CLASSIFYING NEIGHBORHOODS IN WARSAW (POLAND) BY COMMERCIAL ACTIVITY

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Motivation

- How and why do neighborhoods change?
  - Urban neighborhood change studies since early 1900s
  - Formal models of neighborhood change
    - Invasion and succession (Burgess, 1925)
    - House filtering (Hoyt, 1933)
    - Multiple nuclei (Park et al., 1925; Harris & Ullman, 1945)
    - Neighborhood life cycles (Hoover & Vernon, 1962)
    - Structural/organizational (Temkin & Rohe, 1996; Schwirian, 1983)
    - Revitalization & Gentrification, "Great Inversion" (Lees, 2000)
    - Post modern/chaotic (Dear, 2002)
    - Integration/diversification (Logan & Zhang, 2010)
- Models based on neighborhood classification
  - Empirical studies measuring neighborhood differences

Motivation

- Classification (pattern) before theory and model (process)
- Empirical classifications of neighborhoods typically based on **socioeconomic**, **demographic** and **housing** characteristics across time (Delmelle, 2015)
  - Education, unemployment, poverty
  - Age (18-, 60+)
  - Owner occupied, home value, house age, tenure
- Older studies: single or a few characteristics for two time periods
- Newer studies : identify trajectories/transitions based on longitudinal analysis of multiple neighborhood attributes
- Most recent: trajectory analysis for multiple metropolitan areas (Wei & Knox, 2014; Delmelle, 2017)

Motivation

- Neighborhoods have **other spatially-based attributes**
- To date, empirical neighborhood classifications have mostly **neglected commercial activities**
- **Processes** of commercial/retail locational change
  - Decentralization
  - Gentrification (Gould Ellen & O'Regan, 2010; Grodach et al., 2014)
  - Globalization
  - Agglomeration (Stern & Seifert, 2010)
  - Consumerism/Quality of life (Meltzer and Schuetz, 2012; Kuang, 2017)
- " **Urban neighborhoods are defined as much by their commercial character as their residential**" (Meltzer & Capperis, 2017, p. 3023)

Research questions

- What commercial characteristics are important in neighborhood classification?
- What is the commercial character of urban neighborhoods?
- What commercial neighborhood types can we distinguish?
- How does it vary over time? What are its trajectories?

Multiple dimensions of neighborhood commercial activity

- Types of activities
  - Residentially-oriented retail and services
    - Food stores, restaurants, apparel, home goods, banks, personal fitness
  - Dining, drinking, and entertainment
    - Restaurants, coffee shops, bars, clubs
  - Tourism
    - Hotels
  - Culture
    - Museums, art galleries, theaters, cinemas
  - Health care
    - Primary care centers, pharmacies

Multiple dimensions of neighborhood commercial activity

- Gentrification
  - Upscale, (un)healthy
- Economic restructuring and globalization impact
  - independent vs. chain stores
- Diversity
- Density
- Agglomeration
- Frequency
- Necessity vs. discretionary

