

**URBAN PLANNING
AND POLICY
COLLEGE OF
URBAN
PLANNING AND
PUBLIC
AFFAIRS**



Emerging Technologies and Transportation Considerations

Kazuya Kawamura

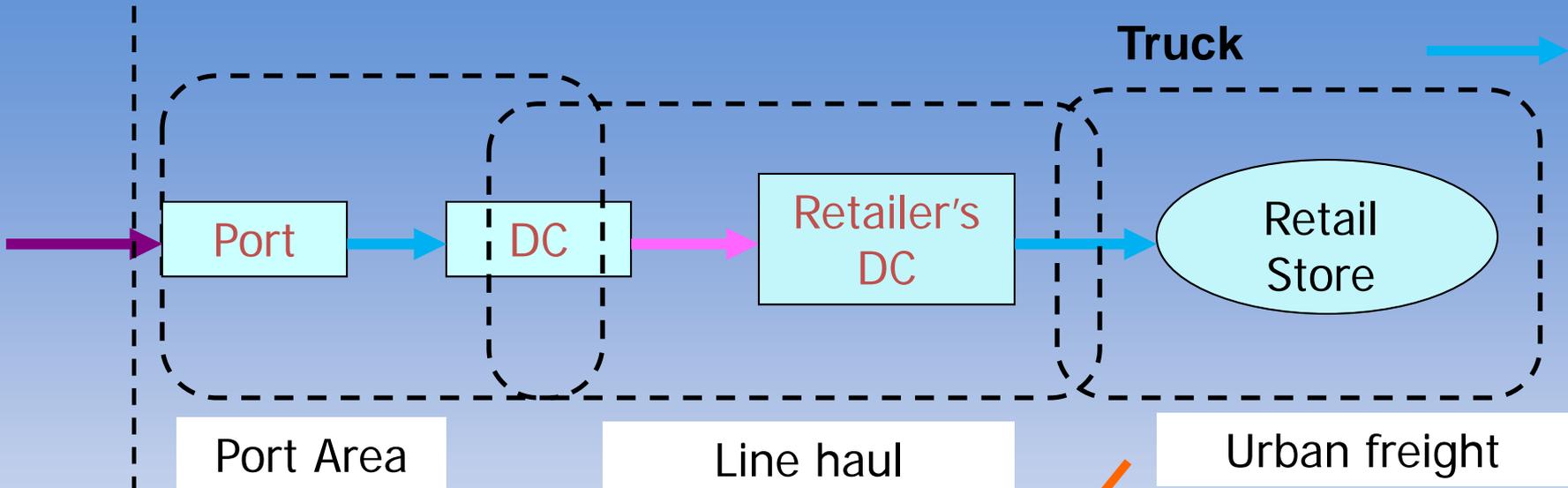
Professor

Department of Urban Planning and Policy
Department of Civil and Materials Engineering
University of Illinois at Chicago

Objective

Provide high-level insights based on research (e.g. NCHRP 08-117 Impacts of Transformational Technologies on Land Use and Transportation, The Chicago Southland Center for Smart Logistics, Transportation Experience (Garrison & Levinson))

Some terminologies



Foreign U.S.



An example of imported retail goods flow

Outline

1. Freight industry behavior paradigm
2. Freight systems considerations:
infrastructure, equipment, operation
3. Broad land use changes



Plausible scenarios & insights

Focus on relatively short term future (i.e. up to 10 years)

1. Freight Sector behavior paradigm

Optimization driven by competition, not
“satisficing”

