

# Changes in the Retail and Distribution Landscape: Behavioral and Logistics Modeling Implications

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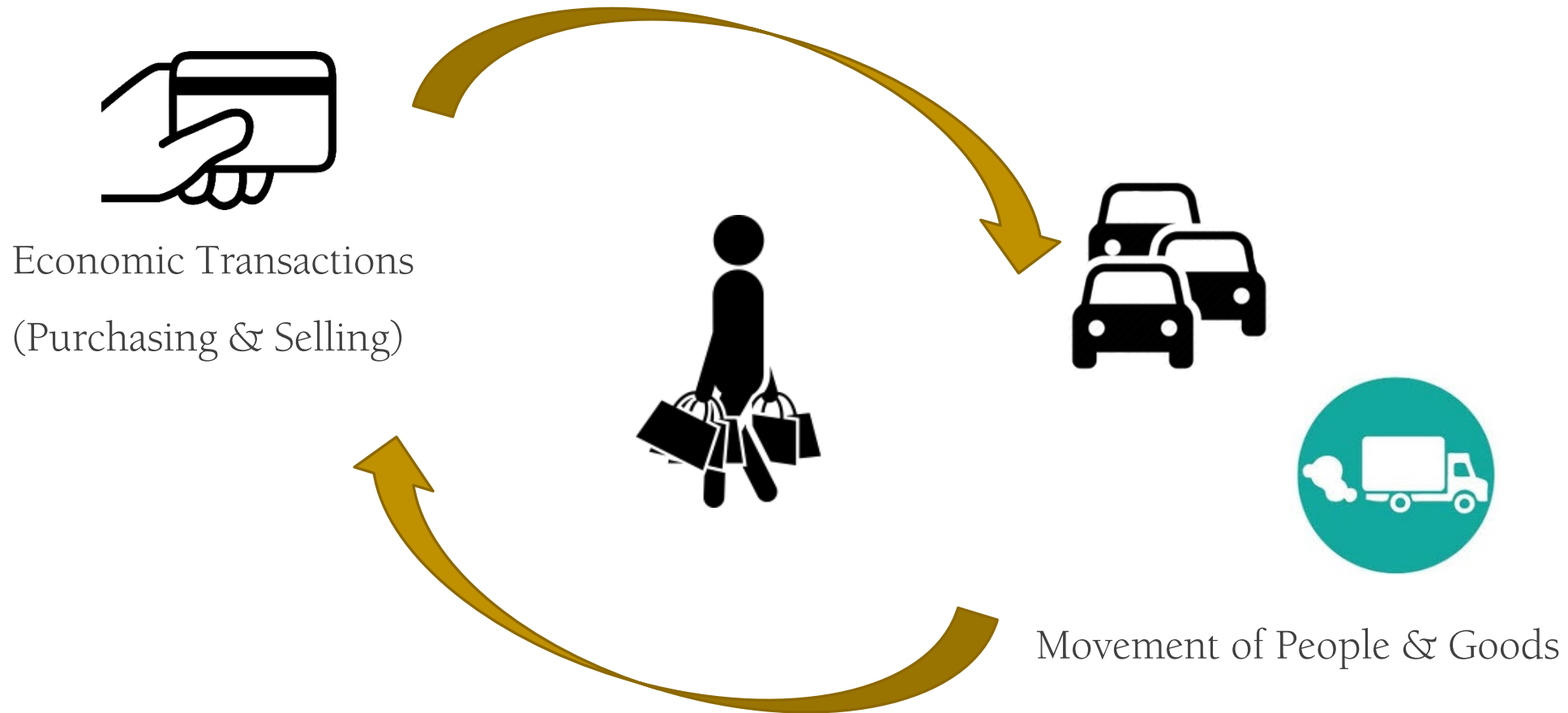
Associate Professor, Civil & Environmental Engineering,  
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Institute of Transportation Studies (ITS)  
University of California, Davis (UCD)

# Outline

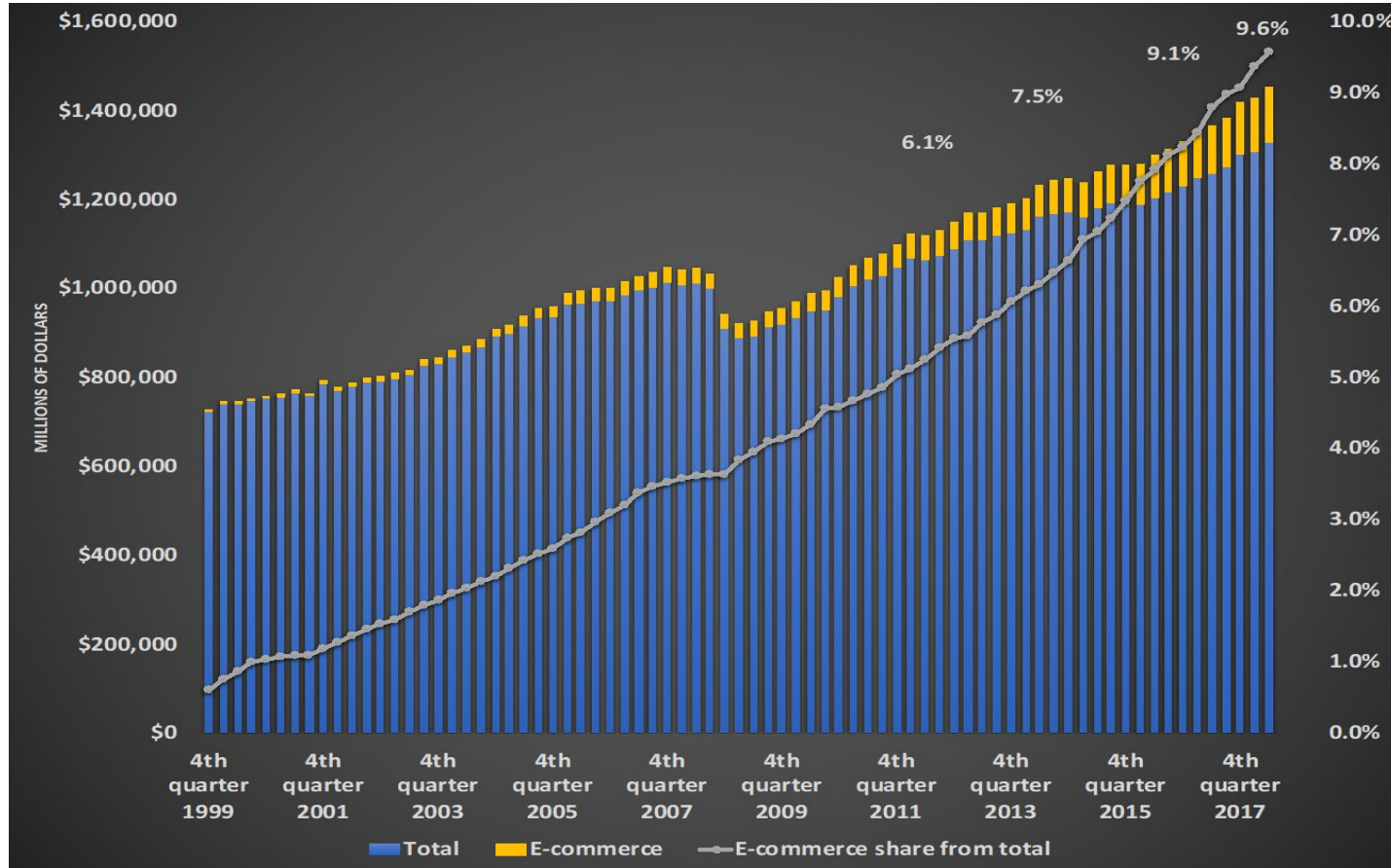
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- Background
- Disruptions in the Retail & Distribution Landscape
  - Retail
  - Shopping Behaviors
- Examples in California
- Key Modeling Implications

# Retailing and Distribution



# Growth in Retail Sales



E-commerce has  
grown almost 30%  
since 2009

# Shopping

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Any day...

40% of the population shop  
(5-6% shop online) (ATUS, 2016)

Today...

