Séminaire EMAR-IFSTTAR-CEREMA, avec le soutien de la Fondation SEFACIL du 11.03.2016

ON THE LOCATION OF LOGISTICS COMPANIES: RESULTS OF RESEARCH ON MACRO AND MICRO LEVEL IN BELGIUM

ANN VERHETSEL
DEPARTMENT OF TRANSPORT AND REGIONAL ECONOMICS
UNIVERSITY OF ANTWERP

TPR
Departement of Transport and Regional Economics
University of Antwerp

PARIS – IFSTTAR – 11/03/2016

Geographical Clustering of Buyer-Supplier Linkages in the Logistics Sector in Belgium

Joris Beckers, Isabelle Thomas, Thomas Vanoutrive, Ann Verhetsel
University of Antwerp - University of Louvain la Neuve

TPR
Departement of Transport and Regional Economics
University of Antwerp

“Logistics is that part of the supply chain that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point-of-origin and the point-of-consumption in order to meet customers’ requirements.”

(Council of Supply Chain Management Professionals - CSCMP, 2013)

Logistiek.be
Nieuws, trends & meer

Flanders Smart Hub

LOGISTICS IN WALLONIA
connect move share

Flanders Logistics

Logistics in Wallonia
innovation | network

L'emploi dans le secteur Transport et Logistique en Belgique francophone

Logistiek Platform Limburg

provincie Limburg
POM Limburg

ARDENNE LOGISTICS
THE GLOBAL SOLUTION

European Commission

Connecting Smart and Sustainable Growth through Smart Specialisation

A practical guide for ERDF managing authorities

Belgeo

Revue Belge de Géographie
Belgisch Tijdschrift voor Geografie
Belgian Journal of Geography

Recherche

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1-2 | 2012 : Inaugural issue

Paradigm change in regional policy : towards smart specialisation ? Lessons from Flanders (Belgium)

Changement de paradigme dans la politique régionale : vers une spécialisation intelligente ? Les leçons de la Flandre (Belgique)

Ties Vanthillo et Ann Verhetsel

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Résumés

English | Français

Il semble qu'en vertu de l'évolution du rôle de la "région" en matière de développement économique, les politiques tournées vers les régions ont subi d'importants changements en termes d'objectifs, d'envergure géographique, de gouvernance ou encore d'outils politiques. Cet article se penche sur trois questions majeures liées aux évolutions récentes caractérisant cette politique régionale. En premier lieu, quelles sont les particularités des "anciennes" politiques régionales ? Ensuite, l'"ancien" paradigme a-t-il évolué vers un nouveau paradigme dans ce domaine ? Et, dans ce cas, comment ces changements se sont-ils matérialisés et quels sont les aspects qui ont été touchés ? Enfin, nous examinons comment ces évolutions ont été intégrées dans les politiques régionales menées en Flandre.

Entrées d'index

Mots-clés : Flandre, changement de paradigme, approche axée sur le lieu, politique régionale

REGIONAL SCIENCE – ECONOMIC GEOGRAPHY

- MARSHALL: agglomeration of firms (1890)
- PORTER: industrial cluster (2000)
- COOKE: regional innovation systems (1997)

AGGLOMERATION – CLUSTERING

- SPECIALISED INFRASTRUCTURES
- SPECIALISED LABOUR MARKETS
- KNOWLEDGE SPILLOVERS

- INNOVATION AND SPECIALISATION DUE TO FIRM LINKAGES

Measuring Clustering: twofold

- Geographical colocation:

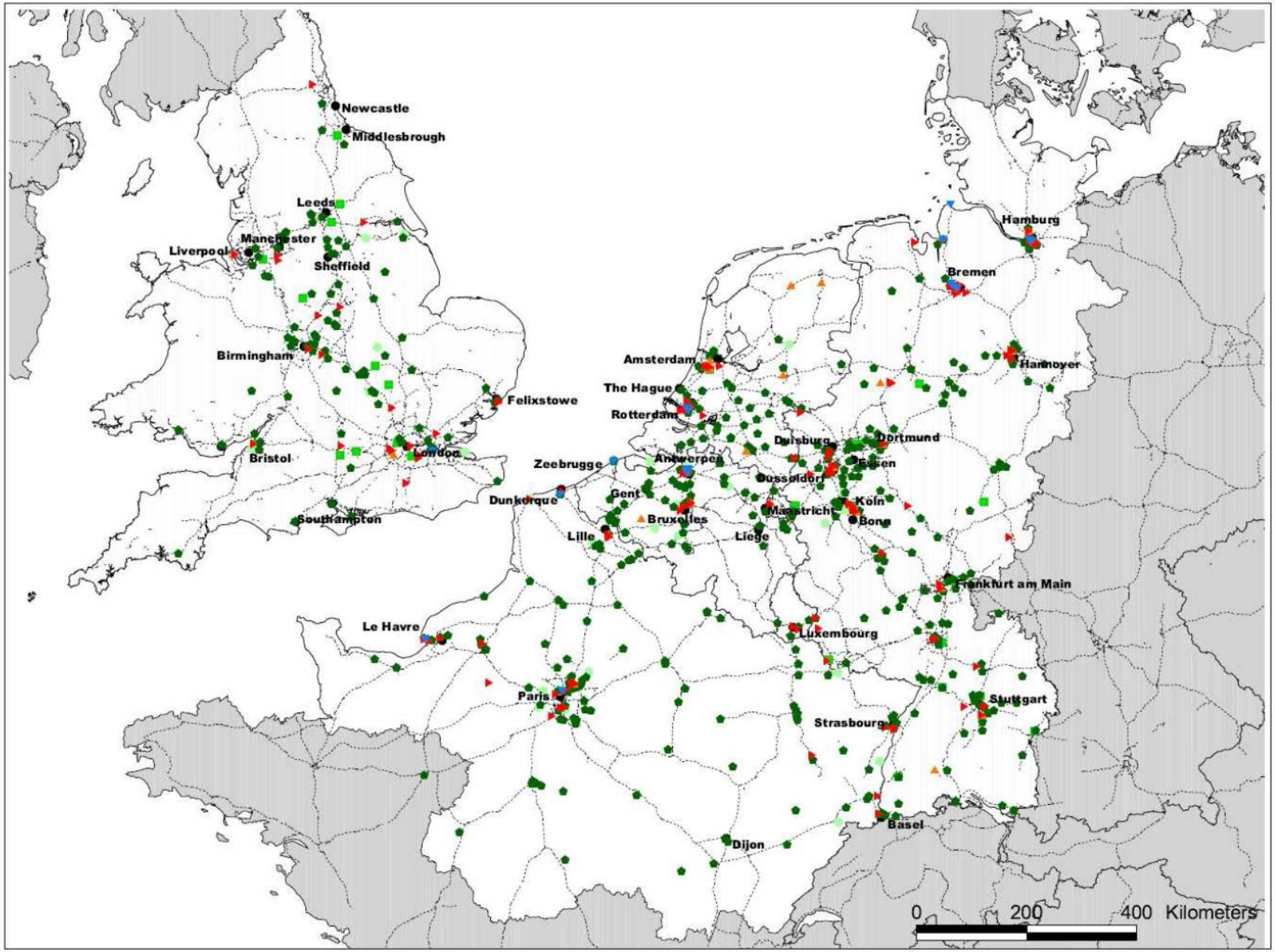
  Local concentration of employment

- **Close relationships**:

  Buyer-supplier linkages

The logistics sector in Belgium

- Logistics companies in Belgium: 8% of GDP and 8% of employment (also in the rest of EU!)
- Logistics have a huge demand for sites – are currently relocating (25% of companies!)
- **Purpose: to find locations that can profit from and reinforce logistics clusters**



Activité de l'établissement logistique

- Expedition - organisation de la chaine de transport
- Expédition de fret maritime
- Expédition de fret aérien
- Stockage - distribution
- Logistique de la chaine du froid
- logistique de l'industrie
- Autoroutes et grands axes routiers
- Voies d'eau navigables

Source: Strale, 2013

Research scope

1. What is the spatial pattern of the logistics sector in Belgium?
2. Does colocation imply more intense buyer-supplier relations?

=> Range of research methods to analyse patterns and network

Economic Geography perspective: Indicators of agglomeration

A-spatial indictors

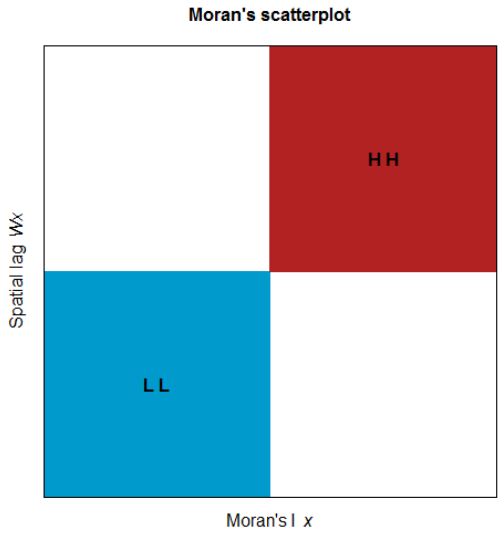
- Do not take neighbourhood into account
- Locational Gini coefficient