1. Freight Sector behavior paradigm

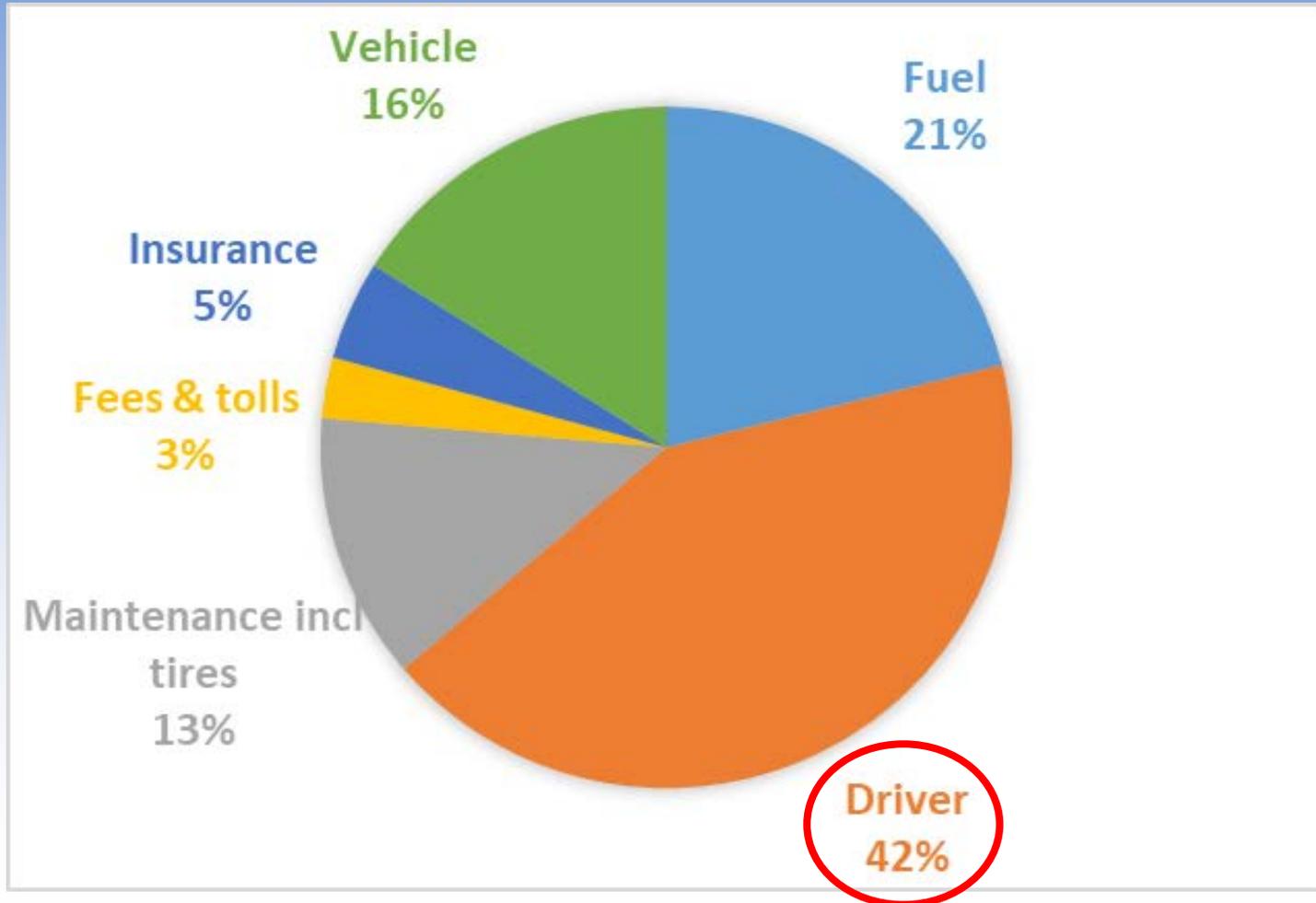
Optimization driven by competition, not
“satisficing”

Technology
adoption

- Rational (return on investment), detailed, calculated & relentless
- Cautious with new technology (lack of data, questionable first mover advantage, etc.)
- Swift adaptation once benefit is proven
- Possibly myopic (but rational)

Freight sector decision factors

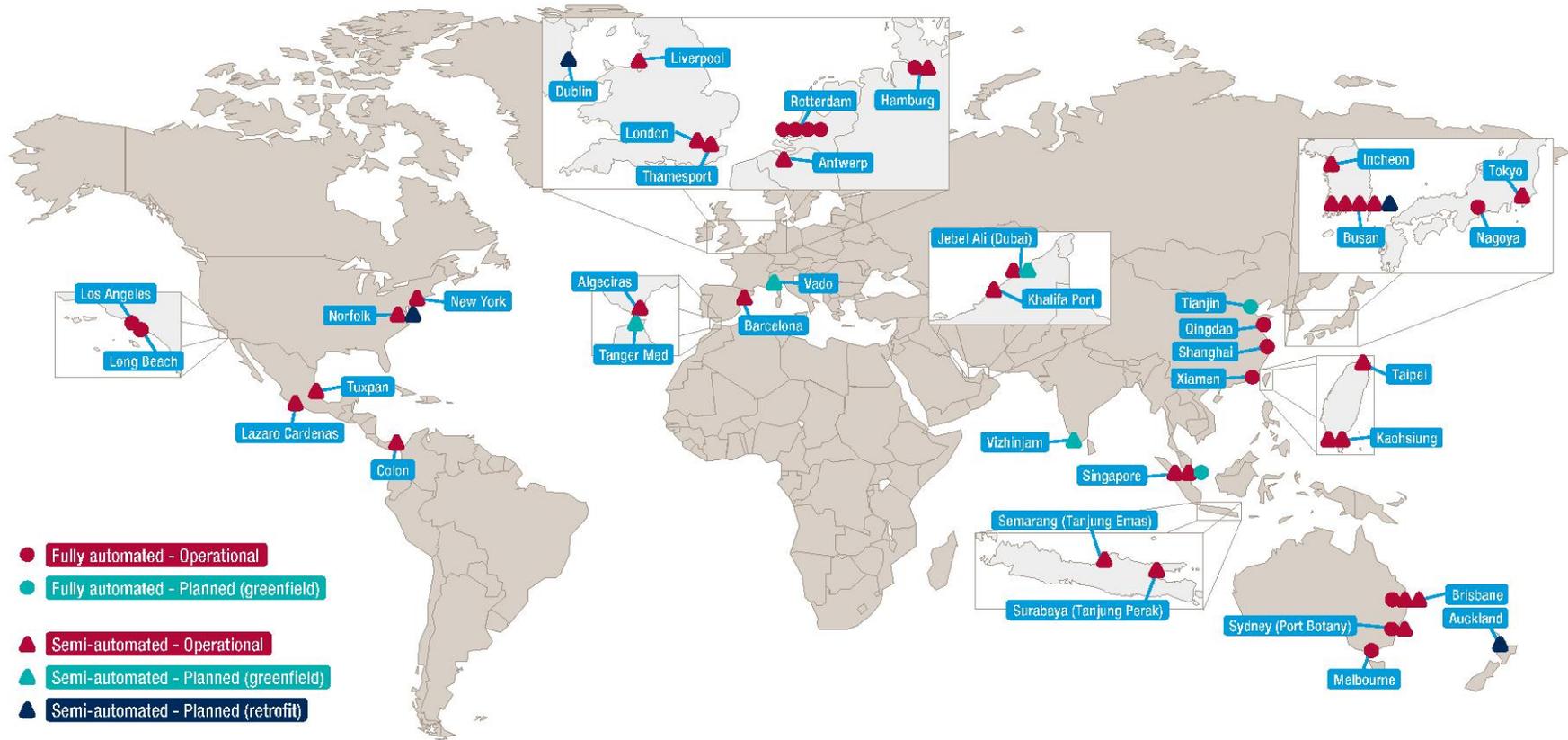
- Trucking costs (marginal cost per mile, Oct. 2017 estimates - ATRI)



