Relationships among urban characteristics, real estate market and spatial patterns of warehouses in different geographic contexts

Renata Oliveira | Splott/UGE seminar | 10/05/2021

Authors

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Research Hypothesis

(Dablanc, L., 2019)

Logistics sprawl is higher in cities with a **high differential** between **central and suburban land/rent values**.

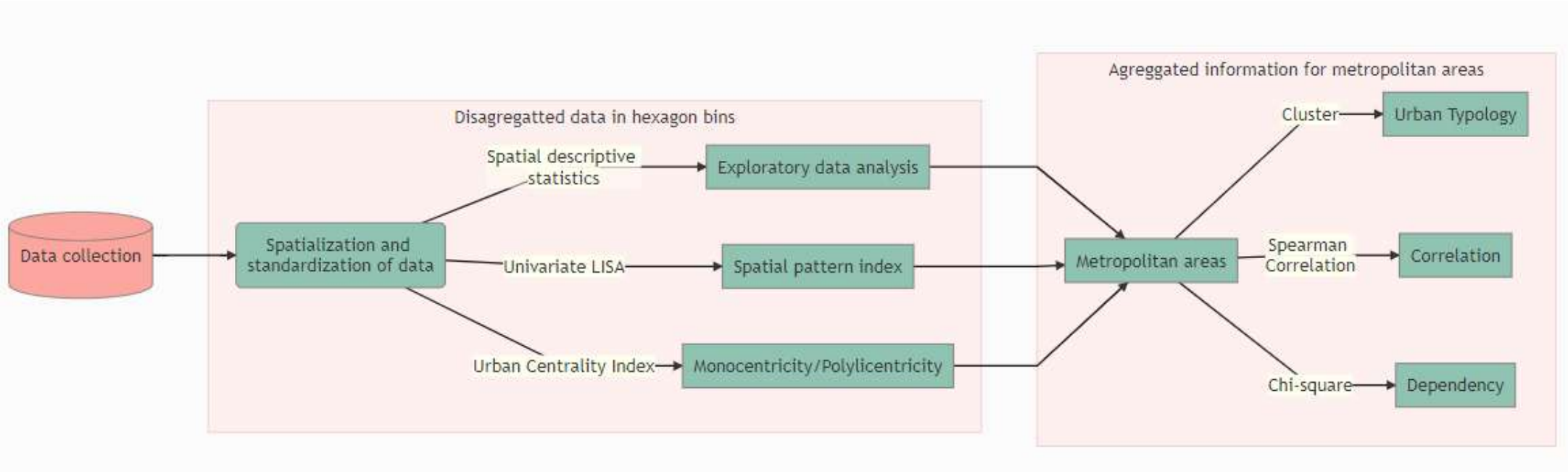
The **location of warehouses** is closely related to **land/rent values** of logistics facilities.

Objectives

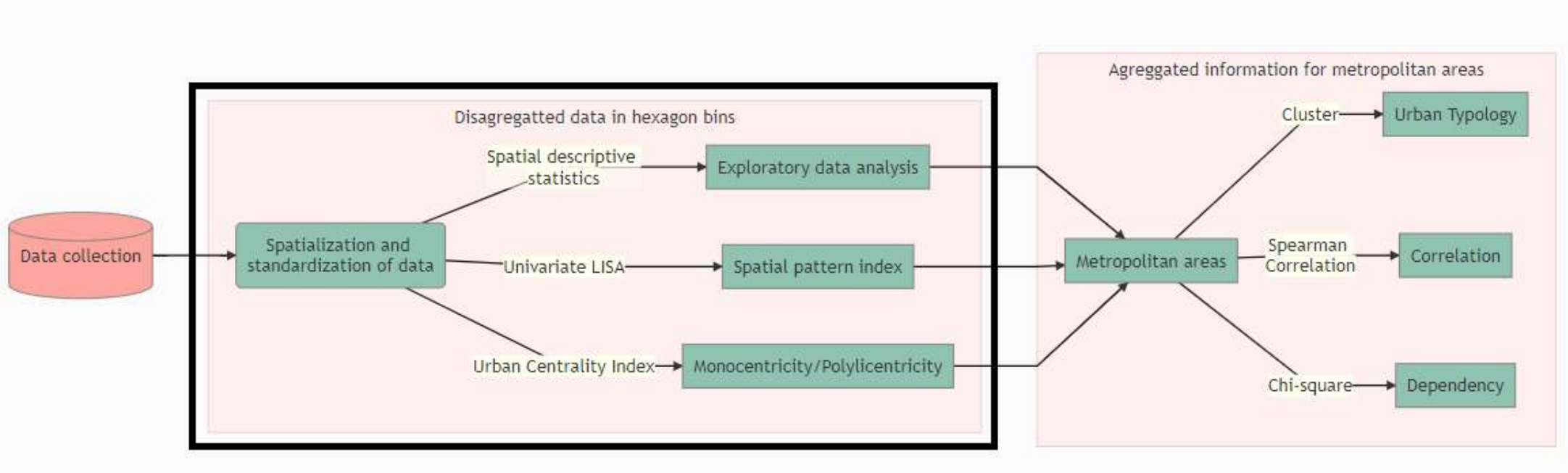
Chair Logistics City Theme 1 objective: Compare spatial patterns of warehouses overtime and in different cities around the world connecting urban form to the evolution in the number and location of logistics facilities (Dablanc, L., Palacios, L., 2019)

