenzhen
Bogota
Cleveland
Sao Paulo
Buffalo
Indianapolis
Winnipeg
Ethekwini
Tampa
Orlando
Dallas
Denver
Louisville
Zuid Holland
San Diego
Cincinnati
Noord Holland
Virginia Beach
St Louis
Seattle
Rochester
Greensboro
Greenville
Tucson
-30
-20
-10
0
10
20
30
Logistics sprawl per million inhabitants

Hypotheses: Logistic sprawl



Change in average distance of WHs to centre of gravity (km/year)

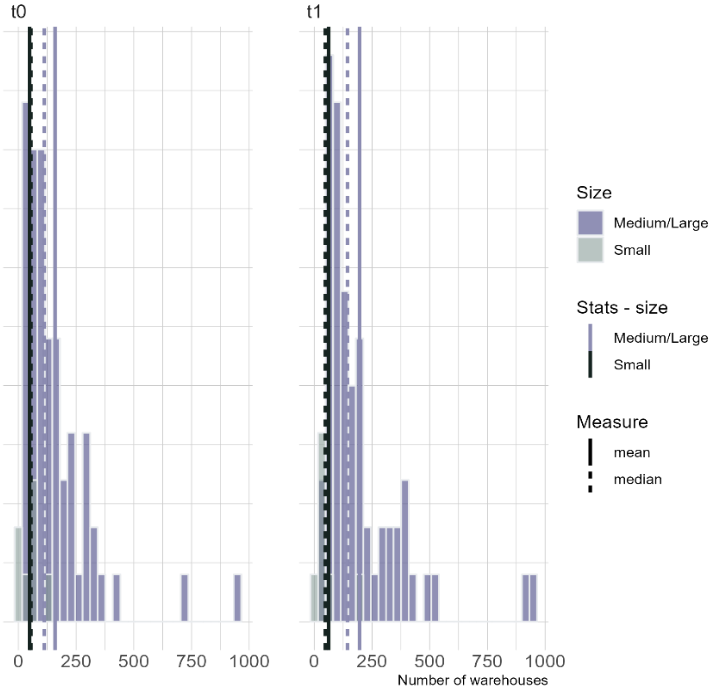
H1: There are more warehouses in large and medium metropolitan regions than in smaller ones

Result: The number of warehouses in medium and large metros **is higher** than in small ones, at a significance level of 5%

Variable Name	Description
metro	The name of the metropolitan area.
size	The size of the metropolitan area (small, medium, or large).
number_ware_t0	The number of warehouses in the metropolitan area at the start of the period covered by the dataset.
number_ware_t1	The number of warehouses in the metropolitan area at the end of the period covered by the dataset.

Average number of warehouses, metro classification, and timeframe – H1 number of warehouses

Data	Time	The average number of warehouses	Size	
			Small	Medium/Large
Complete	t0	374	49	407
	t1	518	62	564
Without outliers	t0	148	49	158
	t1	183	62	196



Histograms for the number of warehouses in different categories of metros and time – H1

H1: There are more warehouses/pop in large and medium metropolitan regions than in smaller ones

Result: The number of warehouses **per million inhabitants** and **per 1000km²** in medium and large metros **is higher** than in small ones

Large regions have the highest number of warehouses at both t0 and t1, followed by the medium and small regions.

- The **number of warehouses per million inhabitants** follows the same trend as the number of warehouses presented previously, however, the highest number of warehouses per million inhabitants is located in medium size metropolitan areas followed closely by large metro areas.

- As for the **number of warehouses per 1000 km²**, the same tendencies for the number of warehouses are observed.

Number of warehouses per million inhabitants						
Statistics	Size: Small metropolitan areas		Size: Medium metropolitan areas		**Size: Large metropolitan areas**	
	T0	T1	T0	T1	T0	T1
Count	7	7	46	48	23	23
Mean	95.3	101.6	145.6	258.9	131.9	150.2
Std	77	77.4	326.75	776.2	227	223.3
Min	17	23	5	5	10	6
25%	30.5	42.5	45.5	45	30.5	47.5
50%	65	61	60	64	63	80
75%	162	164.5	134.75	130.5	101.5	123

Number of warehouses per 1000 km2						
Statistics	Size: Small metropolitan areas		Size: Medium metropolitan areas		**Size: Large metropolitan areas**	
	T0	T1	T0	T1	T0	T1
Count	7	7	46	48	23	23
Mean	14.4	18	36.5	134.5	3708.5	12367
Std	17.3	21.8	153.4	674.1	17271.3	58669.3
Min	1	2	1	2	3	6
25%	2.5	3.5	6	6.75	10.5	16
50%	5	8	7.5	9.5	29	42
75%	24	26.5	14	18	79	170
Max	42	56	1046	4588	82933	281500