2. Freight systems – relevant characteristics

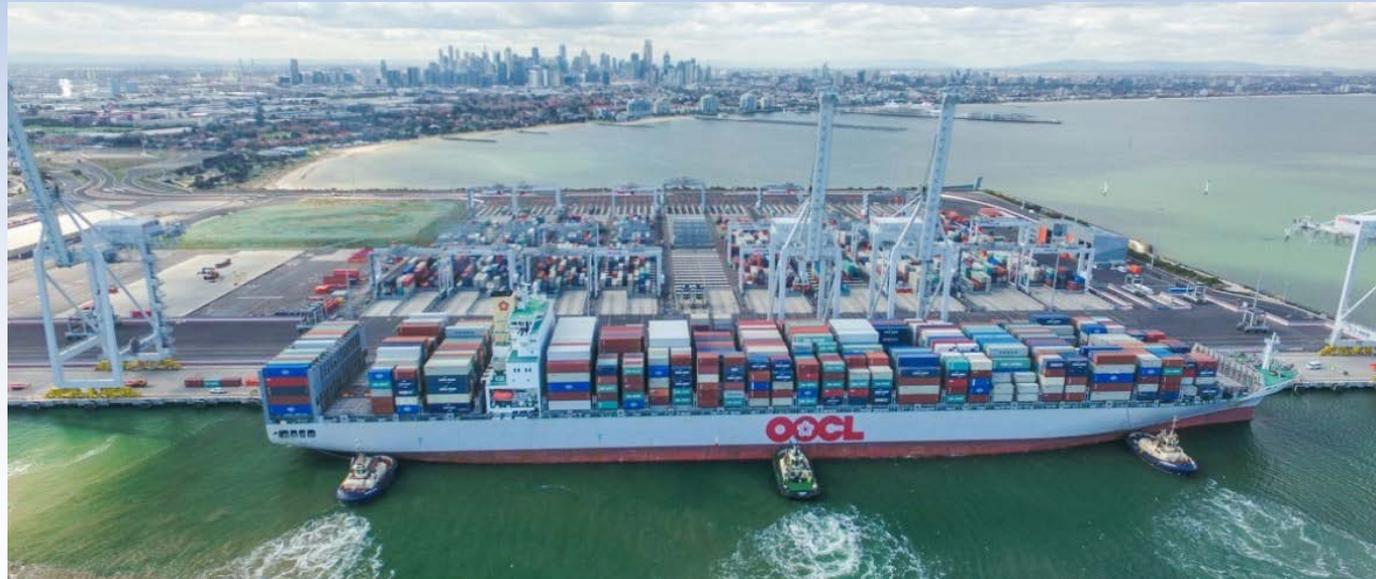
- Line haul portion is most cost efficient because of economy of scale, but majority of end-to-end trucking cost
- Last mile is expensive (up to 50% of logistics cost)
- With growth in B2C, last 50 feet is becoming a serious challenge (curbside space, loading docks, freight elevators, etc.)
- Nodes (warehouses, terminals, ports, etc.) are expensive in terms of capital and operation