$$LQ = \frac{VTE_{log}}{VTE_{tot}}$$

- MAUP/checkerboard problem

Spatial indicators

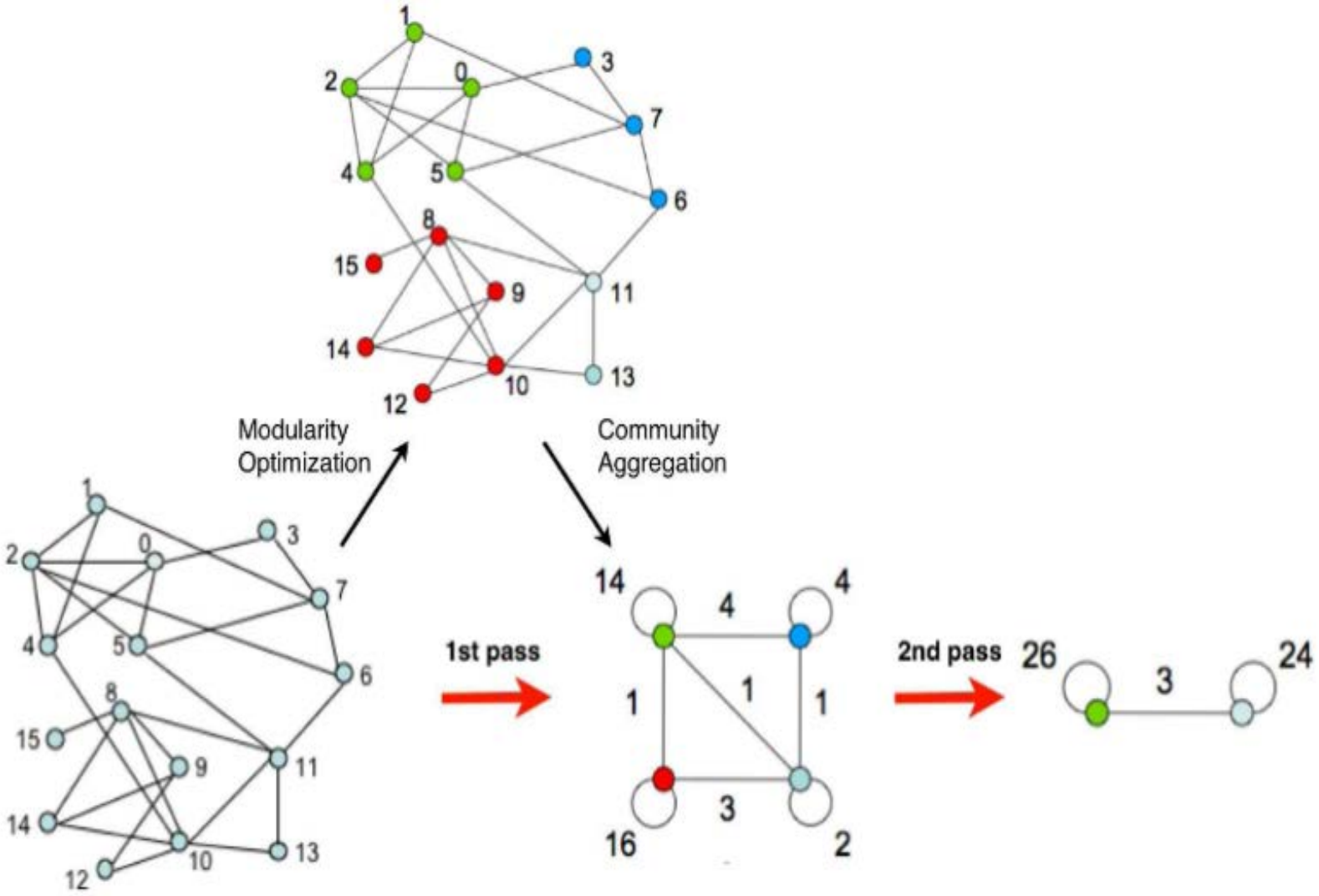
- Neighbourhood via Weight matrix
- Moran's I – LISA



Complex System perspective: Cluster algorithms - community detection: communities of networks

- Louvain Method:
  - Fast, greedy approach
  - Modularity optimization

  - BUT TAKE CARE!



Blondel et al., 2008

Positions of nodes in the network

- Within-module degree *z*
- Participation coefficient *P*

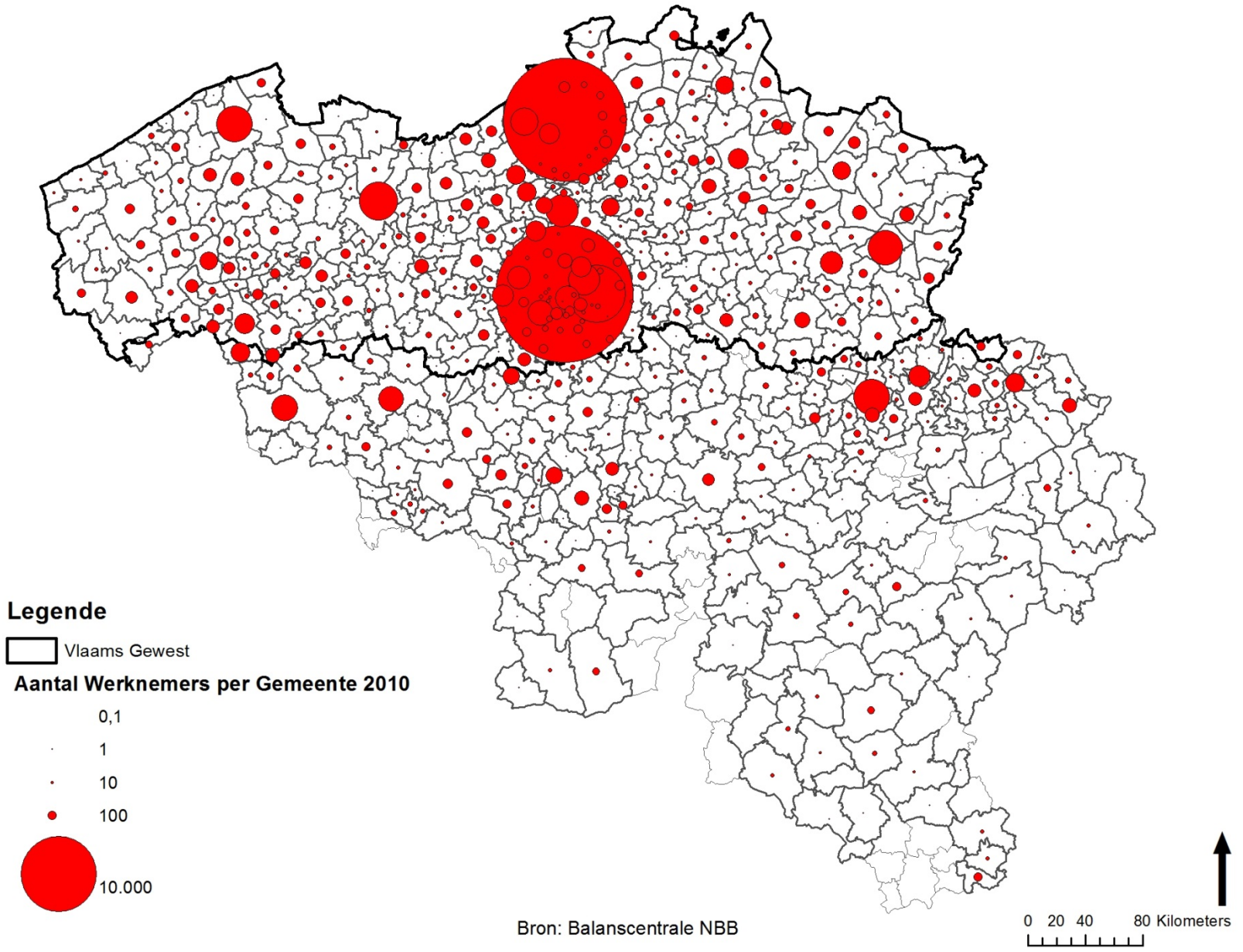
Node role	*Within-module degree z*	*Participation coefficient P*
Ultra-peripheral nodes	<2.5	<0.05
Peripheral nodes	<2.5	0.05 < P < 0.62
Non-hub connector nodes	<2.5	0.62 < P < 0.8
Non-hub kinless nodes	<2.5	>0.8
Provincial hubs	>2.5	<0.3
Connector hubs	>2.5	0.3 < P < 0.75
Kinless hubs	>2.5	>0.75

Table 1: Parameters of node connectivity in a network (Guimerà and Nunes Amaral, 2005)

Data:
Micro-economic data National Bank of Belgium (VAT)

- Employment in logistics by postal code
- 800,000 links of logistics buyer-supplier relations