Focus of this research: Identify the relationships between urban attributes, logistics real estate, and logistics facilities' spatial structure focusing on logistics sprawl

Methodological approach



Methodological approach



Methodological approach

Spatial descriptive statistics

Urban Classification

Classification	Category
Lower outlier	Suburban
< 95 %	Suburban
>= 5 %	Central
Upper outlier	Central

Warehouse location and rent prices

Classification	Category
Lower extreme	Extremely low
Lower outlier	Very low
< 25 %	Low
25 % - 50 %	Medium
50 % - 75%	Medium
> 75 %	High
Upper outlier	Very high
Upper extreme	Extremely high

Methodological approach

Spatial pattern index

Univariate Global and Local Moran's I - spatial autocorrelation.

LISA map generated considering a 0.05 level of significance and a Monte Carlo simulation (2000 permutations).

Methodological approach

Urban Centrality Index (UCI)*

Computed considering:

- location coefficient - measure the unequal distribution factor of the urban intensity index within each urban area
- spatial separation index, namely Venables index, which aims at evaluating the spatial distribution of spatial patterns of activities; and
- proximity index, which is the normalization of the Venables index considering the respective maximum attainable value. The UCI values range from 0 to 1, where 0 the most polycentric area and 1, maximal monocentricity.

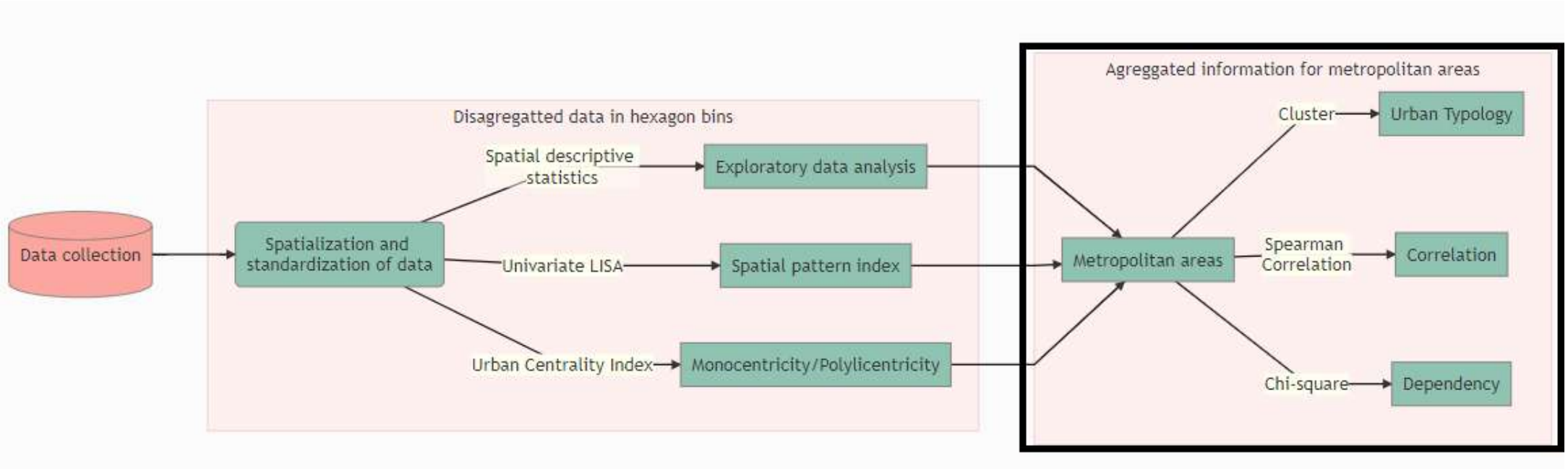
*Pereira (2013)

Methodological approach

Dataset containing all hex bins for all the metropolitan regions investigated

- Number of warehouses in each hex bin
- Average warehouse price in each hex bin
- Urban intensity index
- Spatial cluster identification for urban intensity index and warehouse count and rent prices
- Classification and outlier's identification for warehouse count and rent prices