55%-80% of the population shop online  
79% of all shopping influenced by e-commerce  
(NHTS, 2017)

# Retail and Behavioral Disruptions

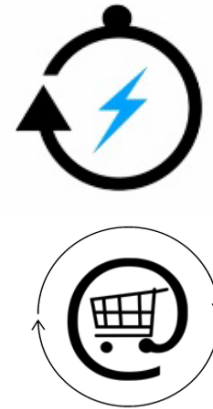
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# Disruptions



## Freight & Logistics

- Location of freight facilities
- Location of demand
- Retail landscape
- Inventory practices and distribution services



## E-commerce

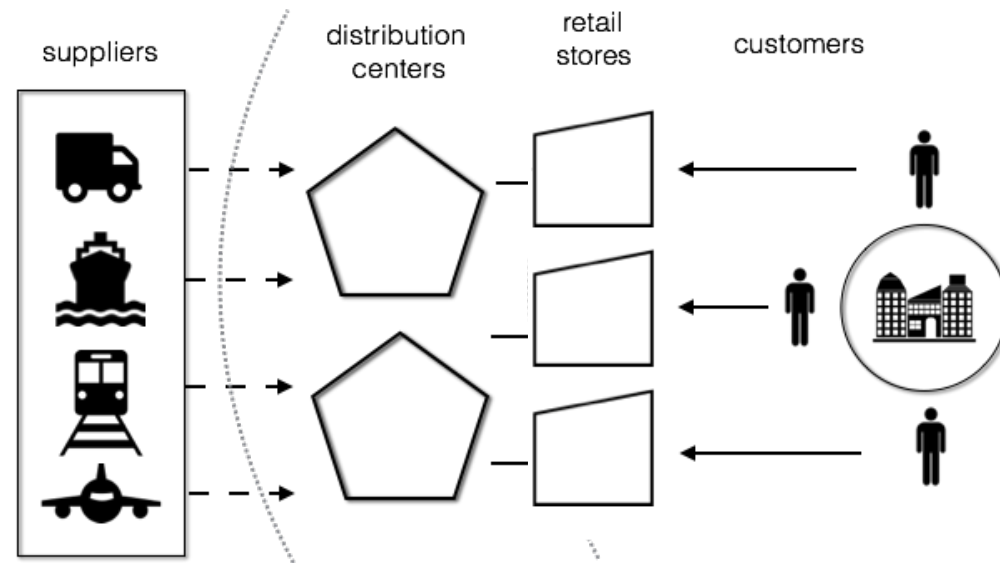
Omni-channel distribution  
and consumer behaviors



## Shopping Practices

- Shopping process (search, purchase, transport)
- Tradeoff between individual's travel and deliveries

# Freight & Logistics





# Retail

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# Changes in Recent Years

THE WALL STREET JOURNAL.

REAL ESTATE | COMMERCIAL REAL ESTATE

## Shopping-Mall Vacancies Are Highest in Seven Years After Big-Box Closings

The vacancy rate has risen despite the country's strong economic growth

Forbes

EDITOR'S PICK | 31,195 views | Oct 14, 2018, 05:53am

### The Fall Of The Mall And How To Make Them Rise Again

odyssey

## The Death Of The American Mall

Mall culture is dying, and here is why.

by Nikki Linnea Bridgewater State University | Jan 8, 2018

TIME

U.S. POLITICS WORLD TECH ENTERTAINMENT

U.S. • SHOPPING

## Why the Death of Malls Is About More Than Shopping

Vox

RECODE EXPLAINERS THE HIGHLIGHT FUTURE PERFECT THE GOODS POLITICS & POLICY MORE

## What the decline of American shopping malls means for social space

By Carlos Waters | carlos.waters@vox.com | Apr 11, 2018, 11:10am EDT

Vox

RECODE EXPLAINERS THE HIGHLIGHT FUTURE PERFECT THE GOODS POLITICS & POLICY MORE

## Get ready for the regional shopping mall apocalypse

Fragile ecosystems poorly suited to a changing world.

By Matthew Yglesias | @mattyglesias | matt@vox.com | May 4, 2017, 9:00am EDT

# Retailers are Closing Stores

ANNTAYLOR	268	BON•TON	256		500
	250	JCPenney	8		65
Brookstone®	102	★ macy's	11		150
 Foot Locker	110	TOYS R US	~800		
	200	sears 	~700		
GAP	200				

<https://www.forbes.com/sites/pamdanziger/2018/10/14/the-fall-of-the-mall-and-three-ways-to-make-them-rise-again/#6f30d37b58ef>

# Forecast

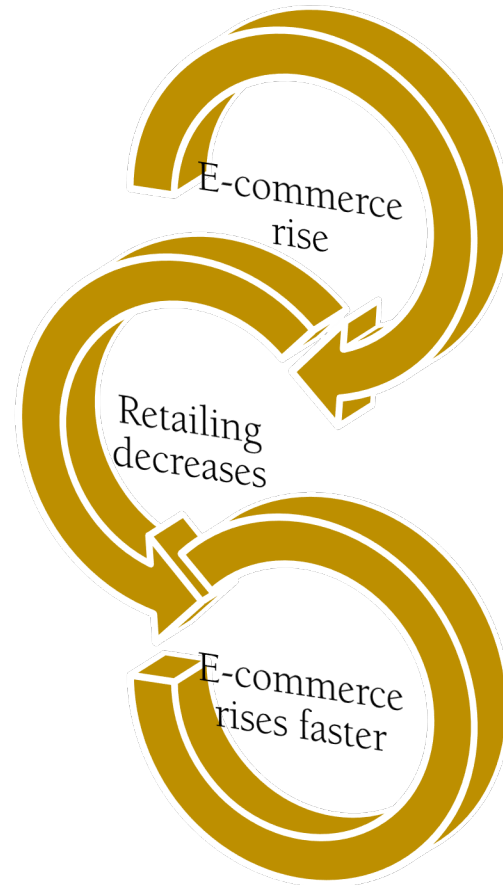
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1/5 – 1/4 of all malls will close in the  
next 5 years

Credit Suisse

[https://research-doc.credit-suisse.com/docView?language=ENG&format=PDF&sourceid=csplusrsearchcp&document\\_id=1075851631&serialid=0H35FD75wQHBUjm3x5lkvUaUWAN03QsDSMQWFvss5x4%3D](https://research-doc.credit-suisse.com/docView?language=ENG&format=PDF&sourceid=csplusrsearchcp&document_id=1075851631&serialid=0H35FD75wQHBUjm3x5lkvUaUWAN03QsDSMQWFvss5x4%3D)

# Cascading Effects



E-commerce will grow from 17%  
of industry sales to 35%+

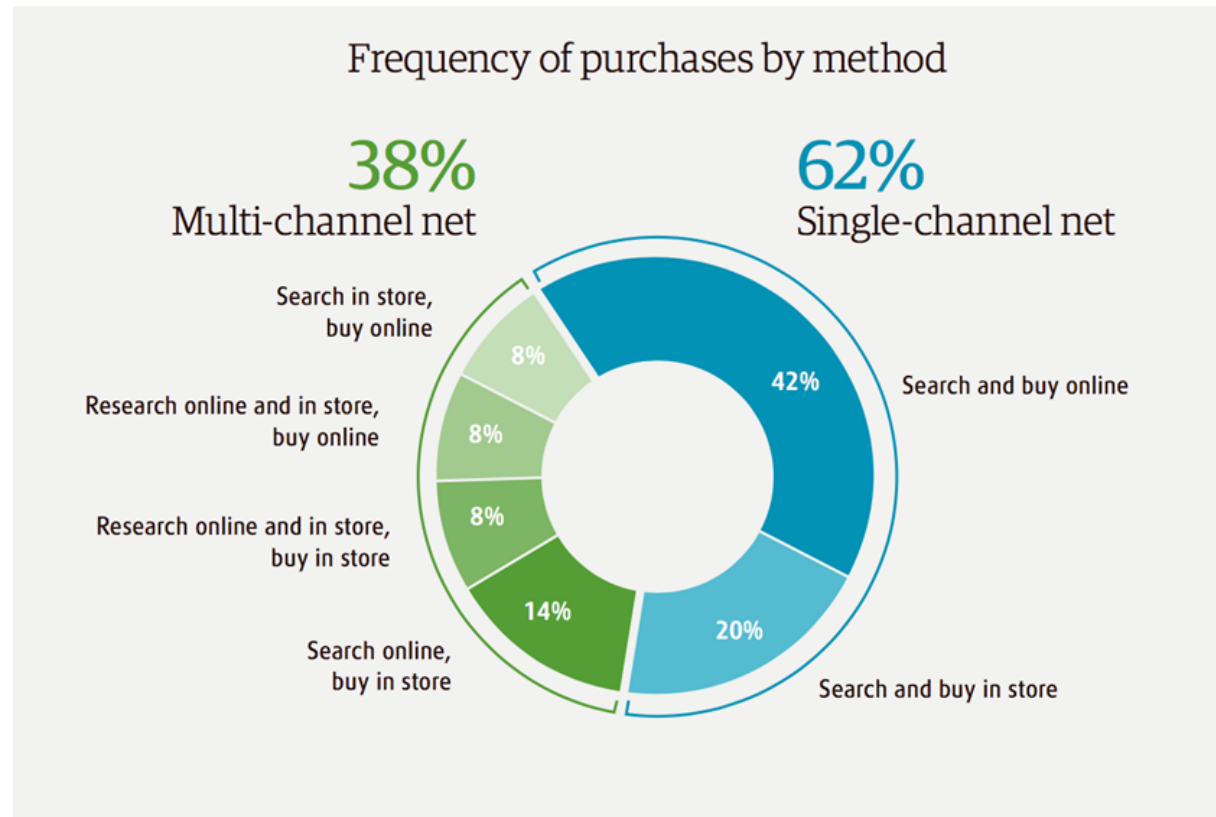
Credit Suisse

[https://research-doc.credit-suisse.com/docView?language=ENG&format=PDF&sourceid=csplusresearchcp&document\\_id=1075851631&serialid=0H35FD75wQHBUjm3x51kvUaUWAN03QsDSMQWFvss5x4%3D](https://research-doc.credit-suisse.com/docView?language=ENG&format=PDF&sourceid=csplusresearchcp&document_id=1075851631&serialid=0H35FD75wQHBUjm3x51kvUaUWAN03QsDSMQWFvss5x4%3D)

# Shopping Behavior

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# How We Shop

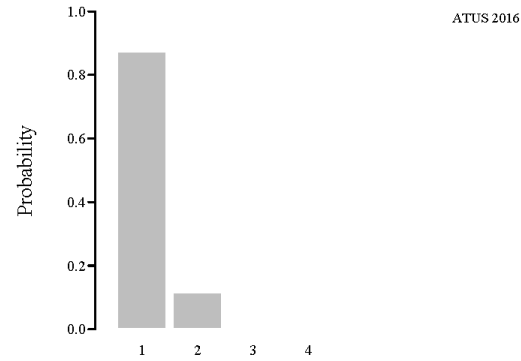


Stores continue to play a major role even among avid online shoppers

Almost half (45%) of the avid online shoppers agree that shopping in store is still a major part of their shopping routine.

