

LOCATION OF WAREHOUSES AND ENVIRONMENTAL JUSTICE

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Overview

- ❑ Motivation
- ❑ Questions
- ❑ Research approach
- ❑ Data
- ❑ Results
- ❑ Discussion

Motivation

- ❑ Environmental justice & transportation facilities
 - Airports, rail yards, high-volume freeways, etc. are locally undesirable land uses (LULUs)
 - Co-location of disadvantaged population
- ❑ Warehouses: major truck terminals and attractors
 - Air pollution, noises, pavement damage, accidents
 - Rapid growth of freight demand and warehousing expansion
- ❑ Are warehouses an environmental justice problem?

Motivation



AAA Foundation for Traffic Safety

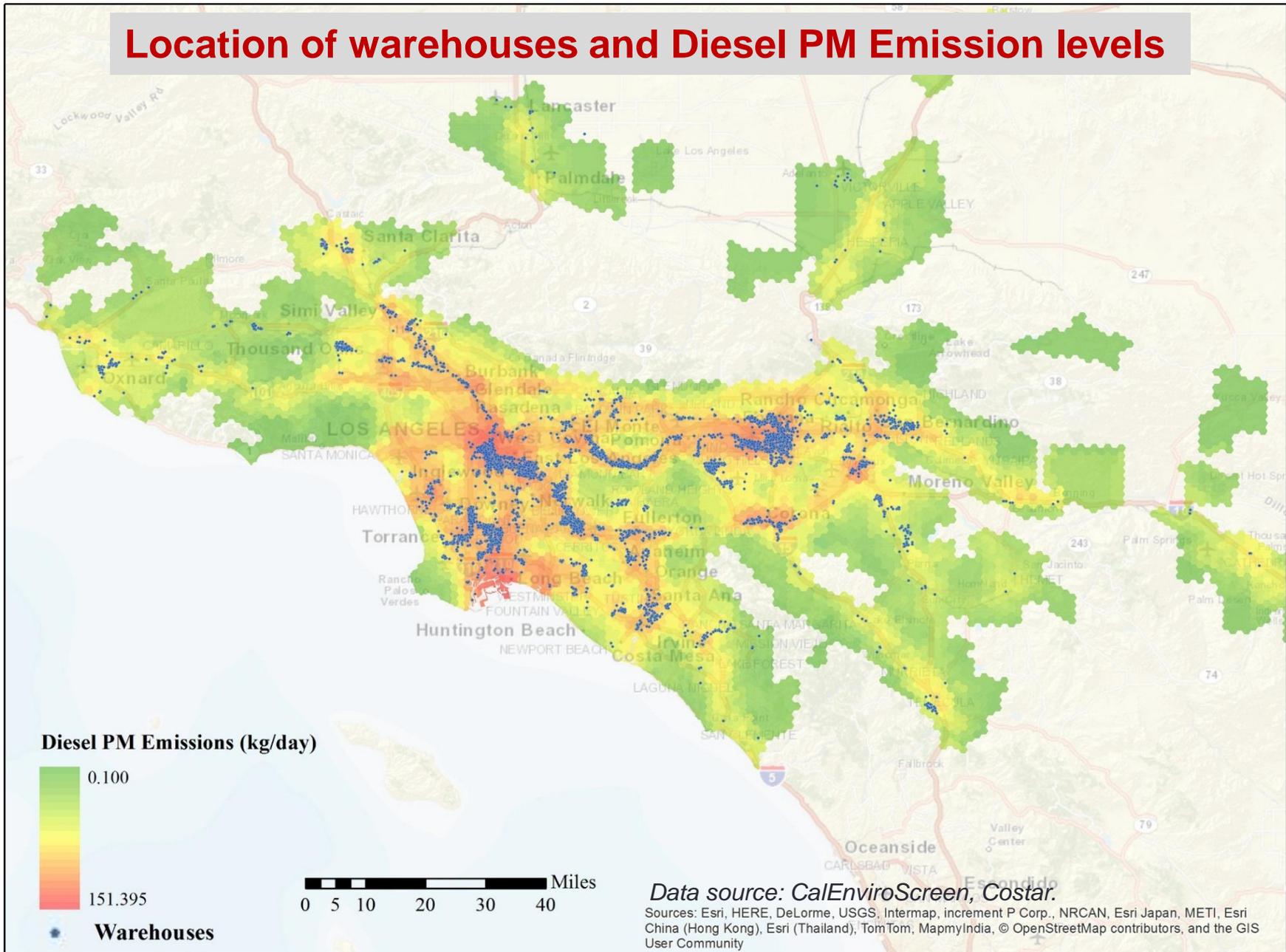


Image source: FHWA, Thebatavian, and NRDC.

