Detour Ahead

Market Frictions and Path Dependence in Transport Networks

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Economics of Transportation in the 21st Century Conference
NBER

Motivation: Expansion of Highway 156 in San Benito County, CA

TRANSPORTATION

Property acquisition and utilities continue to delay Highway 156 expansion

Published 09/14/2020 *BenitoLink Reporter,* **Noe Magaña**

Email this Article

If Caltrans can't reach agreements with landowners, they'll be settled in court.

- Project would reduce daily congestion by 1,902 hours/day
- Began in 1999
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- Transport infrastructure requires significant land to host investment projects
- **Research question:** Are transport networks shaped by frictions in the land acquisition process?
  1. Does the government face large frictions to acquire land?
  2. Are frictions large enough to shape planning and construction?
  3. Can these frictions create inefficiencies in the transport network?
- **Context:** Construction of Interstate Highway System in U.S. (1950-2000)

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This Paper: Findings

- Transport infrastructure requires significant land to host investment projects
- **Research question:** Are transport networks shaped by frictions in the land acquisition process?

1. Does the government face large frictions to acquire land?
   - Right-of-way costs important to determine route (up to 40% of cost, 1950-90)
2. Are frictions large enough to shape planning and construction?
   - Deviations from plan & construction rate shaped by land frictions
3. Can these frictions have consequences on the transport network?
   - Inequality: ROW payments lower for low income & black owners
   - Inefficiencies: Quantify cost of deviations/delays w/spatial model **(not today)**

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Literature Review

- **Transport Infrastructure Development**
  Duranton and Turner (2012); Baum-Snow (2006); Allen and Arkolakis (2019); Fajgelbaum and Schaal (2020); Heblich, Redding and Sturm (2020)

- **Transport Infrastructure Costs**
  Glaeser and Ponzetto (2018), Brooks and Liscow (2019), Mehrotra, Uribe and Turner (2019), Brinkman and Lin (2020)

- **Right of Way Acquisitions**
  Munch (1976), Chang (2010), Jeong (2016)

- **Infrastructure and Path-Dependence**
  Bleakly and Lin (2012), Allen and Donaldson (2020)

Background

Eminent Domain and Right of Way (ROW)

- ROW acquisition is the act of taking land from its original owner by another party—with legal rights to take the property—by providing a monetary compensation for its value (Francis, 2009)
  - Costly and creates delays: Many cities *today* spend over 30% of their budget for transportation projects on right-of-way acquisitions (Jeong, 2016)
  - Can have distributional impacts

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- 5th amendment to the U.S. Constitution → private property may not be taken for public use w/o just compensation
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Right of Way Regulation: Uniform Act of 1970

- Seeks to ensure fair compensation & assistance for those whose property was compulsorily acquired for public use under "eminent domain" law
  1. to ensure **relocation assistance** is provided
  2. to provide uniform, fair and equitable treatment
  3. to encourage acquisition by agreement & w/o coercion
- Many owners could obtain more than the "replacement value" of their property
- Compensation → Moving expenses, including mortgage/closing costs; reestablishment costs (businesses), help finding new property (owners/tenants)

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Right of Way Regulation and Uniform Act of 1970

- Before Uniform Act, relocation payments were
  - Discretionary (a judge would decide on a case-by-case basis)
  - Mandatory under *state* laws for **some states** (31%)
- After Uniform Act: Federal law made relocation payments mandatory in **all** states
- Adoption effectively staggered: states adopted at $\neq$ points 1950-70 (50':31%; 69':73%; 70':100%)
- On avg, relocation costs=18% of tot ROW costs (& as high as 138%, 1970-2000)

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- **Right-of-way acquisition costs**: Highway Statistics
  - *Newly collected and digitized*
  - Right-of-way expenses by state (and other costs)
  - Available by type (highway, rural/urban road, street, and federal road)
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- "Red Book" & "Blue Book": gold standards for highway/street design in urban/rural areas pre-1984
- From the "Red Book":

