Location choices of warehouses' users: local vs regional accessibility

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IFSTTAR

Is it relevant to study « location choices »?

"logistics facilities are limited to where they can locate and can only conform to what is offered and where it is already available"

Aljohani & Thompson, 2016

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Aim of this study

A better understanding the relationship between:

- the characteristics of (large) warehouses, and,

- their location (in terms of accessibility)

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Outline

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1. Background: two strands of research

- Geographical patterns of logistics activities
  - Where? (e.g. Mckinnon, 1983, Dablanc and Andriankaja, 2011, Cidell, 2011...)

- Location decisions of logistics activities vs accessibility
  - Why? (e.g. Bowen, 2008, Verhetsel et al, 2015, Holl and Mariotti, 2018)
    - Very focused on transport infrastructure (distance to highway, port, airport)
    - The heterogeneity of logistics activities is poorly considered
    - The accessibility concepts used are operational (easily understandable amd measurable) but theoretically weak (Geurs and van Wee, 2003)

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2. Data and method

Data

- Survey carried out by MoT (France, 2010) « Enquête entrepôt »
- Sample of 1436 warehouses (>5000m²):
  - floor size number of employees,
  - activity description, main cargo types and o/d, administrative characteristics, status of logistics parks,
 - added value services
- Accessibility measures to population

Method

- OLS Linear Regression
- Accessibility potential (Hansen, 1959)

3. Our sample

• Data collected in 2010 (from warehouse managers)

• Sample: about 1/3 of the warehouses with a floor size area of at least 5,000 m² (CGDD, 2012).

• Smaller warehouses are not studied

• Very large warehouses (>150,000 m²) have been excluded.

  • Mostly located along highways
  • Highly concentrated around:
        - Paris
        - other large urban areas
  • More detailed interpretation would be misleading (lack of representativity)

Legend: Sampled warehouses · Highways · Paris
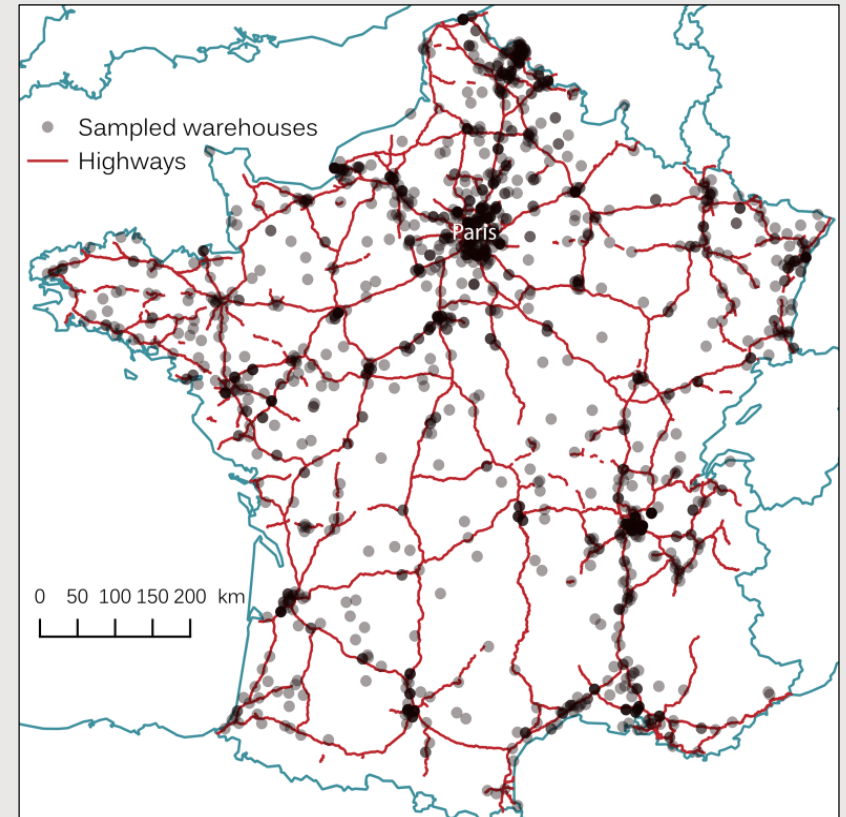
1436 warehouses

3. Accessibility potential (Hansen, 1959)

• Useful to study location when a survey is not representative at regional level.