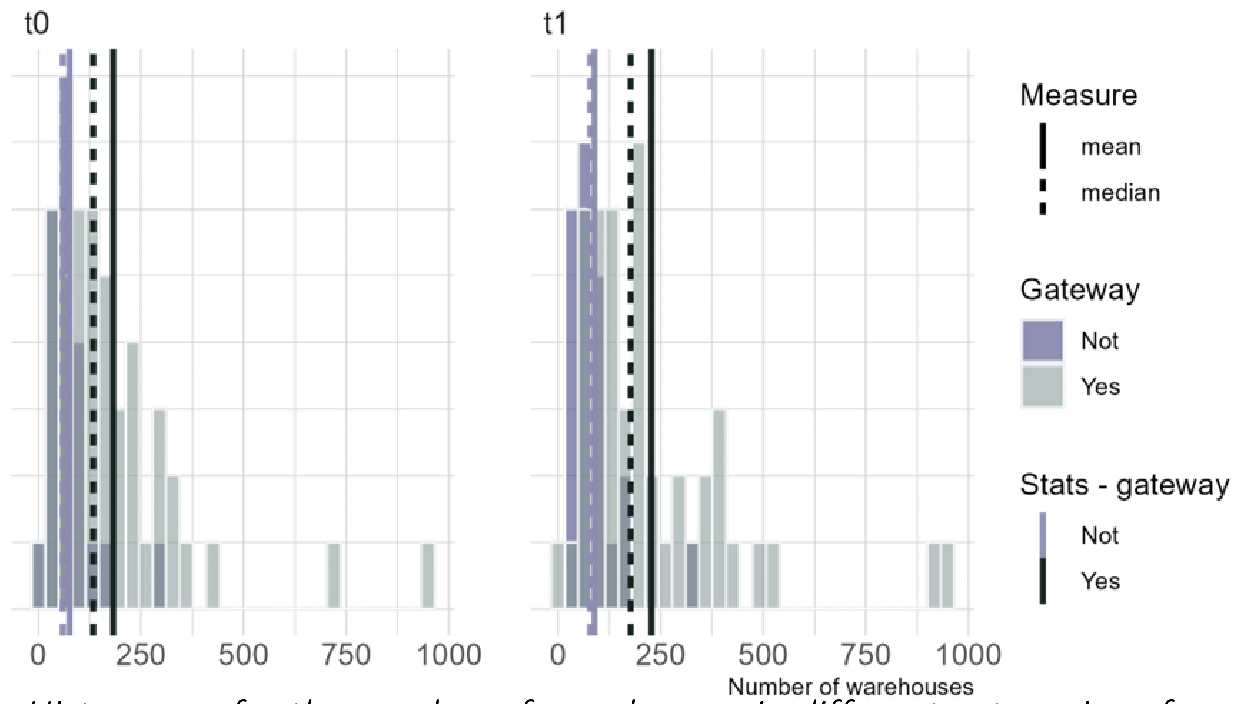
H2: There are more warehouses in global hub metropolitan regions (or 'gateways') than in regular ones

Result: The number of warehouses in gateway metro areas **is higher** than in non-gateway ones, at a significance level of 5%

Variable Name	Description
metro	The name of the metropolitan area.
gateway	If the metropolitan region is a global hub city or gateway.
number_ware_t0	The number of warehouses in the metropolitan area at the start of the period covered by the dataset.
number_ware_t1	The number of warehouses in the metropolitan area at the end of the period covered by the dataset.

Average number of warehouses, metro classification, and timeframe – H2

Data	Time	The average number of warehouses	Gateway	
			Yes	No
Complete	t0	374	347	438
	t1	518	541	466
Without outliers	t0	148	183	76
	t1	183	228	89



Histograms for the number of warehouses in different categories of metros and time – H2

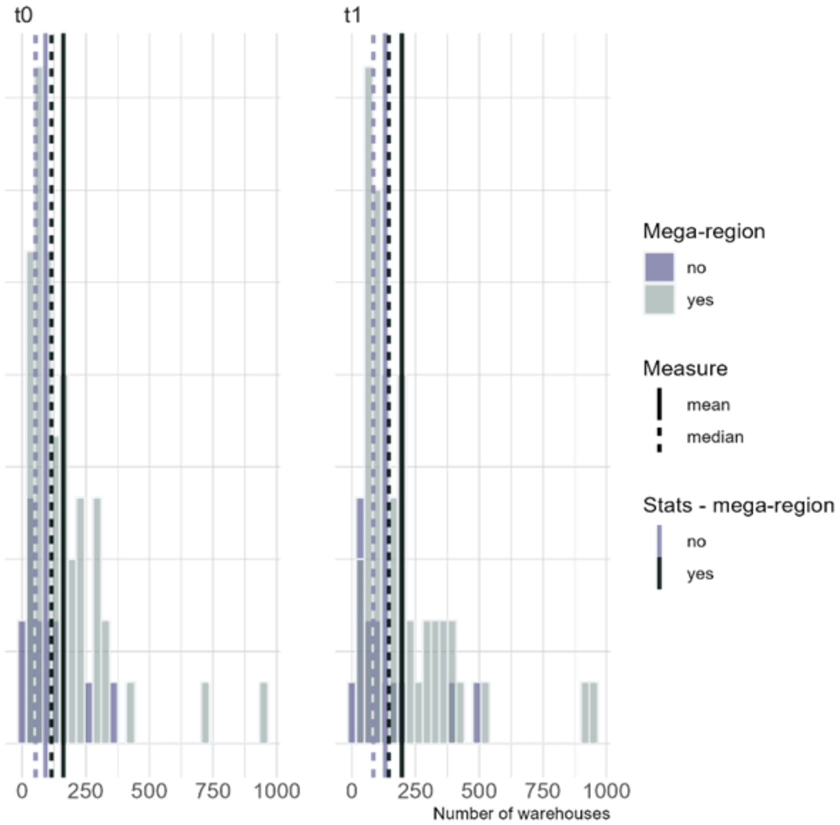
H3: There are more warehouses in metropolitan regions that belong to megaregions than in “regular” ones