Existing and planned automated container terminals





Source: Port.today

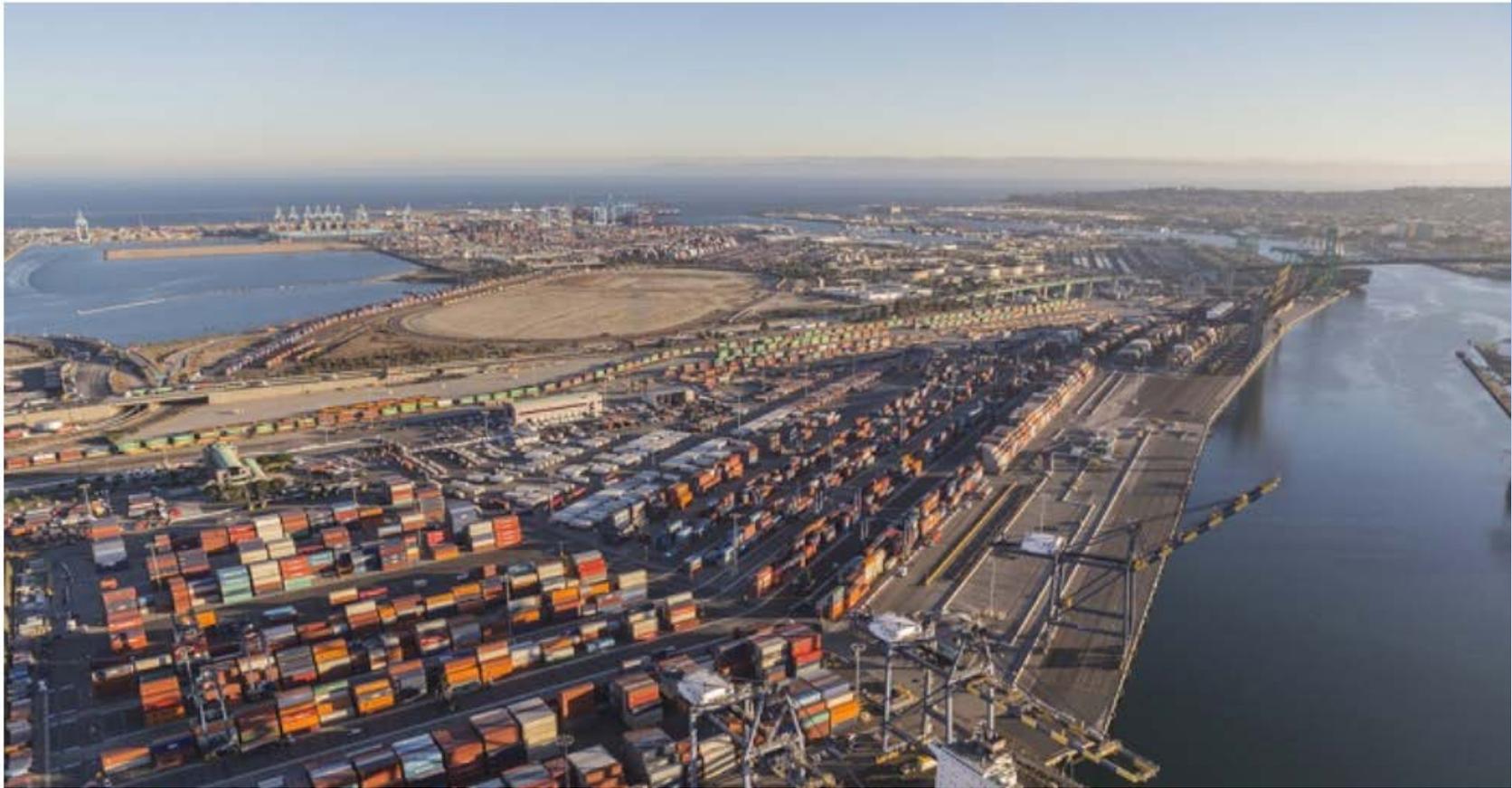


Source: Victoria International Container Terminal Ltd. (VICT)

APM Terminal's automation at LA foreshadows more

Bill Mongelluzzo, Senior Editor | Jan 25, 2019 10:45AM EST

Print [✉](#) [🐦](#) [in](#) [f](#) [g+](#)



Source: JOC.com

2. Systems considerations

Automation of Middle Harbor terminal in LB is expected to more than double the capacity

It costs \$1.3-1.5 Billion

Q: Where will processed cargo will go?

2. Systems considerations

Automation of Middle Harbor terminal in LB is expected to more than double the capacity

It costs \$1.3-1.5 Billion

Q: Where will processed cargo will go?

“Automated container terminals can help European hubs handle mega-ships and the exchanges of up to 10,000 TEU that can accompany each port call, but those efficiencies are often lost as inland-bound cargo moves from the quay to the intermodal connections”. (JOC, Dec 13, 2018)

2. Systems considerations

technode

BECOME A MEMBER

CHINA INVESTMENT TRENDS

FEATURES

China to build 150 advanced logistics hubs by 2025

DEC 25, 2018 | IN WITH CHINESE CHARACTERISTICS | BY NICOLE JAO

🔍 Search

Bloomberg

Business

Hillwood Announces Establishment of AllianceTexas Mobility Innovation Zone

June 10, 2019, 9:00 AM CDT

Daimler Trucks invests half a billion Euros in highly automated trucks



07.

January 2019
Stuttgart / Las Vegas

<https://media.daimler.com/>

Volvo Trucks' autonomous vehicle is hauling goods in Sweden

Vera will move shipping containers between a logistics center and nearby port.