Methodological approach



Methodological approach

Dataset containing the summary indicators for each metropolitan region

- Global Moran's I index for urban activity index
- Global Moran's I index for warehouse spatial distribution
- Global Moran's I index for warehouse rent prices distribution
- UCI for urban activity index
- UCI for warehouse location
- Price differential for central and suburban warehouses
- Population (t0 and t1) (Dablanc, L; Palacios, L., 2019)
- Metropolitan territorial area (Dablanc, L; Palacios, L., 2019)
- Number of municipalities (Dablanc, L; Palacios, L., 2019)
- Number of warehouses (t0 and t1) (Dablanc, L; Palacios, L., 2019)
- Average distance to barycenter (t0 and t1) (Dablanc, L; Palacios, L., 2019)
- Yearly logistics sprawl (Dablanc, L; Palacios, L., 2019)
- The proportion of HH, HL, LH and LL clusters for the urban activity index, warehouse location and warehouse price.

Methodological approach

Typology - K-means cluster analysis

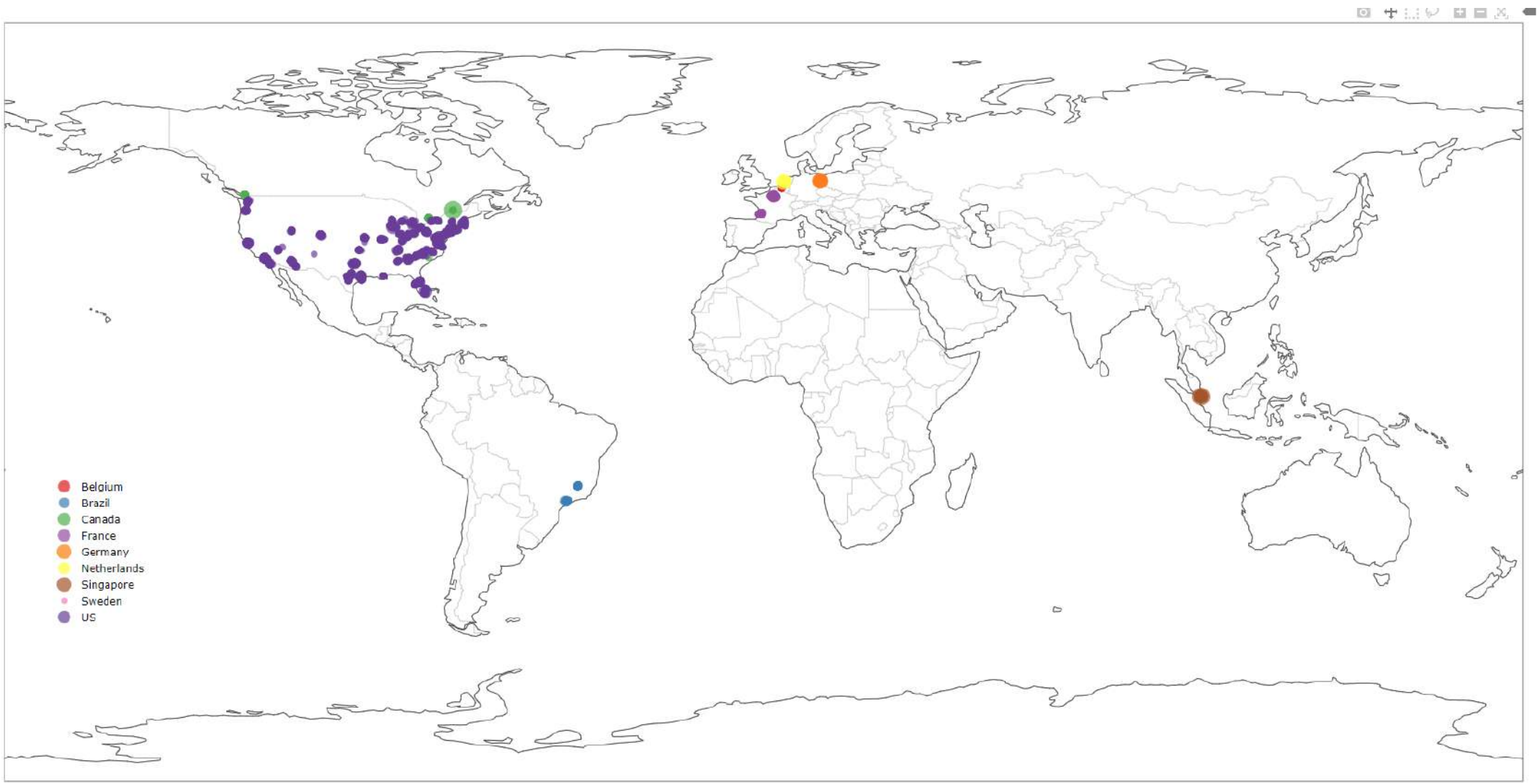
Can we gather all metropolitan regions into one comparative analysis?