Result: The number of warehouses in metros located in megaregions **is higher** than in the others, at a significance level of 5%

Variable Name	Description
metro	The name of the metropolitan area.
mega_region	If the metropolitan region is part of a mega-region.
number_ware_t0	The number of warehouses in the metropolitan area at the start of the period covered by the dataset.
number_ware_t1	The number of warehouses in the metropolitan area at the end of the period covered by the dataset.

Average number of warehouses, metro classification, and timeframe – H3

Data	Time	The average number of warehouses	Megregion	
			Yes	No
Complete	t0	374	230	832
	t1	518	299	1210
Without outliers	t0	148	163	92
	t1	183	196	131



Histograms for the number of warehouses in different categories of metros and time – H3

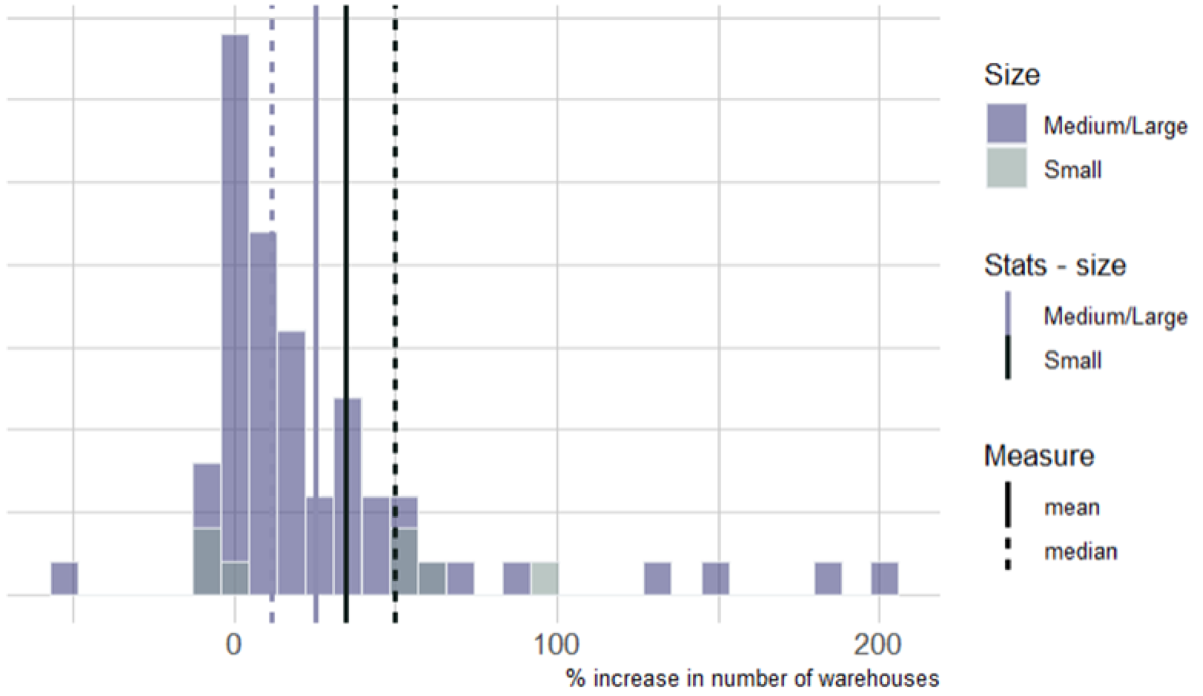
H4: The increase in the number of warehouses over time is larger in medium and large metropolitan areas than in smaller ones

Result: The average % increase in the number of warehouses in small metros is **not statistically relevant** from that in medium and large ones, at a significance level of 5%

Variable Name	Description
metro	The name of the metropolitan area.
mega_region	If the metropolitan region is part of a mega-region.
number_ware_t0	The number of warehouses in the metropolitan area at the start of the period covered by the dataset.
number_ware_t1	The number of warehouses in the metropolitan area at the end of the period covered by the dataset.