Employment in logistics – absolute number



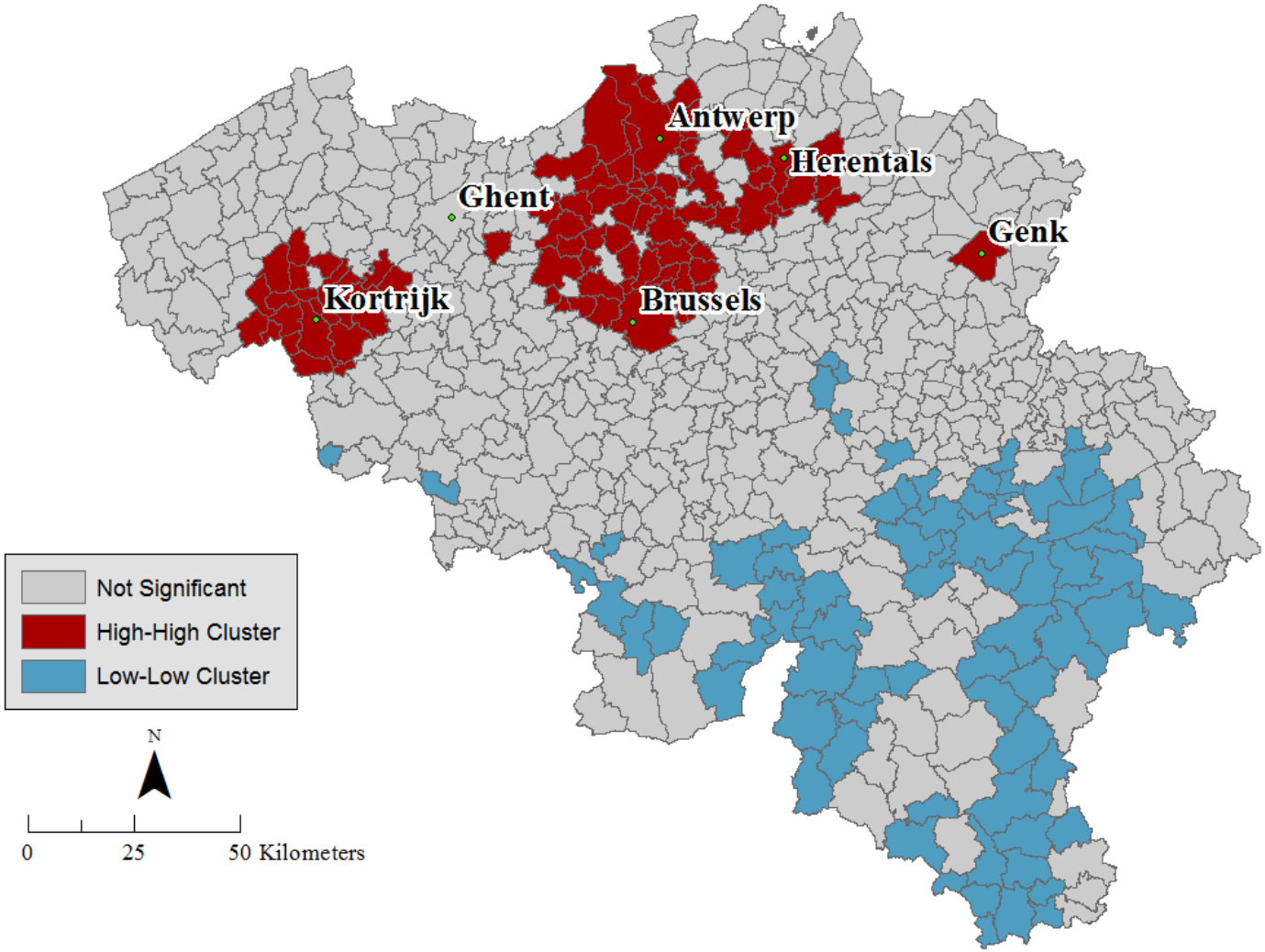
A-spatial measure of agglomeration

- Locational Gini coefficient

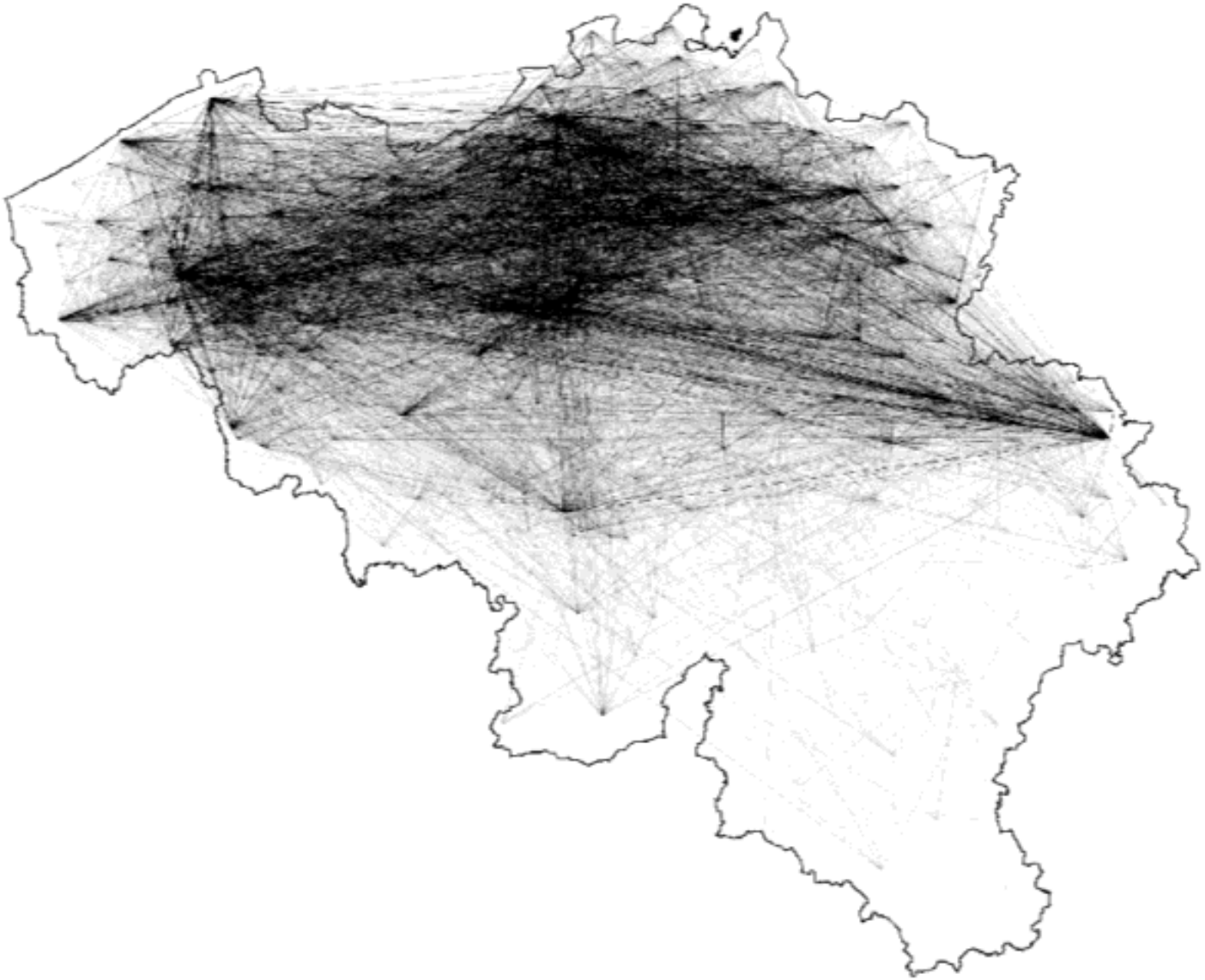
Region	Locational Gini coefficient
Belgium	0,2991
North Brabant[1]	0,2984
Ile-de-France and surroundings[2]	0,3797

[1] van den Heuvel et al. (2014)
[2] Guillain and Le Gallo (2010)