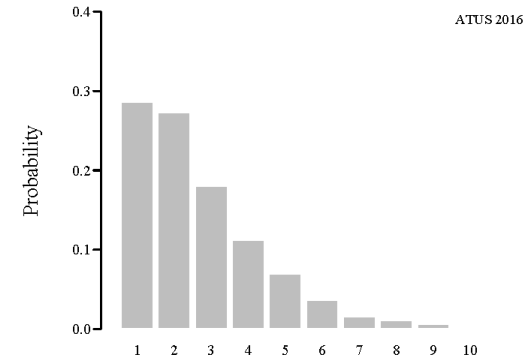
# Shopping Travel

(a) Shopping tours per person



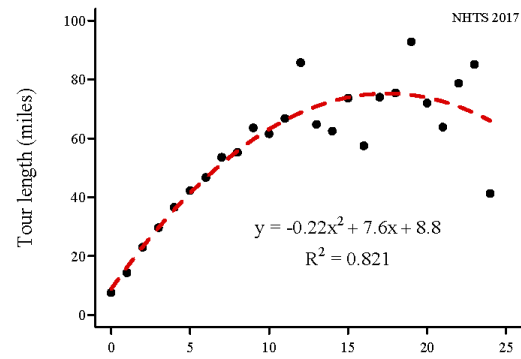
Shopping tours per person

(b) Stops per shopping tour



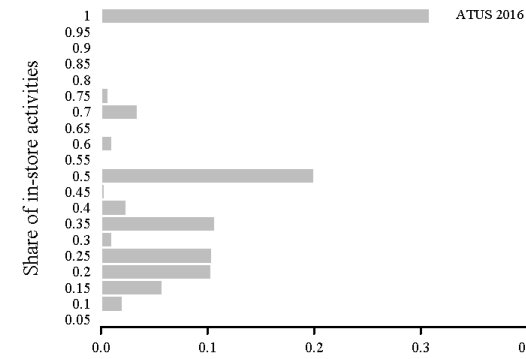
Stops per shopping tour

(c) Tour length vs Stops



Stops per tour

(d) Share of in-store activities in a shopping tour



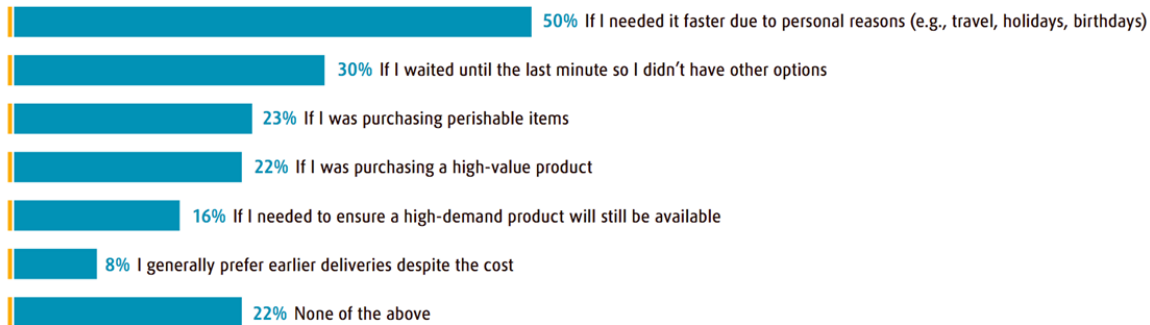
Frequency



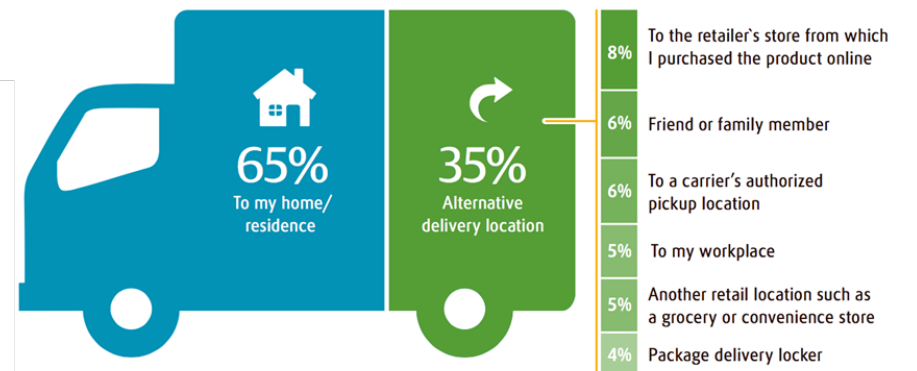
# Delivery Preferences



Circumstances under which shoppers are willing to pay a premium for faster shipping



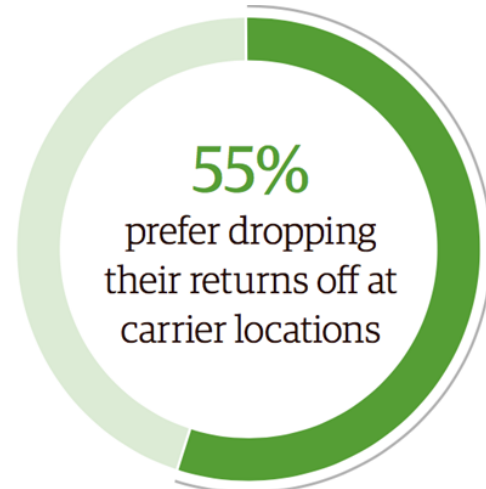
## Preference in delivery location



Source: UPS Pulse of the Online Shopper™ White Paper, June 2016

# Convenience of Returns

Preferred way to get return to shipping carrier



21%  
Leave it in my mailbox  
or by my front door

13%  
Schedule a pickup from  
my home or office, so I  
can hand it to a driver  
(a pickup fee may apply)

6%  
Hand the package to  
the carrier's driver  
when I see them

5%  
Bring it to my office  
to include in my  
company's regularly  
scheduled pickup



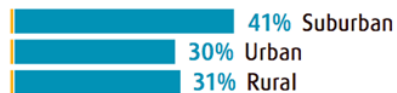
Bring it to the carrier's  
**retail store** (UPS Store, etc.)



Bring it to the  
carrier's **drop box**



Bring it to a **local business** near my home that accepts  
packages (i.e., independent pack-and-ship stores)