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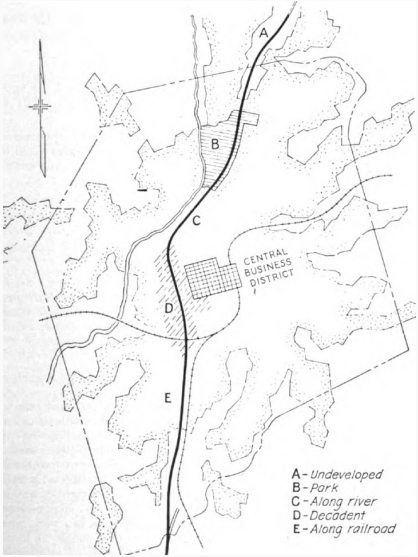
  "Since the cost of constructing arterial highways will vary throughout the area, savings should be evaluated *in relation to the cost of right-of-way and construction* to determine the most economical combination"
  (American Association of State Highway Officers, 1966, p.89)

  ‘

Example of Optimal Highway Route (According to the Red Book, 1966)



ROW Costs After Uniform Act and Adoption of Relocation Payments?

- Exploit adoption of Uniform Act laws using newly collected data

	Mean Pre-Reform	**Mean** Post-Reform
Right-of-Way Cost	**1180.8**	**4662.3**
(per new km)	(3809.2)	(9111.2)
Relocation Payment	**385.15**	**789.7**
(per unit)	(275.5)	(1066.5)
Share Non-Whites	**0.26**	**0.30**
(of all displaced)	(0.169)	(0.307)
Share Low Value Properties	**0.35**	**0.55**
(of total properties)	(0.1112)	(0.387)

Notes: Std dev in parenthesis. Real dollars. Last 2 rows use dwellings only. **Range: 10 years before/after adoption.**

- Higher ROW costs, relocation payments & displaced non-whites/low-value properties

Did ROW Costs Increase After Adoption of Relocation Payments?

- Test if costs increased after adoption using relocation assistance data:

$$Y_{st} = \beta \text{Post-Reform}_{st} + \delta_s + X'\phi + u_{st}, \quad (1)$$

Outcome Y_{st}

1. Right-of-way cost per kilometer
2. New kilometres built
3. Deviations from the 1947 plan
4. Total relocation payments per unit (dwelling, farm, business)

- Test if payments per unit change with demographics:

$$Y_{st} = \beta \text{Post-Reform}_{st} + \mu \text{Post-Reform}_{st} \times \textit{Non White} + \delta_s + X'\phi + u_{st}, \quad (2)$$

$$Y_{st} = \beta \text{Post-Reform}_{st} + \mu \text{Post-Reform}_{st} \times \textit{Tenant} + \delta_s + X'\phi + u_{st}, \quad (3)$$

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Did ROW Costs Increase After Adoption of Relocation Payments?

Highway Construction Before and After the Reform

	Speed of Construction	Right-of-Way Cost (per km)
	(1)	(2)
Post-Reform	**-45.000**	**3113.609**
	(2.717)	(700.441)
Share Built	38.723	2924.749
	(2.728)	(1280.753)
Mean	33.383	3658.152
Std. Dev.	50.530	12,640
Adjusted R^2	0.250	0.097
State FE/Controls	Y	Y
Observations	2,352	2,352

- Speed of construction was *lower* & ROW costs were *higher*

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Did Relocation Payments Increase After Uniform Act?

Relocation Payments per Unit Controlling by Type

(Types: dwellings, businesses, farms)

	(1)	(2)	(3)
Post-Reform	**449.365**	**507.7156**	**662.714**
	(189.902)	(259.562)	(229.034)
Non-White*Post-Reform		-**395.871**	
		(602.484)	
Non-White		42.387	
		(317.449)	
Tenant*Post-Reform			-**1013.294**
			(566.946)
Tenant			805.370
			(501.641)
Mean	585.320	585.320	585.320
Adjusted R^2	0.163	0.165	0.163
State FE/Controls	Y	Y	Y
Observations	93	93	93

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Relocation Payments per Unit Separately by Type

	Dwellings			Businesses	Farms
	(1)	(2)	(3)	(4)	(5)
Post-Reform	**58.623**	**69.618**	**65.192**	**1029.861**	**166.686**
	(10.615)	(8.218)	(11.776)	(379.440)	(102.488)
Non-White*Post-Reform		**-59.638**			
		(39.818)			
Non-White		45.117			
		(48.801)			
Tenant*Post-Reform			**-1.750**		
			(1.057)		
Tenant			1.351		
			(1.054)		
Mean	206.750	206.750	206.750	1824.037	341.064
Adjusted R^2	0.678	0.389	0.211	0.287	0.094
Controls	Y	Y	Y	Y	Y
Observations	93	93	93	89	56

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Detours and Delays Due to ROW

Are Frictions Large Enough to Shape Construction?