Average number of warehouses, metro classification, and timeframe – H4

Data	Size	
	Small	Medium/Large
Complete	35%	59%
Without outliers	35%	26%



Histogram for the increase in the number of warehouses in different categories of metros – H4

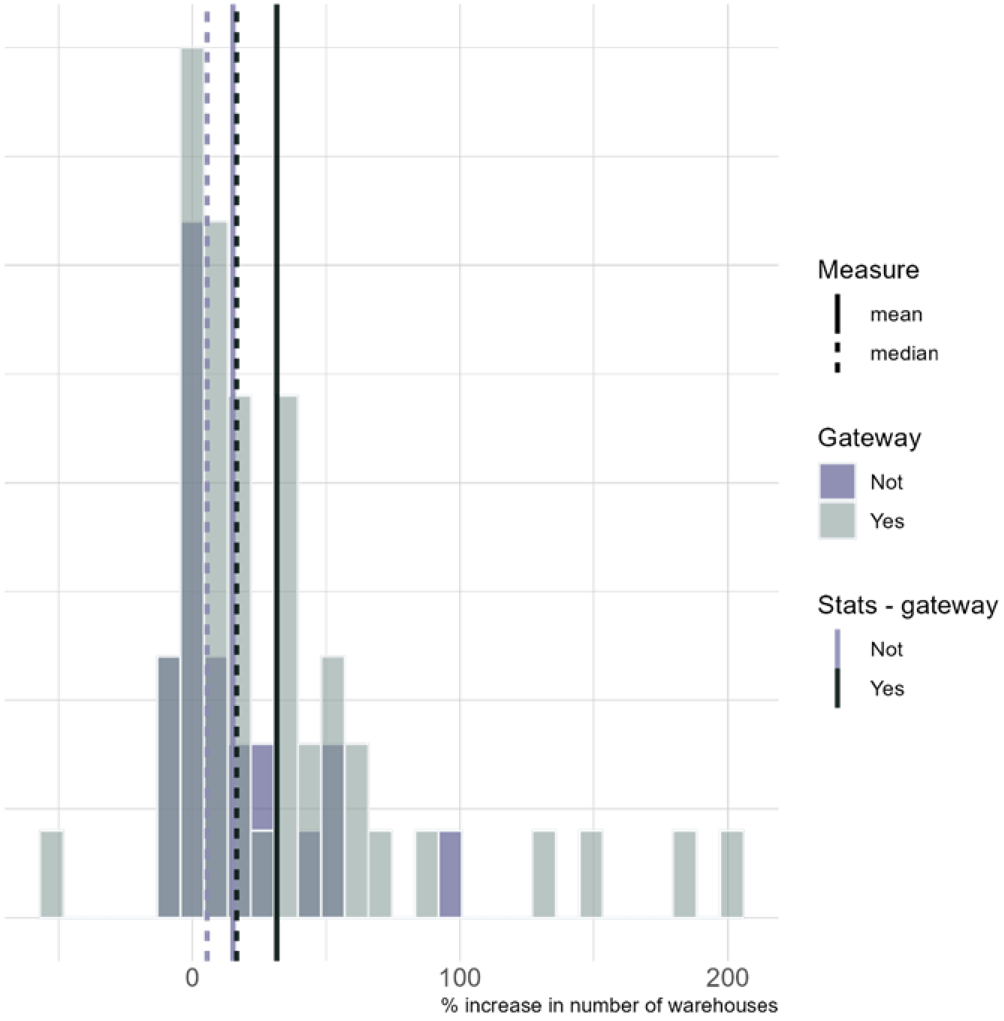
H5: The increase in the number of logistics facilities over time is positively related to the importance of the role of global logistics hub (or gateways) played by an urban area

Result: The average % increase in the number of warehouses in gateway metros is **not statistically relevant** from that in non-gateway ones, at a significance level of 5%

Variable Name	Description
metro	The name of the metropolitan area.
gateway	If the metropolitan region is a global hub city or gateway.
number_ware_t0	The number of warehouses in the metropolitan area at the start of the period covered by the dataset.
number_ware_t1	The number of warehouses in the metropolitan area at the end of the period covered by the dataset.

