Freeway Revolts!

The Quality of Life Effects of Highways

Jeffrey C. Brinkman   Jeffrey Lin

Federal Reserve Bank of Philadelphia

Why do freeways affect spatial structure?

Interstates caused city growth and suburbanization. Duranton & Turner, 2012; Baum-Snow, 2007

Why? Economists agree: Reduced transport costs. Redding & Turner, 2012

However, freeways also reduce local quality of life through noise, pollution, etc.

How much do *local* disamenities matter for *overall* city structure and welfare?

Reaction to negative quality of life effects: The freeway revolts


Early urban Interstate construction in 1950s led to widespread protests in 50+ cities.

123 revolts & "major" problems in 25 cities in 1967–68. DOT; Mohl, 2002

S.F. banned freeways in Jan. 1959, leaving Embarcardero Freeway unfinished.

What we do (1)

Identify freeway disamenities

- Urban land use theory building on Alonso (1964) et al.
  - *Negative* freeway effects in center but *positive* effects in suburbs.
- Test with consistent-boundary nbhd. panel across 64 U.S. metros, 1950–2010.
  - We address non-random allocation of freeways to neighborhoods with IV.
  - We address confounding firm demand using new historical job estimates.
- Evidence of significant *barrier effects* using newly-rediscovered travel diaries.

What we do (2)

Quantify the effects of freeway disamenities on city structure and welfare

- Develop and calibrate a quantitative spatial GE model to 2000 Chicago.
  - QOL 0.75σ lower next to a freeway; 95% attenuation at $2\frac{1}{2}$ miles.
- Simulate a "Big Dig" where all freeway disamenities mitigated.
  - Large welfare costs of freeway disamenites, $\approx$5% of income.
  - QOL effects are $1/3$ of total effect of freeways on central-city decline.
  - Barrier effects are main factor in disamenity value of freeways.

Contributions

Freeways affect spatial structure via quality of life, not just commutes.

LeRoy & Sonstelie '83; Chandra & Thomspon '00; Baum-Snow '07; Michaels '08; Duranton & Turner '12; Redding & Turner '15

Identify QOL channel with dependence of freeway effects on *nbhd centrality*.

Freeway disamenities help explain the large absolute decline in central city populations.

Margo '92; Kopecky & Suen '10; Inman '95; Cullen & Levitt '99; Collins & Margo '07; Boustan '10; Duranton & Puga '15

Freeways disamenities affect city structure, not just prices.

Anderson '16; Currie & Walker '11; Parry, Walls, & Harrington '07

Barrier effects have large spatial scale and are a main factor in lower QOL.

Forman & Alexander '98; Downs '70; Kain '68; Ananat '11

Freeways increasingly diverged from plans in response to the revolts.

Knight '02; Altshuler & Luberoff '03; Glaeser & Ponzetto '17

Background: Building the Urban Interstates

Consensus, protest, and response

1956 Federal-Aid Highway Act

Authorized and financed 41,000 miles to be constructed by 1969.

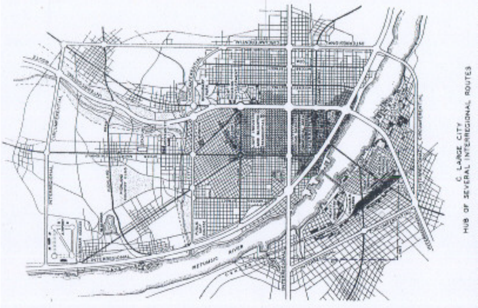
Planners faced few constraints and little opposition. Surprise

Mass construction led to widespread "freeway revolts" in 50+ cities

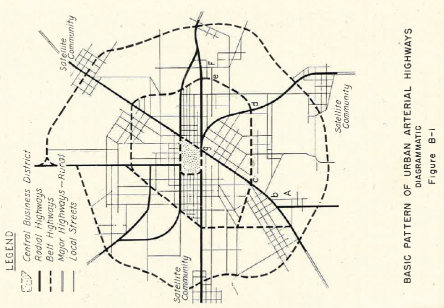
Policy responses constrained planners and by 1967 increasingly favored revolts.