• closely related to the gravity model, based on an analogy between the interaction of groups of people and the attraction of physical masses

• consist in two elements: the attractiveness (population) of potential origins/destinations and the effort (distance) of reaching them.
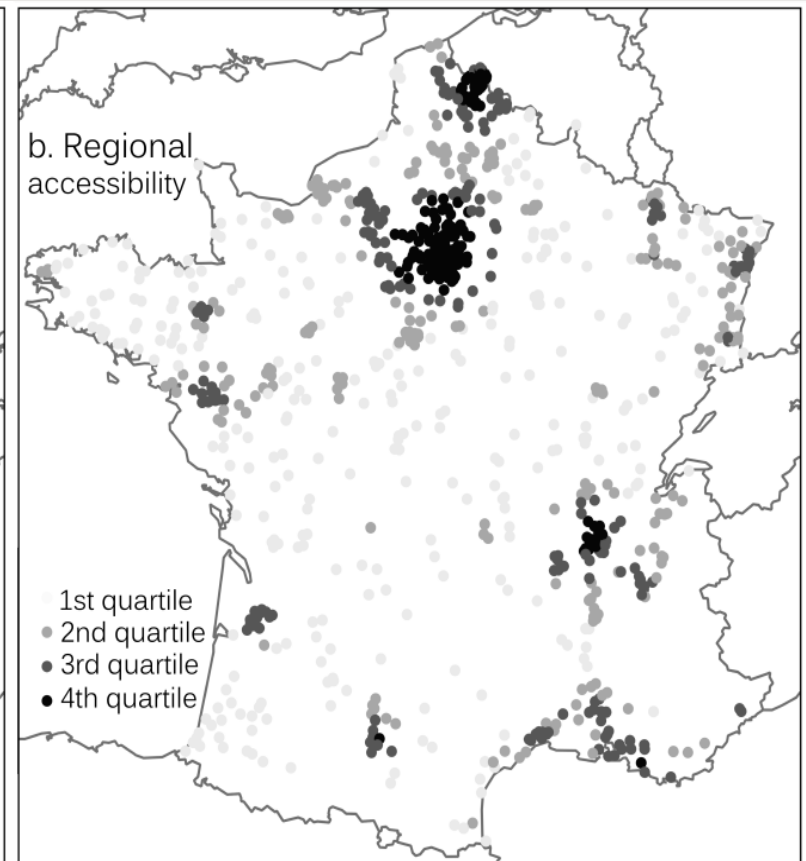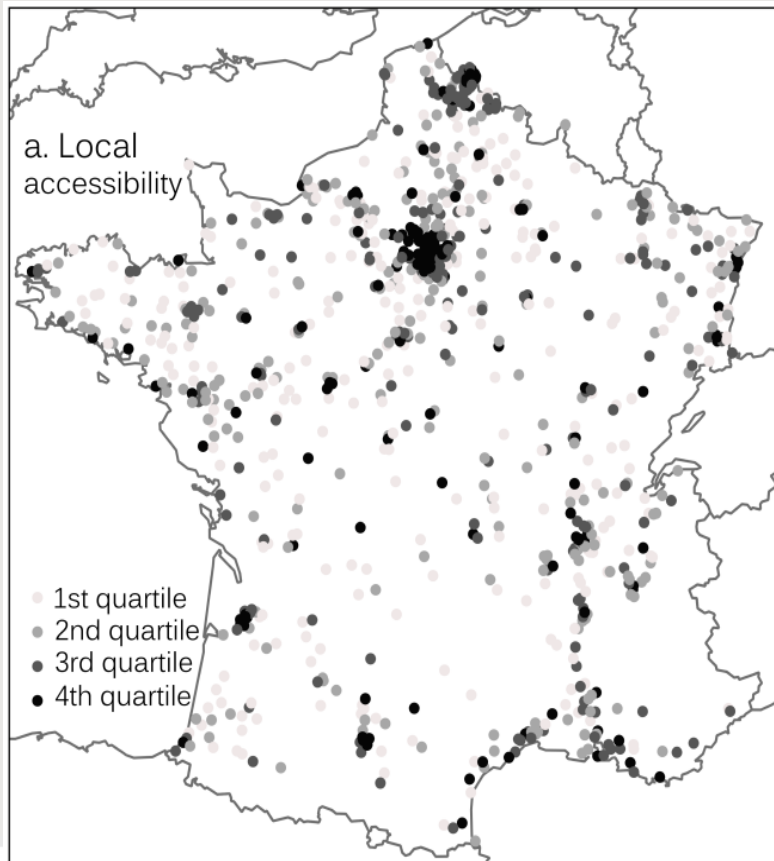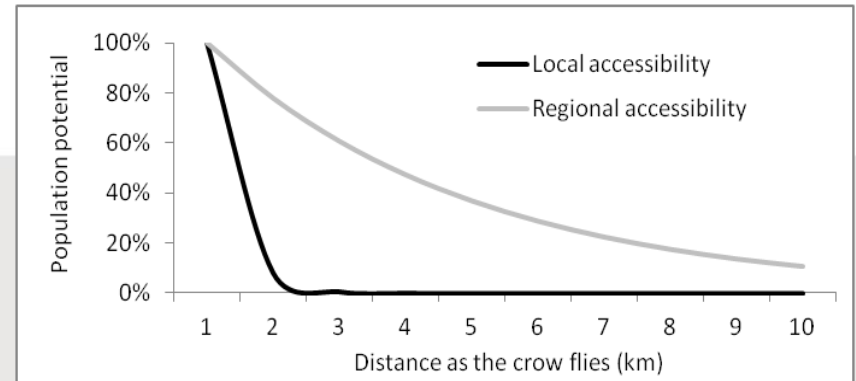
$$P_i = \sum_j \frac{M_j}{d_{ij}{}^a}$$

