The Direct and Indirect Effects of Transit Infrastructure

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Rapid pace of urbanization
Cities are engines of economic growth
Big challenges in developing countries

Congestion

Informal Housing
What are the effects of urban interventions?

Transportation and land use:
- BRT or subways
- New roads
- Land use regulations
- Housing or transport subsidies

GE framework:
- Classic approach: Demand
- Not GE effects
- Externalities and spillovers

Implications:
- Housing prices
- Wages and prices
- Reallocation of workers
- Aggregate welfare
Outline of the talk

1. New Quantitative Model
   • GE effects: wages, prices, quantities
   • Externalities

2. What are the effects of infrastructure?
   • Informality and spatial misallocation – Mexico City
   • Labor market power – Santiago de Chile

3. Toolkit of the basic model:
   • Policymakers
   • Cape Town
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The New Urban Quantitative Model

* Ahfeldt et al., (2015)

The model*
Residential and employment choices
Land developers
Externalities

Minimum data requirements
Employment and population by spatial unit
Housing prices
Size of each spatial unit
Travel times across locations

Extensions
Multiple groups of workers and sectors
Distortions and wedges: taxes or markups
Crime
Pollution and emissions
Some places become more attractive
Amenities and salaries positively affect people's utility levels, while commuting costs and housing prices negatively affect them.

People move across places
The more productive locations will receive more workers since these places have a comparative advantage in production.

Markets out of steady state equilibrium
When people move, the demand and supply of labor and housing markets can be affected. For instance, there can be an increase in the housing demand that exceeds the current supply.

Transport innovation
Suppose that a new transport infrastructure reduces travel times across locations. (e.g., BRT or metros)

Prices adjust
Prices of floor space, and the number of workers and residents from each location change.
The model proceeds in two steps

1. Matching the model with the data:
   - Amenity distribution: how attractive is a location
   - Productivity distribution: how efficient is a location
   - Density of development: how much land is developed

2. Explore different counterfactuals:
   - Transportation infrastructure
   - Housing subsidies
   - Productivity shocks
Main Intuition to recover scale parameters

Development density

Floor space prices
Wages
Land
Workers
Residents

Productivity & Total output

Floor space prices
Wages
Workers

Amenities

Floor space prices
Wages
Residents
Evaluating infrastructure

- Distortions: taxes, subsidies, crime, markups

- Informality: taxes and subsidies
- Crime: Khana et al. (2021)

- Indirect effects of transit infrastructure
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Line B in Mexico City connected remote areas
1. Informal workers spend less time commuting

- Informal jobs easier to substitute across locations
- Informal workers work closer to home

Higher commuting elasticity
Informal sector
2. Remote locations have poorer access to formal jobs

a) Informality rates (jobs)

b) Market access index (formal-informal)
3. Transit Improvements decrease Informality

a) Workers (informality rate)

b) Population (formal-informal ratio)
4. Household composition does not change
Market access to formal jobs improve relative to informal jobs

- Market access is a wage index
- Workers reallocate to the formal sector
- Parameter that governs this reallocation:
  - Labor supply elasticity across sectors
The interaction between transit improvements and informality amplifies the welfare gains.
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Expansion of the metro in Chile
1. Workers work further away and earn more

Notes: Event Study results on distance to work. Coefficients are scaled by 0.42 to represent the effect on the average worker.
2. Workers in the same firm also earn more

Notes: Event Study results on earnings using worker-firm fixed effects. Coefficients are scaled by 0.42 to represent the effect on the average worker.
3. Earnings converge across space

Notes: The dependent variable is the log absolute value of the difference between each worker’s monthly earnings and the average earnings for the worker’s sector-education-age bin average wage. Event Study with firm fixed effects. Coefficients are scaled by 0.42 to represent the effect on the average worker.
Model of infrastructure and labor market power
Wage posting model*

- Markdown=1 -> Perfect competition
- As $\beta \rightarrow \infty$, perfect competition
- Larger firms exert more market power
- What are the effects of market integration?

*Card et al. (2018); Berger et al. (2020)
1. Labor market power and profits decrease
2. The dispersion of markdowns decreases, amplifying the welfare gains
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Toolkit to evaluate transit infrastructure

- In collaboration with **The IGC**: R package for the basic model
  - Version 0 is called IGCities
  - You can download all the documentation [here](#)

- Policymakers can estimate the effect urban policies:
  - Minimum data requirements
  - Transit improvements, roads, housing policies

- We want to include other extensions to the toolkit:
  - Multiple sectors or groups of workers
Population and Amenities

Population density

Amenities

- Population density:
  - [0.9]
  - [0.25]
  - [0.66]
  - [0.101]
  - [101.143]
  - [143.172]
  - [172.217]
  - [217.269]
  - [259.334]
  - [334.1528]
  - NA

- Amenities:
  - [0.0315, 0.693]
  - [0.825, 1.7]
  - [1.72, 2.4]
  - [2.24, 2.68]
  - [2.68, 3.07]
  - [3.07, 3.47]
  - [3.47, 3.84]
  - [3.84, 4.49]
  - [4.48, 5.73]
  - [5.73, 12.6]
Housing Prices and Land Development

Housing prices

Density of development
Floorspace subsidies – 10%
Employment increases in the treated locations
Prices increase in the treated locations
Conclusion

New quantitative model to evaluate urban policies
Minimum data requirements
Some examples in the Bank:
• Kolkata, Cairo, Amman (Tatjana Kleineberg)
• Cape Town

Importance in developing countries of considering the role of market failures:
• Informality: subsidies and taxes
• Labor marker power
• Crime

Future research
What else can we do?
• Optimal policies
• Co2 and carbon emissions
• Gender
• Expansion of cities

Capacity building
Toolkit for policymakers to evaluate different urban policies
Thanks