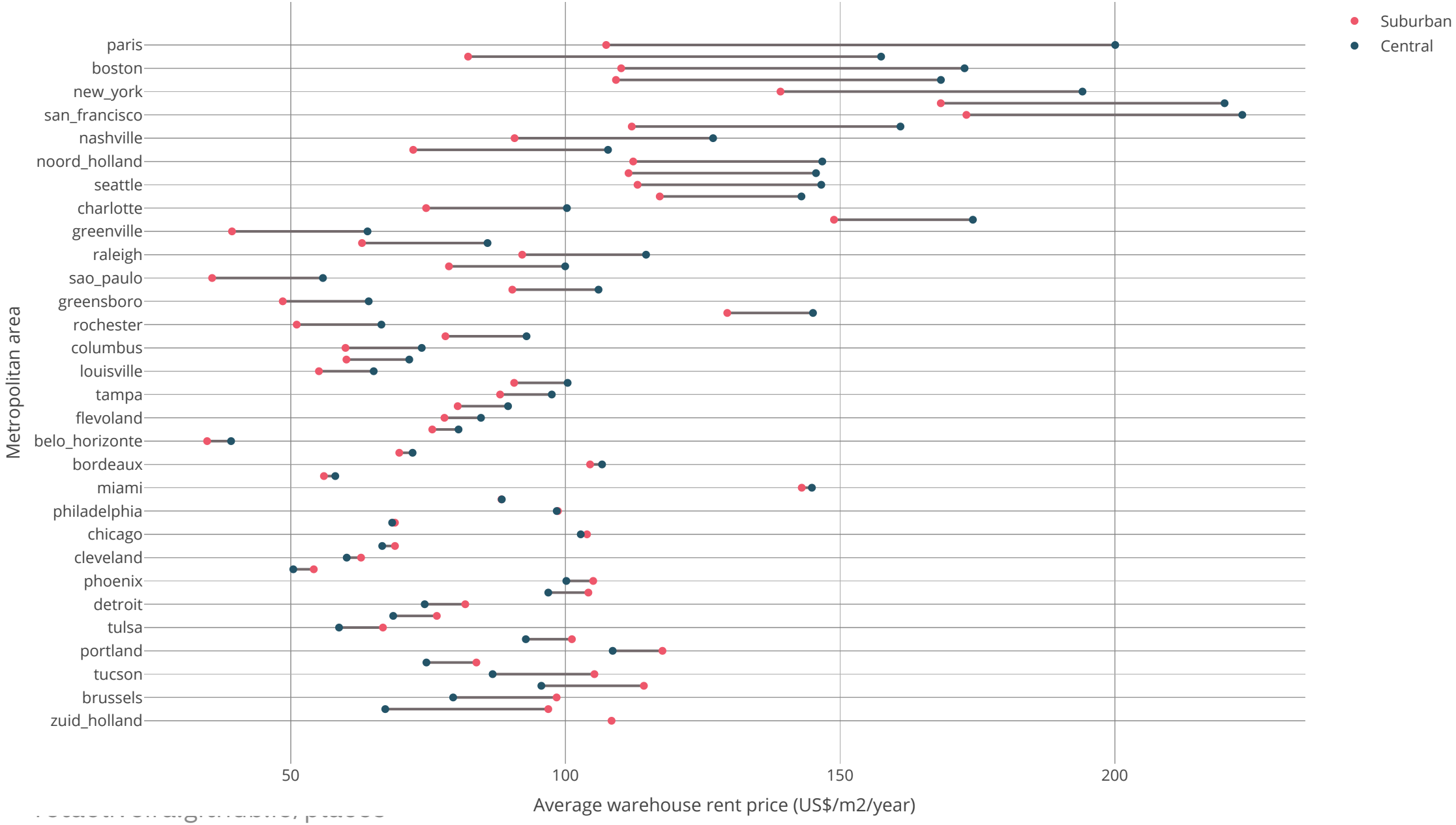
Dependency of warehouse location and prices on urban activity - Chi-square independent

