Environmental Justice and Urban Freight

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Basics

• Cities could not function without a goods movement system
  • Food and other basic needs
  • Business/commercial activity
  • Construction
  • Trash collection

• Goods movement has negative effects on cities
  • Air pollution, noise, GHG emissions
  • Conflicts with passenger travel
  • Safety

• Goods movement affects both justice and inclusiveness of cities
Justice

• Negative impacts of goods movement not equally distributed across population groups
  • Low income, minority communities near pollution “hot spots”
    • Intermodal rail yards, truck depots, ports
  • Some goods movement segments are hyper-competitive, pushing down wages
    • Drayage service in the US
    • Local urban deliveries in many countries
  • Deliveries conflict with public transport, non-motorized modes
Environmental Justice

Source: South Coast Air Quality Management District, 2014
Low wages, old and dirty trucks

Photo source: Dablanc
Inclusiveness

• As with access to jobs, public services (school quality in the US), or other opportunities, the goods movement system does not serve everyone equally
  • Food deserts in the US
    • Limited fresh food options
    • Less inventory, higher prices
  • Delivery service availability and reliability
    • Instant deliveries
    • Delivery stations/lockers
Environmental Justice 1

Warehouse location: California case study

Quan Yuan

Photo source: Dablanc
Warehouse location: motivation

• Environmental justice & transportation facilities
  • Airports, rail yards, high-volume freeways, etc. are locally undesirable land uses (LULUs)
  • Co-location with disadvantaged population

• Warehouses: major truck terminals and attractors
  • Air pollution, noise, pavement damage, accidents
  • Rapid growth of freight demand and warehousing expansion

• Are warehouses an environmental injustice problem?
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 noise during operation
  • Trucks contribute disproportionately to pavement damage

☑️ The Compton case study: truck traffic, noise and complaints.
Location of warehouses and Diesel PM Emission levels

Data source: CalEnviroScreen, Costar.
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.
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.
Data

• Study area: The Los Angeles Region
  • 2nd largest metro area in the US
  • The largest trade gateway in US
  • Comprehensive data available

• N of observations = 3,636 census tracts (normally with around 3,000 residents per tract)
Data

- There is a strong linear relationship between **household income** and **minority ratio** in the region.
- We divide neighborhoods (CTs) into categories of minority concentration and household income levels.

<table>
<thead>
<tr>
<th>High-income Minority</th>
<th>Medium-income Minority</th>
<th>Low-income Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-income White</td>
<td>[Reference]</td>
<td>Medium-or-low-income White</td>
</tr>
</tbody>
</table>
Warehouse locations

Warehouses are spatially clustered

N of CTs

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<th>2-9</th>
<th>10</th>
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<tr>
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<td>337</td>
<td>106</td>
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Warehouses tend to locate near highways, intermodal facilities

Distance (km) to the nearest

<table>
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<tr>
<th>Location</th>
<th>CTs w/o WH</th>
<th>CTs w/ WH</th>
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<tbody>
<tr>
<td>Seaport</td>
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<td>51.9</td>
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<tr>
<td>Airport</td>
<td>25.1</td>
<td>22.1</td>
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<tr>
<td>Intermodal</td>
<td>27.1</td>
<td>22.7</td>
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</table>
Warehouses and neighborhoods

Warehouses are more frequently located in minority, lower income neighborhoods

Population shares

<table>
<thead>
<tr>
<th></th>
<th>CTs w/o WH</th>
<th>CTs w/ WH</th>
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</thead>
<tbody>
<tr>
<td>Latino</td>
<td>65</td>
<td>58</td>
</tr>
<tr>
<td>Asian</td>
<td>715</td>
<td>681</td>
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<tr>
<td>Black</td>
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<td>681</td>
</tr>
<tr>
<td>White</td>
<td>715</td>
<td>681</td>
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</table>

Median household income (Thousand $)

<table>
<thead>
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<th></th>
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</table>
Location of warehouses and different types of neighborhoods

Data source: Costar, American Community Survey 2014, etc.
Model findings

• The probability of a neighborhood having at least one warehouse....
• The number of warehouses in a neighborhood....
• The intensity of warehousing operations in a neighborhood....

.....are all positively related to share of medium, low income minority population
Conclusions

• Warehouse location is an environmental justice problem
  • 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.

• Follow-on work: what is the causal relationship?
  • Do minorities seek housing near warehouses, or do warehouses seek location near minority neighborhood?
  • Warehouses follow minority population
Environmental Justice 2

Truck and bicycle conflicts: New York case study

Alison Conway
Truck and bicycle conflicts

• What happens when a city extends its bicycle infrastructure?
  • What does the new infrastructure replace?
  • Do truck parking and delivery problems increase?
  • Do truck and bicycle conflicts increase?