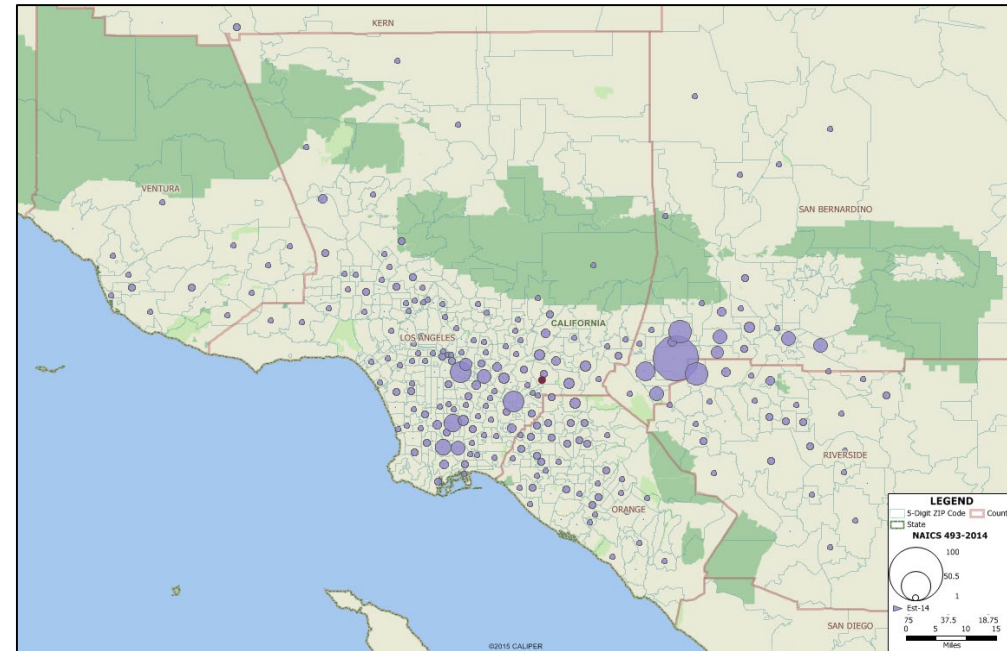
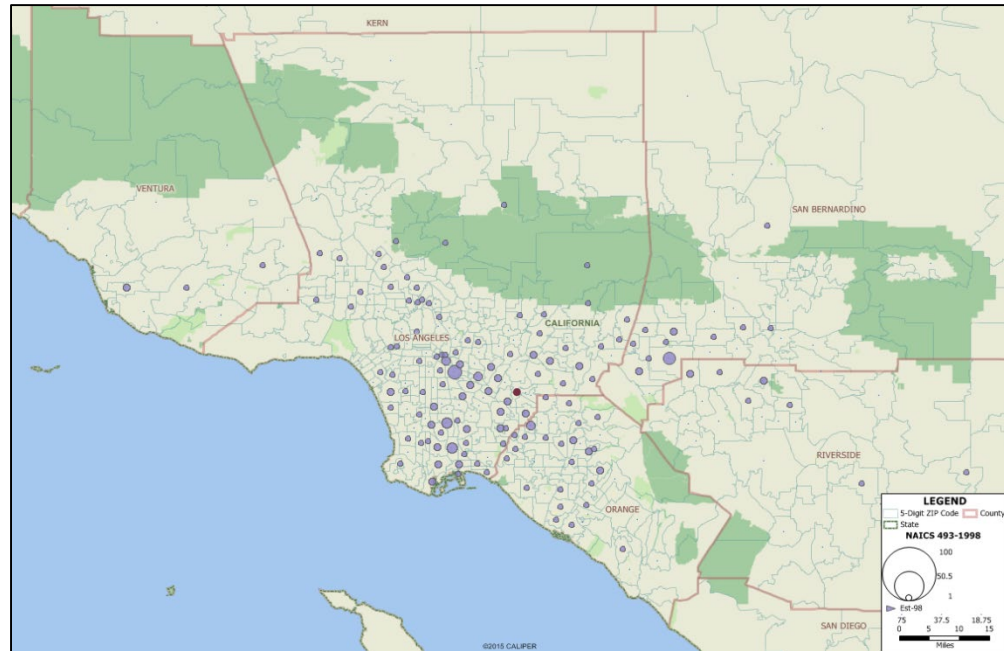
# Examples from California