Pi: potential at the warehouse location i,
Mj: population (attraction) of municipality
Dij: distance
α: friction of distance

Accessibility potential

- The values of α=0.5 (local) and α=0.05 (regional) have been chosen arbitrarily

Warehouses' characteristics

- Magnitude: floorsize, number of employees
- Geographical scope (local, national, EU, overseas)
- Facility types (e.g. reefer, dry...)
- Logistics parks characteristics (e.g. port/airport, public/private...)
- Administrative issues (e.g. leased, seveso...)
- Type of activity (e.g. seasonal, multiclient...)
- Added-value services (e.g. custom clearance, packaging...)
- Main customers (e.g. large retaileers, manufacturing...)

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Model specification

A linear multiple regression model was drawn up using the ordinary least squares (OLS) method for testing explanatory variables of accessibility

1. Local accessibility (r^2=6%)
2. Local accessibility (controlling for sector and region fixed effects) (r^2=17%)
3. Regional accessibility (r^2=13%)
4. Regional accessibility (controlling for sector and region fixed effects) (r^2=68%) [Tautology]

	Local accessibility (log)		Regional accessibility (log)	
	Model I	Model II	Model III	Model IV
floorsize (log)	-.0958833***	-0.0837226**	-.0483092	-.0430986**
	(.0367524)	(.0348716)	(.0336325)	(.0206081)
n_employ (log)	.0825106***	0.0331528	.1503867***	.0515693***
	(.0246154)	(.0237768)	(.0225258)	(.0140515)
ori_national	.2043543**	0.1441756*	.2673502***	.0933062*
	(.0851897)	(.0811771)	(.0779579)	(.0479735)
ori_ue	.2050685**	0.1025308	.3909013***	.1207551**
	(.0850778)	(.0816836)	(.0778555)	(.0482728)
ori_overseas	.1996423**	0.106802	.2443395***	.0590672
	(.0969661)	(.0925691)	(.0887347)	(.0547058)
dest_national	-.1013297	-0.1263683*	.1444383**	-.0136869
	(.1164164)	(.1129198)	(.1065338)	(.0667325)
reefer	-.1603808**	-0.1058035	-.2465184***	-.1359549***
	(.073125)	(.0691727)	(.0669174)	(.0408792)
outdoor	-.0006496	0.0611957	-.2335752**	-.0995081*
	(.0993332)	(.0951607)	(.0909008)	(.0562374)
port_logis_park	.3987218**	0.4326653**	-.1534116	-.0640736
	(.1793946)	(.169628)	(.1641659)	(.1002455)
air_logis_park	-.6504298**	-0.6279399**	-.0481248	-.0096274
	(.2154518)	(.2034554)	(.1971621)	(.1202366)
public_planning	-.015542	-0.1621772	.3676151**	.0732322
	(.1572661)	(.148331)	(.1436158)	(.0876595)
private_planning	-.0381874	-0.0550264	.2721955	.2187331**
	(.1873688)	(.1762437)	(.1714631)	(.1041552)