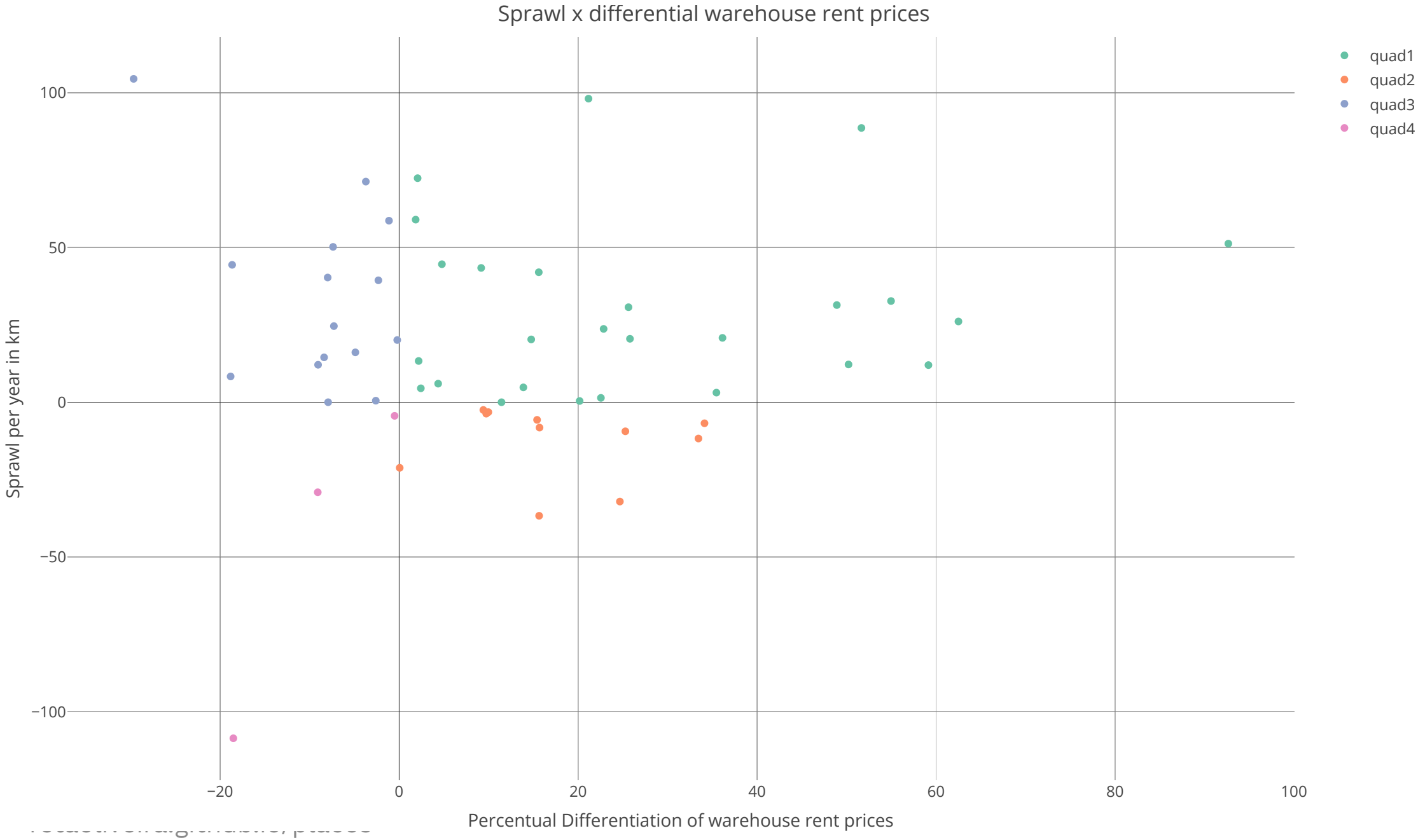
Do warehouse location and prices depend on urban activity?

