

Exploring the Relationship Between Urban Form and Spatial Organisation of Amazon Fulfilment Facilities in the United Kingdom and Japan

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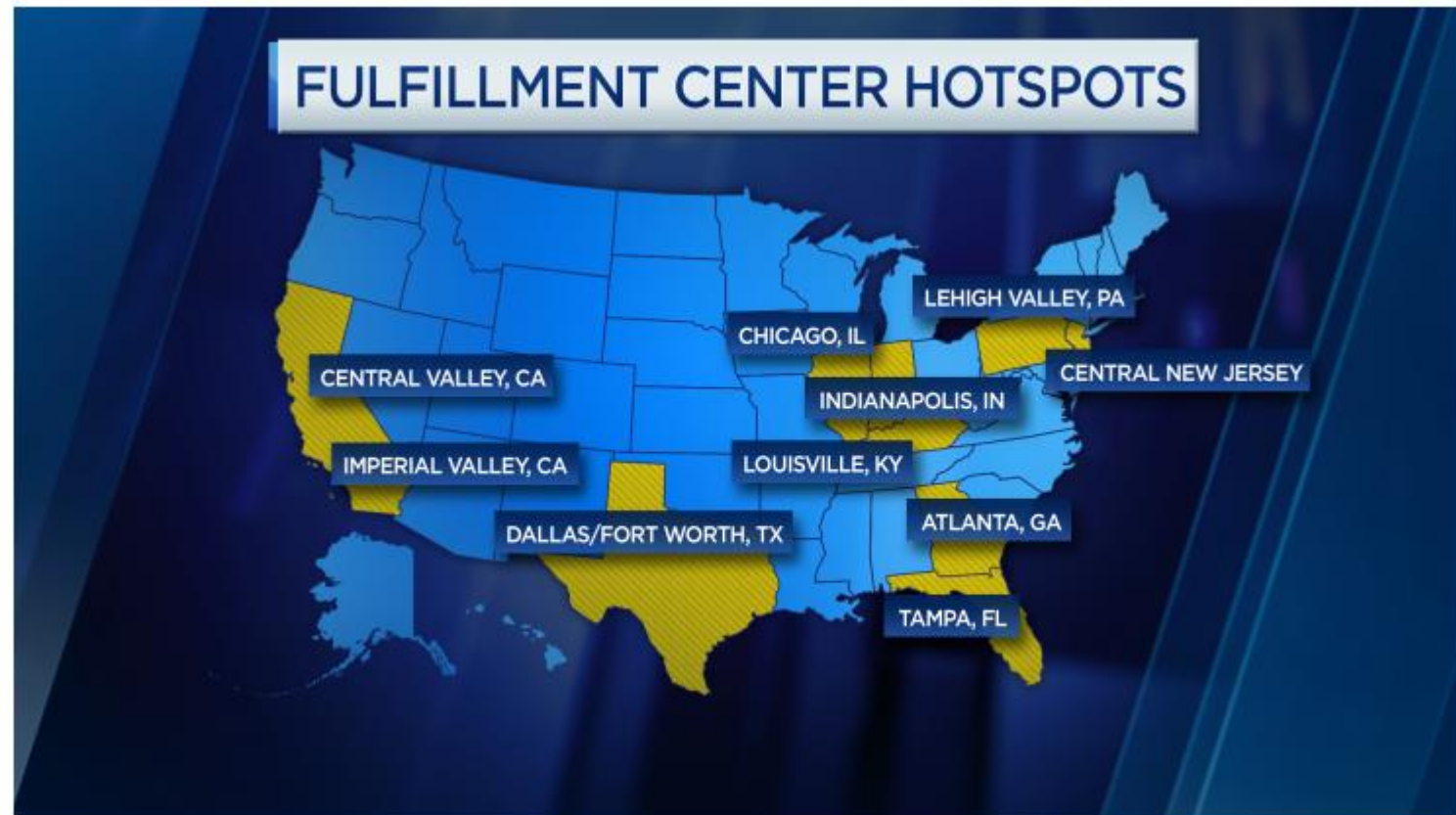


Outline of the presentation

- Research motivation
- Purpose, contribution and the significance of the study
- Methodology
- Results and discussion
- Conclusion

TECH

A new industry is beginning to thrive in rural America with Amazon leading





Are things changing?

High demand doesn't come without its consequences. This prime stretch of land has become almost saturated with warehouses. Demand for this location has also seen rent prices continue to increase by over 2.8% in Q1 of 2018, and with labour and energy prices also becoming a real issue, there are now more hurdles to overcome than ever when investing in the region.

It could be these factors that have led several companies to start looking elsewhere in the UK for prime warehousing locations. Is focussing distribution activity in this region still going to be a financially viable option?

New data from [Savills](#) demonstrates that the Golden Triangle is slowly losing its unchallenged status as the go-to location for big sheds, as online retail is reshaping the geography of the commercial property market. To establish a quicker and more efficient delivery service into stores and customers, firms are now starting to focus on developing their final mile delivery centres closer to other major population centres.

**Is T
Log**

Amazon has recently announced plans for two new warehouses in the East and North West of England, Savills figures show Amazon took 4 million sqft in 2017 – 82% of that was outside the Midlands. Lidl is also hot on their heels, taking new warehouses located near Bristol, and more recently in Leeds.