Many proposed freeways were *altered or cancelled*. Policy changes

Early urban Interstate design standards — Radials and beltways



National Interregional Highway Committee,
Interregional Highways, 1944.



American Association of State Highway Officials,
A Policy on Arterial Highways in Urban Areas, 1957.

Revolts and policy responses shaped freeway allocation in central cities

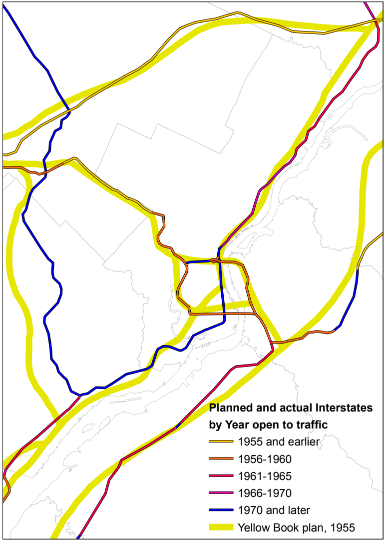
"In cities where the highway builders moved quickly in the late 1950s to build the urban interstates, the inner beltways and radials, *opposition never materialized* or was weakly expressed. . . .

"Where freeway construction was delayed into the 1960s, affected neighborhoods, institutions, and businesses had time to organize against the highwaymen. In some cases, freeway fighters successfully *forced the adoption of alternative routes*, and they even shut down some specific interstate projects permanently."

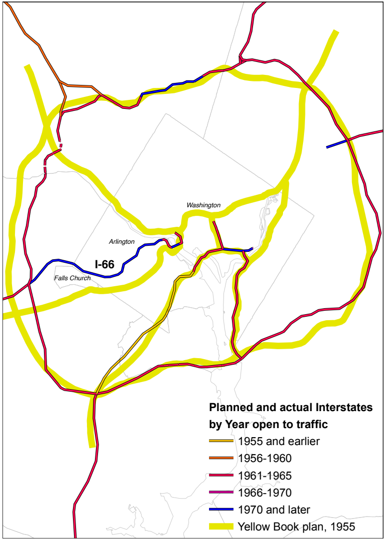
Mohl, 2004

Later-programmed freeways deviated from 1955 Yellow Book plan

Philadelphia

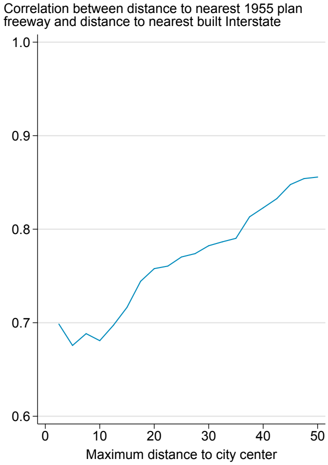


Washington

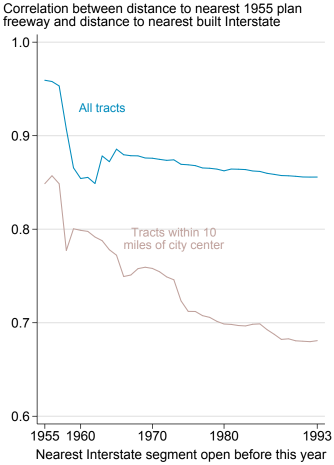


Built freeways increasingly deviated from 1955 plan in central cities

Least correlated in central cities



Correlation fell faster and farther in central cities



Discussion

Little evidence that planners selected "easy to build" segments first

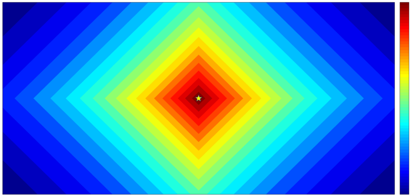
- "No one anticipated the urban battles" in early 1950s. Surprise
- States "believed they had to finish in 13 years."
- Early freeways selected on *higher* cost factors compared with later ones. Selection
  - Later freeways near river/rail, less dense, less educated, more black nbhds.