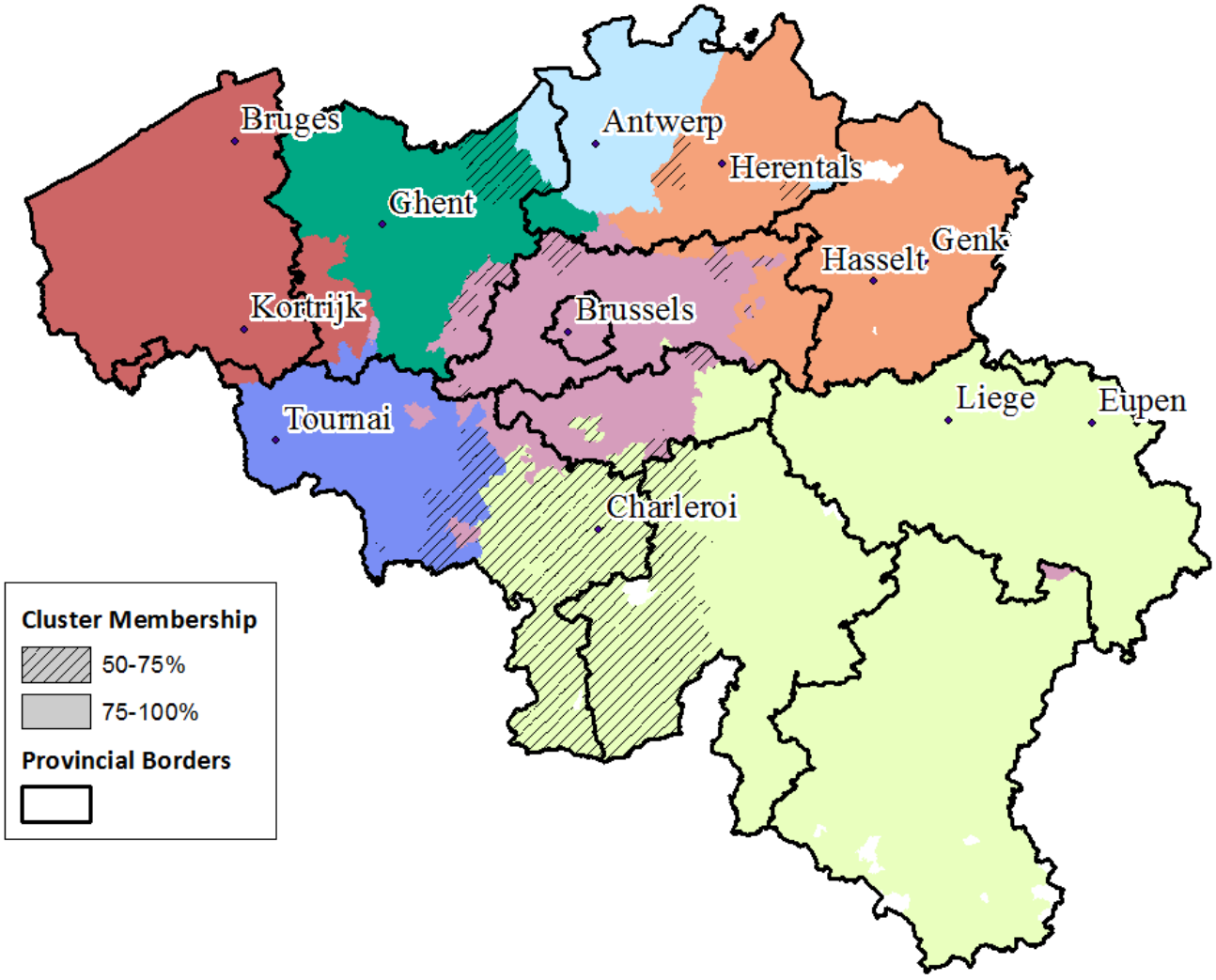
Spatial measure of agglomeration



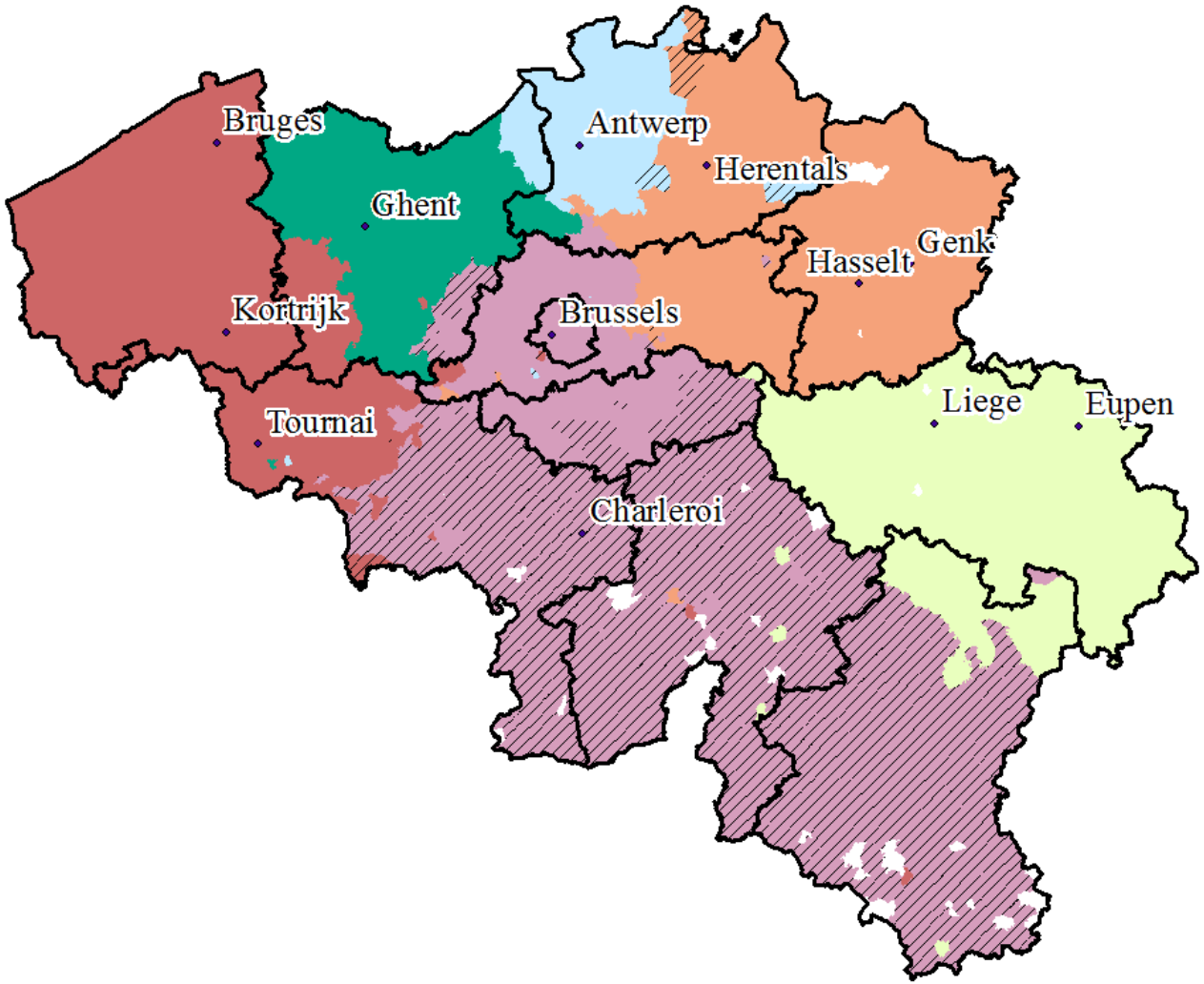
Buyer-supplier data

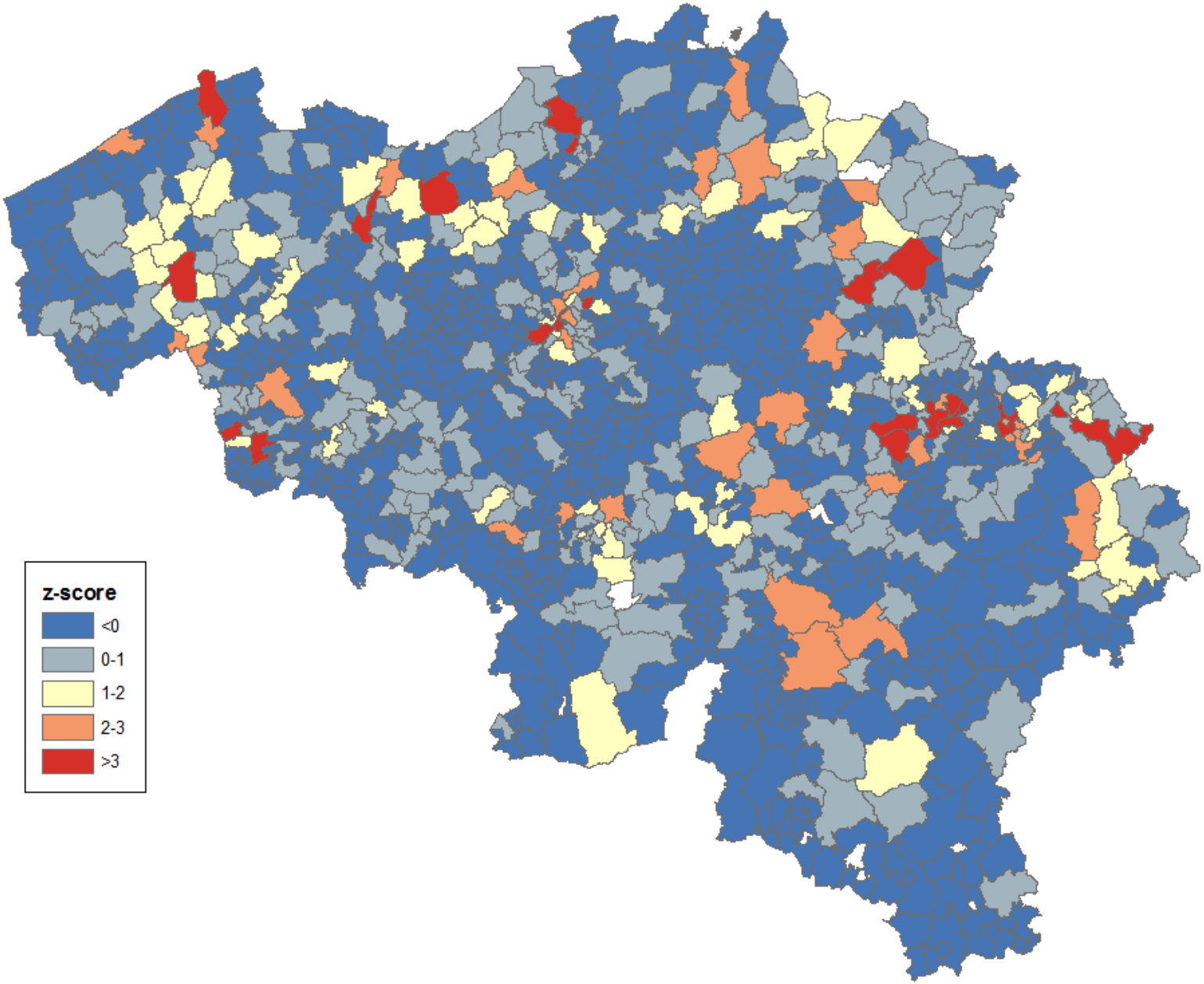


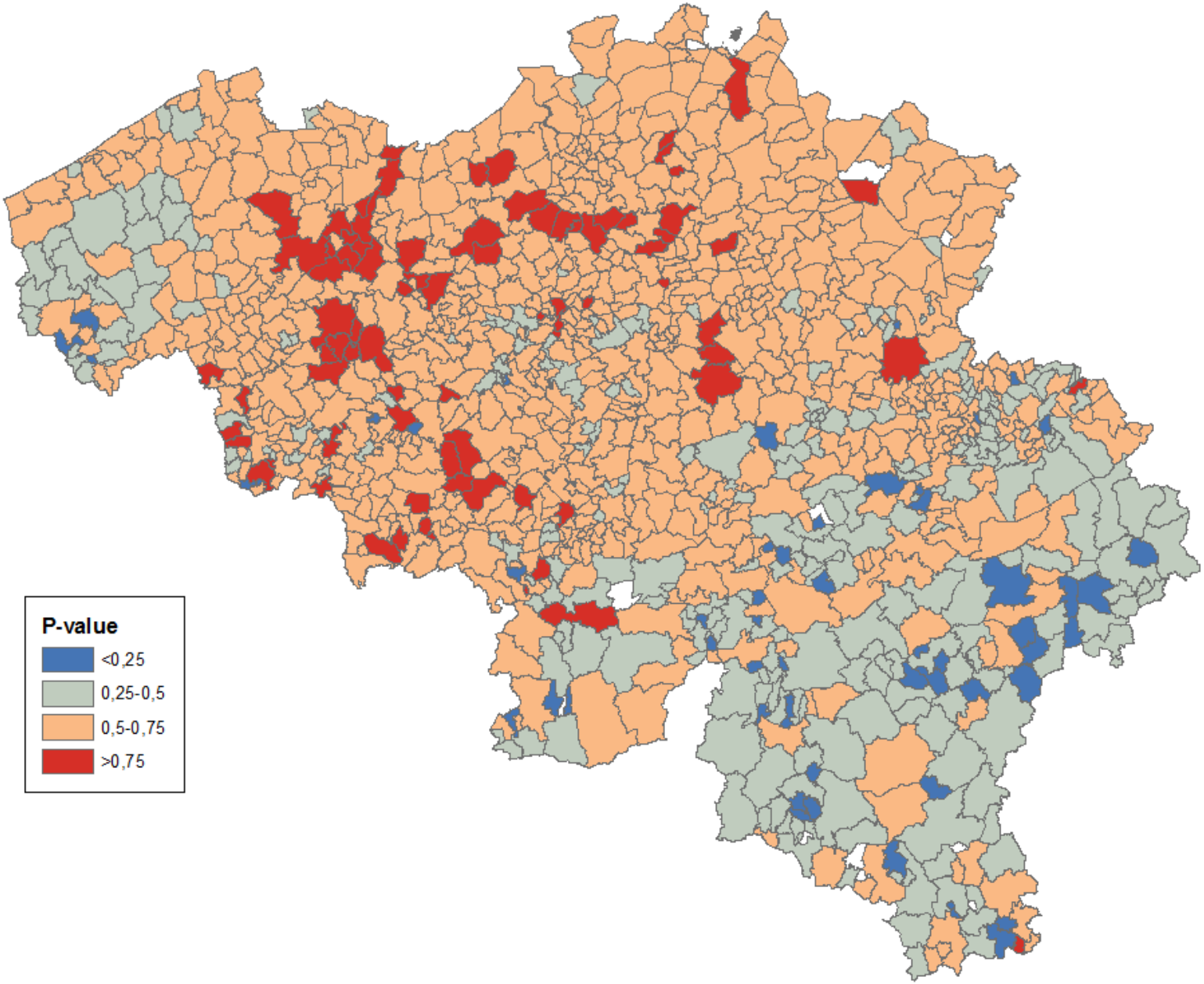
Cluster results: all links

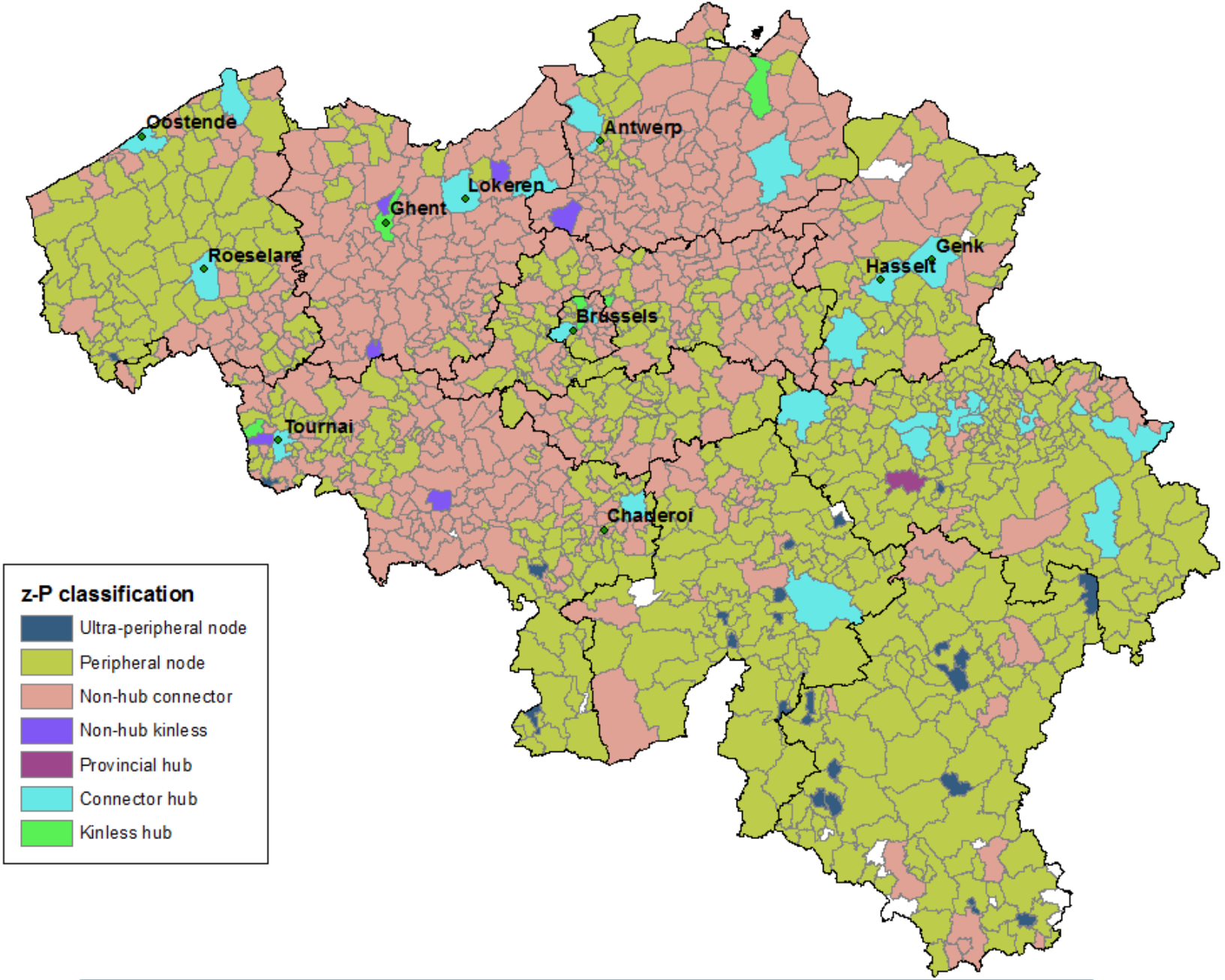


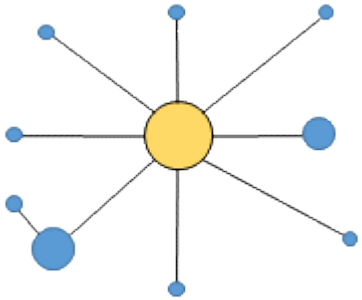
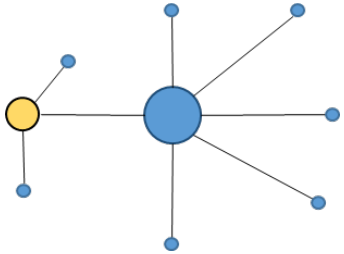
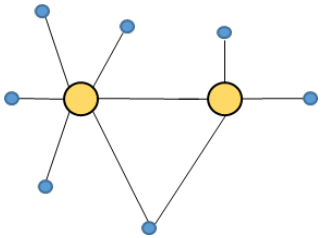
Cluster results: pure logistics flows