Amazon in B2C business

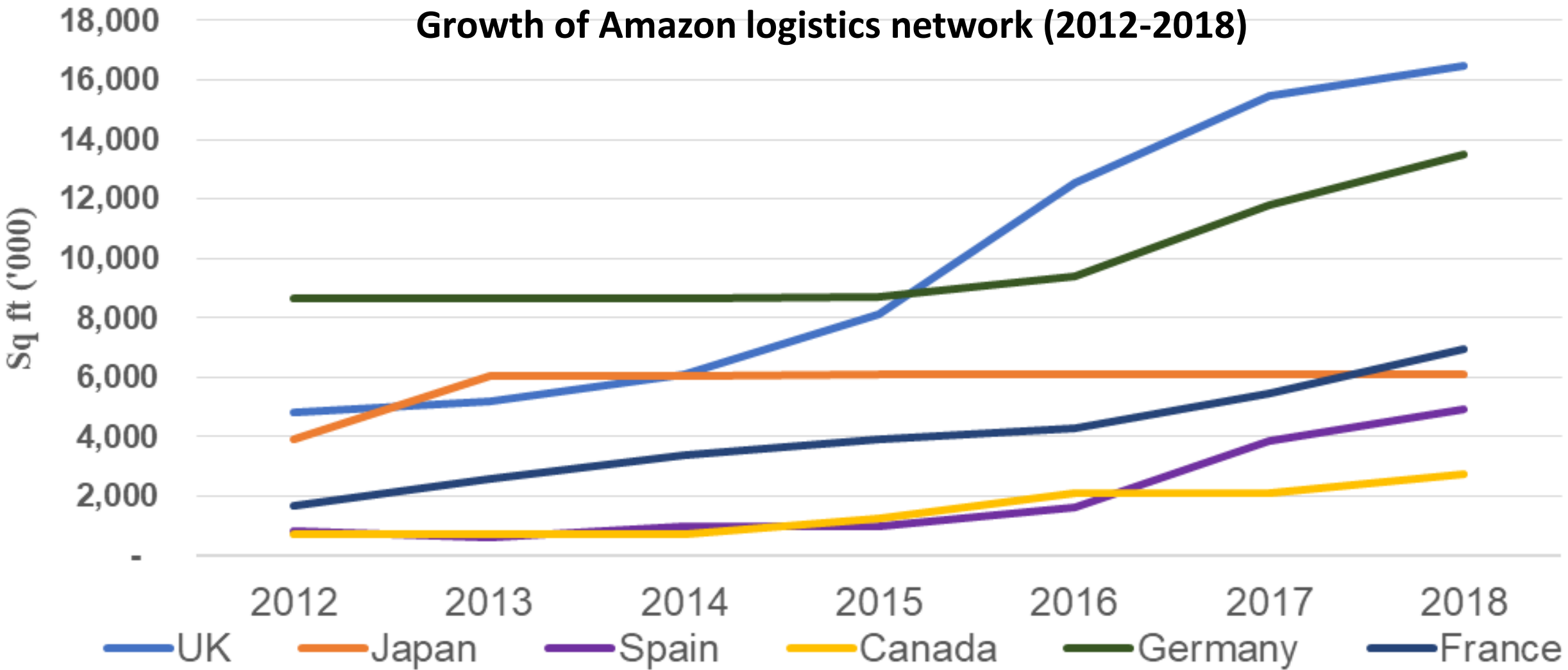


- **E commerce** and **Amazon Web Service** as main businesses
- Started based on USA and expanded to more than 21 countries

	Logistics facility area (in million sq ft)	
	Active (by 2019)	Future planned
In USA	141	34
Other countries	71	19

- **Core principles** in the business strategy
 - Customer centrality** (maximize experience and satisfaction)
 - Thinking long term**
 - Invention**

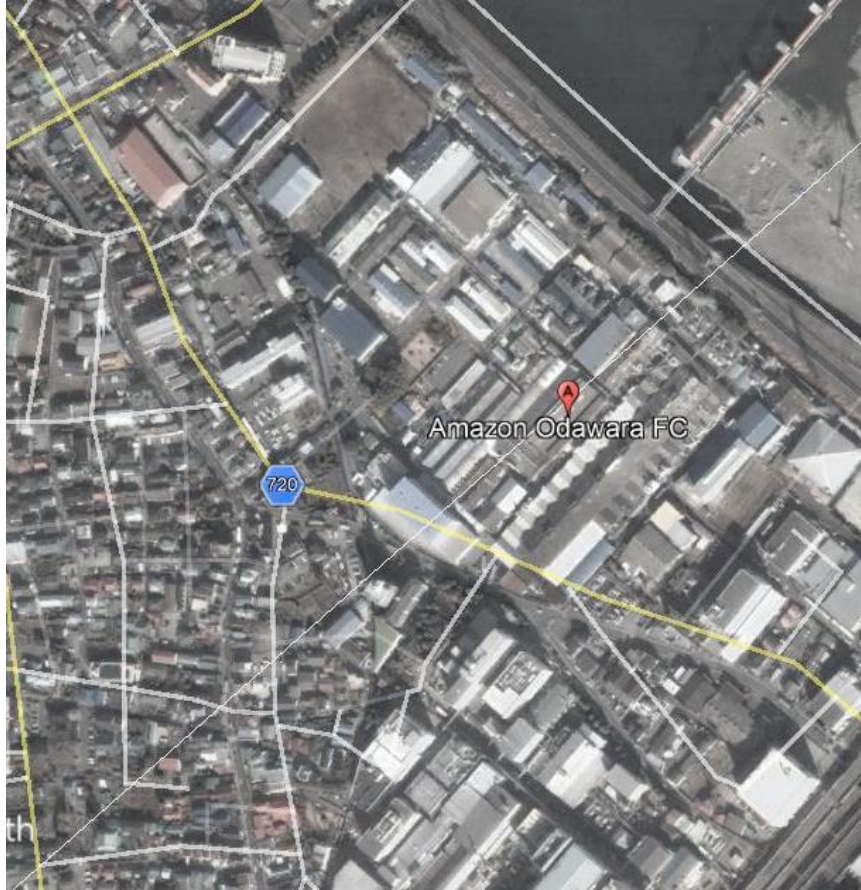
Growth of Amazon logistics network (2012-2018)



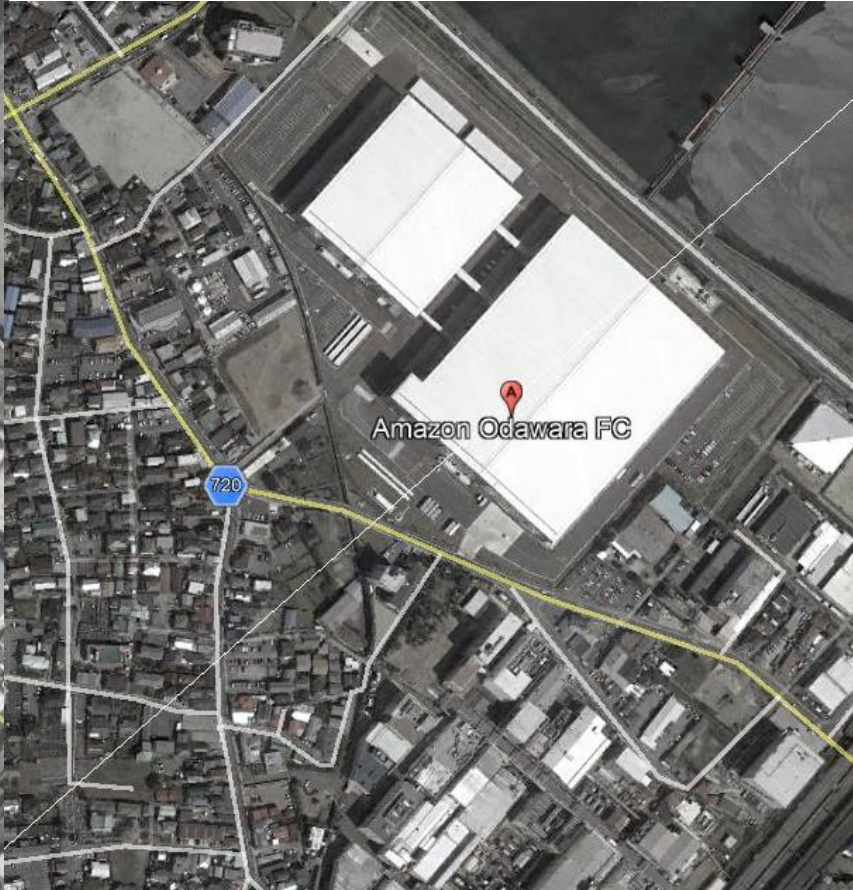
Source Compiled by authors using the database of MWPVL (2019)