• Project objectives
  • Identify truck route impacts
  • Identify commercial vehicle – bicycle interactions
Data sources

**Network Data**
- NYC DOT Local Truck Route Network
- NYC DOT Bicycle Network
- NYC DCP Lion Street Centerlines

**Incident Data**
- NYPD Collisions
- NYC DOF Parking Violations

**Other Data**
- US Census Population Data
- Economic Census LEHD Data
- Field Observations
Findings

• Truck route and bicycle route overlaps
  • Overlap with about 11% of all truck route miles
  • Those that overlap typically are protected lanes (dedicated space)

• Illegal parking not necessarily due to lack of legal parking
Examples of truck and bicycle conflicts

Bicycle lane parking violations

Truck in bicycle lane
Findings 2: collisions

• Truck and bicycle collisions are rare
• They are frequently located in specific corridors
• More than half of all bicycle collisions happen on truck route segments, which account for 19% of on-street bicycle network
• Relatively high rate of collisions on protected paths
Conclusions

• Bicycle lanes on truck routes increase risk
• Reducing capacity of truck routes does not necessarily lead to more safety for bicyclists
• Protected lanes on truck routes do not necessarily lead to more safety for bicyclists
• Wholesale, transportation, warehousing, retail are truck attractors
The environmental justice connection

- Bicycle is essential mode of travel for low income households, especially in places with limited or expensive public transport

- Many low wage workers in wholesale, transportation, warehouse, retail sectors
  - Demand for bicycle commuting may be significant
  - These routes may be most at risk

- Who is served by protected bicycle lanes?
Inclusiveness 1

Food deserts in the US

What is a food desert?

• US Dept of Agriculture:
  • “Parts of the country where there is limited availability of fresh fruit, vegetables, and other healthful whole foods”
  • Usually in impoverished areas
  • Usually due to lack of grocery stores, farmers markets, other healthy food providers

• In urban areas:
  • Low income and/or minority neighborhoods
  • More fast food, liquor stores, mini-markets
  • Fewer supermarkets with less selection and poorer quality of fresh foods
Census tracts with low income (green), with no supermarket within 1/2 mile (blue), for large share of residents

Source: USDA Food Access Research Atlas
Food desert market mechanisms

**Household demand**
- Less consumption per HH
- Purchase in smaller lots
- Less mobility to shop further away

**Food suppliers**
- Not enough demand for high volume stores
- More low cost items
- Profit on price, not volume

**Food consumption**
- Packaged foods
- Snack foods
- Few fresh foods
Consequences of food desert

• Obesity – adults and children
• Obesity related health problems
  • Diabetes, high blood pressure, cardiovascular disease
• Effects of generally poor nutrition
  • Lower school performance
  • Inability to concentrate
  • More frequent work and school absences
The freight connection

• The US high volume supermarket or big box model depends on cheap and efficient transport

- Large lot deliveries
- High sales volume
- Fast inventory turnover
- Low prices

• Deliveries for small markets less efficient, more costly, contributes to higher prices

- Small lot deliveries
- Small trucks
- Higher transport costs
Inclusiveness 2

Who benefits from e-Commerce?

Photo source: http://www.pewinternet.org/2016/12/19/online-shopping-and-e-commerce/
USPS mail and parcels carried by major carriers

Traditional mail is declining, package delivery is increasing, Delivery speed is increasing

Source: Rodrigue, 2017
Percent internet users who purchased online last 12 months, EU-28, 2017

Source: Eurostat
Online shopping and low income households

• Low income households less likely to have....
  • Internet connection
  • Credit card
  • Funds for bulk purchases
  • Discretionary purchase funds

• Types of goods or services most frequently purchased online:
  • Clothes and sporting goods
  • Travel accommodations
  • Household goods
  • Tickets for events
Less demand means less service

Amazon areas for same day deliveries

• Darker blue areas are higher income

Source: Bloomberg, 2016
Conclusions

• Freight is part of everyday life in cities
  • It influences consumer choices
  • It provides new conveniences and consumption opportunities
  • It conflicts with passenger transport
  • It contributes to pollution, noise, GHG emissions

• The benefits and costs of freight are not equally distributed
  • Higher income households reap the benefits of lower prices, more choices
  • Lower income, minority households incur more of the costs and enjoy fewer of the benefits
Policy directions

• Freight is woven into poverty, discrimination problems
  • Need to address these larger societal problems

• How to reduce negative impacts
  • Cleaner fuels
  • Active management of truck routes, parking, loading facilities
  • Dematerialization

• How to expand the benefits
  • Universal internet access
  • Micro credit, purchase methods that are not credit based
  • Pop-up fresh food markets
Thank You

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