Average number of warehouses, metro classification, and timeframe – H5

Data	Gateway	
	Yes	No
Complete	71%	26%
Without outliers	32%	16%

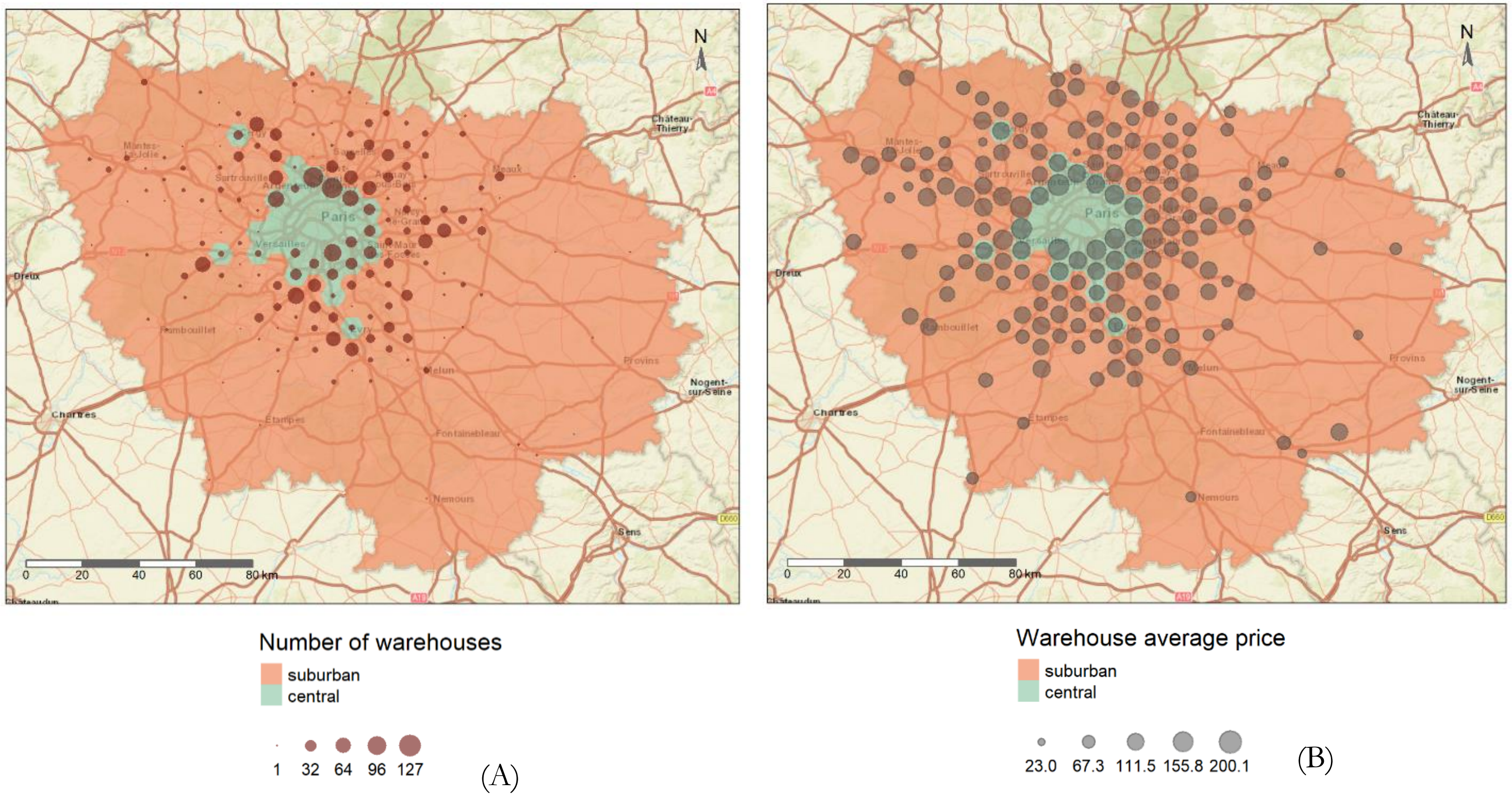


Histogram for the % increase in the number of warehouses in different categories of metros – H5

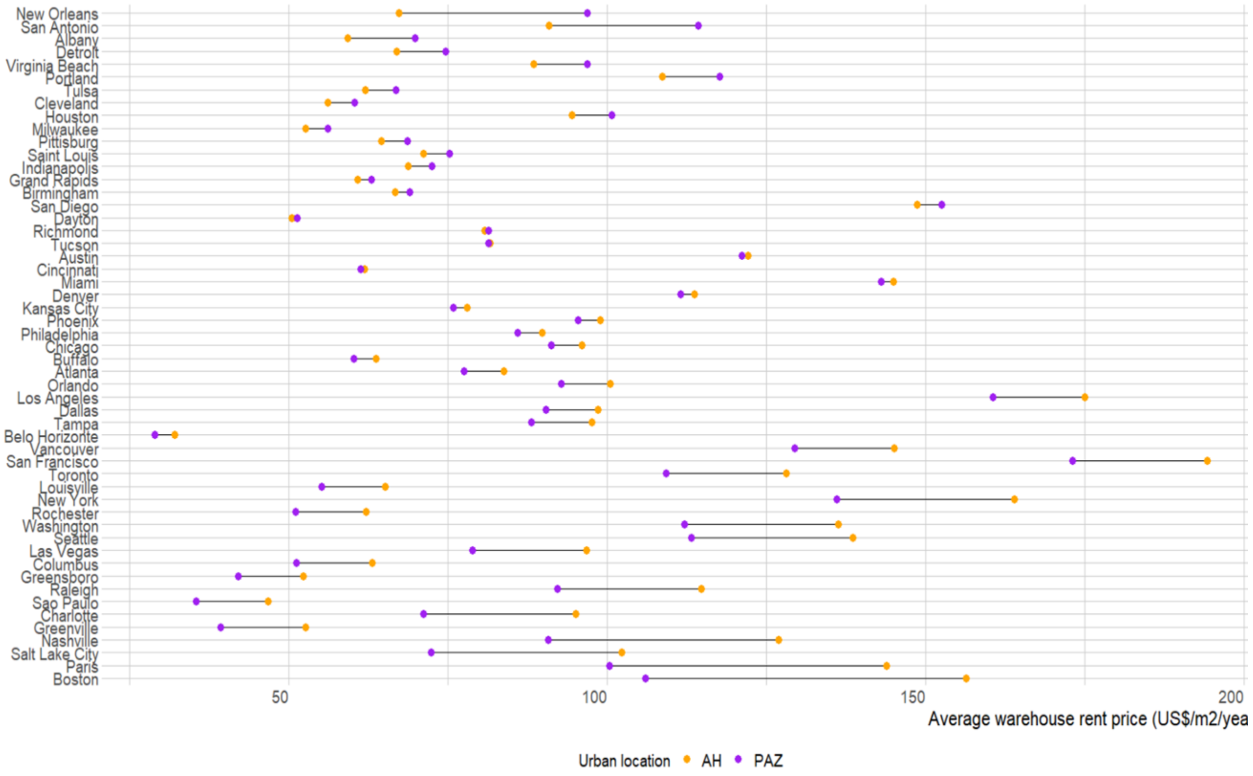
H6: Logistics sprawl is positively related to the differential in land/rent values for logistics land uses between suburban and central areas in an urban region