Correlation among continuous variables - Spearman correlation

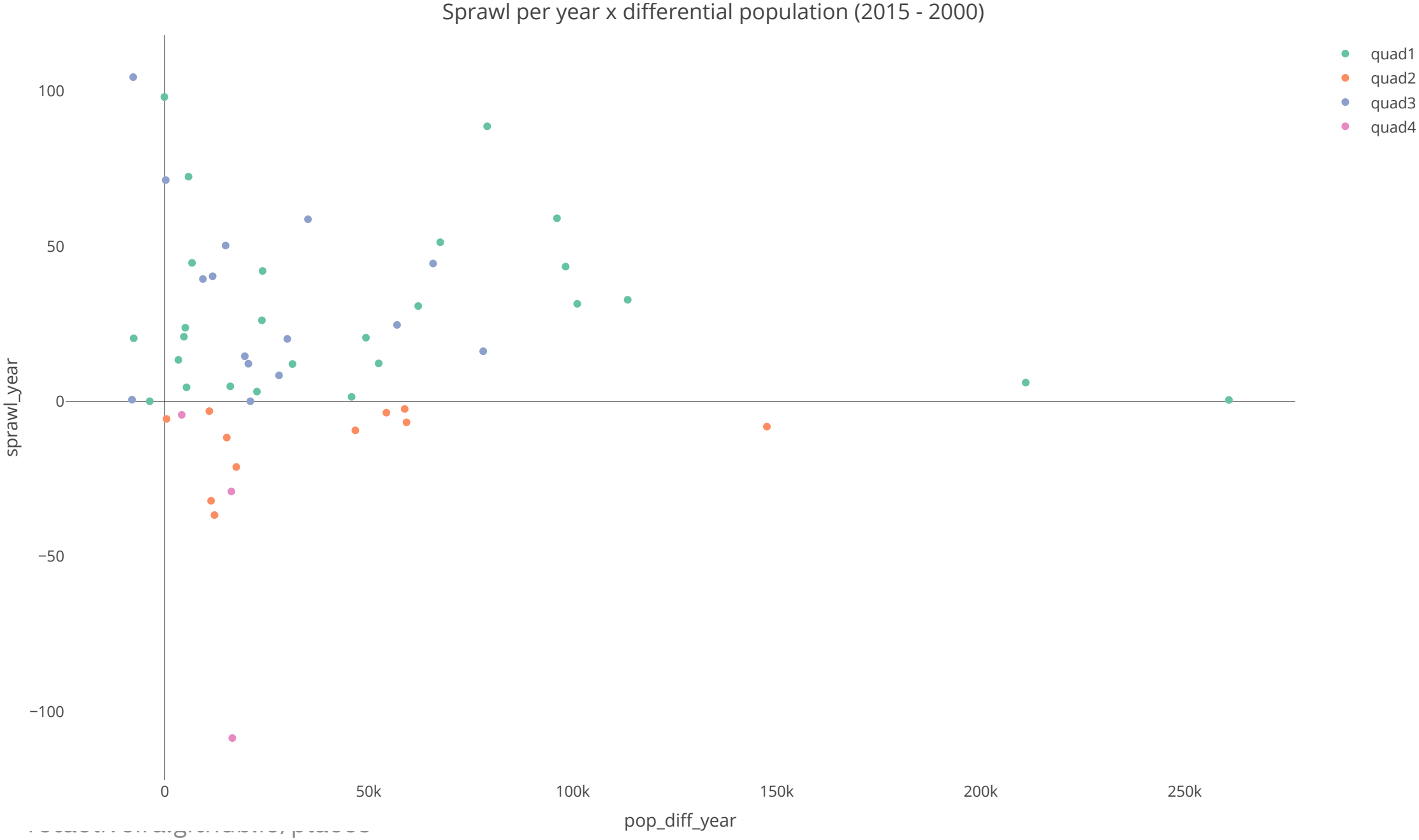
Is logistics sprawl related to warehouse rental prices?


Belgium
Brazil
Canada
France
Germany
Netherlands
Singapore
Sweden
US

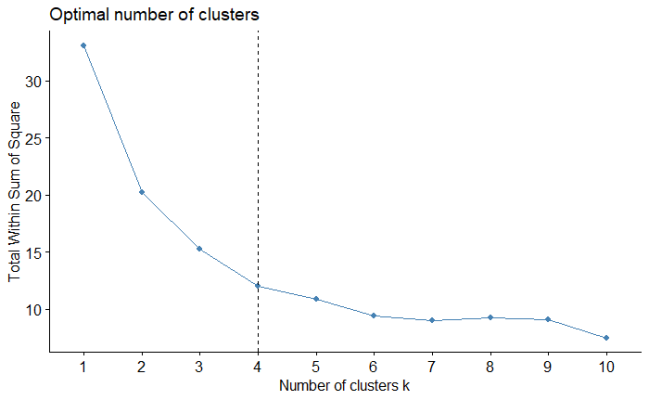

Suburban
Central
paris
boston
new_york
san_francisco
nashville
noord_holland
seattle
charlotte
greenville
raleigh
sao_paulo
greensboro
rochester
columbus
louisville
tampa
flevoland
belo_horizonte
bordeaux
miami
philadelphia
chicago
cleveland
phoenix
detroit
tulsa
portland
tucson
brussels
zuid_holland
Metropolitan area
50
100
150
200
Average warehouse rent price (US$/m2/year)


Sprawl x differential warehouse rent prices
quad1
quad2
quad3
quad4
100
50
0
−50
−100
Sprawl per year in km
−20
0
20
40
60
80
100
Percentual Differentiation of warehouse rent prices