Question 1: Are warehouses locally undesirable?

- ❑ Air pollution
 - Trucks generate about 60% of the PM_{10} in total transport related emissions (Dablanc, 2013).
 - Diesel trucks are a major emitter of toxic diesel PM and NOx in California (CARB, 2008).
- ❑ Other environmental externalities
 - Trucks generate high level of noises during operation
 - Trucks contribute disproportionately to pavement damage
- ❑ The Compton case study: truck traffic, noises and complaints.

Location of warehouses and Diesel PM Emission levels



Question 2: Are warehouses disproportionately located in disadvantaged neighborhoods?

- ❑ Economic, Sociopolitical or Racial factors (e.g. Mohai et al., 2009).
 - Land rent
 - Political power of local population
 - Decrease in land values
 - inflow of disadvantaged population
- ❑ Environmental justice issues focus on **Minority** and **Poor** population
- ❑ The Rialto case study: jurisdictional fragmentation, lack of zoning coordination and ineffective political power.

Question 3: Is a disadvantaged neighborhood more likely to have higher warehousing activity intensity?

- ❑ Warehousing activity intensity and truck “footprints”.
- ❑ Warehousing consolidation and clustering (e.g. Cidell, 2010).
- ❑ Disadvantaged neighborhoods may be more subject to high concentration of warehousing activities

Research approach

Estimate models of warehousing location and population characteristics

General form:

$$Y_i = f (PC_i, CV_i)$$

Where: Y = warehousing location

PC_i = population characteristics variables

CV_i = control variables

Research approach

Dependent variables:

Name	Definition
Warehouse location	Whether a TAZ contains at least one warehouse
	Number of warehouses in a TAZ
	Warehousing activity intensity in a TAZ

Binary, discrete and continuous dependent variables

Research approach

Independent variables:

Name	Definition
Population characteristics	Minority ratio Median household income
Transport Access	Distance to nearest highway ramp Distance to nearest airport Distance to nearest seaport Distance to nearest intermodal facility
Zoning	Percentage of areas zoned for residential land uses Percentage of areas zoned for light manufacturing land uses Percentage of areas zoned for heavy manufacturing land uses Percentage of areas zoned for retail land uses
Economic attributes	Employment density Median housing values

Data

- ❑ Study area: The Los Angeles Region
 - 2nd largest metro
 - The largest trade gateway
 - Warehousing development and freight demand
 - Comprehensive data available: Costar, SCAG, LEHD, Census, etc.
- ❑ N of observations = 3,709 Traffic Analysis Zones (TAZs)

Data

- Given the strong linear relationship between **household income** and **minority ratio** in the region, I divide the neighborhoods (TAZs) into categories regarding minority dominance and household income levels:

High-income
Minority

Medium-income
Minority

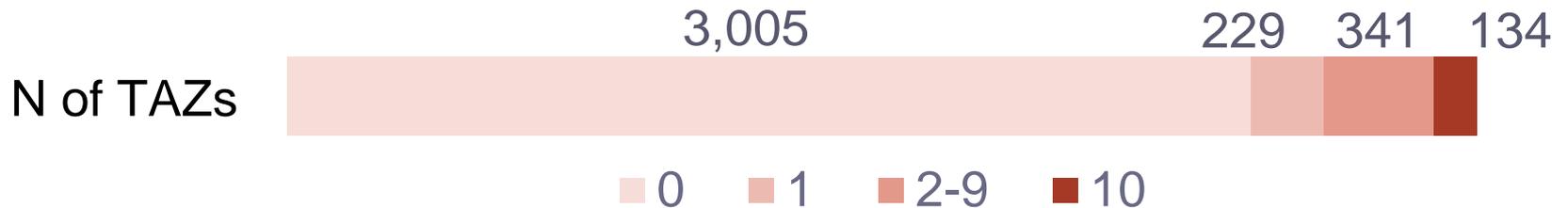
Low-income
Minority

High-income
White

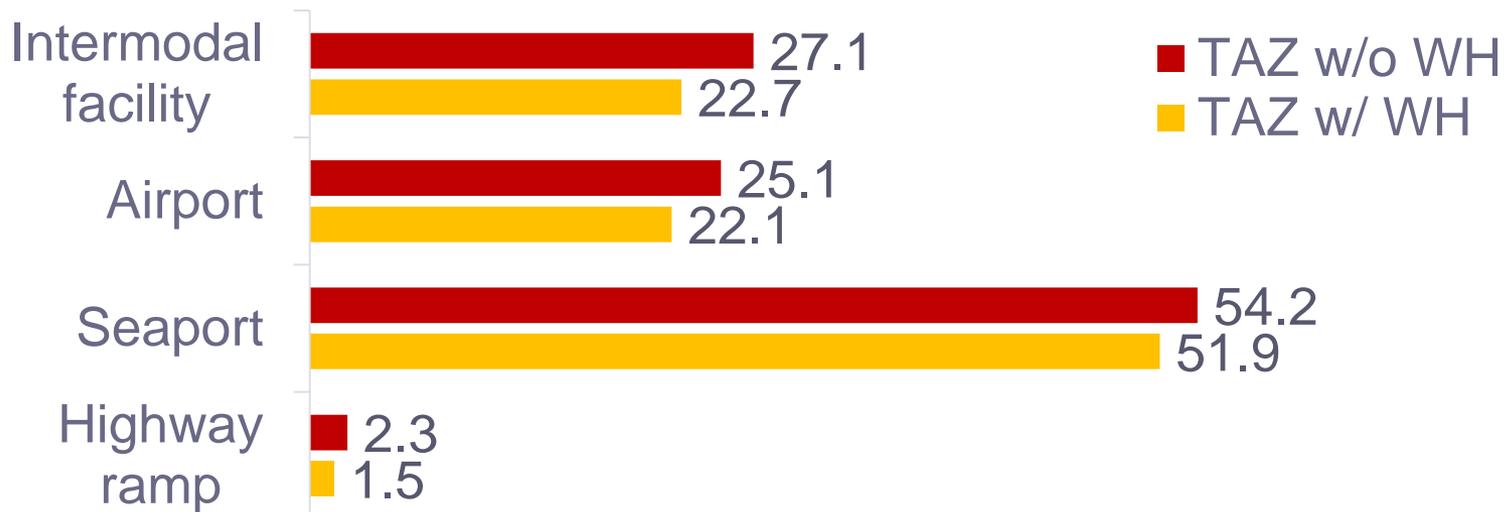
[Reference]
Medium-or-low-income White

Data: warehouse locations

Where are the warehouses located?