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# Distribution Landscape

1998

2014



Warehouses and Distribution Centers in Southern California

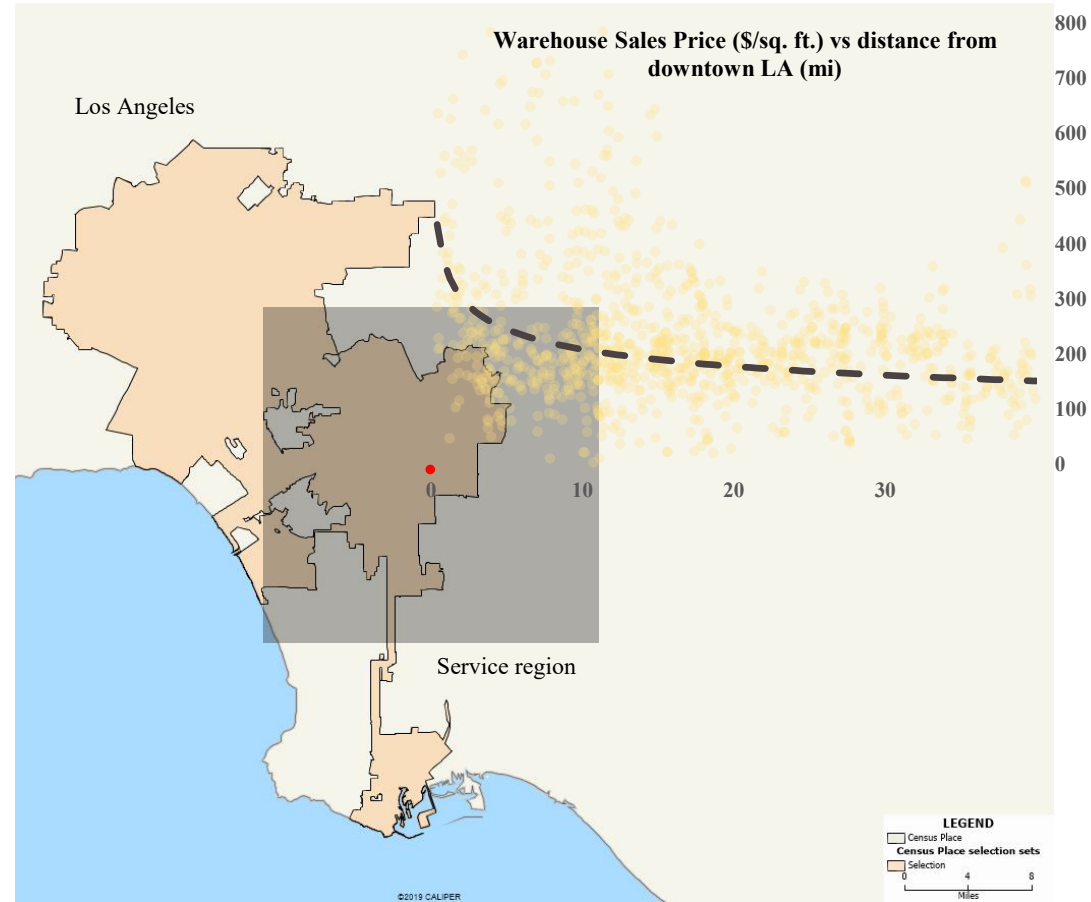
# Serving Los Angeles

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# Serving Los Angeles



Fast delivery services come  
at cost



# Proximity to Customers

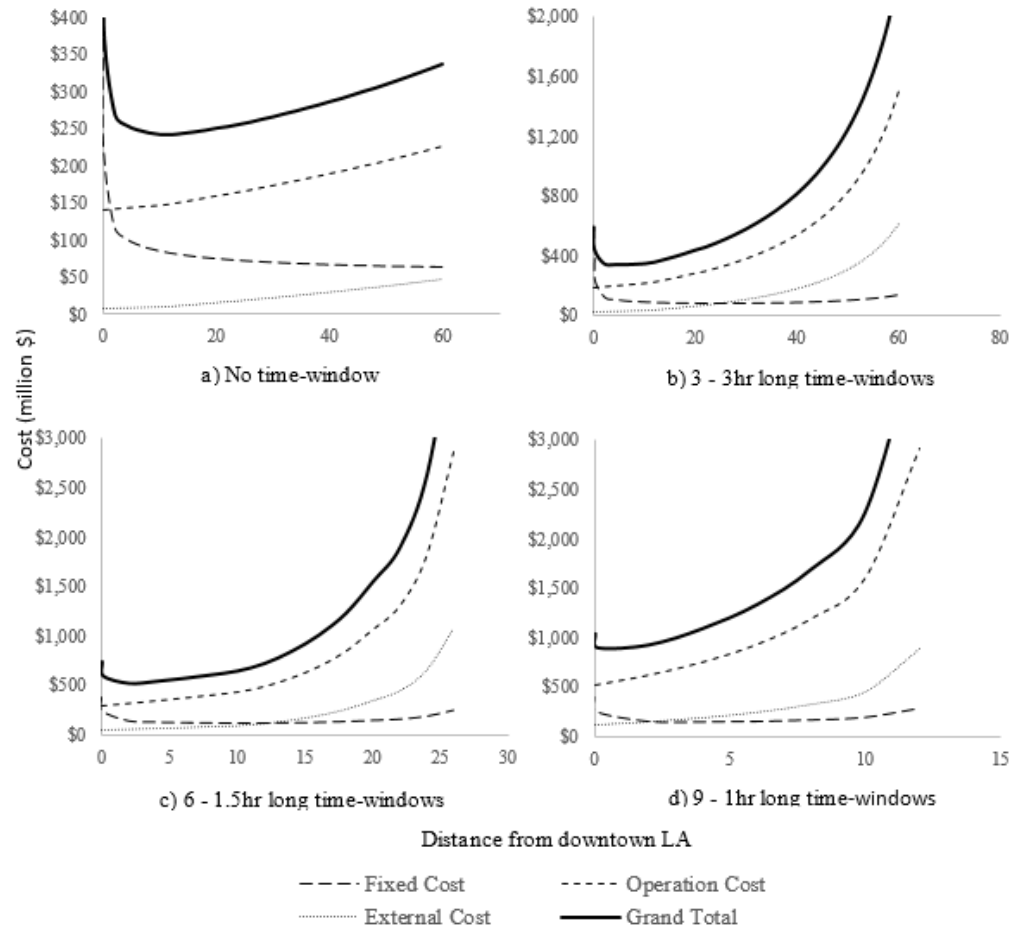
## Costs

Fixed: warehouse, fleet

Operational: driver, maintenance, fuel

Externalities: GHGs and criteria

Time windows: 1, 1.5, and 3 hours



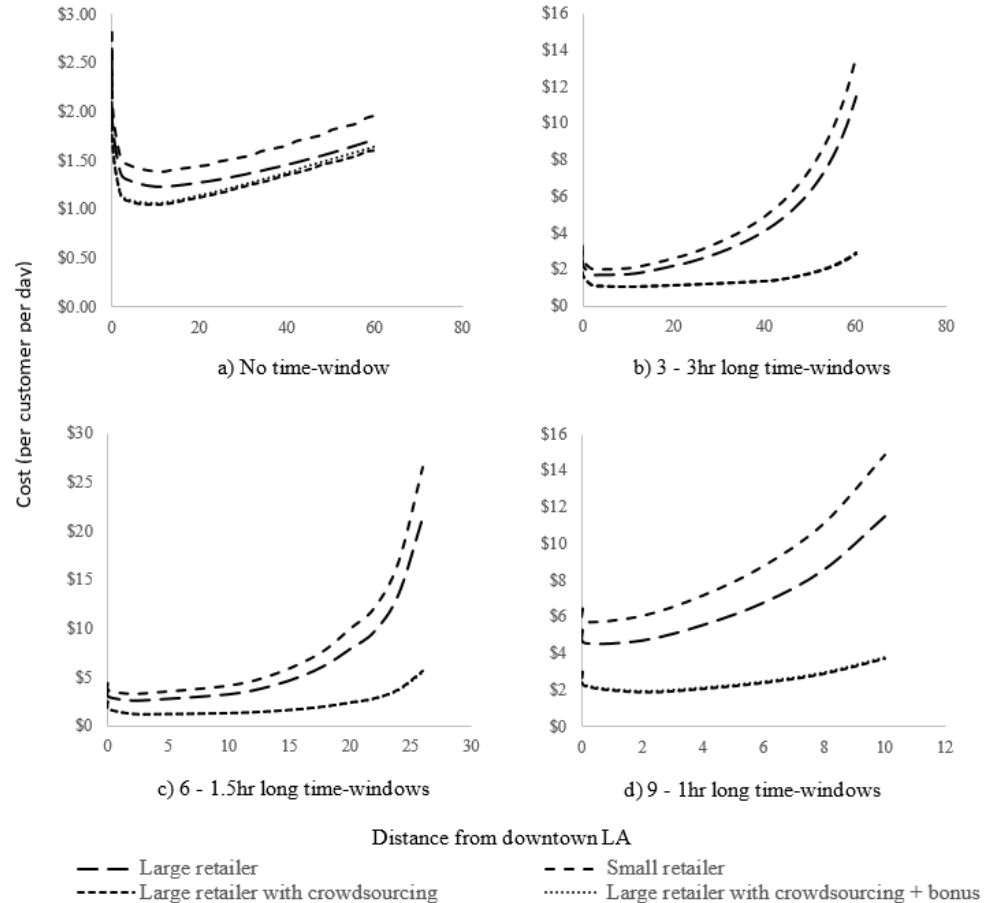
# Market Share

Retailer's market share

Large: 47%

Small: 6%

Crowdsourcing: Flex vehicles





# Serving Sacramento

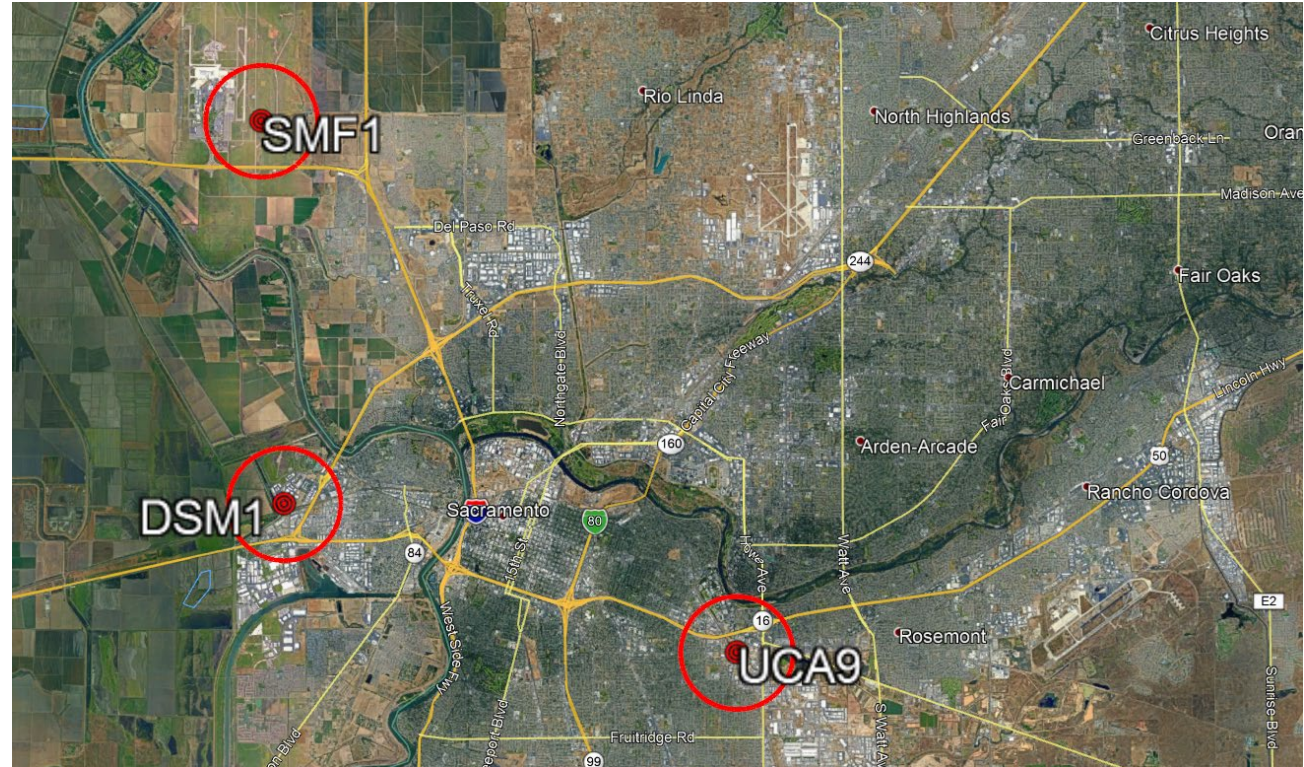
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# Amazon Facilities