- Test if frictions in land acquisition affected construction of 1947 plan
- Difference-in-differences exploiting Uniform Act (county-level):

$$Y_{ct} = \beta \text{Post-Reform}_{ct} + \mu \text{Post-Reform}_{ct} \times F_{ct} + \delta_c + ln(Pop)_{ct} + v_{ct}, \quad (4)$$

- Y_{ct}: **Share of highways built according to 1947 Plan** by county & year
- Measures of land frictions F_{ct} (from "Red Book")
  1. Share of 1947 plan near a railroad (within 5 km of 1947 Plan)
  2. Share of 1947 plan near a river
  3. Share of blacks in a county

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	Share of built according to plan		
	(1)	(2)	(3)
Post-Reform × Share Plan Near River	**7.880**		
	(10.865)		
Post-Reform × Share Plan Near Railroads		**7.000**	
		(4.004)	
Post-Reform × Share of Blacks			**5.992**
			(3.394)
Share of Black Population			12.948
			(14.161)
Post-Reform	-0.485	-0.360	-0.448
	(0.645)	(0.569)	(0.638)
FE/Controls	Y	Y	Y
Observations	5424	5830	5424
R^2	0.312	0.312	0.336

Are Frictions Large Enough to Cause Delays?

- Test if frictions in land acquisition affected *speed of construction* of highways
- Difference-in-Differences exploiting 1970 Uniform Act (county level):

$$Y_{ct} = \beta \text{Post-Reform}_t + \mu \text{Post-Reform}_t \times F_{ct} + \delta_c + \ln(\text{Pop})_{ct} + \text{Share built}_{ct} + \nu_{ct}, \quad (5)$$

- Outcome Y_{ct}: **New highways built** in county c, year t
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Are Frictions Large Enough to Cause Delays?

	Km of New Highway		
	(1)	(2)	(3)
Post-Reform × Share Plan Near River	**3.675**		
	(1.541)		
Post-Reform × Share Plan Near Railroads		**0.000**	
		(0.000)	
Post-Reform × Share of Blacks			**1.983**
			(0.478)
Share of Black Population			-1.994
			(1.665)
Post-Reform	-2.434	-2.240	-2.607
	(0.085)	(0.123)	(0.097)
Mean	33.38	33.38	33.38
FE/Controls	Y	Y	Y
Observations	30856	30856	30856
R^2	0.093	0.097	0.093

Suggestive Evidence on the Mechanism Behind Higher Expropiation of Black and Low-Income Owners (and Lower Payments)

- Black and low-income owners were (Kelly, 2006)
  - The least politically powerful
  - Sistematically less likely to put their lands to the highest use
  - Less likely to file court cases for unfair compensation*

Quantifying the Welfare and Distributional Effects of Land Frictions in Transport Networks

Next Steps: Consequences of Frictions in Land-Acquisition

- After estimating effect of higher acquisition costs on deviations and delays
  - Build model with endogenous infrastructure and heterogenous land costs
    Uniform act $\rightarrow$ increase in ROW cost that depends on land value
  - Enrich model w/two levels of workers to study distributional concerns
    For example, are low-skilled households more likely to be expropiated?
  - Include probability of filing a case in court $\rightarrow$ delays, which can be estimated using different types of owners

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Concluding Remarks

- Nature of transport infrastructure → requires significant land
- Transport networks are shaped by frictions in the land acquisition process
  - Right-of-way costs important & higher after Uniform Act
  - Deviations from plan & construction rate shaped by land frictions:

    Speed of construction was *lower* & ROW costs were *higher*
  - These frictions could affect tenants, low income & black owners disproportionately

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