z-score
<0
0-1
1-2
2-3
>3


P-value
<0,25
0,25-0,5
0,5-0,75
>0,75


Oostende
Antwerp
Lokeren
Ghent
Roeselare
Genk
Hasselt
Brussels
Tournai
Charleroi
z-P classification
Ultra-peripheral node
Peripheral node
Non-hub connector
Non-hub kinless
Provincial hub
Connector hub
Kinless hub

Indicator	***Major hub***	***Spillover hub***	***Polycentric hubs***
Employment concentration	High-High	High-High	High-High/N.S.
Network structure	Hub and spoke Many internal links	Linked to hub(s)	Multi-point
Within-module degree	>2.5	<2.5	~2.5
Network configuration			
Examples	Antwerpen, Brussels, Ghent, Roeselare	Mechelen, Sint-Niklaas Kortrijk?	Hasselt-Genk Liège-Seraing Ostend-Bruges

Conclusions

On the methodology:

community detection in big data is suitable

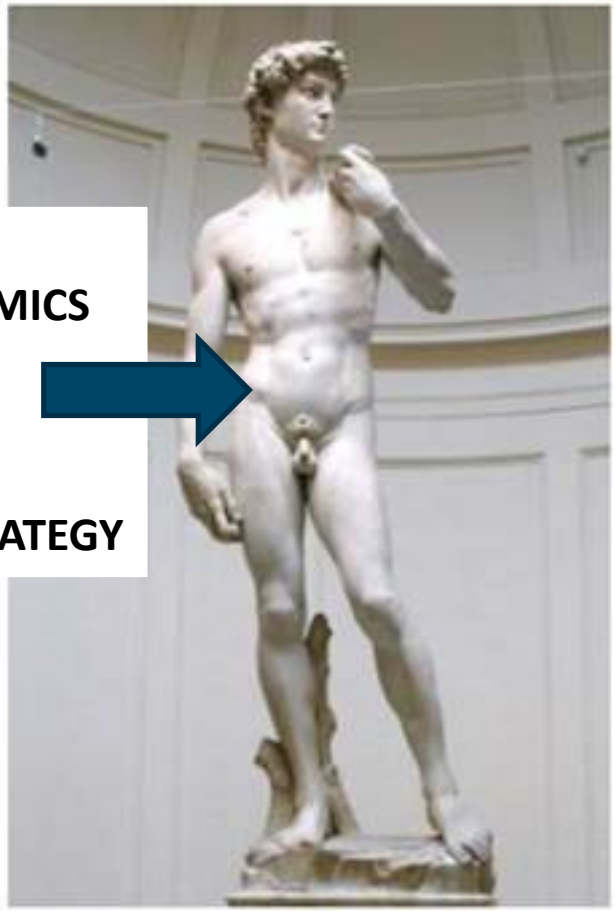
- for getting insight in cluster linkages
- and identifying logistics clusters for regional policy

For Belgium:

- logistics employment is concentrated
- geographical dimension in clustering of buyer-supplier linkages

MODEL:
AGGLOMERATION ECONOMICS

POLICY:
SMART SPECIALISATION STRATEGY



BIG DATA

INFORMATION

LOCATION OF LOGISTICS COMPANIES:

A Stated Preference Study to disentangle the impact of Accessibility.

Ann Verhetsel, Roselinde Kessels, Nele Blomme, Jeroen Cant & Peter Goos

TPR
Departement of Transport and Regional Economics
University of Antwerp

Figures and tables






Table 1


Table 2

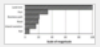



Table 3
Table 4
Table A1

Journal of Transport Geography
Volume 42, January 2015, Pages 110–121

Location of logistics companies: a stated preference study to disentangle the impact of accessibility

Ann Verhetsel[a], Roselinde Kessels[b], Peter Goos[b, c], Toon Zijlstra[a], Nele Blomme[a], Jeroen Cant[a]
Show more

doi:10.1016/j.jtrangeo.2014.12.002

Highlights

- We quantify the impact of accessibility on the location decision process of logistics companies.
- We use revealed preference data on location as input for a stated preference study.
- Land rent is the most important factor in the location choice of logistics companies in Flanders.
- The next most important factors are port and motorway access, and access to waterways.
- Logistics companies prefer locations in business parks.

Abstract

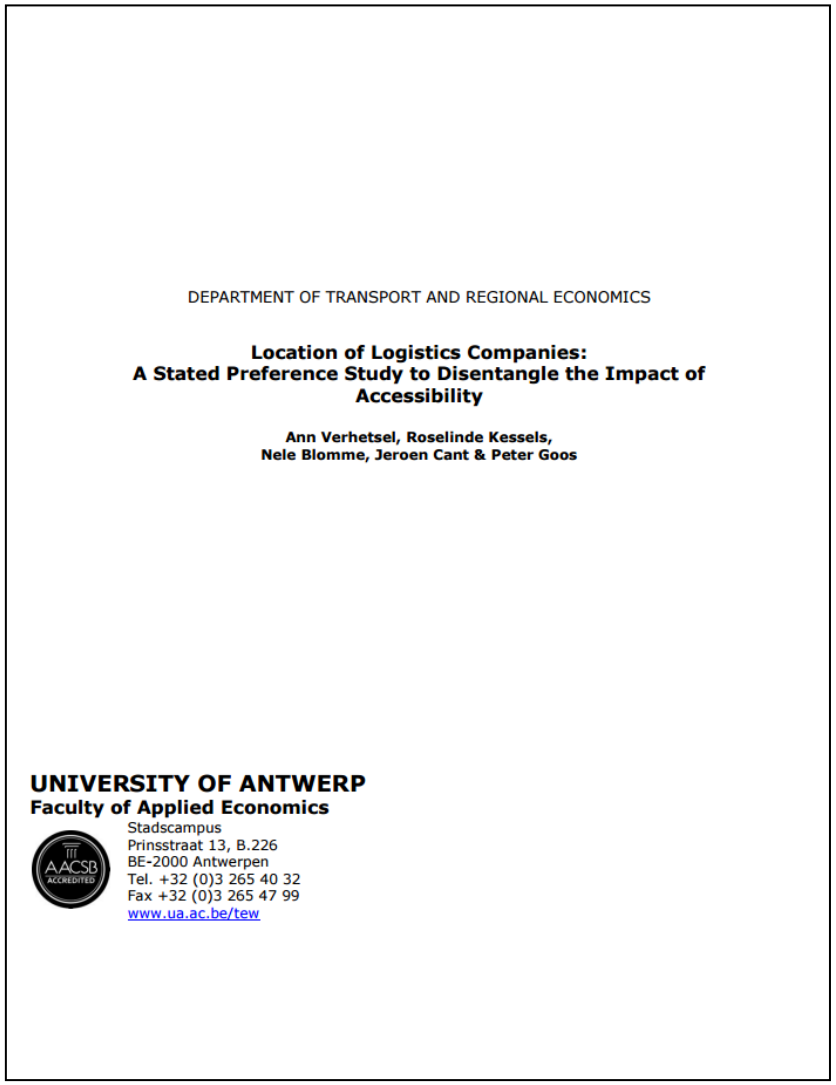
Due to the globalization and the fragmentation of industrial production processes, the logistics sector, organizing the linkages between different production plants and the market, is growing fast. This results in an increasing demand for suitable new business locations. Previous research has indicated that accessibility is a key factor in the location decision making process. Though the literature on this subject is extensive, little research has been done to quantify the impact of the different dimensions of accessibility on the location decision process of logistics companies. This paper aims to fill this void in the literature by means of a revealed preference study (using a Geographic Information System (GIS) analysis) and a stated preference study (using a designed discrete choice experiment) in Flanders (Belgium). The results of the revealed preference study served as input to the design of the choice situations in the stated preference study. In the stated preference study, the respondents were confronted with a series of choice situations described by means of accessibility variables as well as land rent information. An analysis of the resulting data by means of discrete choice modeling revealed that land rent is the most important factor in the location choice of logistics companies in Flanders. Access to a port is the second most important factor, followed by access to a motorway, the location in a business park and an inland navigation terminal, which are all about equally important. Access to a rail terminal plays no significant role in the location choice of logistics companies in Flanders.

Keywords

Logistics; Accessibility; Transport geography; Discrete choice modeling; Belgium

https://www.uantwerpen.be/nl/faculteiten/toegepaste-economische-wetenschappen/onderzoek-innovatie/publications-and-res/working-papers/working-papers-1999-/

Working paper 2013/024



DEPARTMENT OF TRANSPORT AND REGIONAL ECONOMICS

Location of Logistics Companies:
A Stated Preference Study to Disentangle the Impact of Accessibility

Ann Verhetsel, Roselinde Kessels,
Nele Blomme, Jeroen Cant & Peter Goos

UNIVERSITY OF ANTWERP
Faculty of Applied Economics
Stadscampus
Prinsstraat 13, B.226
BE-2000 Antwerpen
Tel. +32 (0)3 265 40 32
Fax +32 (0)3 265 47 99
www.ua.ac.be/tew

Suitable locations are however scarce in Flanders

PURPOSE:

UNCOVERING WHAT ATTRIBUTES OF LOGISTICS SITES ARE THE MOST IMPORTANT TO LOGISTICS COMPANIES

Stated Preference Study:

QUANTIFY THE TRADE-OFFS MADE IN LOCATION DECISION OF LOGISTICS COMPANIES

Confront respondents with hypothetical location profiles

Analyze the importance of the different attributes

STEP 1

Accessibility is divided in 4 attributes: road access, rail access, inland shipping access and port access.