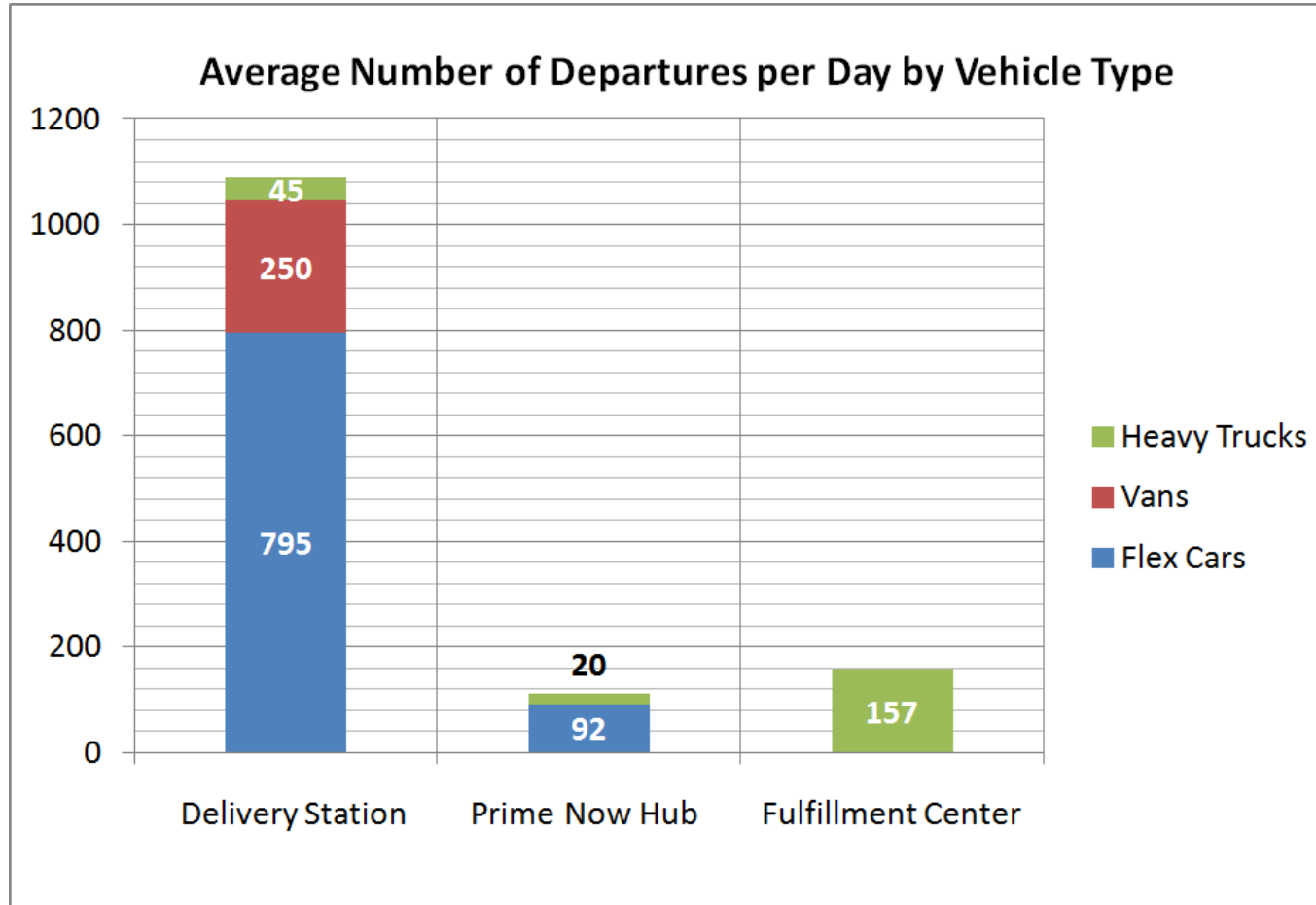
“SMF1” Amazon Fulfillment  
Center

“DSM1” Amazon Delivery  
Station

“UCA9” Amazon Prime Now  
Hub in East Sacramento

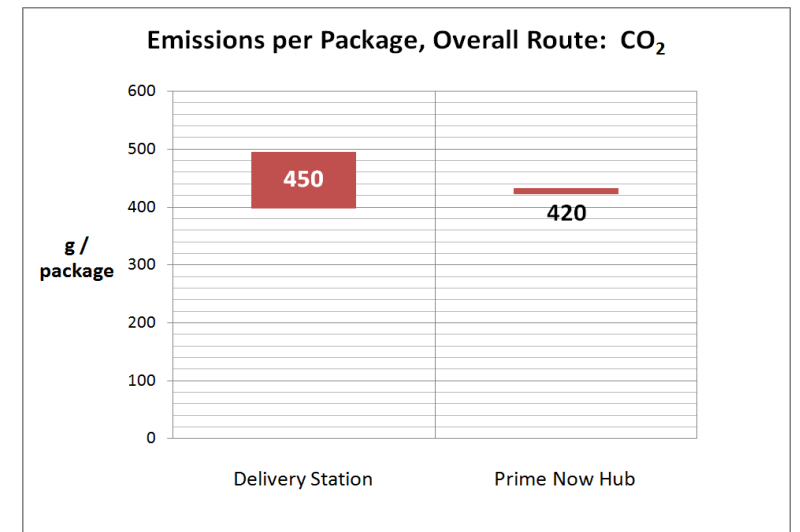
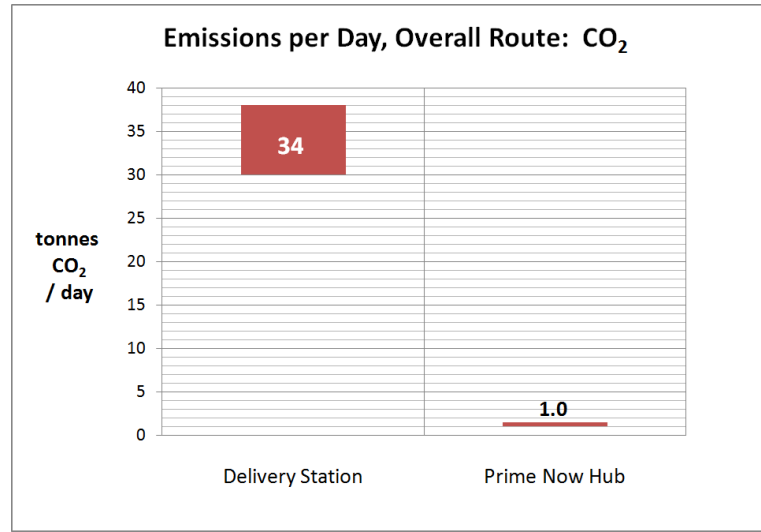
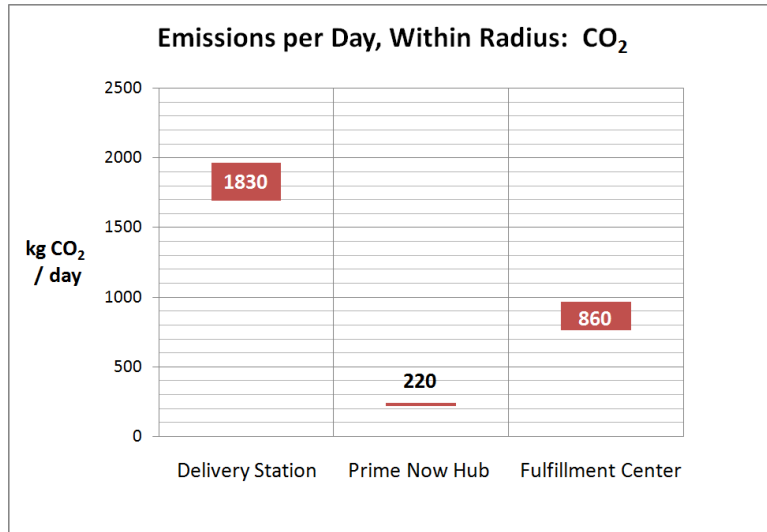


# Distribution Patterns

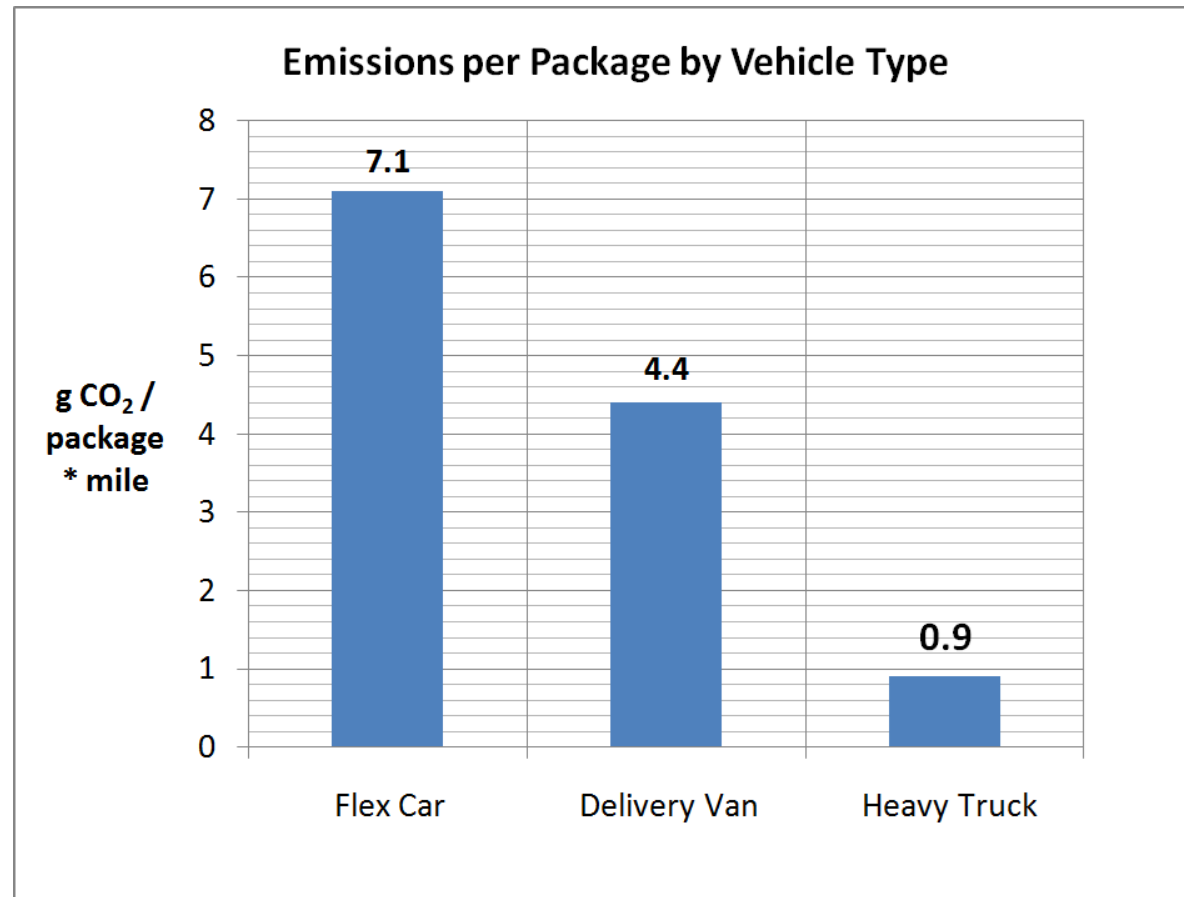


# Estimated Impacts

1 mile radius from the facility



# Efficiency per Delivery Option



# Key Implications

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# Location and Distribution

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Need to be located closer to the customer