<https://www.volvotrucks.com>

2. Systems considerations

Impactful concepts for urban freight

- On-demand goods deliveries
 - Drones/robots
 - Cross-mode/cross-channel freight movements
 - Crowd-shipping
 - Omni channel retail & logistics
 - 3D printing
- All face some uncertainties in terms of effectiveness, adoption, and impacts

Possible adoption scenario of freight technologies

Adoption of technology tend to be path-dependent: regulatory environment, public acceptance, breakthroughs, & timing



Possible adoption scenarios

1. Container port automation is underway
2. Port automation will incentivize automation at container and intermodal terminal downstream
3. Assuming labor is still required (not full AV) and fuel cost remains significant, economy of scale still drives competition (CAV technology)
4. Because of administrative and technical feasibilities and return on investment, in-house operators will likely be the early adopter

Expected land use impacts

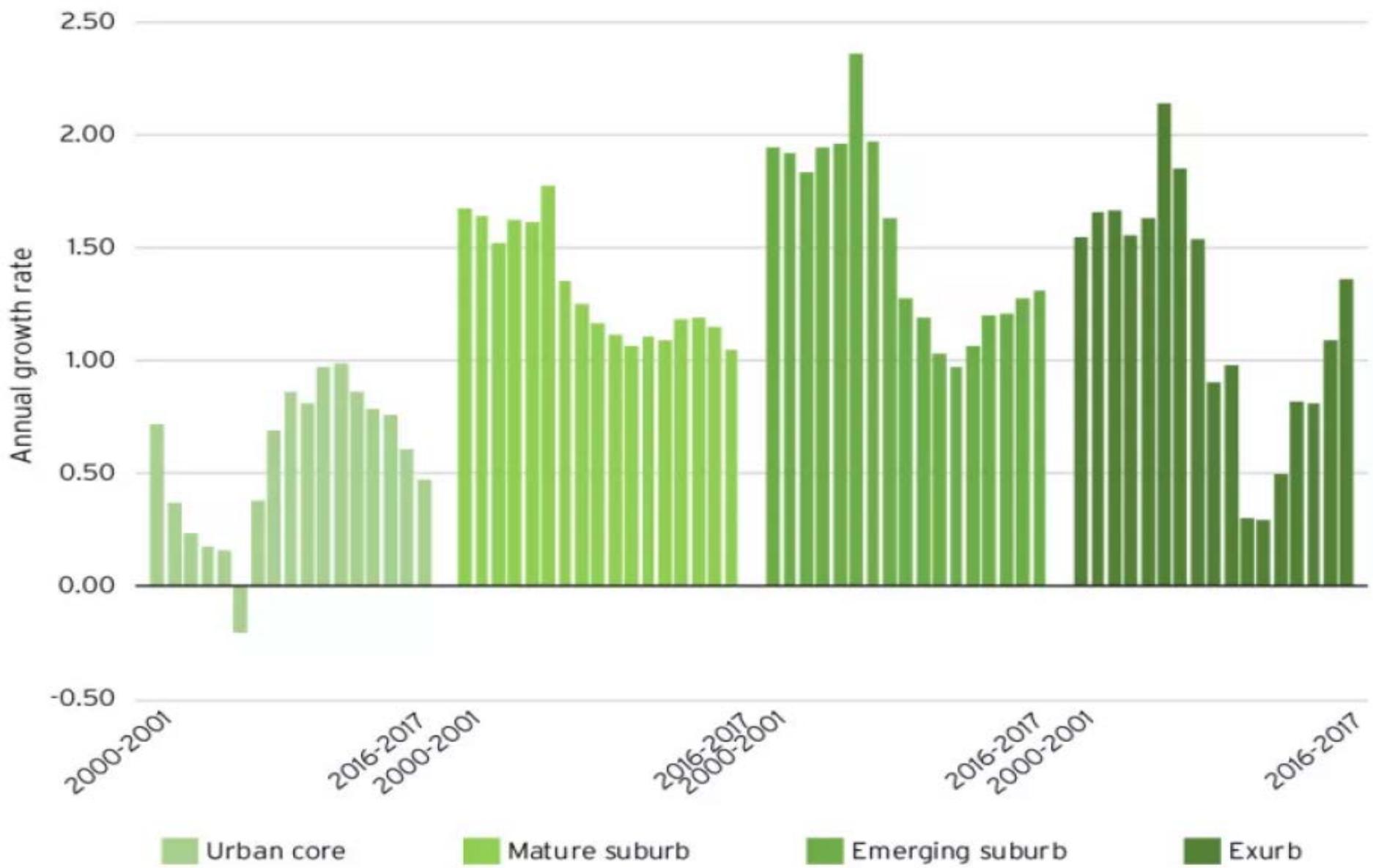
- Flexible and high throughput (possibly with storage capacity).
- 24/7 operation and low priority on labor access



- Large, technologically advanced logistics facilities will appear along major shipment corridors (e.g. Interstates, ports, and airports)
- Possible network reconfiguration (e.g. additional layer of logistics facilities)

Annual growth rates for urban and suburban counties

2000-2017*



Source: Brookings Institute

Expected land use impacts of (sub)urbanization

After rent, distance to shipment origin/destination is one of the most important decision variables for logistics facilities siting.