Result: The relationship between the differential warehouse prices and the yearly logistics sprawl is statistically **quite positive** but limited (de Oliveira, Dablanc, Schorung, 2022)

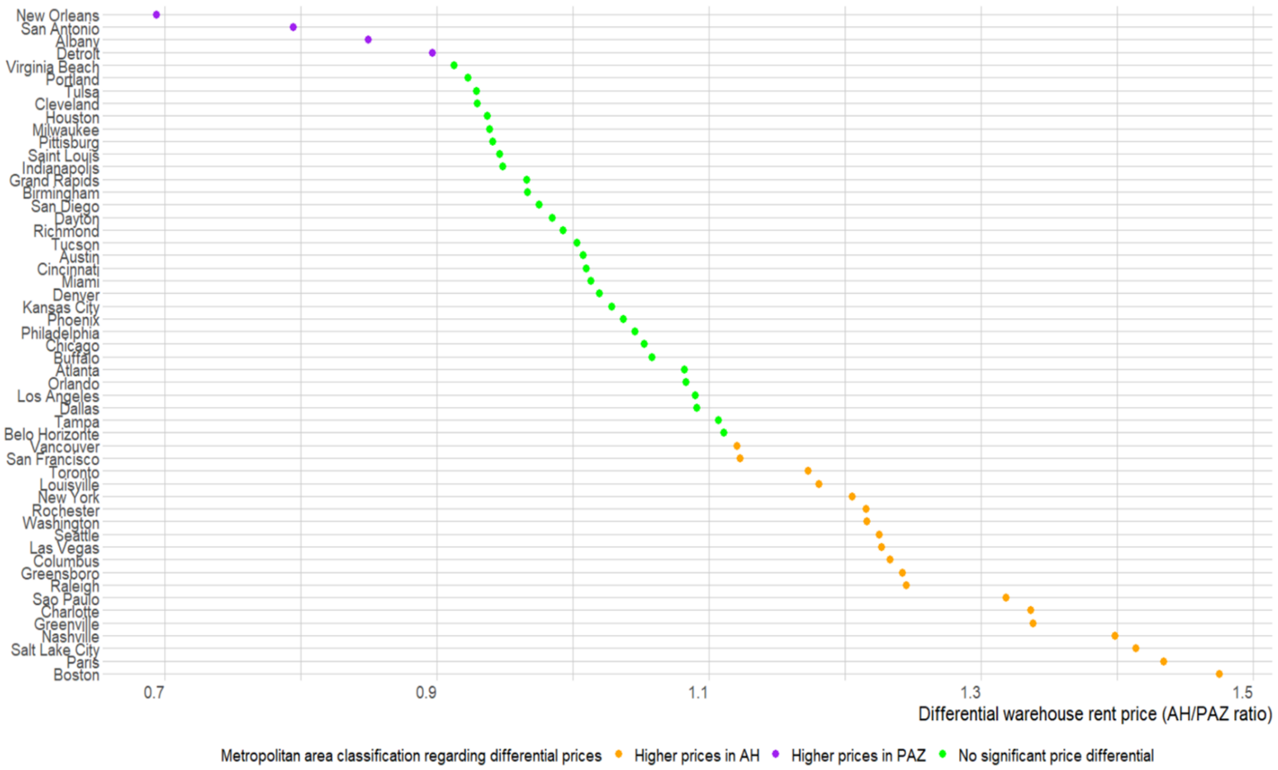
The data was obtained in structured statistics datasets and warehouse real estate websites. We proposed a typology of the urban regions for determining the differential warehouse rent prices, namely Activity Hubs and Peripheral Activity Zones. This classification was based on an Urban Activity Index.



Representation of the number of warehouses and the average rent price in each hexagon for Paris (region Ile-de-France)



Representation of warehouse average rent prices for AH and PAZ for each metropolitan region