Additional variables: cost of land and whether the location is situated on an industrial site or not

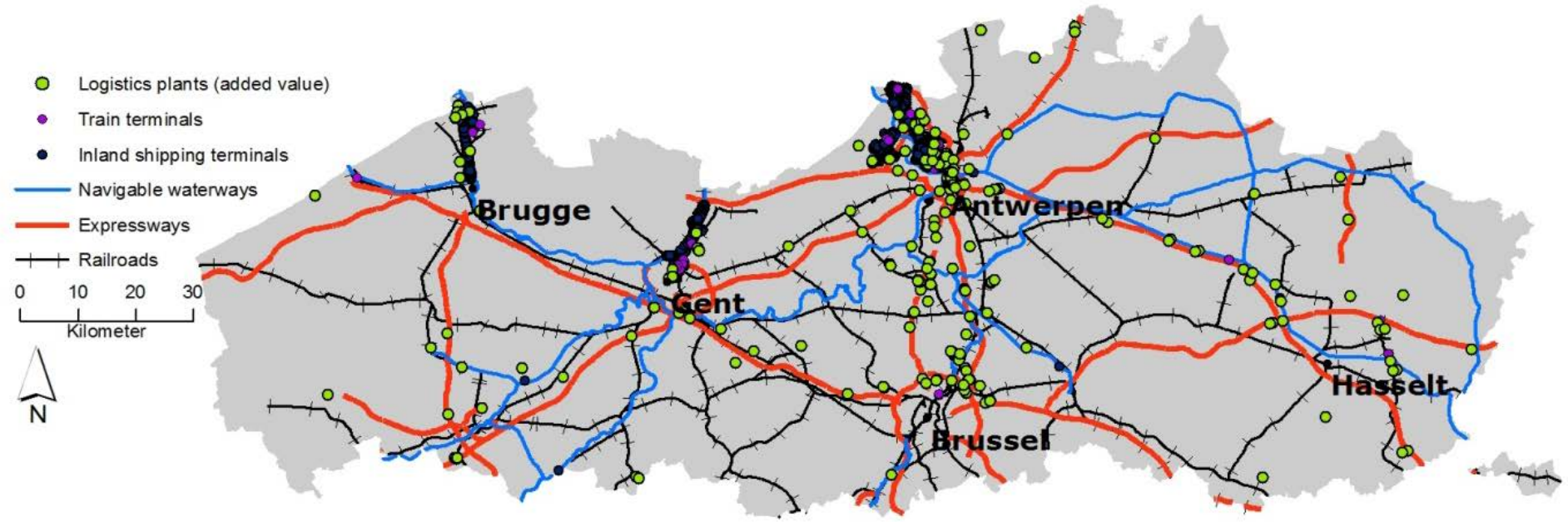
Levels are chosen on the base of the revealed preference

REVEALED PREFERENCE – GIS EXCERCISE

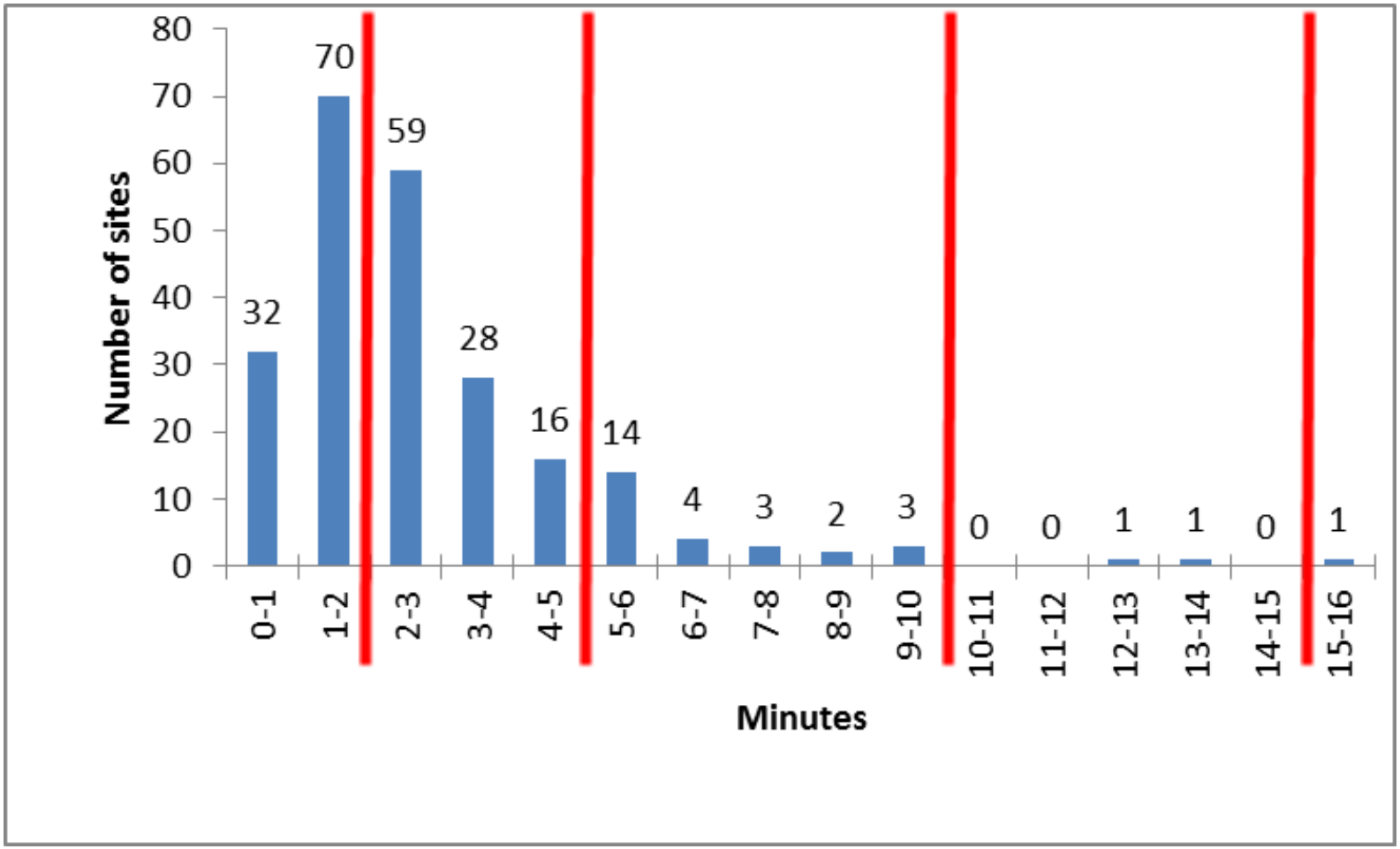
Actual location of logistics companies

235 logistics companies located in Flanders (Belgium) with the highest added value