Revealed-preference evidence of freeway disamenities

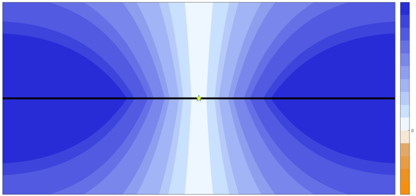
- In the 1960s and 70s freeways were increasingly difficult to build in central cities.

Identifying Freeway Disamenities

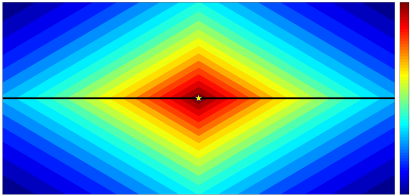
Density before



Change in density — access benefits only



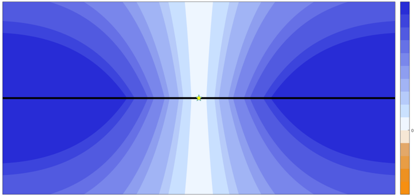
Density after



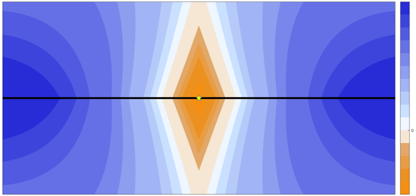
In a monocentric city model with access benefits only, benefits largest in outlying neighborhoods, especially near freeway.

When freeways also have disamenities, population falls in central neighborhods, especially near the freeway.

Change in density — access benefits only



Change in density — with disamenity



In this theory, freeways have diverging effects in center vs. suburbs

Decline in commuting costs

1. Population gains in the suburbs.
2. In suburbs, larger population gains near highways.

Disamenity from freeways

3. Population declines in city centers.
4. In center, larger population declines near highways.

Similar predictions for prices; for incomes; in closed city.

Data

Neighborhoods, roads, trips

Consistent-boundary Census tracts in *64 metropolitan areas* — Lee and Lin, 2018

- Population, income, house prices, 1950–2010.
- Natural and historical factors: coastlines, rivers, 19th-c. rail.
- City centers from 1982 retail trade census. — Fee and Hartley, 2013

Freeway routes merged with cleaned PR-511 database (*year open*) — FHWA, 2016, Baum-Snow '07

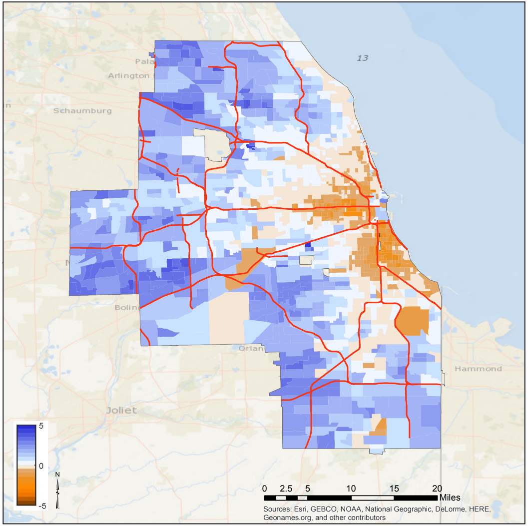
Digitized 1955 Yellow Book plan routes — 50 metros were also tracted; BPR, 1955

- First national publication showing planned routes within metros.

Land prices, modern & historical travel surveys, other plan and historical routes, . . .

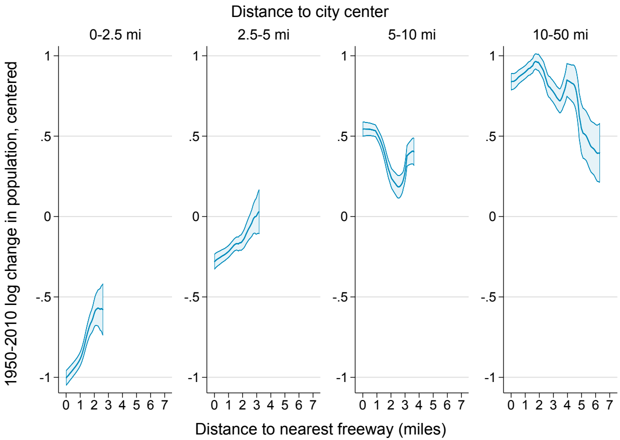
Evidence

Log population growth, 1950–2010



Center vs. suburbs in 64 metropolitan areas

In city centers, tracts near freeways declined more in population.