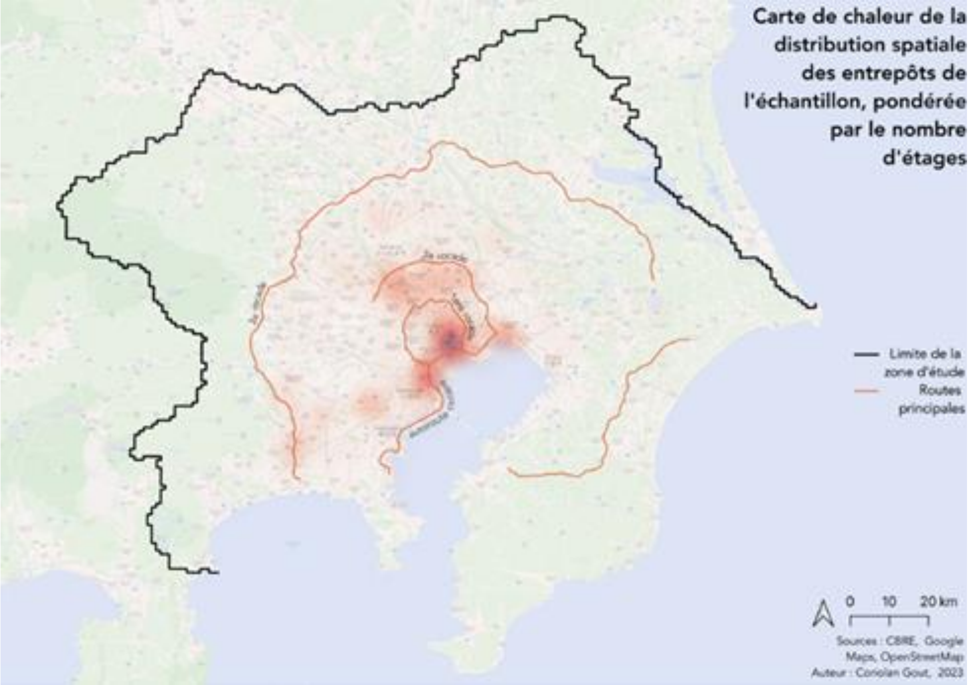


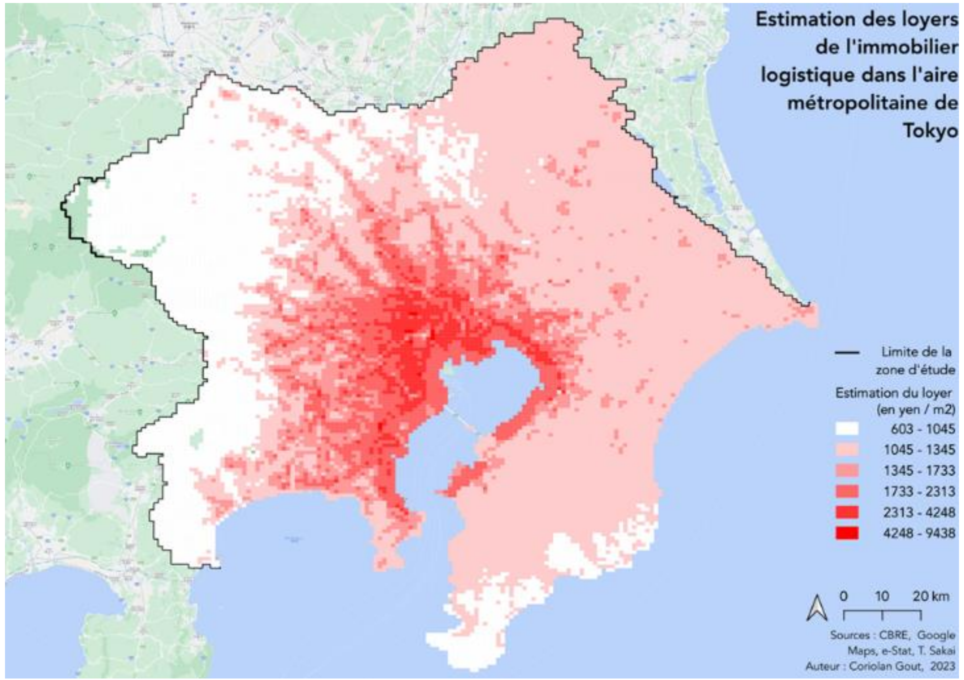
Representation of proportional rent prices differential for warehouses in each location for each metropolitan region

Focus on Tokyo Metro Area (Gout, 2023)

On the scale of the study area, the variables with the greatest impact on rent per m² are, in order: distance-time to the nearest port, accessibility to the night-time population and accessibility to industry. Around Tokyo Bay, the variables with the greatest impact on rent per m² are, in order: accessibility to the night-time population, distance-time to the nearest port and accessibility to consumption. There is a **significant relationship** between rent per m² and night-time pop accessibility, consumer accessibility and the presence of a warehouse in the Tokyo Bay area.

We can identify three areas with high rents in Tokyo Bay: downtown Tokyo, around the bay (5 km from the coast) and along the main highways → this case study **confirms** the center-periphery gradient for logistics real estate rents