- At the expense of facility cost
- Smaller facilities
- Higher delivery frequencies

Time windows:

- Increase the overall cost significantly
- Decrease the distribution efficiency
- Require more vehicles
- Locate even closer to customer

# Location and Distribution

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## Use of crowdsourced deliveries

- Reduce capital expenditures
- Increase freight activity due to smaller vehicles
- Less efficient than vans or trucks
- Allow contending with demand fluctuation
- Trade-offs with other costs

## Distribution structure

- Smaller facilities for distribution, require sortation, and fed by larger facilities
- Last few feet could use alternate distribution modes



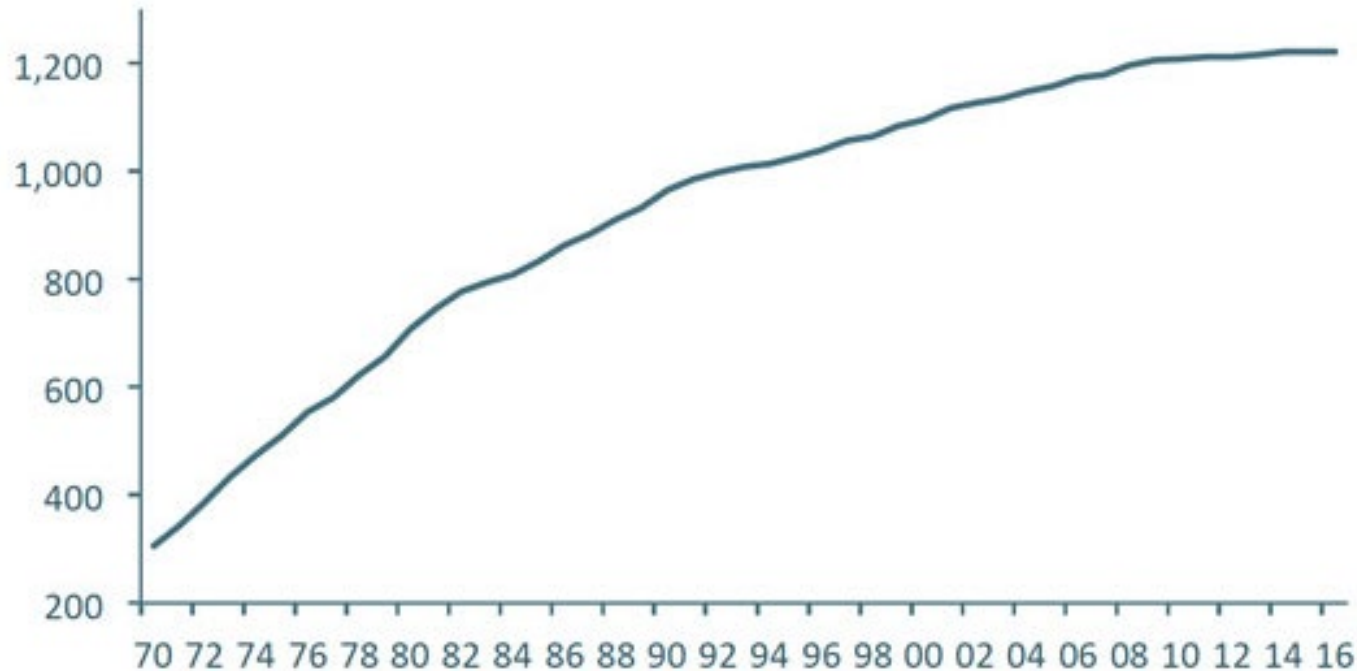
# Questions!

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- Contact info:  
[mjaller@ucdavis.edu](mailto:mjaller@ucdavis.edu)

# Shopping Malls in the US

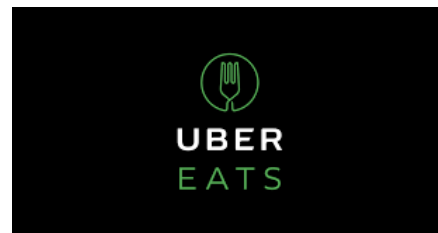
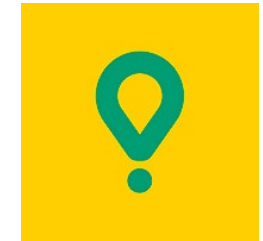


(2012-2017)  
19% drop in:  
Regional and  
Super-regional  
Shopping Centers

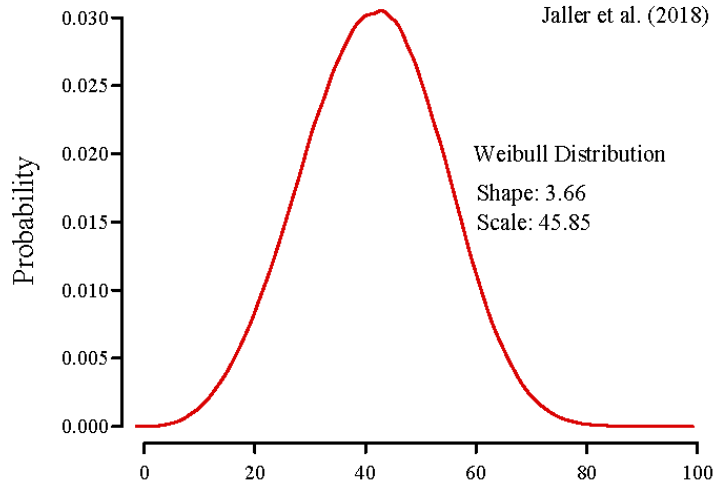
Source: International Council of Shopping Centers  
<https://digital.hbs.edu/platform-digit/submission/death-to-american-malls-its-2018-and-the-largest-mall-operator-in-the-us-refuses-to-agree/>

# Shared Delivery Services

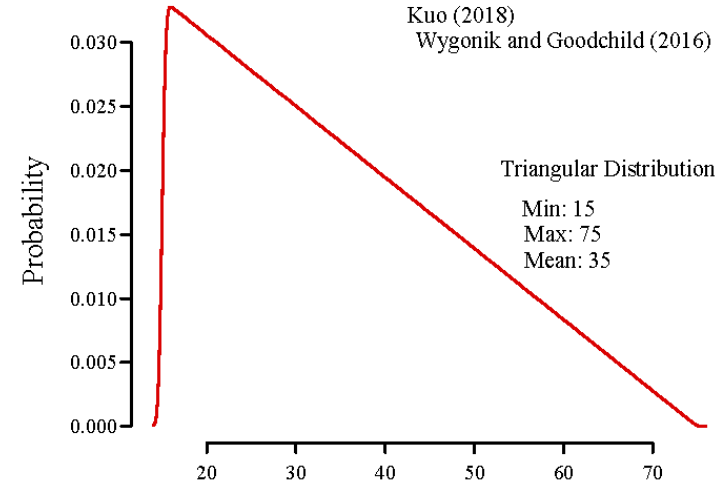
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# Delivery Tours



Delivery tour length (miles)