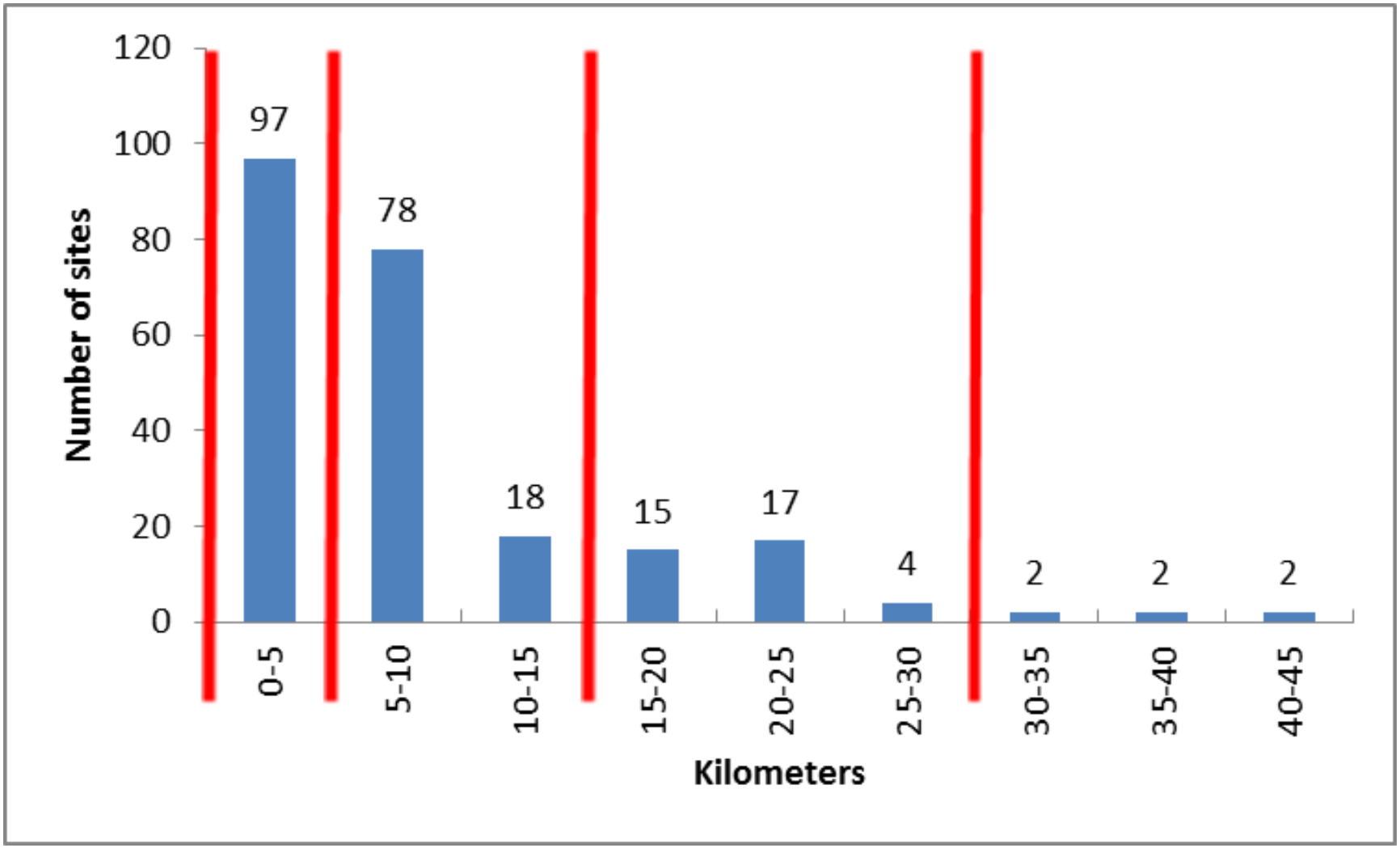
Revealed preference



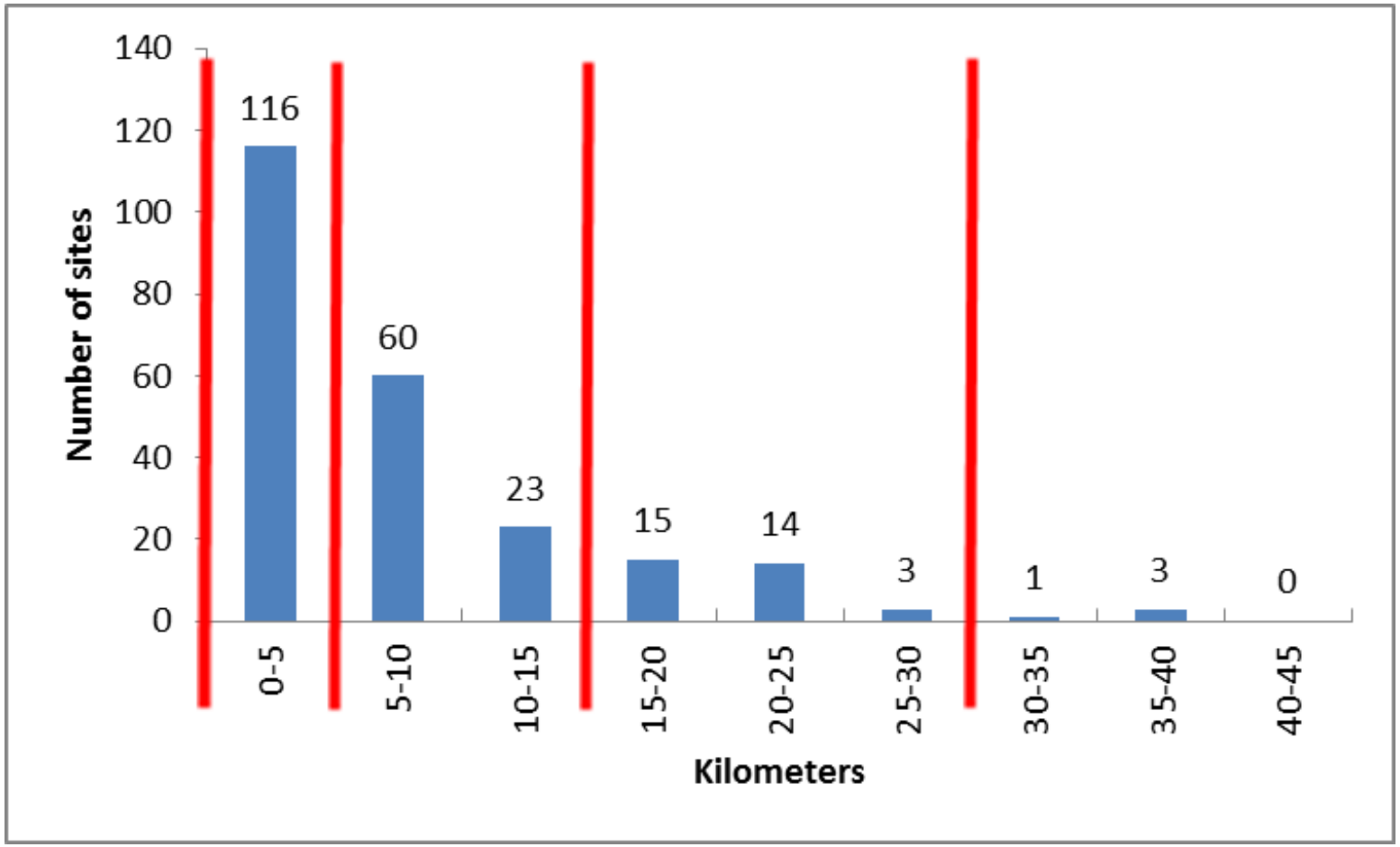
Distance in minutes to access motorway of main logistics companies in Flanders



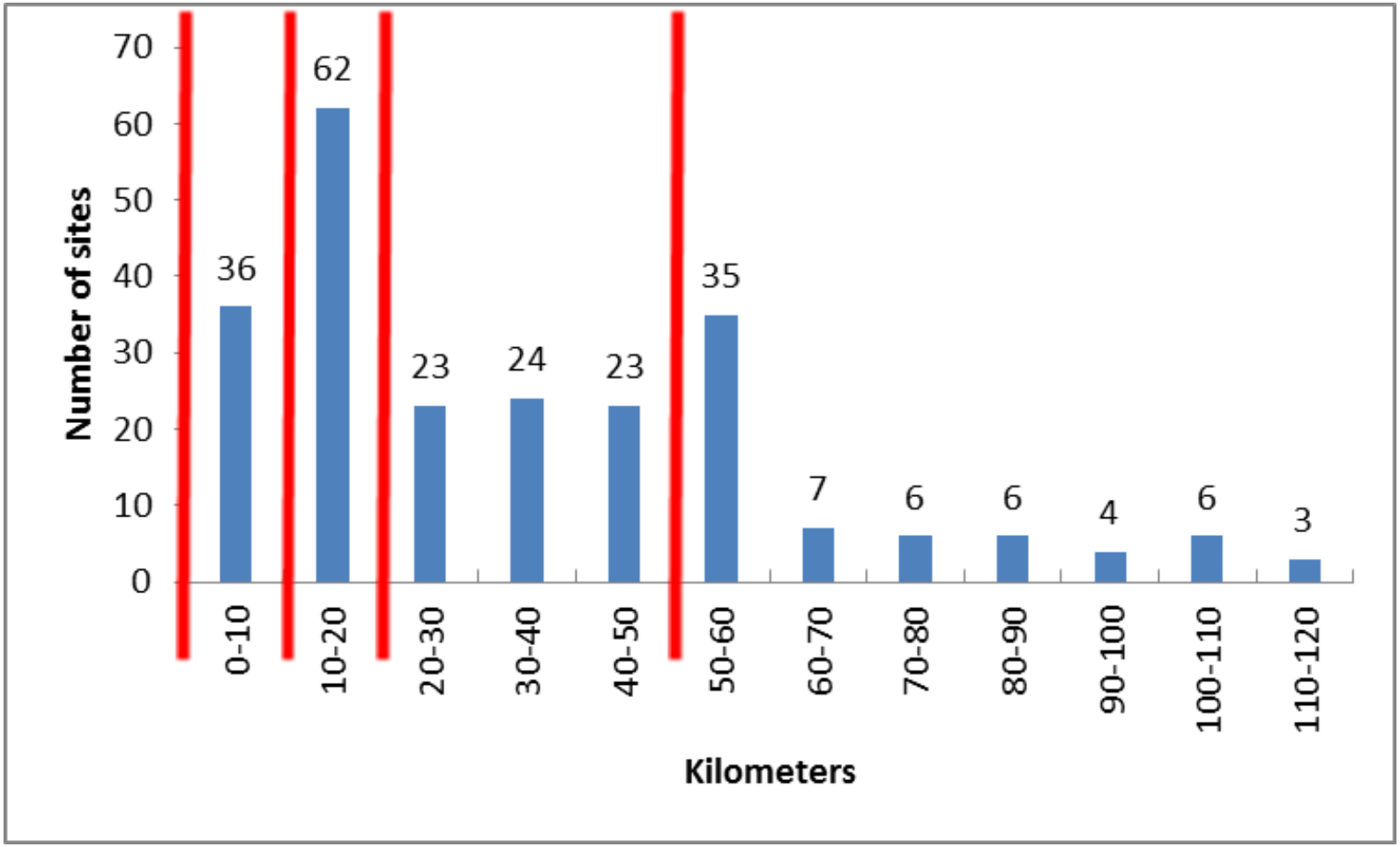
Distance in kilometer to rail terminal of main logistics companies in Flanders



Distance in kilometer to inland shipping terminal of main logistics companies in Flanders



Distance in kilometer to center seaport of main logistics companies in Flanders



Cost of location

The levels of the attribute cost of location are drawn up from publications of the main Flemish real estate companies, active in real estate for logistics companies

Rents at the logistics property market amounted in 2010 to an average of €45/sqm/year in Flanders

Attributes + levels

Attribute	Levels
Motorway access	2 – 5 – 10 – 15 min
Inland shipping access	0 – 5 – 15 – 30 km
Port access	0 – 10 – 20 – 50 km
Rail access	0 – 5 – 15 – 30 km
Cost of location	10 – 35 – 50 – 65 – 90 €/m²/year
Industrial area	Yes – No

STEP 2
DESIGN OF STATED CHOICE EXPERIMENT
(Rose Bliemer Kessels Jones Goos)
determine the varying attributes in every choice situation using the Variance-balance partial profile design approach
Bayesian D-optimal or D-efficient stated choice designs

Web survey using SawTooth

1st part: general questions

Name and address logistics plant
Contact details respondent
Main activities + type of transported goods
Offered transport modes
Surface of the plant + cost
Already moved + moving plans
Located on an industrial area

Web survey using SawTooth (2)

2nd part: 20 choice sets with 2 location profiles

The respondents need to choose between the 2 location profiles which profile they prefer.

Each location profile is build up by 4 attributes, instead of all 6 attributes, to make it more manageable for the respondents.

Example of choice set

Location A	Location B
2 min to motorway access	15 min to motorway access
15 km to rail access	30 km to rail access
10 km to port	Located in port with quay directly available
65 €/sqm/year as rent price	35 €/sqm/year as rent price

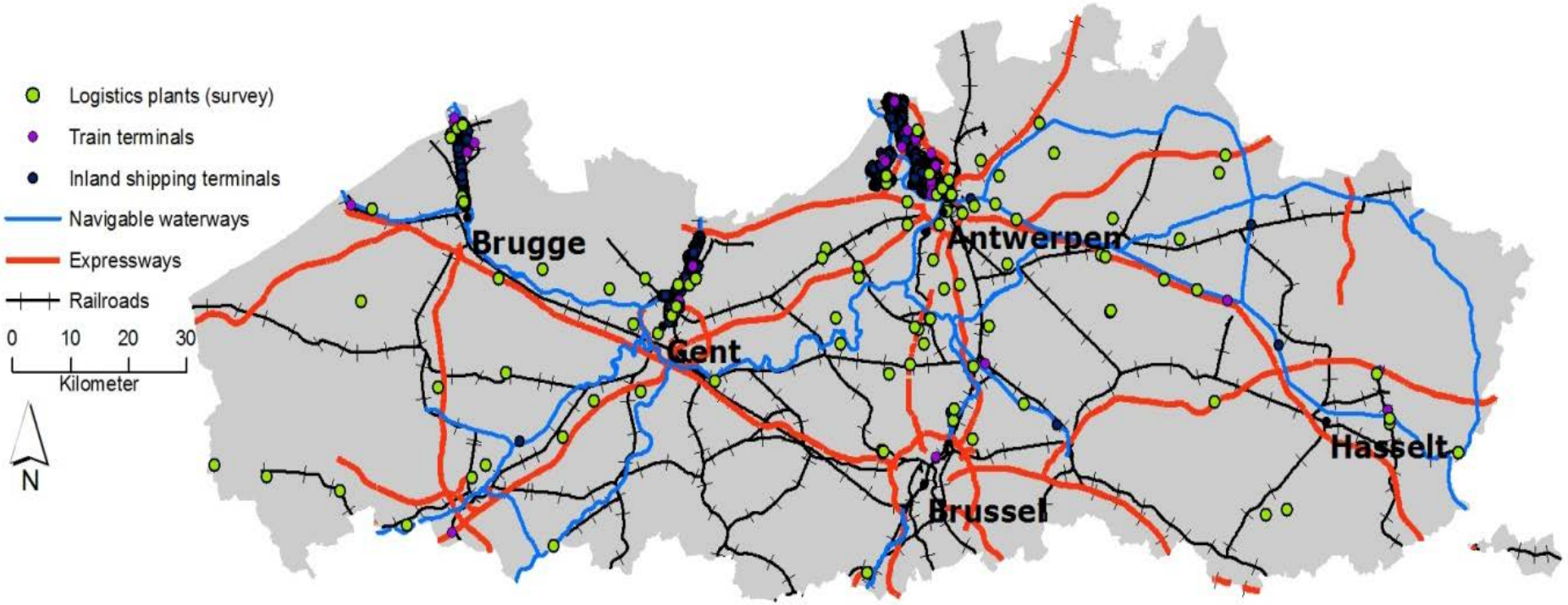
Multinomial logit model (MNL)