Provision for income taxes	(167)	(950)	(1,425)
Equity-method investment activity, net of tax	37	(22)	(96)
Net income (loss)	\$ (241)	\$ 596	\$ 2,371
Basic earnings per share	\$ (0.52)	\$ 1.28	\$ 5.01
Diluted earnings per share	\$ (0.52)	\$ 1.25	\$ 4.90
Weighted-average shares used in computation of earnings per share:			
Basic	462	467	474
Diluted	462	477	484
	<u>2014</u>	<u>2015</u>	<u>2016</u>
North America			
Net sales	\$ 50,834	\$ 63,708	\$ 79,785
Operating expenses	49,542	60,957	75,686
Operating income before stock-based compensation and other	1,292	2,751	4,099
Stock-based compensation and other	932	1,326	1,738
Operating income	\$ 360	\$ 1,425	\$ 2,361
International			
Net sales	\$ 33,510	\$ 35,418	\$ 43,983
Operating expenses	33,654	35,509	44,460
Operating income (loss) before stock-based compensation and other	(144)	(91)	(477)
Stock-based compensation and other	496	608	806
Operating income (loss)	\$ (640)	\$ (699)	\$ (1,283)

Source : Annual report of Amazon (2016)



2008



2014



2017

Amazon Odawara, Japan facility established in 2009
Size: 2.1 million sq ft
5 stories building for handling sortable items

B2C E-commerce models

A. Operation with **own** logistics system

B. Operation with **partially or fully outsourced** logistics system

C. Operation **without a** logistics system (market place / facilitator)

	SUPPLIER FULL MANAGED			SUPPLIER MANAGED INVENTORY			DISTRIBUTED INVENTORY		
	Supplier	Merchant	Courier	Supplier	Merchant	Courier	Supplier	Merchant	Courier
Inventory ownership	●			●			●	●	
Picking + preparation	●				●		●	●	
Order assembly	●	●			●		●	●	
Order delivery			●			●			●
	CONSIGNMENT INVENTORY			MERCHANT MANAGED INVENTORY			FULL IN-SOURCE		
	Supplier	Merchant	Courier	Supplier	Merchant	Courier	Supplier	Merchant	Courier
Inventory ownership	●	●			●			●	
Picking + preparation		●			●			●	
Order assembly		●			●			●	
Order delivery			●			●		●	

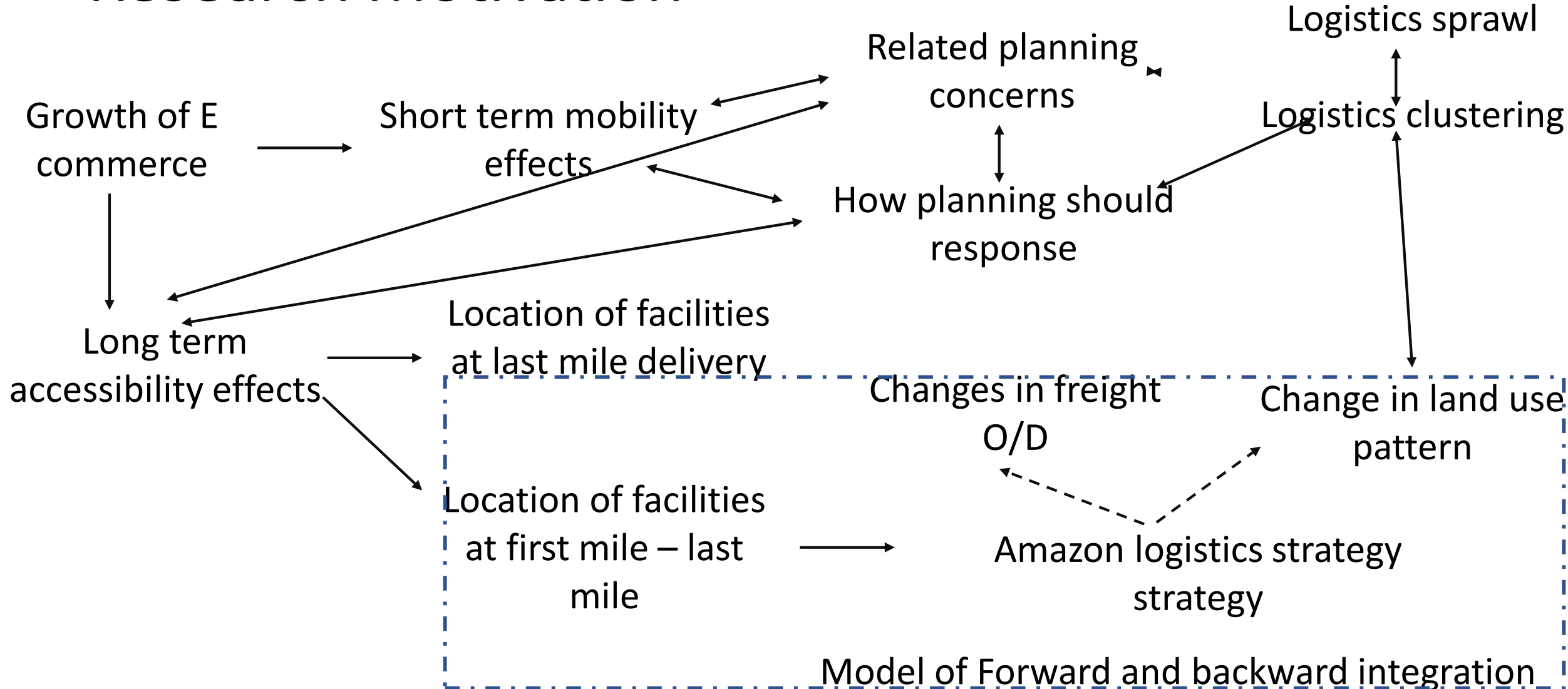
Source : Ghezzi, Mangiaracina and Perego (2012) -page 8

“Softbank, Yahoo Japan, and retailer Aeon are teaming up to launch a new online marketplace”

(Aeon has product and logistics network; yahoo already have a e commerce platform and Softbank will be a gateway to new market segments & advanced in robotics technology)

“Alibaba initiate cainiao, a logistics company, with partnership of 8 other companies”

Research Motivation



Purpose, Contribution and Significance

Understand the spatial dimension (location aspect) of different types of Amazon logistics facilities in the UK and Japan