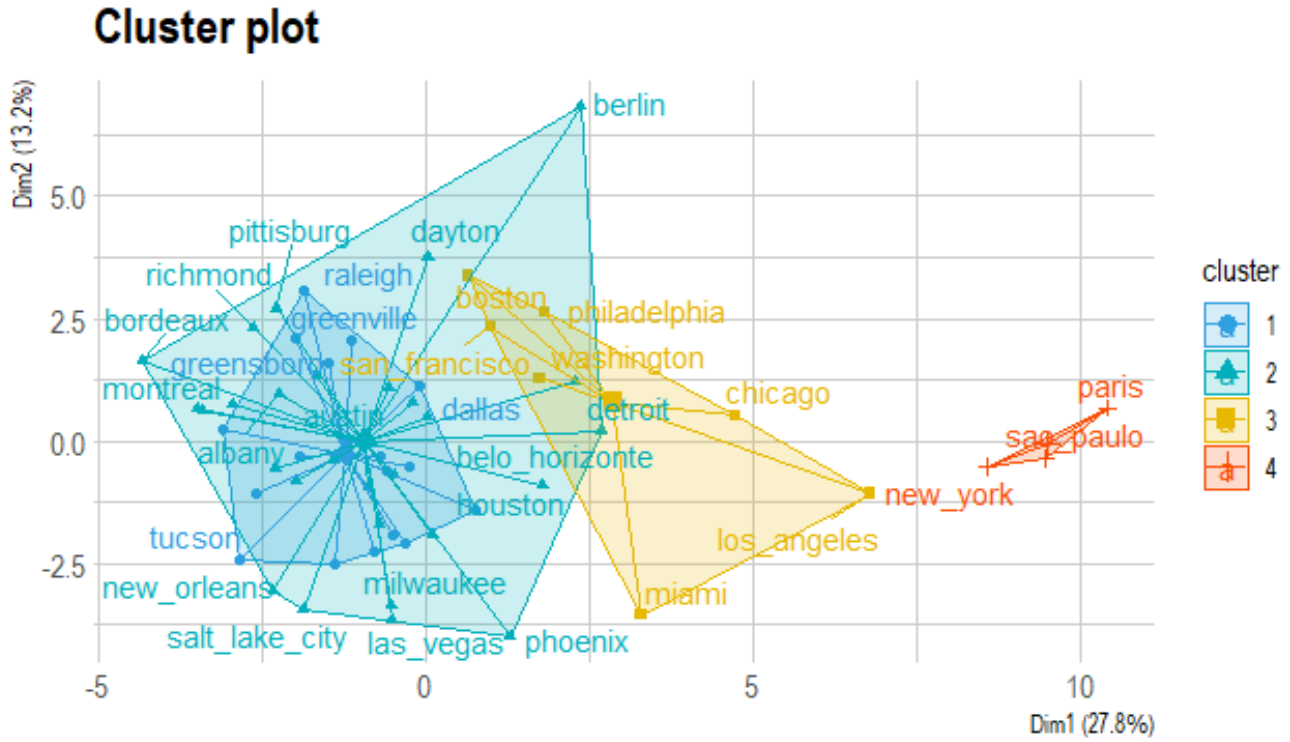

Quadrant for differential warehouse rent prices (central and suburban) and logistics sprawl
Quadrant
washington
vancouver
tucson
tampa
sao_paulo
san_diego
salt_lake_city
rochester
raleigh
pittisburg
philadelphia
orlando
new_orleans
montreal
miami
los_angeles
kansas_city
houston
greensboro
detroit
dayton
columbus
cincinnati
charlotte
brussels
bordeaux
berlin
austin
albany
quad1
quad2
quad3
quad4
quad1
quad2
quad3
quad4


Sprawl per year x differential population (2015 - 2000)
quad1
quad2
quad3
quad4
100
50
0
−50
−100
sprawl_year
0
50k
100k
150k
200k
250k
pop_diff_year