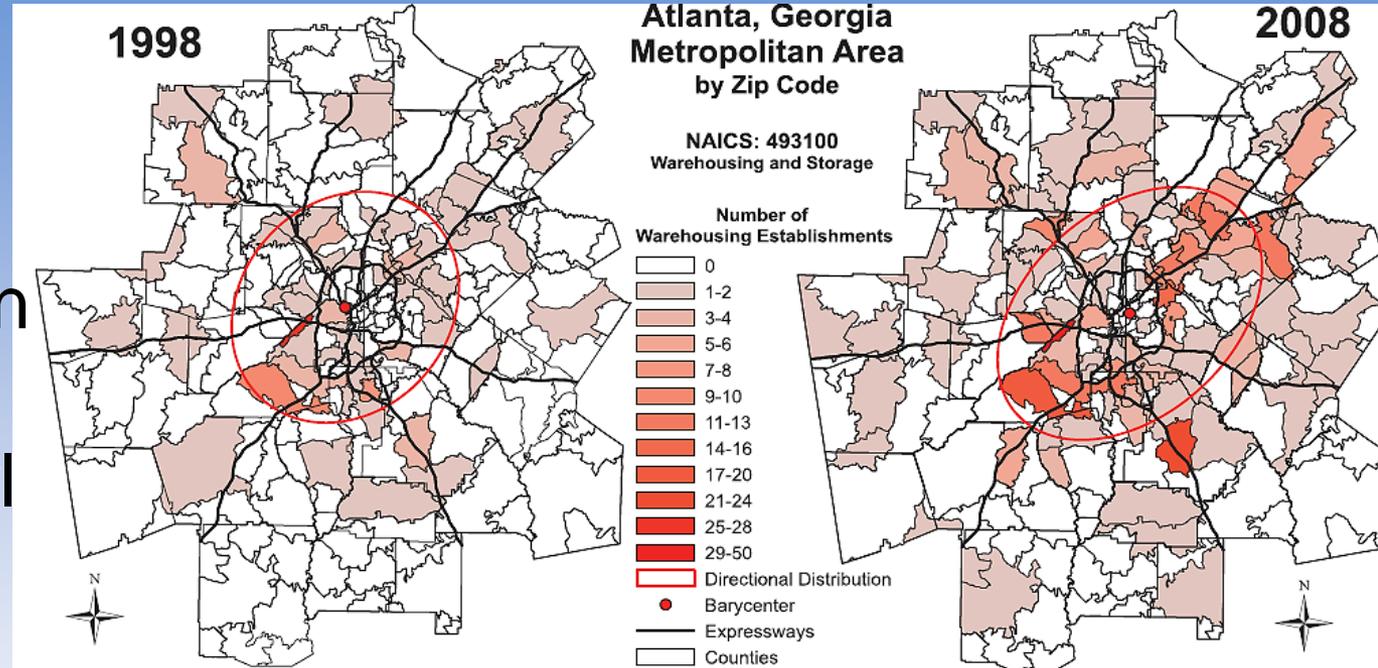
If population & jobs decentralize, logistics sector will follow



Exacerbate decentralization (“Logistics Sprawl”).

Expected land use impacts

Both vehicle technologies and urbanization point to more Logistics Sprawl



Dablanc & Ross, 2012

It is not well understood how logistic sprawl affect truck travel.