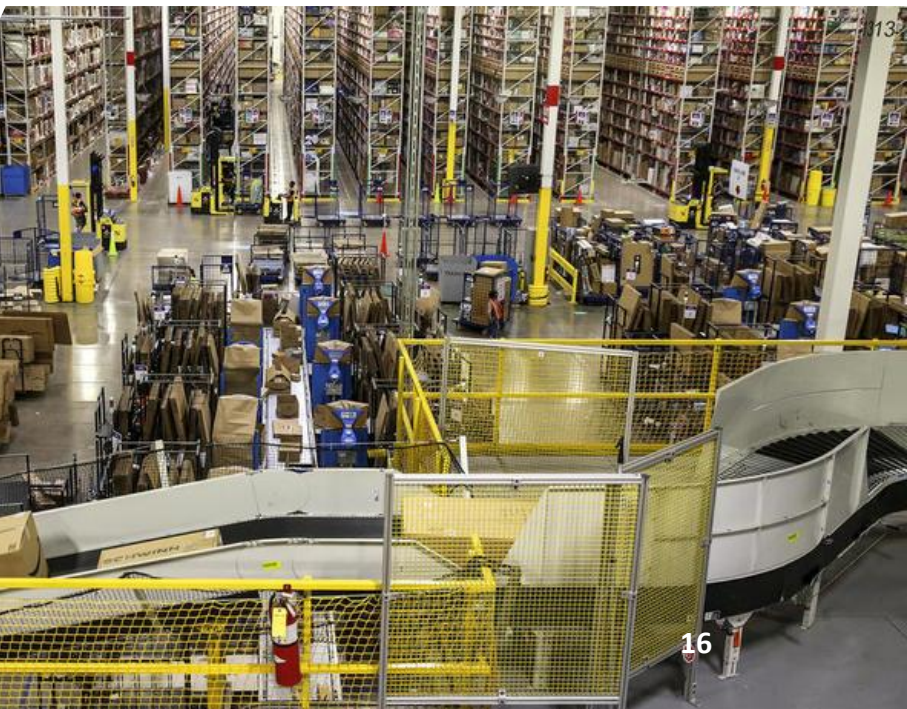
- I. Do Amazon cluster into specific regions or areas?
- II. Are different types of logistics facilities always follow same location pattern?
- III. Distribution pattern with respect to population distribution
- IV. Facility location with respect to transport infrastructure

Purpose, **Contribution** and Significance

- **Lack of awareness among planners about e-commerce driven spatial changes** (Pettersson et al., 2018)
- **Direct mobility effects** - change in passenger and freight transport- and **indirect accessibility effects** -supply chain configuration, **logistics facility location and land use changes-** (Visser and Lanzendorf, 2004)
- This study is part of the doctoral research project, focused on analysing the **effects of e commerce logistics facilities on cities**

Traditional DCs vs. Fulfilment centres

	DC	FC
Type of good (finished or not)	Finished goods	Finished goods
Purpose	To redistribute	Order fulfillment
To whom	Retailers, wholesalers or consumers	Usually consumer
Warehouse facility	Yes	Yes
Thousand to million SKU	Yes	Yes
Single piece / Mass	Pallet and case (Mass)	Single piece pick
Packaging type	Variety - pallets, totes, etc.	Small parcels –in boxes, etc.
Operated with	Usually automated- depending on goods	Usually automated
Small orders	Filled on next order	Are a disappointment to consumer



Classifying e-commerce logistics facilities

Type of facility	Key attributes
Sortable fulfilment centres	Large size (800,000 sq. ft); cross-docking configuration; close to large labour supply (more than 1,500 full time associates); range of products (books, toys and housewares); automated and high-tech operations,
Non-sortable fulfilment centres	Large size (600,000 – 1,000,000 sq. ft); cross-docking configuration; close to large labour supply (more than 1,000 full time associates); large products (furniture, outdoor equipment, etc.);
Sortation centres	Medium sized; automated operation; access to regional centres; orders are sorted by destinations; carry out flexible deliveries
Delivery stations	Low site density; cross-dock configuration; located at the edge of cities; preparation for last-mile deliveries; collaboration with carriers
Returning centres	Depends on operation; close to fulfilment centres; automated and high-tech operations, including Robots
Freight stations/ speciality facilities	Small size; close to high-density neighbourhoods; (including Amazon Prime Now Hub centres)

Source : (Rodrigue, 2017; Jones Lang LaSalle, 2013; Amazon.co.uk, 2019) ¹⁷

Amazon facility location in USA

- **The clustering pattern of Amazon FCs in USA and location at states with low sales tax** (Houde, Newberry and Seim, 2017)
- **Attraction of sites for fulfilment facilities in USA** near by to Airports (Hylton, 2018)
- **Distance from Customer concentrated locations and sale tax of states** as determinants of Amazon logistics facility network (Yu et al, 2016)

Purpose, Contribution and Significance

Can the behaviour and operations of **one company in b2c** be significant?

Yes (somewhere or everywhere) or No

Scenario 01: Amazon model becomes the **state of art**; location choice leads to form of **logistics clustering** and further agglomeration leads to **trigger spatial changes**

Scenario 02: Amazon model becomes the **state of art**; location choice may **differ, spatial changes vary from scenario 01**

Scenario 03 : Amazon model becomes **obsolete model**

BUT, Just in Time (JIT) of Toyota, before and after 1960/70

	USA	China	India	UK	Japan	France	Germany	Spain
Number of Amazon facilities - 2018	331	17	210	90	22	14	27	15
Size of population -2018 (in millions)	327	1415	1354	67	127	65	82	46
population density - 2018 (per km)	36	150	450	274	350	119	236	93
E commerce as % of total retail sales -2017	9	23	2	19	7	5	7	8
Internet penetration - 2018 (%)	88	55	40	95	95	88	91	87
Rank of Logistics performance index - 2018	14	26	44	8	5	16	1	23
Rank of E government Index - 2018	11	65	96	1	10	19	15	17
Market position of Amazon in b2c e commerce sector	1	2-3	1-2	1	1	1	1-2	1-2

Source : Compiled by authors by referring to multiple information sources 20

Methodology

Type of data	Japan	UK
Location of Amazon logistics facilities	MWVPL, 2019, Google earth, Amazon websites, online articles	
Population	Portal site of official statistics of Japan	Office of national statistics
Location of transport infrastructure	National land numerical information service	Ordnance survey National mapping service Open geography data portal

Location mapping with google earth
spatial analysis with QGIS 3.2 Bonn

Type and number of e-commerce logistics facilities considered in the study

Facility type	Japan	UK
Fulfilment centre – unclassified (refer to centres handling all types of items)	06	09
Fulfilment centre – Sortable items	05	11
Fulfilment centre – non-Sortable items	03	07
Delivery stations / Sortation centre	-	49
Receive centre	01	01
Prime now hub centre	07	13
Total	22	90