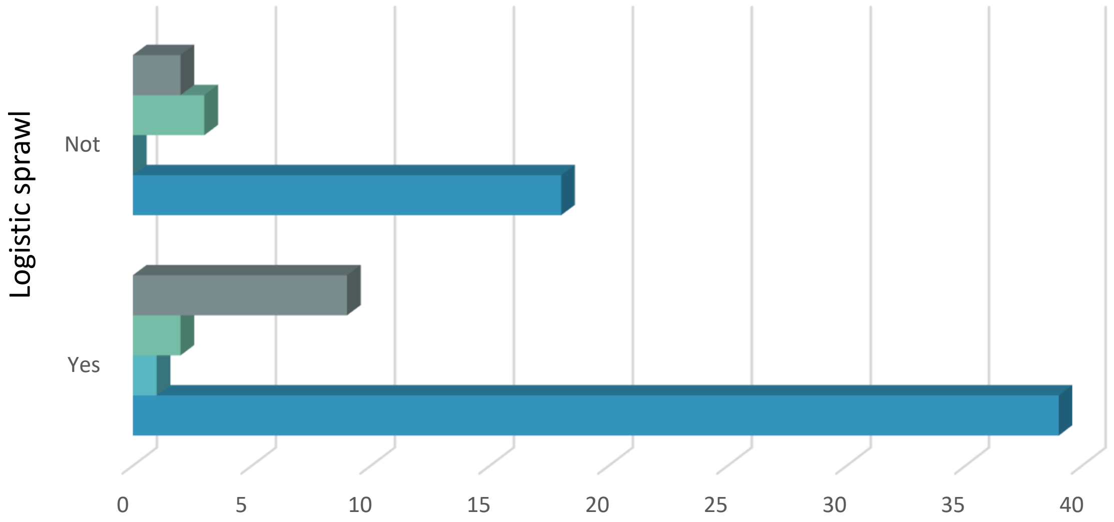
(i) Spatial distribution map of sample warehouses, weighted by number of storeys (dataset of 4048 warehouses);

(ii) Estimated rents for logistics real estate in the Tokyo metropolitan area (yen per sq.m per year) (Gout, 2023)

Hypotheses: Complex analyses

H7: Logistics sprawl is negatively related to the degree of regional logistics land use control

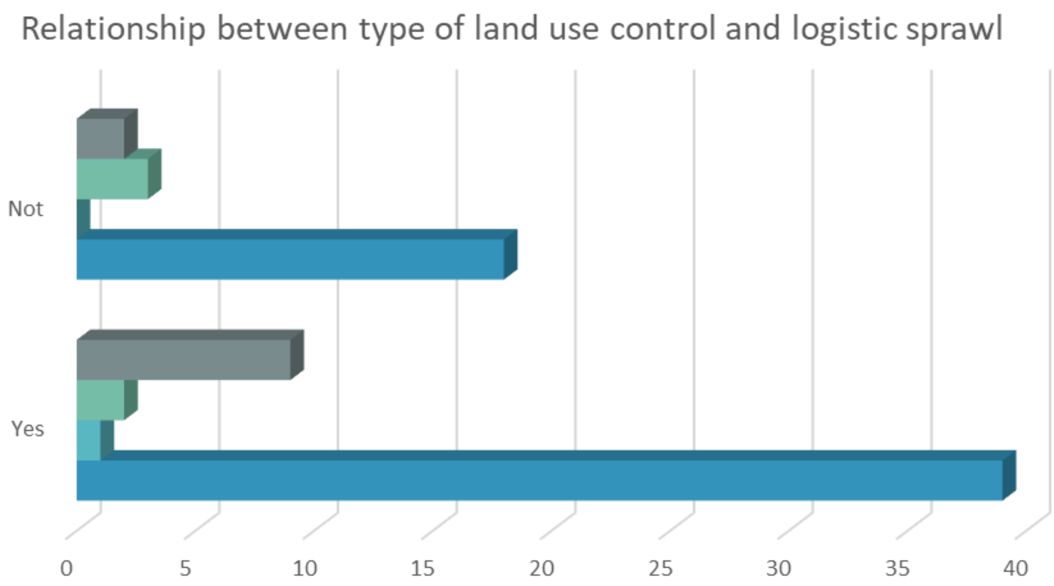
Relationship between type of land use control and logistic sprawl



	Yes	Not
Not indicated	9	2
Regional	2	3
Metropolitan	1	0
Local	39	18

H7: Logistics sprawl is negatively related to the degree of regional logistics land-use control

Result: There is no sufficient data to allow the exploration of the hypothesis. **This will require further analysis.**



	Yes	Not
Not indicated	9	2
Regional	2	3
Metropolitan	1	0
Local	39	18

(Dablanc et al., 2020)

Key conclusions

Hypotheses	Validated	Conclusion
H1	Yes	There are more warehouses/pop in medium and large cities than in smaller cities
H2	Yes	There are more WHs in global hub cities (or ‘gateways’) than in “regular” cities
H3	Yes	There are more warehouses in cities that belong to a megaregion than in “regular” cities
H4	No	The difference of increase in the number of warehouses in small metros is not statistically relevant from the medium/large ones
H5	No	The % increase in the number of warehouses in gateway metros is not statistically relevant from the ones that are not
H6	Yes (but limited)	Logistics sprawl *could be* positively related, in some cases, to the differential in land/rent values for logistics land uses between suburban and central areas in an urban region
H7	Need further study	Logistics sprawl is *not always* negatively related to the degree of regional logistics land use control

Recommendations for further studies

- Replicate the method to analyze differential location prices (Oliveira et al. (2022)) for metropolitan areas in the Global South

- Investigate Asian metropolitan areas and South America metro areas to understand if there are differences in the urban structure and other characteristics compared to the other metro areas

- Refine the analysis of logistics sprawl considering warehouse characteristics, such as size, operation, and type of WH (for example, parcel and express couriers)

- Explore clusters of metropolitan areas grouped by urban characteristics to investigate the hypotheses considering the sub-groups of metro areas

- Perform specific research on H7, exploring land use control, and regional and local policies

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