Study area and data

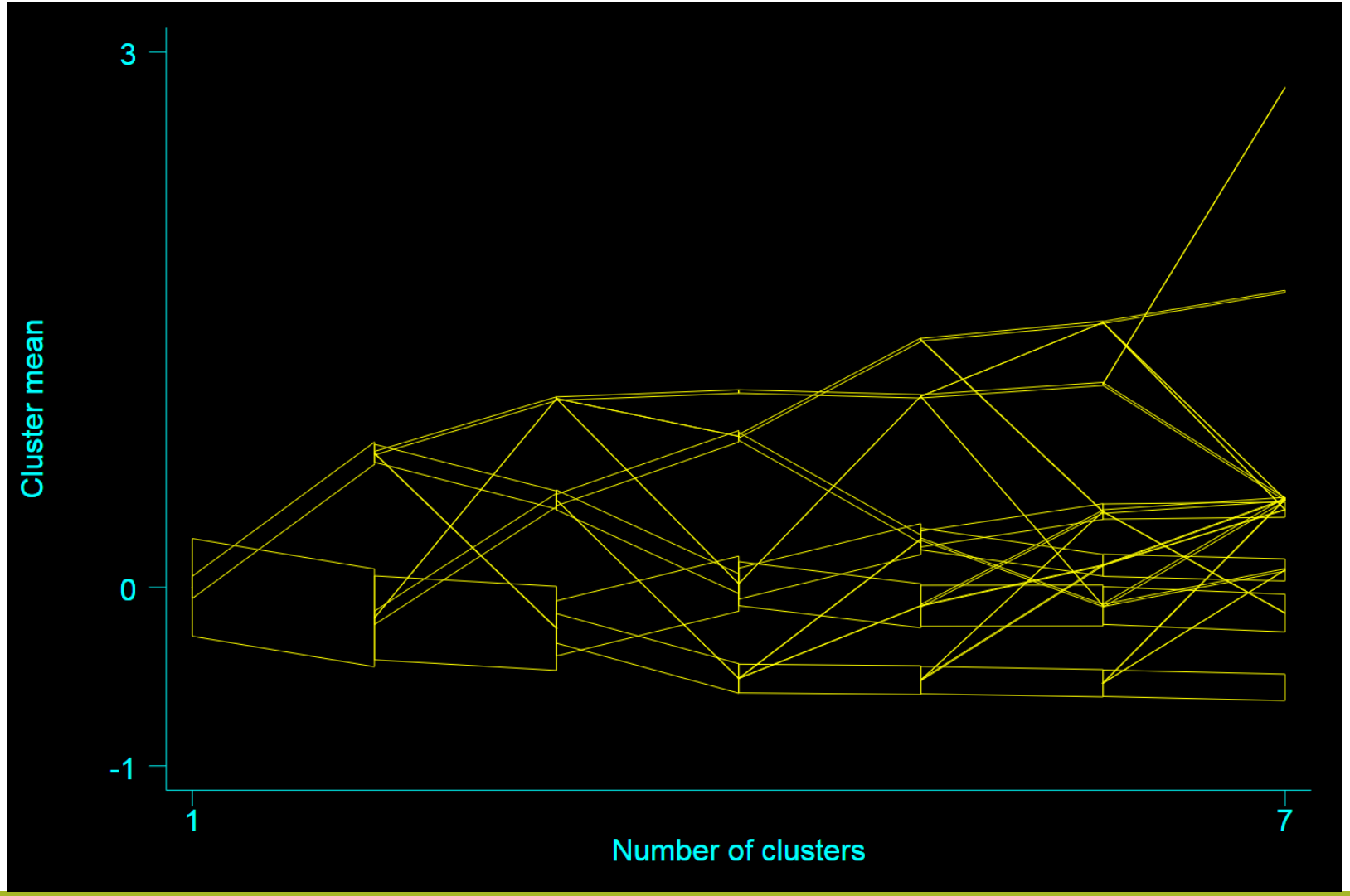
- Warsaw, Poland
  - City population (2016): 1,754,000
  - Metropolitan area (2016): 3,174,000
  - Good test case: economic restructuring since 1989
- Activity data
  - Only for one time period: 2017
  - Partial database from Datawise.pl (local ESRI affiliate)
    - Lacks some types of activities
  - Manual data entry: clean up and extension
  - Database still lacking…
    - Art galleries
    - Home stores, apparel stores
    - Designations: upscale, unhealthy food

Methods

- Two main clustering techniques: hierarchical, partitioning (e.g. *K*-means)
- *K*-means more computationally efficient
  - Study size: transport areas (*n*=900)
- One drawback
  - Have to choose number of clusters to start partitioning proces
- Approach
  - Choose different starting *K* and determine appropriate number of clusters
  - Given 11 variables in this study, I chose *K* = 3-7 clusters
  - Standardize variables before *K*-means using z-score

K-means validation

- clustergram



z-score means across clusters (3 clusters)