	Local accessibility (log)		Regional accessibility (log)	
	Model I	Model II	Model III	Model IV
leased	.1093094*	0.0685326	.1725438***	.0574168*
	(.0559314)	(.0545769)	(.0511834)	(.0322534)
seveso	-.2597899**	-0.1028024	-.2047895*	.0343678
	(.1255659)	(.11884)	(.1149066)	(.0702312)
seasonal	-.1435167**	-0.1406266***	-.0263179	-.0258408
	(.0571273)	(.0539536)	(.0522778)	(.0318851)
s_custom	.3207043***	0.3002792***	.0529627	.0363311
	(.0945105)	(.0892793)	(.0864875)	(.0527617)
c_xlretail	-.1628572*	-0.1307456	-.0503757	.0114063
	(.0940956)	(.089571)	(.0861079)	(.052934)
c_retail	-.0104038	-0.0396102	.1640466*	.0963127*
	(.1021513)	(.0962123)	(.0934797)	(.0568589)
_cons	2.376206***	4.52646***	4.491168	7.020517***
	(.3502894)	(1.019974)	(.3205534)	(.6027767)
Region and sector dummies	No	Yes	No	Yes
Obs	1436	1436	1436	1436
Adj R2	6.10%	17.40%	12.90%	68%
F-test	4.1	8.6	8.1	73.7

Simultaneously linked to local <u>and</u> regional accessibility

- **More accessible locations:**
  - with <u>large number of workers</u> (*n_employees*)
  - <u>sourcing cargo from distant suppliers</u> (*ori_national, ori_ue*)

- less accessible locations :
  - handling specific types of cargo such controlled temperature (*reefer*) or involving high environmental or health risks (*Seveso*)

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Exclusively <u>linked to local</u> accessibility

- More accessible locations:
  - Warehouses located in a <u>port</u> logistics park
  - providing customs clearance services

- less accessible locations :
  - large warehouses,
  - with seasonal activity
  - Warehouses located in an <u>airport</u> logistics park

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Exclusively <u>linked to regional</u> accessibility

- More accessible locations:
  - Leased warehouses
  - Retail activities

- less accessible locations :
  - Outdoor warehouses

4. Preliminary conclusions (1/2)

- A number of warehouses' attributes are linked with:
  - local accessibility,
  - regional accessibility
  - or with both local and regional accessibility

  This underlines the need to consider both the nearby market, as measured by local accessibility, and the distant markets, as measured by regional accessibility, to fully characterize the location patterns of logistics activities.

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4. Preliminary conclusions (2/2)

- Doubly accessible warehouses tend to have more employees and broader supply areas

- Doubly accessible warehouses tend to not to be owned by their users.

- Warehouses' users with specific cargo requirements tend to avoid highly accessible locations.

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Limits/next steps

- No significant relationship has been found between accessibility (either local or regional) and destination.
- Location choices are not unlimited (e.g. Raimbault, 2014)
- Accessibility only represents a (small?) part of the whole explanation (case of Wallony, Strale, Charlier)
- Competition effects (other warehouses already exist…)
- Patchy measures of accessibility (distance as the crow flies, no consideration of regions beyond borders)

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Thank you! Comments/Suggestions?

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