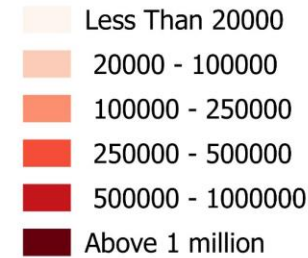
Results and Discussion

- I. Analysis of the facility distribution in UK
- II. Analysis of the facility distribution in Japan
- III. Comparing the pattern in UK and Japan

Amazon at UK

- Polycentric pattern of urban form
- Uniformly distributed network
- Since 2013, concentrate in the corridor between North-west London to Manchester via Birmingham
- Delivery stations/sortation centres and regional delivery capability

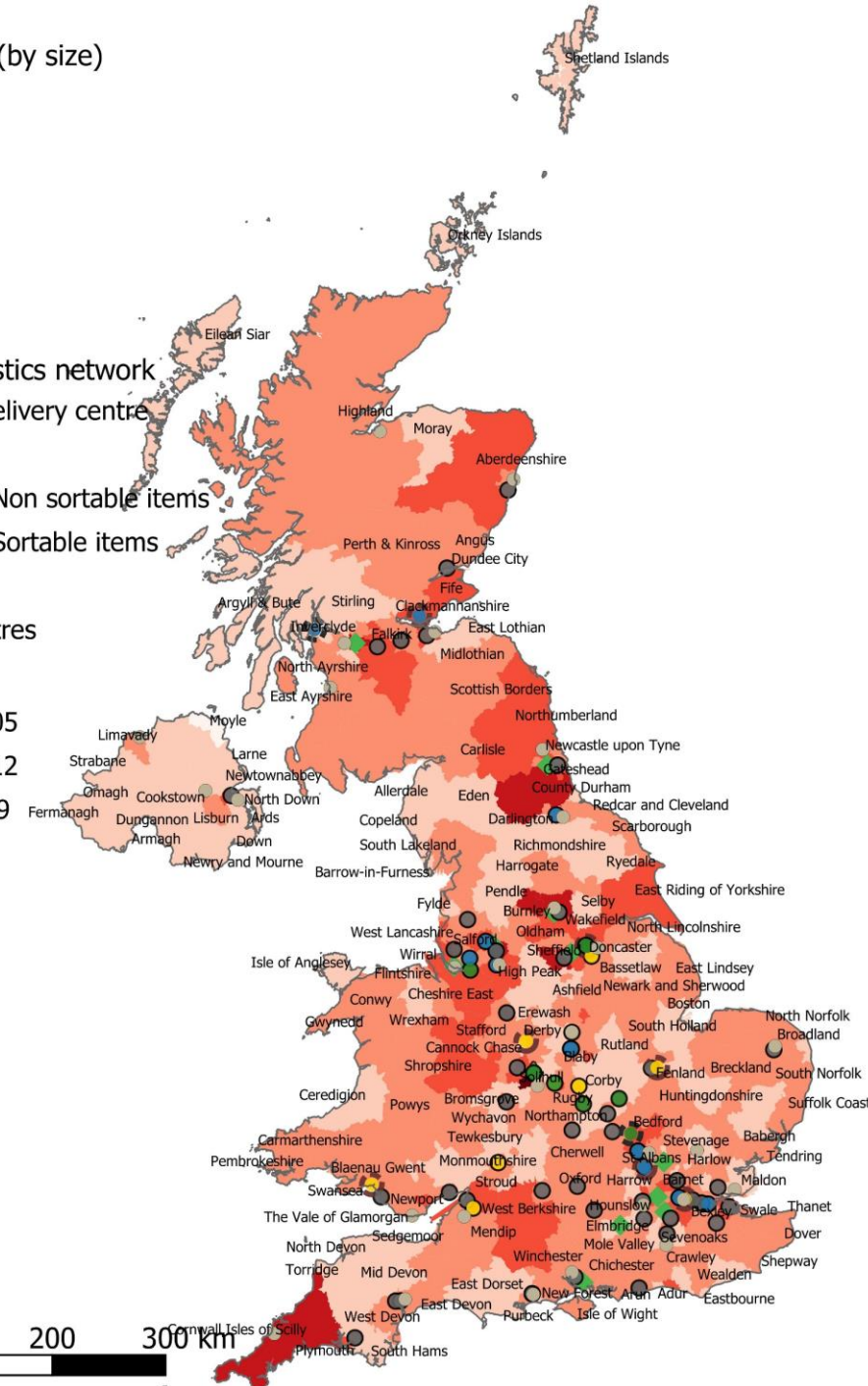
Population distribution (by size)