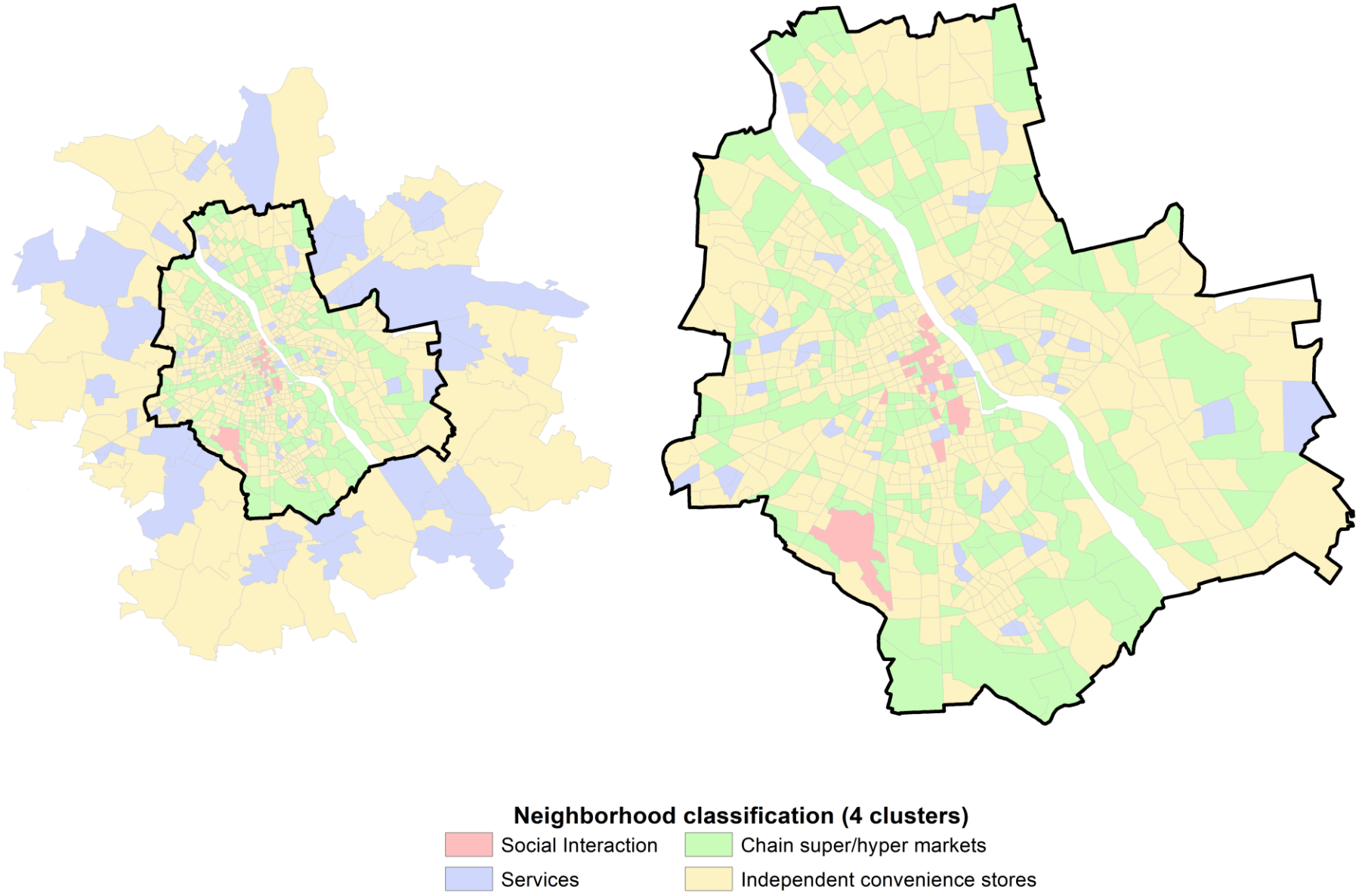
Variables	Social Interaction (29 zones)	Chain super/hyper markets (636 zones)	Services (236 zones)
Ownership status	**0,45**	**-0,06**	0,10
% Independent establishments			
Dining, drinking, entertainment			
# Clubs, bars, pubs	**3,45**	**-0,17**	0,05
# Coffee shops	**3,43**	**-0,21**	0,15
% fast food	-0,07	**-0,26**	**0,70**
Food			
% convenience store	0,35	**-0,20**	**0,49**
Tourism			
# hotels	**1,99**	**-0,17**	0,21
Finance			
# banks	0,64	**-0,36**	**0,88**
Personal fitness			
# gyms, fitness, studios, dance studios, swimming pools, martial arts	-0,03	**-0,35**	**0,94**
Culture			
# theaters, cinemas, museums	**1,39**	**-0,07**	0,03
Health			
# primary care clinics	-0,02	**-0,28**	**0,75**
# pharmacies	0,06	**-0,41**	**1,10**