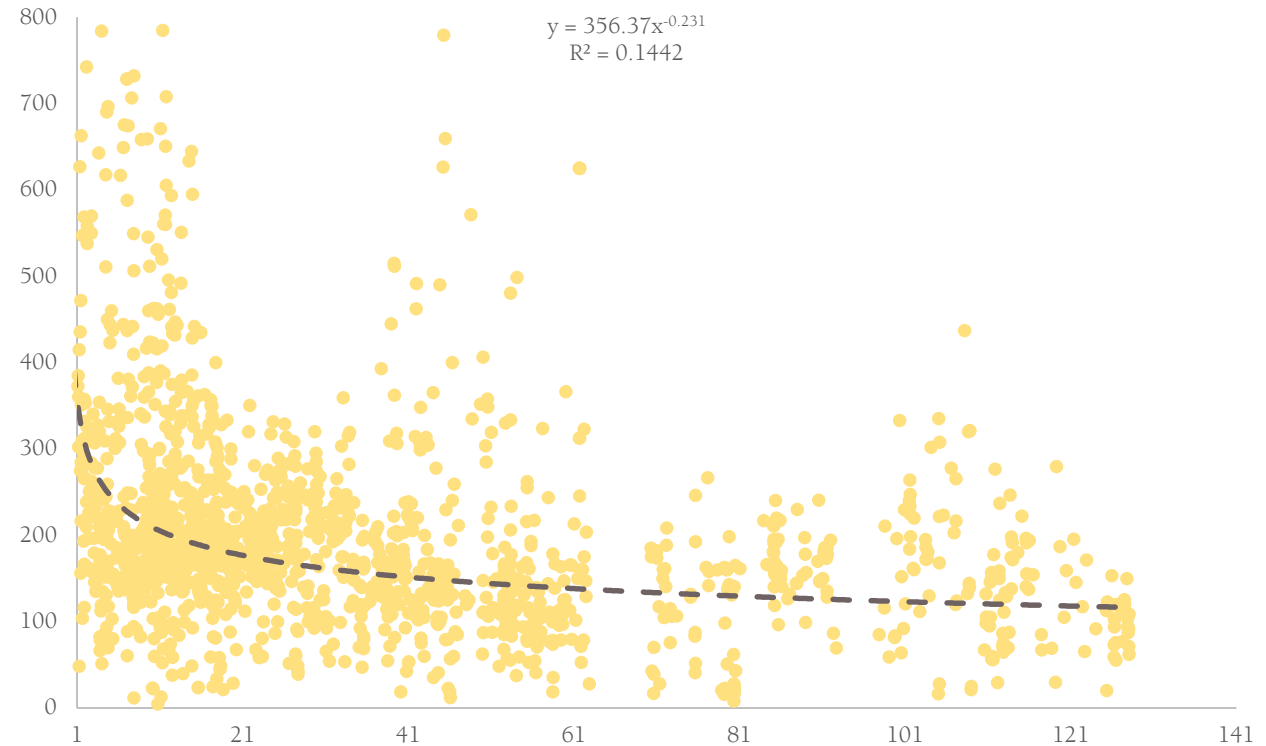
Stops in a tour

# Proximity Costs



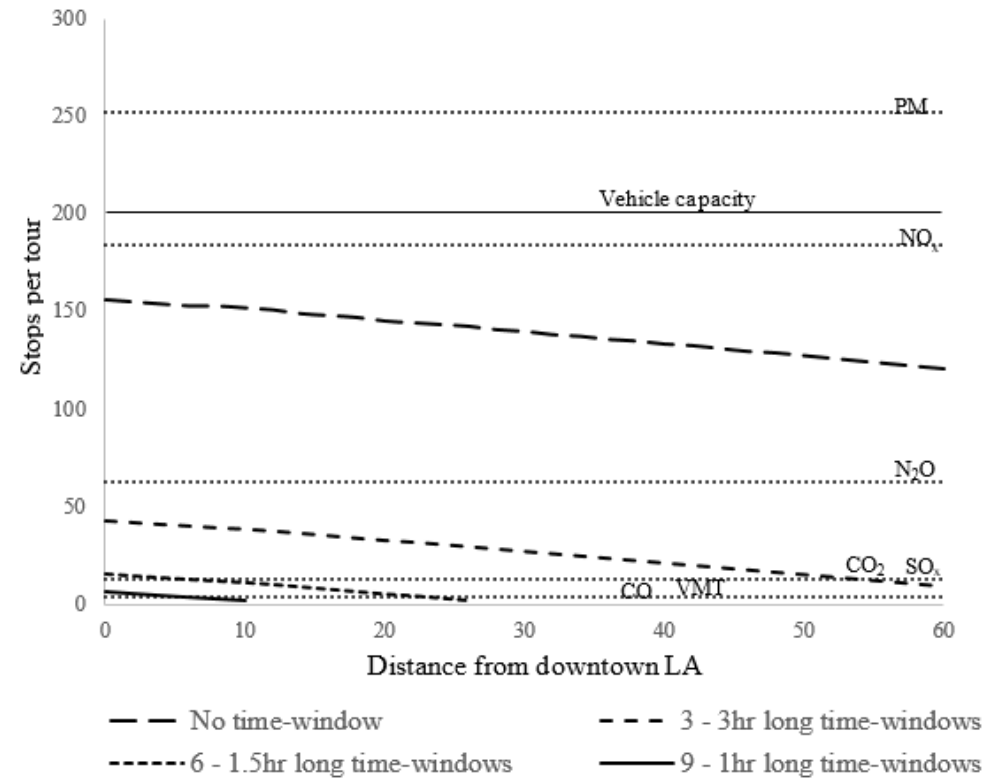
Fast delivery services come  
at cost

Warehouse sales price (\$/sq.ft.) vs. distance from downtown L.A.



# Externalities

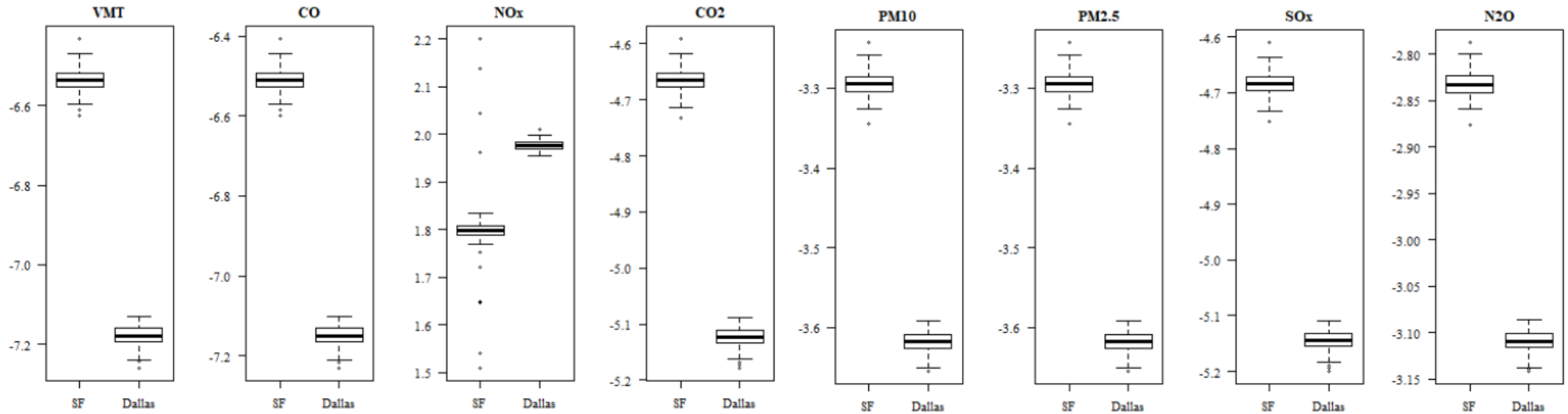
Time windows have a negative effect on the externalities from the delivery operation



# Example from San Francisco and Dallas

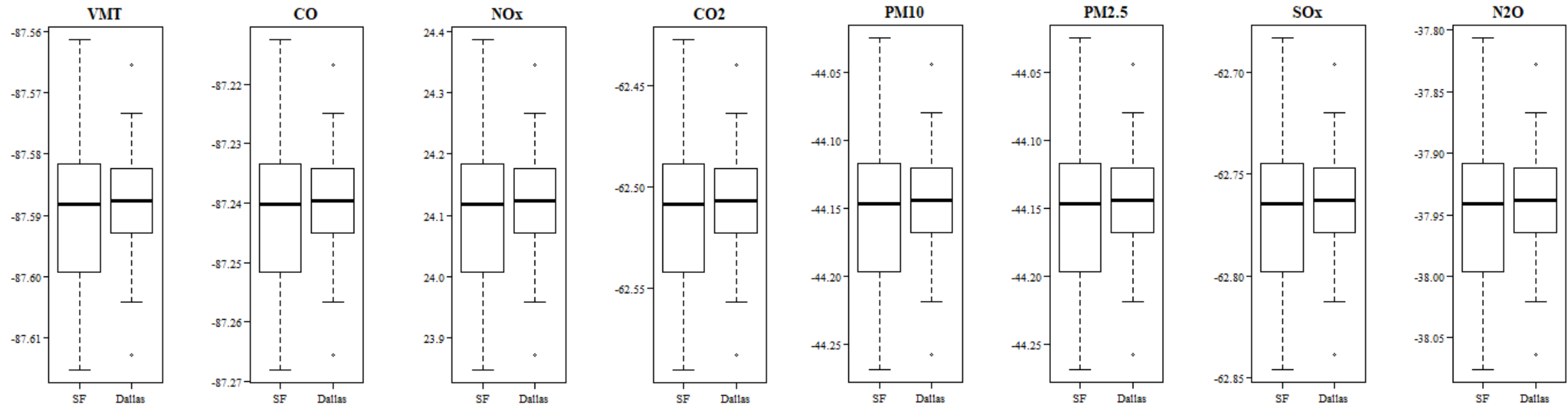
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# Omni-channel vs. in-Store





# Online vs. in-Store



# Shopping Behaviors

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## In-store vs. online

- Online increasing very rapidly
- In-store still dominates
- Store closures increasing
- Less availability in-store
- Customers willing to pay a premium for fast and reliable shipments
- Click-and-pick and option but may not be attractive

## Demographics

- Differences among shoppers and geographic locations

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# Shopping Behaviors

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Shopping includes:

- Pre-purchase: searching/comparison
- Purchasing: channel location and delivery method
- Post-purchase: returns
- Basket size: items per purchase/order
- An related travel

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