Results - to be reviewed



Assumption:
FOUR CLUSTERS



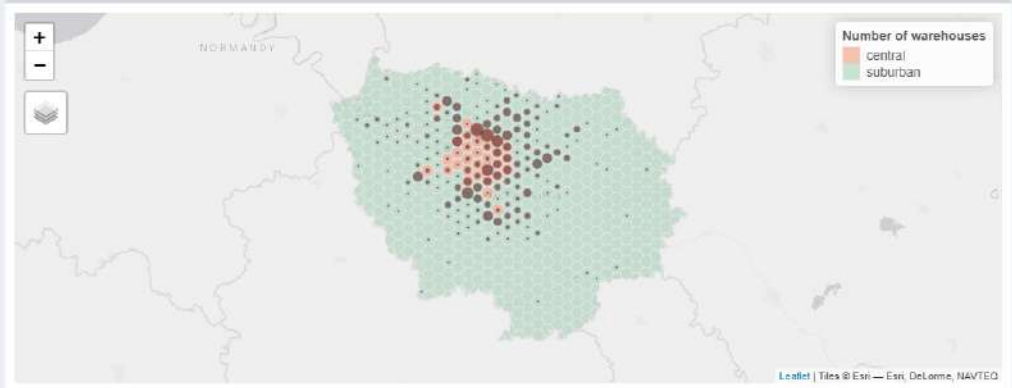
Results

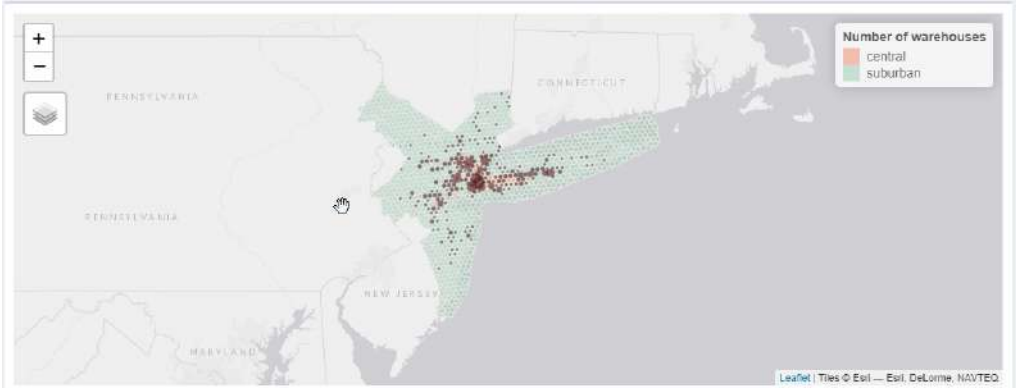
Metropolitan areas for comparison - To be reviewed from cluster analysis

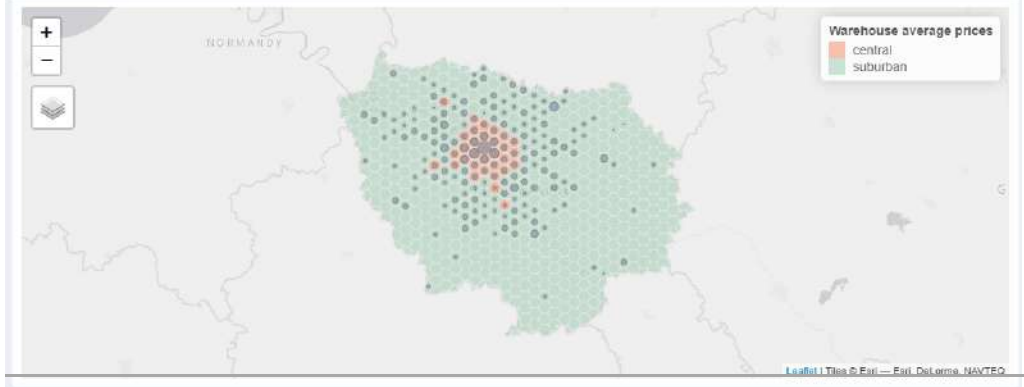
- albany
- atlanta
- austin
- belo_horizonte
- berlin
- bordeaux
- boston
- buffalo
- charlotte
- columbus
- grand_rapids
- kansas_city
- las_vegas
- los_angeles
- miami
- milwaukee
- montreal
- nashville
- new_york
- paris
- pittisburg
- raleigh
- salt_lake_city
- san_francisco
- sao_paulo
- toronto
- vancouver
- washington

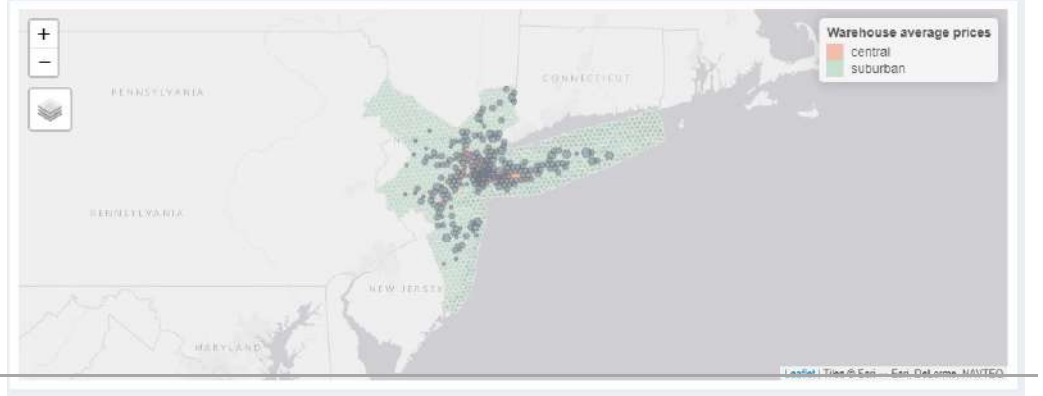
Examples of the representation

Referential for the urban classification









Futher steps

- Conclude classification of metropolitan areas
- Compare different classes of metropolitan areas - sprawl x urban attributes - **scale regarding the comparison between European and North American metros**
- Dashboard
- Paper

Research contributions

Methodological: innovative framework for comparing metropolitan regions considering the spatial pattern of logistics facilities and urban characteristics.

Reproducibility

Public Policy: Can induce local and regional public authorities to develop more effective public policy addressed to logistics land use and transportation planning. Coordinating these dimensions is essential to support urban logistics stakeholders' needs, cities' livability, and the real estate market.

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