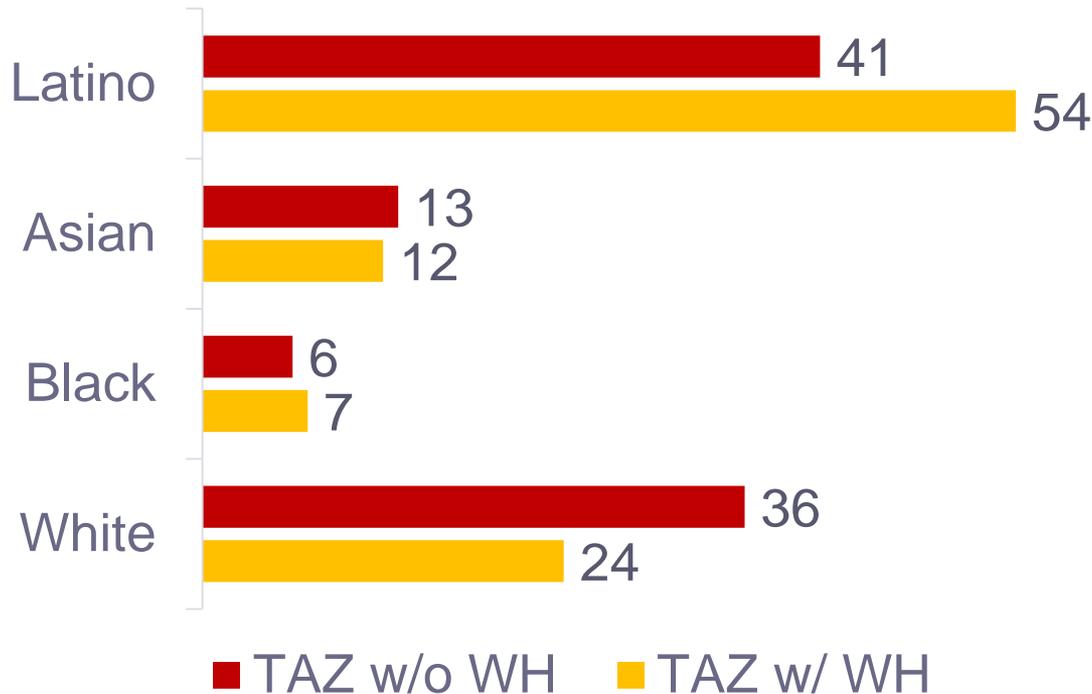
Distance (km) to the nearest



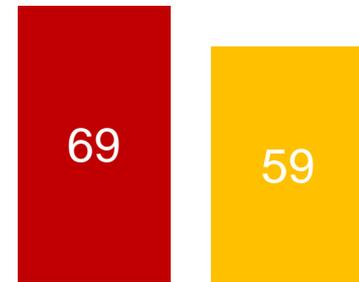
Data: warehouses and neighborhoods

Are there differences between TAZs with and without warehouses?

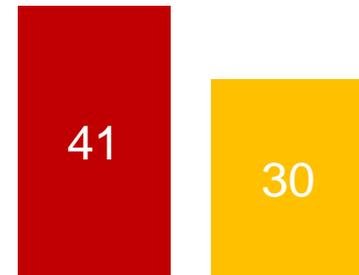
Population shares



Median household income (Thousand \$)



Median housing values (Thousand \$)



Results: Probability of containing at least one warehouse

	Relationship
High income minority	+
Medium income minority	+
Low income minority	+
High income nonminority	+
Distance to seaport	+
Distance to highway	-
Distance to airport	-
Distance to intermodal	-
Residential zoning	-
Light Manu zoning	+
Heavy Manu zoning	+
Retail zoning	-
Employment density	+
Median housing values	-
Constant	+
Pseudo R2	40.2%
Sample Size	3658

Results: Number of warehouses

	Relationship
High income minority	+
Medium income minority	+
Low income minority	-
High income nonminority	+
Distance to seaport	+
Distance to highway	+
Distance to airport	-
Distance to intermodal	-
Residential zoning	-
Light Manu zoning	+
Heavy Manu zoning	+
Retail zoning	-
Employment density	+
Median housing values	-
Constant	+
Log Likelihood	-2868
Sample Size	3658

Results: Warehousing activity intensity

	Relationship
High income minority	+
Medium income minority	+
Low income minority	+
High income nonminority	+
Distance to seaport	+
Distance to highway	+
Distance to airport	-
Distance to intermodal	-
Residential zoning	-
Light Manu zoning	+
Heavy Manu zoning	-
Retail zoning	-
Employment density	+
Median housing values	-
Constant	-
Adjusted R2	42.8%
Sample Size	694

Discussion

□ Minority vs. Income

- Unique demographics and spatial overlap
- Different mechanism from traditional EJ
- Location of poor neighborhoods in LA region
- Zoning and availability of development

Discussion

□ Different models

- Dependent variable and model choices
- Applications in EJ study?
- Widespread distribution of warehouses
- Scale of impacts

Discussion

□ Population characteristics vs. other factors

- One of the major determinants

Dep. Var.: Warehousing activity intensity	
	Beta Coef.
High income minority	0.07
Medium income minority	0.20
Low income minority	0.08
High income nonminority	0.04
Distance to seaport	0.12
Distance to highway	0.01
Distance to airport	-0.13
Distance to intermodal	-0.31
Residential zoning	-0.13
Light Manu zoning	0.16
Heavy Manu zoning	0.00
Retail zoning	-0.14
Employment density	0.36
Median housing values	-0.07

Conclusion and Future research

□ Conclusion

- Warehouses are disproportionately located in **minority-dominant** neighborhoods but the relationship between their locations and **household income** is not clear.
- Environmental injustice exists, but not in a traditional way.

□ Future research

- LA -> other metro areas
- Cross-sectional -> Time series (historical trend)