Amazon Fulfillment logistics network

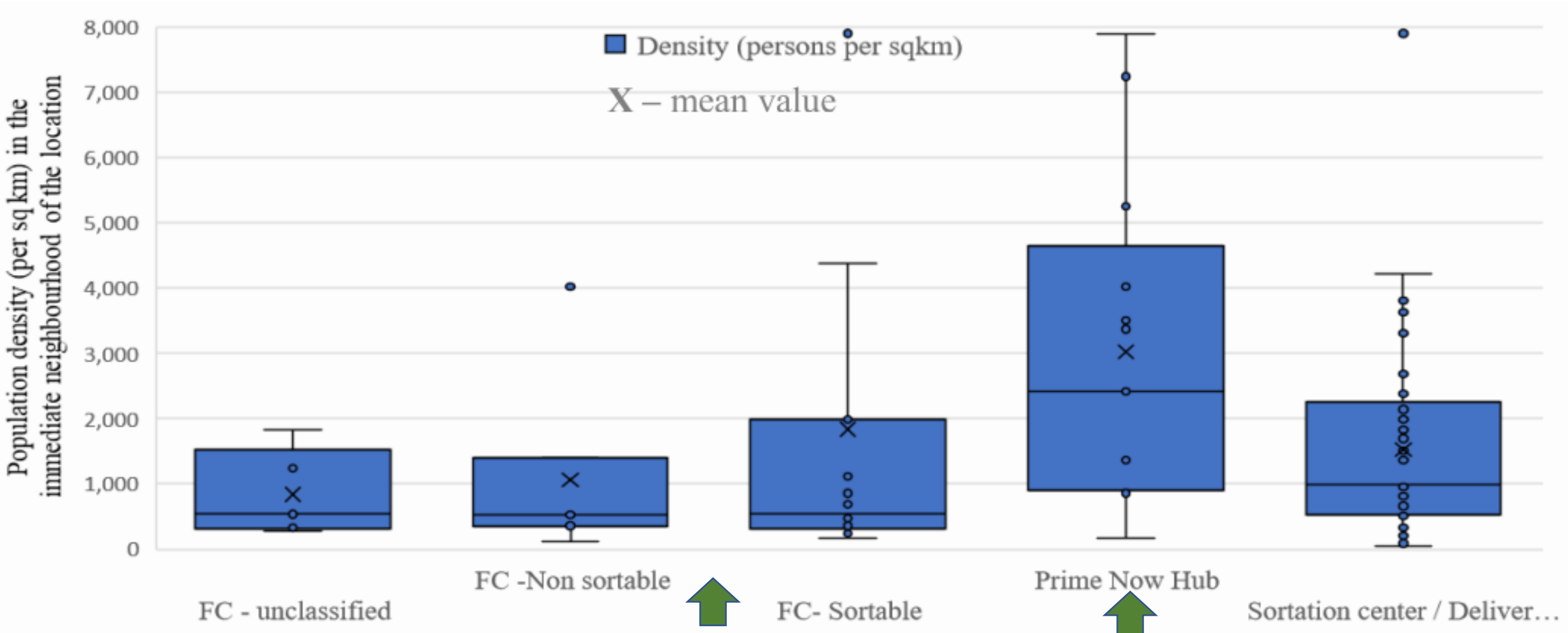


With established year



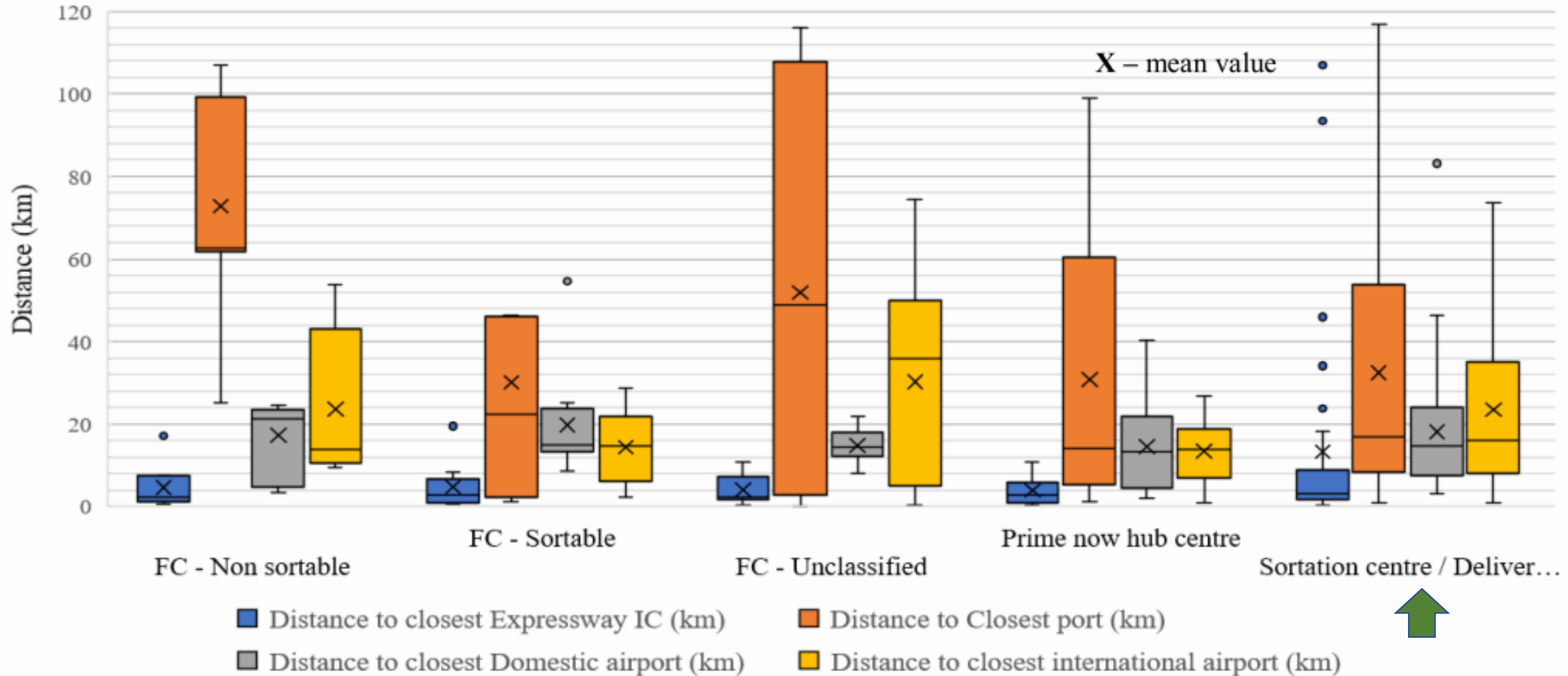
Amazon at UK

Population density in the immediate neighbourhood of the location



Amazon at UK

Distance to transport infrastructure nodes from the location

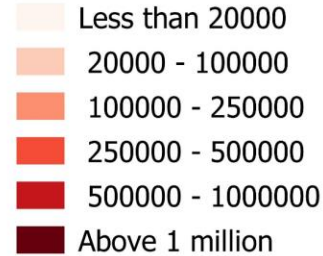


Amazon at Japan

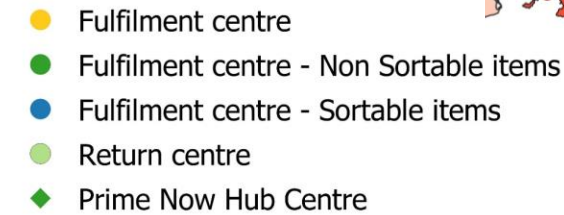
- Logistics facilities are **predominantly concentrated** around Tokyo and Osaka
- **Concentric pattern** of facility distribution
- **No delivery stations**