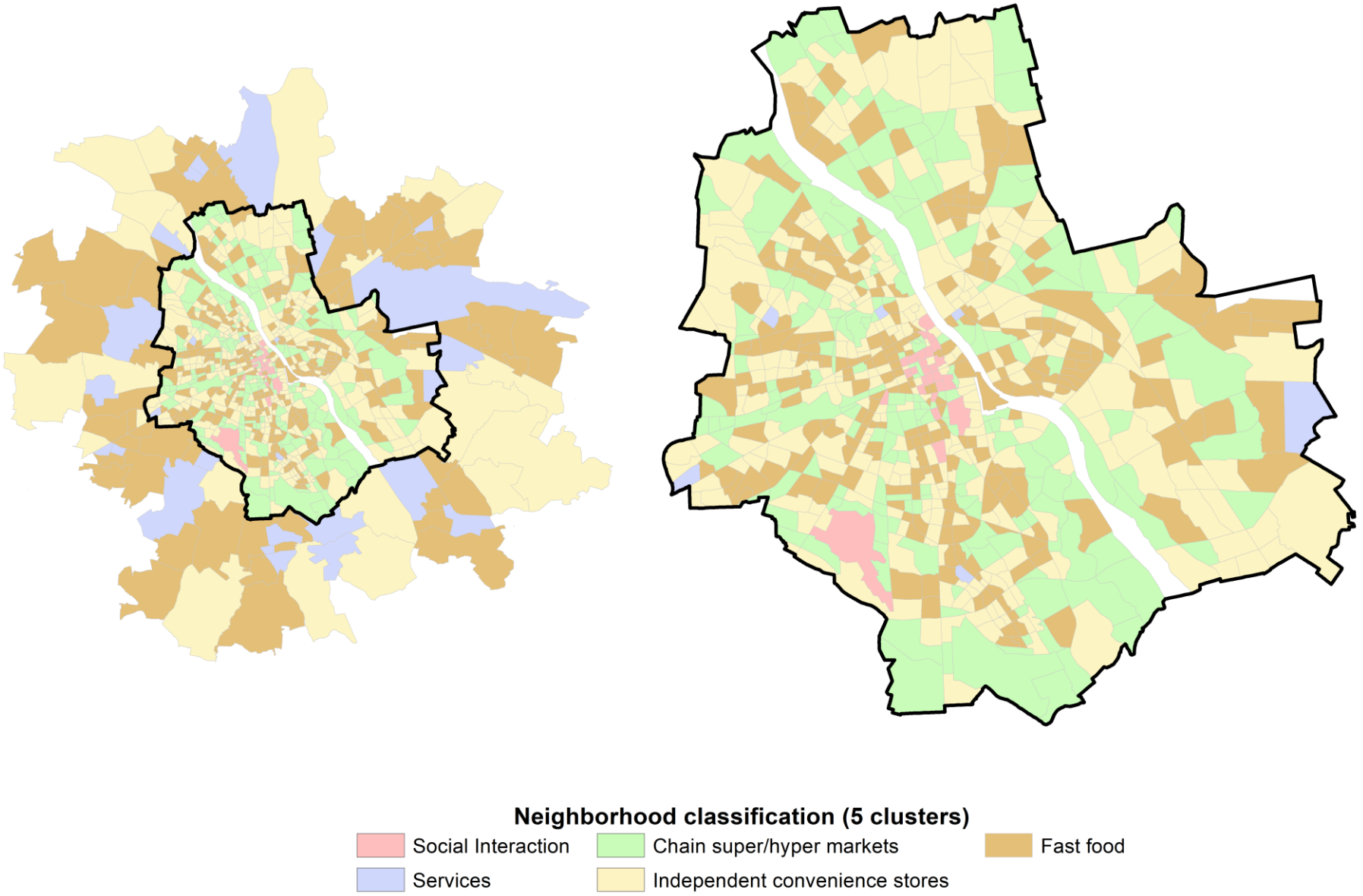
z-score means across clusters (4 clusters)