The model employs random utility theory which describes the utility a respondent attaches to alternative j (j = 1, 2) in choice situation s (s = 1, …, 20) as the sum of a systematic and a stochastic component (Hensher et al., 2005):

$$U_{js} = \mathbf{x}'_{js}\boldsymbol{\beta} + \varepsilon_{js}.$$

In the systematic component $\mathbf{x}'_{js}\boldsymbol{\beta}$, $\mathbf{x}_{js}$ is a k x 1 vector containing the coded attribute levels of alternative j in choice situation s. In our analysis, we initially assumed that all six attributes are categorical, so that our initial model involved k = 17 parameters and $\mathbf{x}_{js}$ and $\boldsymbol{\beta}$ are 17 x 1 vectors. The vector $\boldsymbol{\beta}$ is the vector of parameter values indicating the importance of the different attribute levels to the respondents. The stochastic component ε_{js} is the error term capturing the unobserved sources of utility. Under the assumption that the error terms are independently and identically Gumbel distributed, the MNL probability that a respondent chooses alternative j in choice situation s is

$$p_{js} = \frac{\exp\left(\mathbf{x}'_{js}\boldsymbol{\beta}\right)}{\exp\left(\mathbf{x}'_{1s}\boldsymbol{\beta}\right) + \exp\left(\mathbf{x}'_{2s}\boldsymbol{\beta}\right)}.$$


Logistics plants (survey)
Train terminals
Inland shipping terminals
Navigable waterways
Expressways
Railroads
0 10 20 30
Kilometer
N
Brugge
Gent
Antwerpen
Brussel
Hasselt

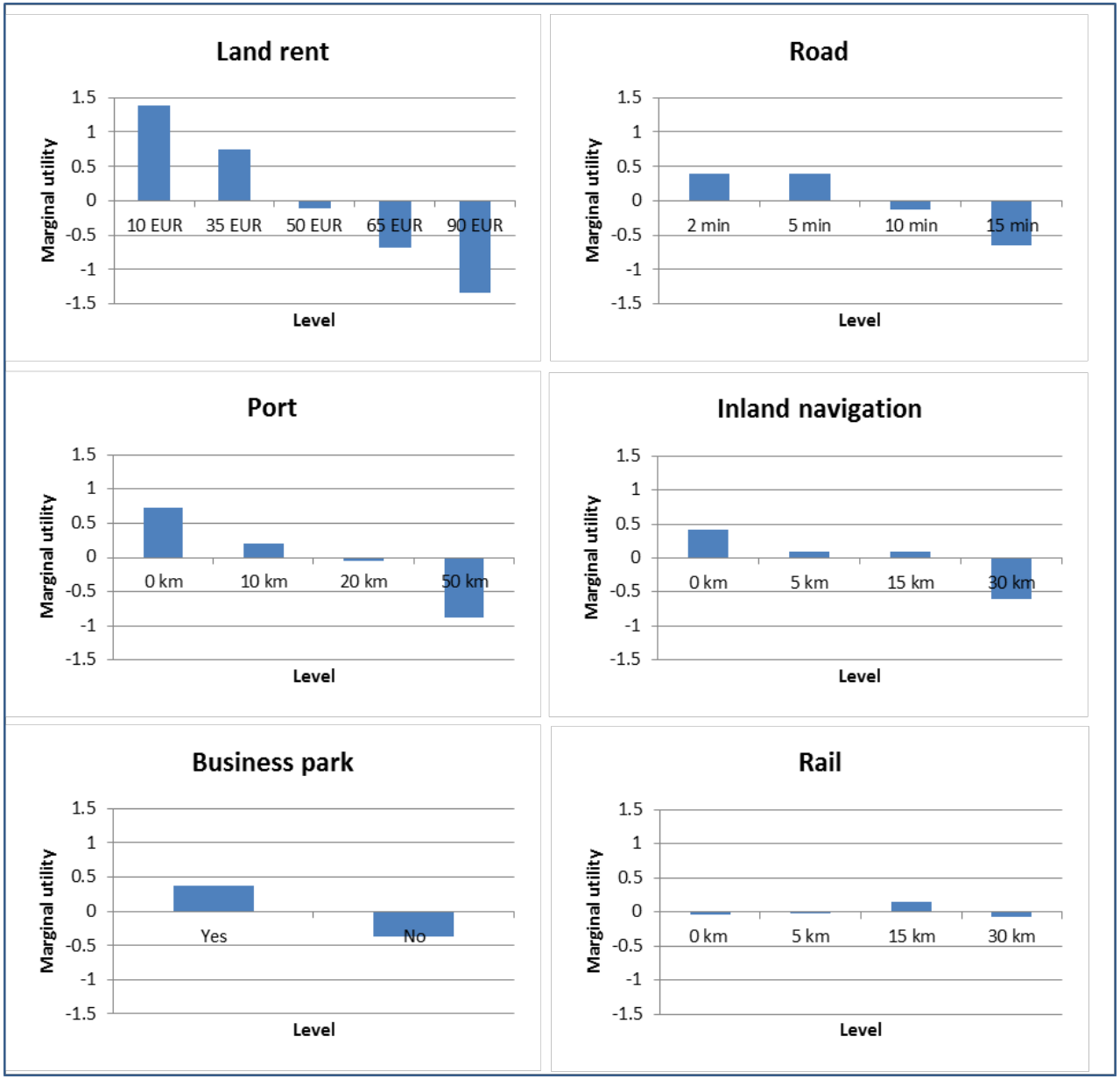
the initial MNL model

Table 2: Marginal utility values of the attribute levels and significances of the attribute effects obtained from likelihood ratio (LR) tests for the initial MNL model.

Attribute with level	Marginal	L-R ChiSquare	DF	P-value
Land rent [10 EUR]	1.378			
Land rent [35 EUR]	0.739			
Land rent [50 EUR]	-0.105	462.499	4	<0.0001*
Land rent [65 EUR]	-0.682			
Land rent [90 EUR]	*-1.330***			
Port [0 km]	0.721			
Port [10 km]	0.211	136.491	3	<0.0001*
Port [20 km]	-0.057			
Port [50 km]	*-0.875***			
Business park [yes]	0.372	74.776	1	<0.0001*
Business park [no]	*-0.372***			
Road [2 min]	0.389			
Road [5 min]	0.395	76.910	3	<0.0001*
Road [10 min]	-0.134			
Road [15 min]	*-0.650***			
Inland navigation [0 km]	0.423			
Inland navigation [5 km]	0.088	64.658	3	<0.0001*
Inland navigation [15 km]	0.087			
Inland navigation [30 km]	*-0.598***			
Rail [0 km]	-0.043			
Rail [5 km]	-0.025	4.035	3	0.2578
Rail [15 km]	0.141			
Rail [30 km]	*-0.073***			

* Significant at 5% level

** Marginal utility values corresponding to the last level of each attribute are indicated in italic to stress that they are calculated as minus the sum of all other marginal utility values of that attribute.


Land rent
Marginal utility
1.5
1
0.5
0
-0.5
-1
-1.5
10 EUR
35 EUR
50 EUR
65 EUR
90 EUR
Level
Road
Marginal utility
2 min
5 min
10 min
15 min
Level
Port
Marginal utility
0 km
10 km
20 km
50 km
Level
Inland navigation
Marginal utility
0 km
5 km
15 km
30 km
Level
Business park
Marginal utility
Yes
No
Level
Rail
Marginal utility
0 km
5 km
15 km
30 km
Level

the final MNL model

Table 3: Marginal utility values of the attribute levels and significances of the attribute effects computed by likelihood ratio (LR) tests for the final MNL model.

Attribute with level	Marginal	L-R ChiSquare	DF	P-value
Land rent (linear coding)	-0.036	553.219	1	<0.0001*
Port [0 km]	0.733	172.880	3	<0.0001*
Port [10 km]	0.223			
Port [20 km]	-0.066			
Port [50 km]	*-0.890***			
Road [2-5 min]	0.544	99.885	2	<0.0001*
Road [10 min]	-0.007			
Road [15 min]	*-0.537***			
Business park [yes]	0.393	82.829	1	<0.0001*
Business park [no]	*-0.393***			
Inland navigation [0 km]	0.471	79.417	2	<0.0001*
Inland navigation [5-15 km]	0.110			
Inland navigation [30 km]	*-0.581***			

* Significant at 5% level

** Marginal utility values corresponding to the last level of each attribute are indicated in italic to stress that they are calculated as minus the sum of all other marginal utility values of that attribute.

Willingness to pay for a change in site location

Table 4: Willingness to Pay (WTP) estimates for port accessibility.

To/from	Port [0 km]	Port [10 km]	Port [20 km]	Port [50 km]
Port [0 km]	/	-14.167	-22.194	-45.083
Port [10 km]	14.167	/	-8.028	-30.917
Port [20 km]	22.194	8.028	/	-22.889
Port [50 km]	45.083	30.917	22.889	/

Table 5: Willingness to Pay (WTP) estimates for motorway accessibility.

To/from	Road [2-5 min]	Road [10 min]	Road [15 min]
Road [2-5 min]	/	-15.306	-30.028
Road [10 min]	15.306	/	-14.722
Road [15 min]	30.028	14.722	/

Table 6: Willingness to Pay (WTP) estimates for inland navigation accessibility.

To/from	Inland navigation [0 km]	Inland navigation [5-15 km]	Inland navigation [30 km]
Inland navigation [0 km]	/	-10.028	-29.222
Inland navigation [5-15 km]	10.028	/	-19.194
Inland navigation [30 km]	29.222	19.194	/

Table 7: Willingness to Pay (WTP) estimates for business park.

To/from	Business park [yes]	Business park [no]
Business park [yes]	/	-21.833
Business park [no]	21.833	/

CONCLUSION

Landrent → most important location factor for logistics plants

Accessibility → very important location factor = seaport within 10km, motorway junction within 5min, inland navigation terminal within 15km, in a business park

Logistics companies are willing to pay a substantially larger annual land rent for attractive locations
Highly accessible locations are preferable to developments on cheap locations with poor accessibility

Input for an exercise to find out which locations in Flanders are most suitable for new logistics sites

Suggestions/questions?

TPR
Departement of Transport and Regional Economics
University of Antwerp

ann.verhetsel@uantwerpen.be