Legend

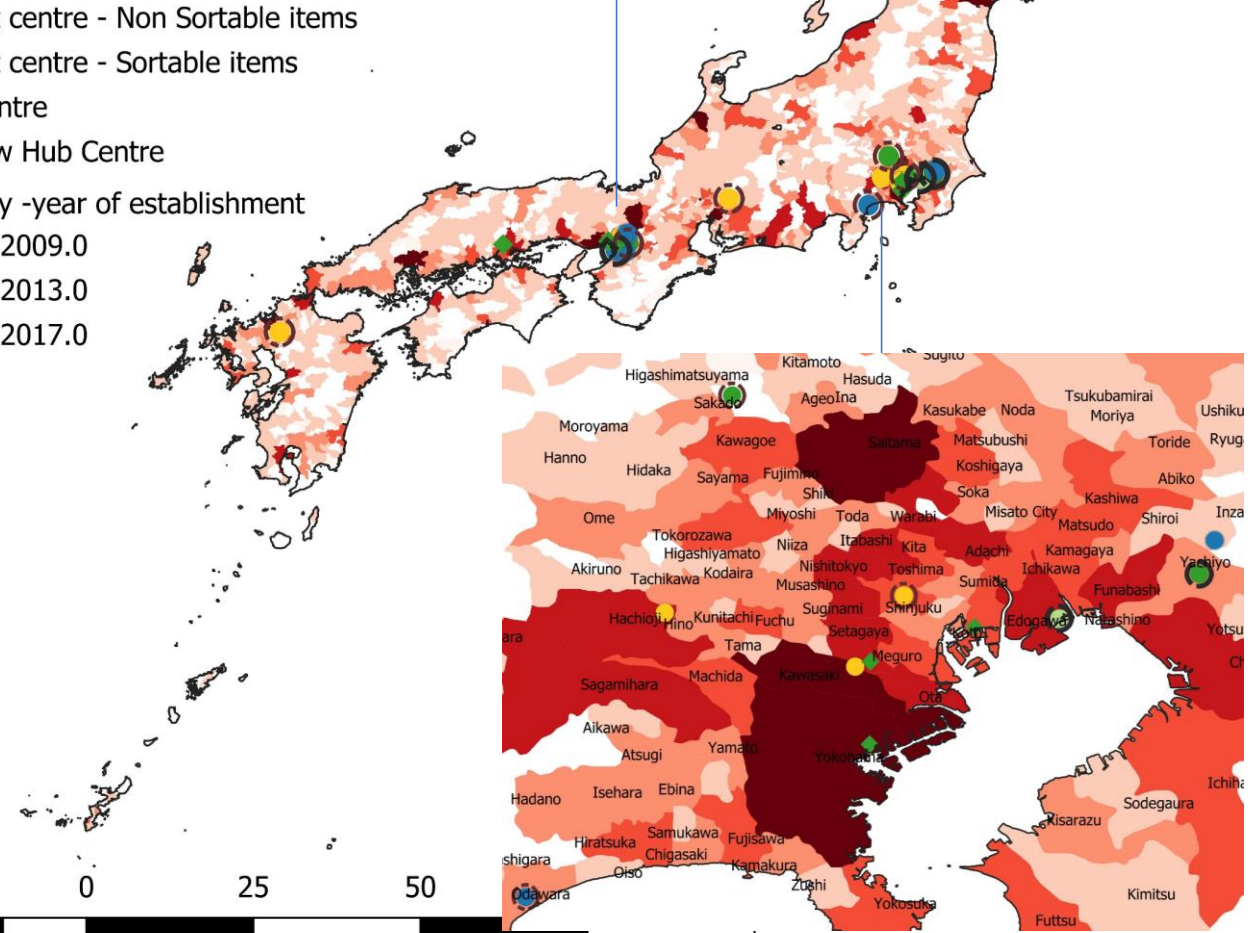
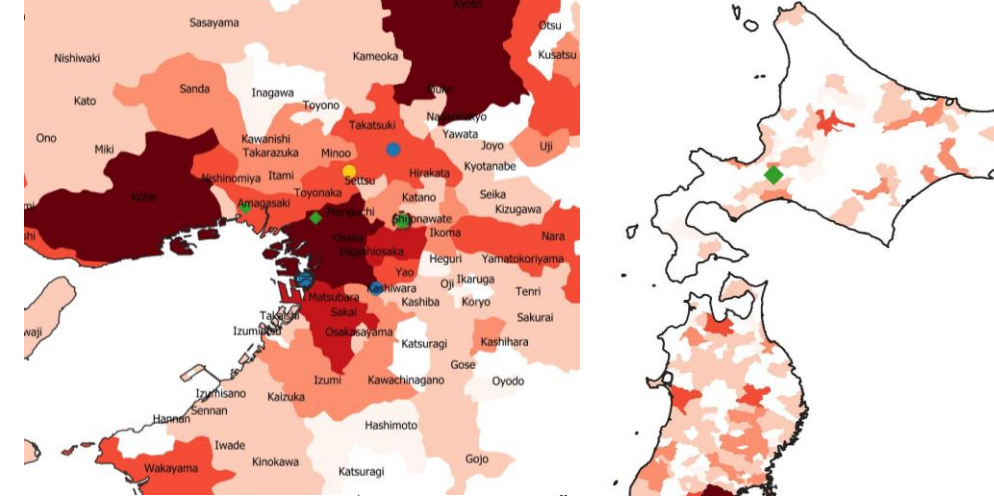
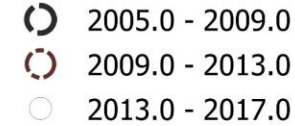
Population distribution (by size)