Variables	Social Interaction (26 zones)	Chain super/hyper markets (223 zones)	Services (87 zones)	Independent convenience stores (565 zones)
Ownership status	**0,48**	**-0,66**	0,07	*0,23*
% Independent establishments				
Dining, drinking, entertainment				
# Clubs, bars, pubs	**3,69**	**-0,22**	0,13	*-0,10*
# Coffee shops	**3,65**	**-0,31**	0,30	*-0,09*
% fast food	-0,12	**-0,44**	**0,71**	0,07
Food				
% convenience store	0,33	**-1,64**	*0,50*	**0,55**
Tourism				
# hotels	**1,84**	**-0,21**	*0,73*	*-0,11*
Finance				
# banks	0,59	**-0,47**	**1,77**	*-0,12*
Personal fitness				
# gyms, fitness, studios, dance studios, swimming pools, martial arts	0,00	**-0,46**	**1,57**	*-0,06*
Culture				
# theaters, cinemas, museums	**1,53**	**-0,12**	0,04	*-0,03*
Health				
# primary care clinics	0,05	**-0,45**	**1,36**	*-0,03*
# pharmacies	0,04	**-0,63**	**2,14**	*-0,08*

z-score means across clusters (5 clusters)

Variables	Social Interaction (27 zones)	Chain super/hyper markets (216 zones)	Services (27 zones)	Fast Food (297 zones)	Independent convenience stores (334 zones)
Ownership status					
% Independent establishments	**0,47**	**-0,71**	0,10	0,09	*0,33*
Dining, drinking, entertainment					
# Clubs, bars, pubs	**3,61**	**-0,22**	0,28	-0,04	-0,14
# Coffee shops	**3,62**	**-0,31**	0,28	0,10	-0,21
% fast food	-0,13	-0,48	*0,83*	**0,96**	**-0,60**
Food					
% convenience store	0,34	**-1,66**	0,46	0,44	**0,62**
Tourism					
# hotels	1,75	**-0,22**	**2,03**	-0,05	*-0,12*
Finance					
# banks	0,61	**-0,46**	**3,24**	0,30	*-0,28*
Personal fitness					
# gyms, fitness, studios, dance studios, swimming pools, martial arts	-0,03	**-0,47**	**2,77**	*0,35*	*-0,23*
Culture					
# theaters, cinemas, museums	**1,46**	**-0,12**	0,17	-0,01	-0,05
Health					
# primary care clinics	0,03	**-0,45**	**2,10**	*0,33*	*-0,18*
# pharmacies	0,04	**-0,63**	**2,99**	*0,51*	*-0,29*


Neighborhood classification (4 clusters)
Social Interaction
Chain super/hyper markets
Services
Independent convenience stores


Neighborhood classification (5 clusters)
Social Interaction
Chain super/hyper markets
Fast food
Services
Independent convenience stores

Discussion and conclusions

- First attempt at systematic neighborhood classification based on commercial functions
  - Previous attempt focused on retail turnover (Meltzer & Capperis, 2017)
- A business location dataset for Warsaw, Poland used to classify neighborhoods
  - 4 distinct groups: social interaction, services, chain super/hyper markets, independent convenience stores
  - Fast food and services in 5 group solution very similar: combination of services in 4 group solution
  - Results partially driven by lack of other consumer services: apparel, home DIY, appliances
  - Spatial pattern of 4 cluster solution follows real world pattern
    - Supermarket and convenience store groups mostly in/near residential areas
    - Social interaction in trendy areas in and near downtown
    - Services generally in/near shopping malls

Future research

- Include expanded business location data set
  - Apparel, home DIY, appliances, art galleries
- Include other dimensions
  - Diversity, density, agglomeration
- Other cities in Poland
- Compare to U.S. cities

Thanks!

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