In periphery, tracts near freeways increased more in population.

Regression

$$\Delta \ln n_{g[m]} = \alpha_m + \beta d_g^F + Z_g' \gamma + \epsilon_g$$

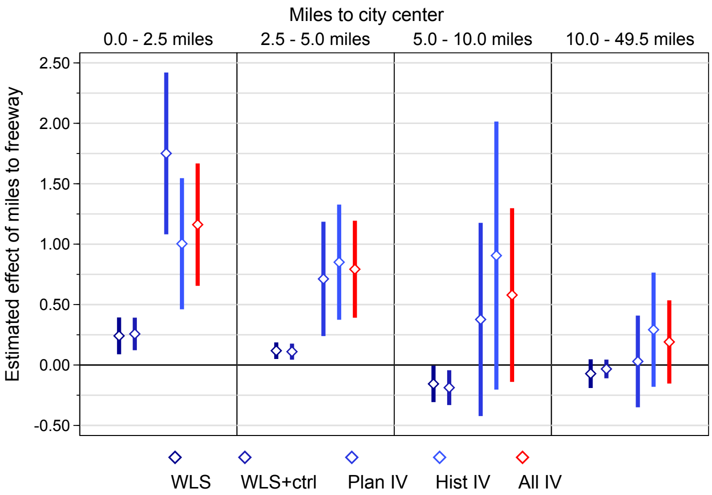
Tract regression of log pop change 1950–2010 on distance to nearest freeway. cdf

Split by distance to city center. Theory: $\beta > 0$ (pop. $\downarrow$) in center due to disamenity.

Freeways may have been allocated to neighborhoods expected to decline.

- Instruments for d_g^F: *plan* and *historical* routes. Redding & Turner, 2015
- *1947* Interstate plan (intercity travel, defense). Baum-Snow, 2007
- Pre-1898 railroads and 16th–19th c. explorer routes. Duranton & Turner '12, National Atlas '70

Freeways caused neighborhood decline in city centers



WLS table IV table

Interpretation — Selection on growth

Downtown *neighborhoods adjacent to freeways* grew 27% slower compared with downtown *neighborhoods 1 mile away from freeways*.

IV: Freeways caused downtown neighborhoods adjacent to freeways to grow 144% slower compared with downtown neighborhoods 1 mile away from freeways.

IV-estimated effect of downtown freeways is more negative compared with OLS, suggesting that freeways were assigned to neighborhoods with high growth potential.

Consistent with historical and statistical evidence that sparsely-populated downtown neighborhoods were more likely to receive freeways.

YB Route selection criteria 1957 Red Book

Extensions & robustness

Incomes grew more farther from freeways, especially downtown. →

House values grew more farther from freeways. →

Downtown Chicago land values grew more farther from freeways.
Suburban Chicago land values grew more closer to freeways. →

10-year effects most negative for freeways opened before 1970. →

Coastal proximity predicts negative freeway effect. →

Controls for 1950 factors, alternative weights, excluding NY+LA. →

Evidence from job growth

Measurement challenge: Detailed geography in 1950s.

Census estimates only for counties+ — Incomplete coverage of sectors.

Travel surveys

BPR/State travel surveys in 45+ metros, 1946–56. Schmidt & Campbell, 1956; MTSA

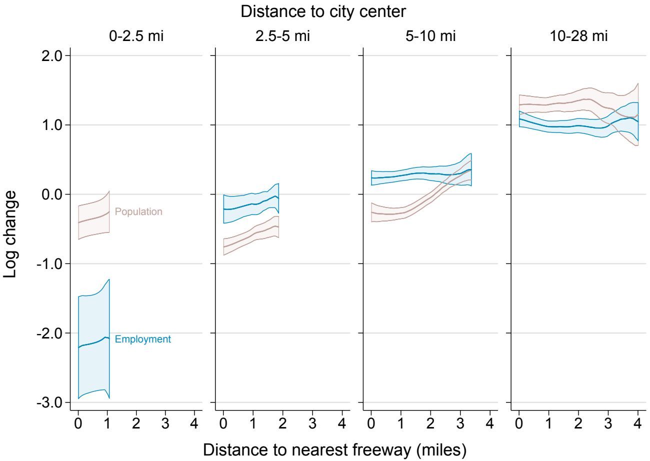
We digitized summary stats from Chicago 1956 (+ CTPP 2000).