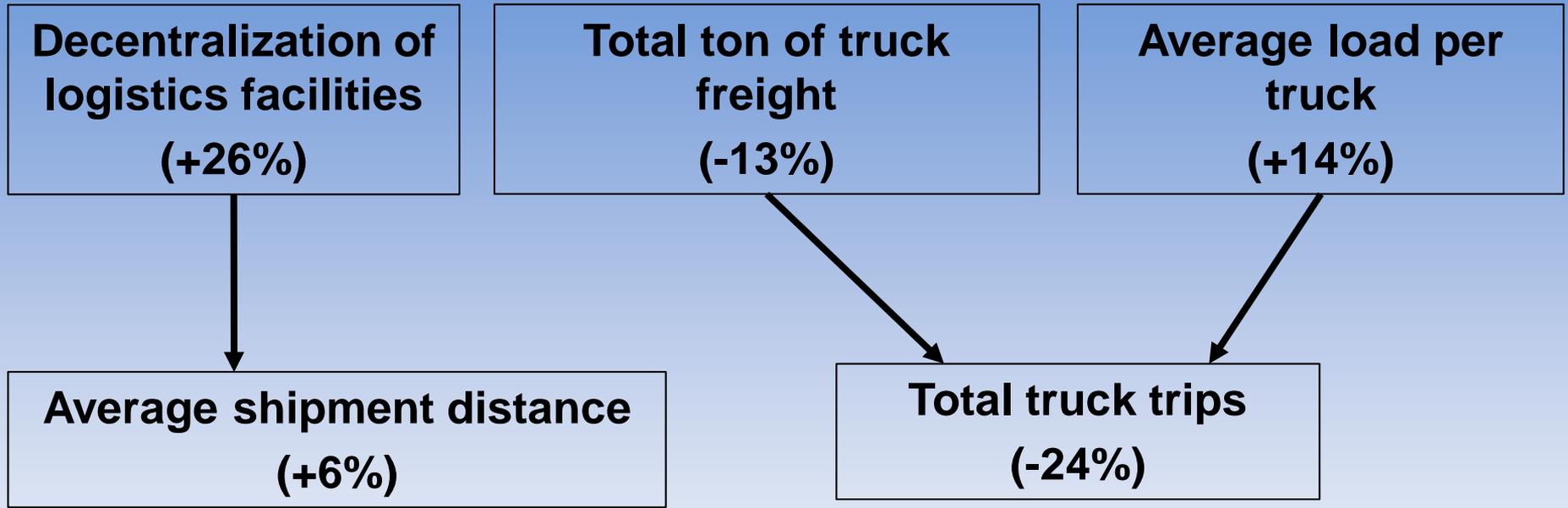
TMFS 2003 and 2013

**Decentralization of
logistics facilities
(+26%)**

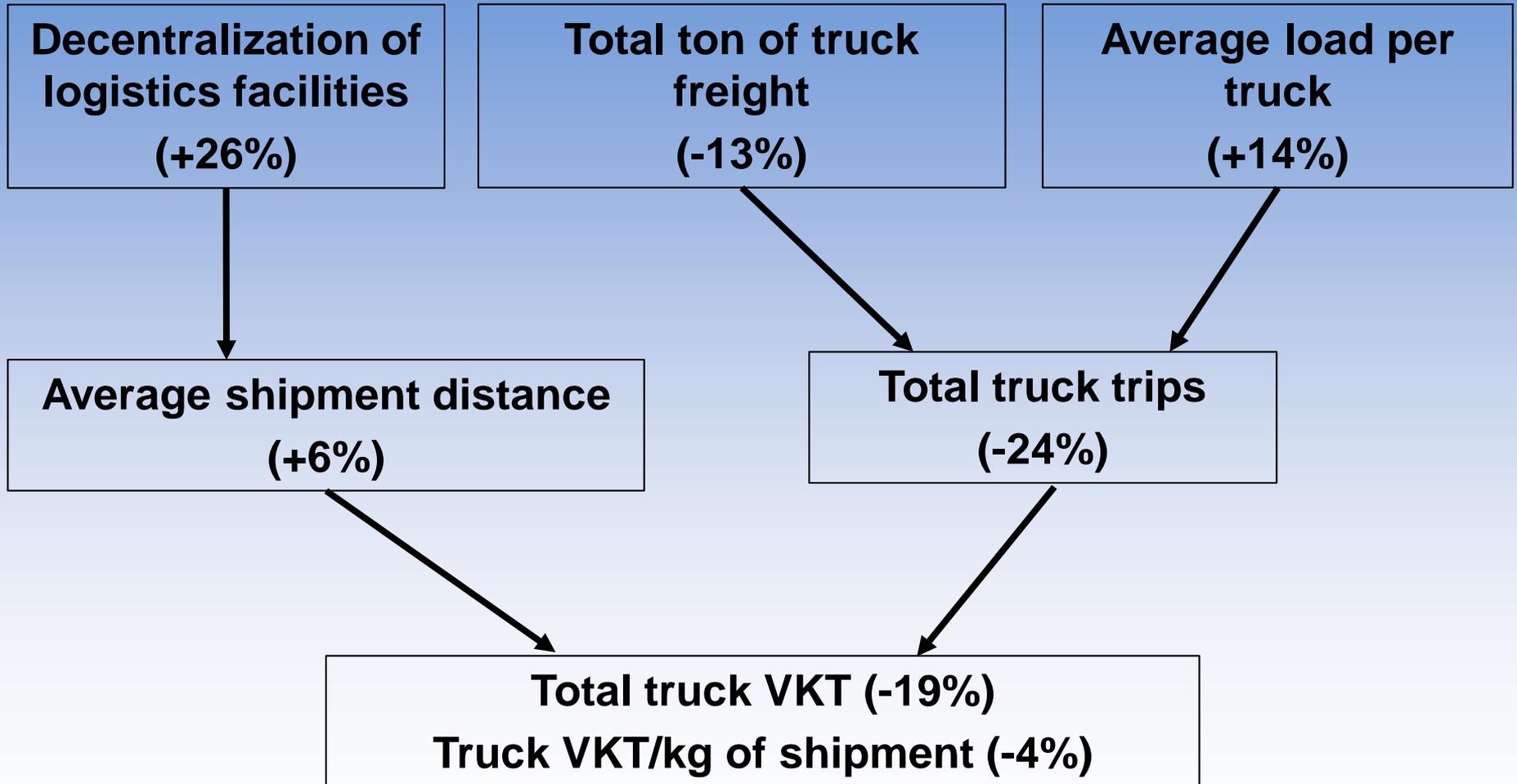


**Average shipment distance
(+6%)**

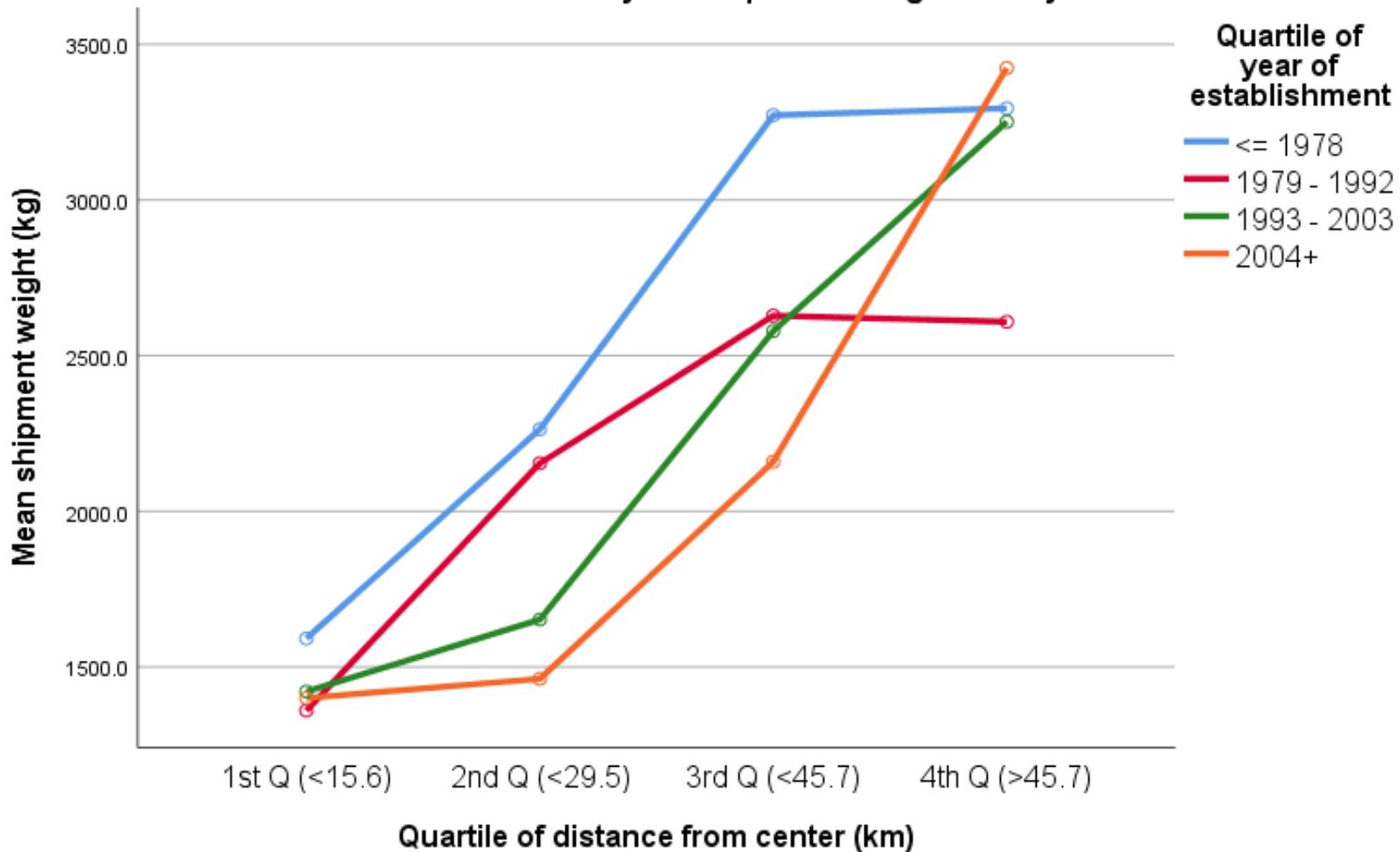
TMFS 2003 and 2013



TMFS 2003 and 2013



2013 Tokyo Metropolitan Freight Survey



Urban facilities tend to produce more truck trips per ton of good shipped in comparison to suburban or exurban ones

Summary

- Container freight is the front-runner in technology adoption (automation)
- Line-haul trucking segment will be under pressure to respond
- System-wide penetration of advanced technologies should eventually occur but take time due to size of investment needed
- Research need for system-wide gains to inform public sector investment
- Research need for system and data integration
- Research need for regulation of CAV technologies

Summary

- We will see more rural facilities and Logistics Sprawl
- (Sub)urbanization will also exacerbate Logistics Sprawl
- Research need for understanding logistics Sprawl-truck travel relationship

**URBAN PLANNING
AND POLICY
COLLEGE OF
URBAN
PLANNING AND
PUBLIC
AFFAIRS**



Thank you

Kazuya Kawamura

Kazuya@uic.edu