Amazon logistics network in Japan



Logistics facility - year of establishment

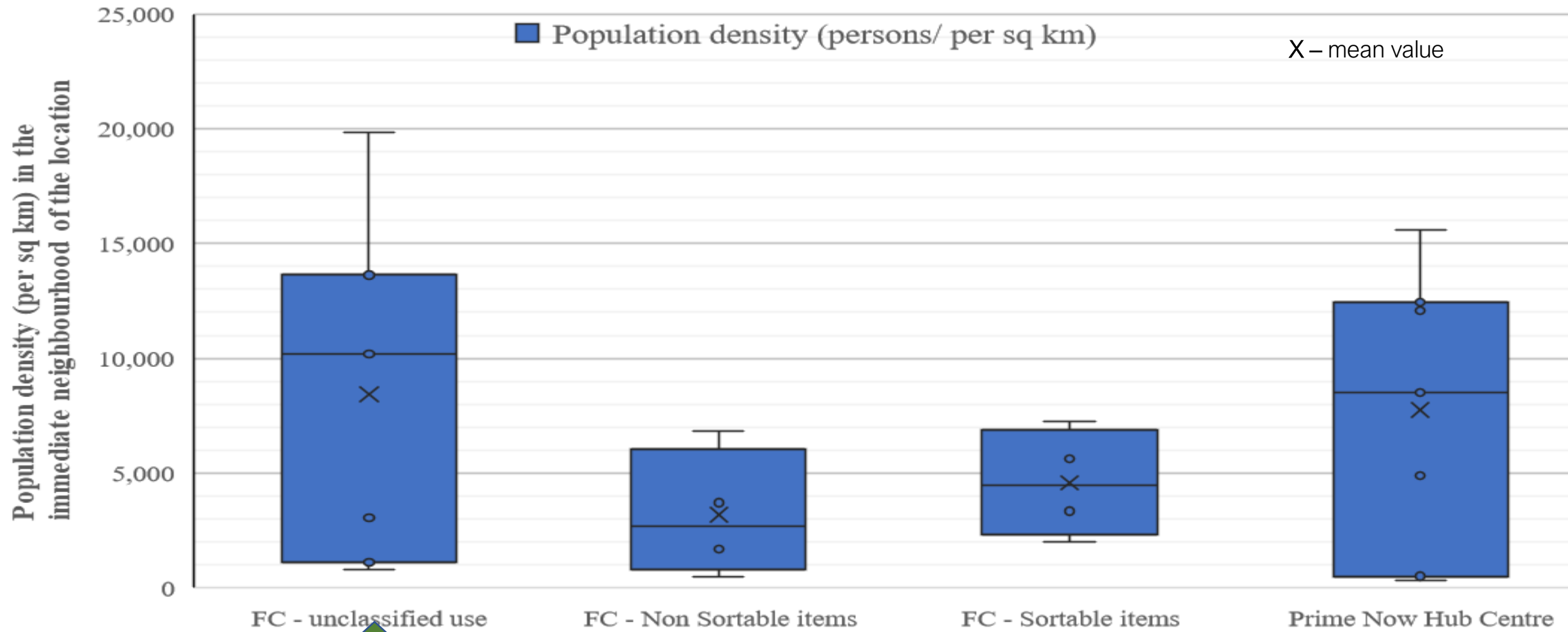


The 11th international conference or

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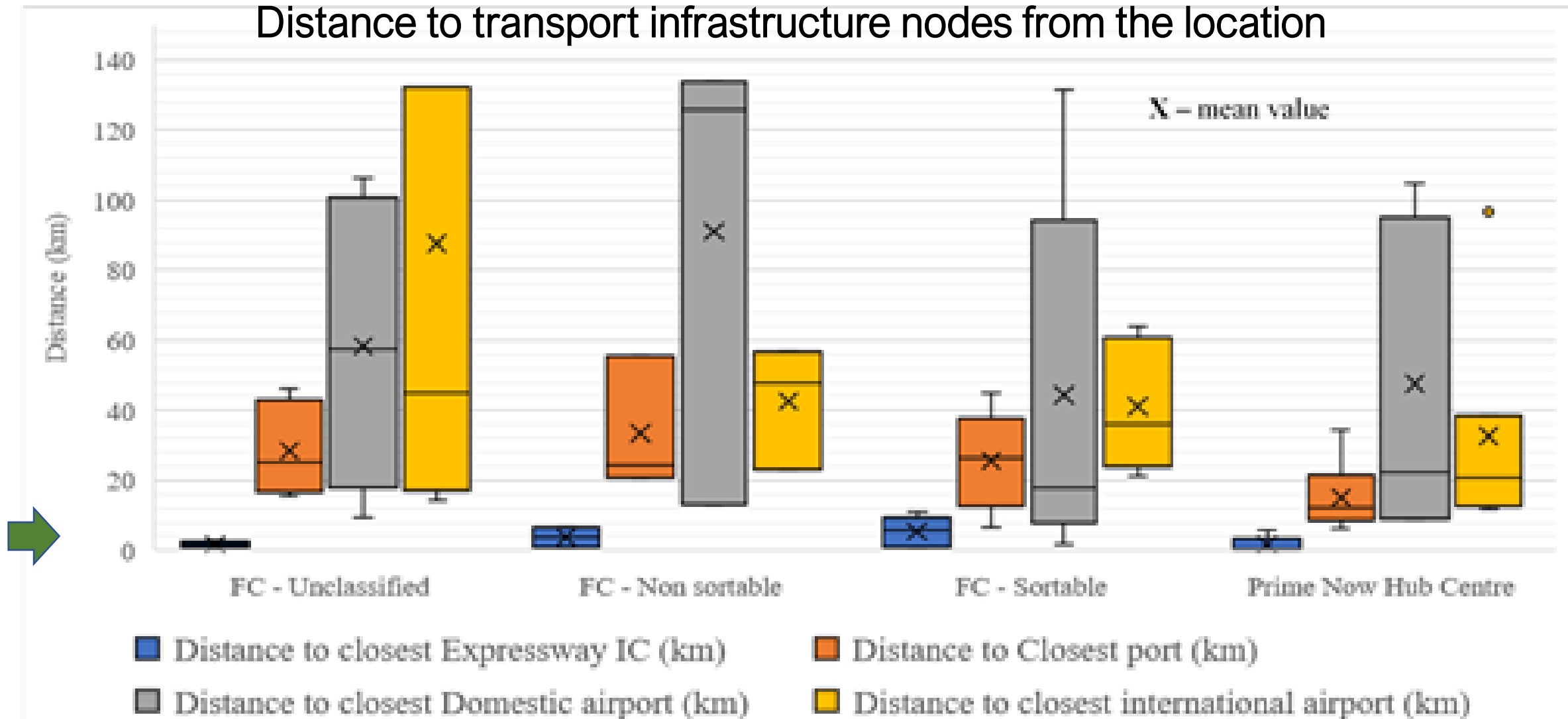
Amazon at Japan

Population density in the immediate neighbourhood of the location



Amazon at Japan

Distance to transport infrastructure nodes from the location



Comparing Amazon at UK and Japan

- Large size fulfilment facilities are clustered around the main population concentrations and located at proximity for road infrastructure.(expressway interchanges)
- The medium-sized cities in the UK will be likely to promote the clustering of other e-commerce related logistics facilities of other firms.
- In the UK, support the observations of Lupton (2018) on demand for logistics facilities outside the Golden Triangle.

Comparing Amazon at UK and Japan

- In comparison to the US-based observation of Houde, Newberry and Seim (2017), in the UK, there is no pattern of **concentration** between old facilities and new facilities. In **Japan** concentration of fulfilment centres mainly at Tokyo and Osaka Metro Regions.
- The distributed structure of **UK logistics facilities is mainly characterized by delivery stations**, which is not featured in Japan.
- The **concentric pattern of urban form, better inter-regional mobility and logistics competency of Japan** in Japan will be unlikely to produce similar scenario

Comparing Amazon at UK and Japan

- **Prime now hub centres (avg size of 25,000 sq ft)** may be established in few more cities in Japan to cater to the **exclusive demand. – same day and 2hr delivery**
- Access to **highway and expressway interchanges** is identified as an important factor in both countries.
- The mean distance between facility **locations and nearest expressway interchange** is **8 km and 4 km** for UK and Japan respectively.

Conclusion

- I. Amazon will continued to **expand its logistics facility network**
- II. This model **may succeed and trigger broader** spatial changes
- III. Distribution of **facilities relate with population distribution pattern**
- IV. Certain facilities locate even at **high density areas**, not necessarily at less demanding areas
- V. **Location pattern vary with the type of functions performed** and overall network integration
- VI. **Access to expressways** remain a key feature in the selected locations

Conclusion (Way forward)

- I. Document the **location choice behaviour** of 3PL and Omni channel retailers
- II. **Location choice** of these facilities and compare them against the location of logistics facilities (given region/ city)
- III. Evaluate and simulate the :
 - a) **effects on urban morphology** at local/ site scale and real-estate market
 - b) **changes on freight O/D** at these locations

Further distinguished dedicated e-commerce fulfilment logistics facilities from traditional logistics facilities and traditional retail stores

Thank you very much for your attention!

Open for discussion...