We rediscovered trip microdata *cf. Kain '68* from Detroit 1953 (+1994).

Panel of jobs by tract from trip purpose & lat-long destination.

Chicago Detroit

Change in tract population (1950–2010) and employment (1956–2000) in Chicago



Little evidence that jobs displaced residents in central neighborhoods.

We estimate null effects of freeways on job growth. Table

Consistent with estimates of negative effects of land prices and near-zero effects on productivity.

Barrier Effects

Estimating barrier effects in Detroit, 1953-1994

$$\pi_{jkt} = \exp(\rho_{jt} + \varsigma_{kt} + \upsilon_{jk} + \boxed{\tau_{jkt}}) + \nu_{jkt}$$

Gravity for travel flows from tract j to tract k

Origin tract–Destination tract–Year panel from trip microdata.

Origin–Year and Destination–Year fixed effects ρ_{jt}, ς_{kt} capture tract factors, including effects of freeways on amenity/wages.

Origin–Destination FE υ_{jk} capture fixed tract *pair* factors, e.g. local road network.

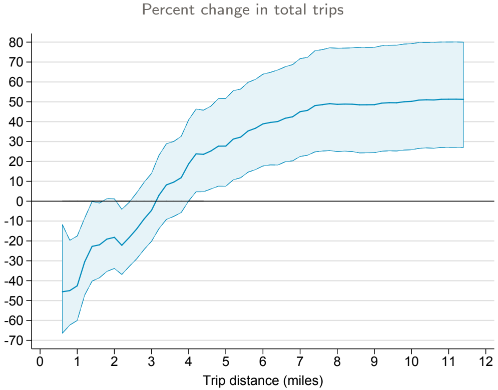
Travel costs $\boxed{\tau_{jkt}}$ depend on interactions between tract-pair distance dummies and Origin-Destination-Year freeway "treatment."

Estimated with PPML. Santos Silva and Tenreyro, 2006; Head and Mayer, 2014

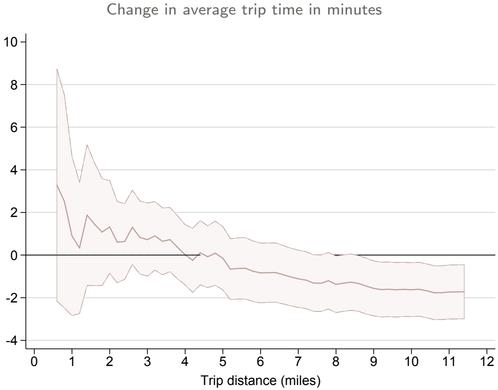
Effect of freeway crossing on trips up to x miles

For short trips (less than 2.5 miles), freeways . . .

Reduce travel volumes by 20%.



Increase travel times by 10–20%.



. . . and most trips are short trips. Summary stats

Quantitative Model

Quantitative model

Goals

Quantify the effect of freeway disamenities on spatial structure and welfare.

GE model with endogenous worker & job location, spillovers, costly commuting.

Estimate freeway disamenities and decompose sources (land excl., barrier effects).

Ahfeldt, Redding, Sturm, & Wolf (2015) w/freeway disamenities

Calibrated to Chicago tract population, jobs, land area, & travel times in 2000.

Data on travel times accomodates "multiple treatment" of downtown tracts.

Geography and firms

Geography

J locations with land L_j for residential or commercial use.

Closed city $\overline{N}$ / Open city $\overline{U}$.

Firms

$$Y_k = A_k L_{Wk}^{1-\alpha} N_{Wk}^{\alpha}$$

Single final good — costlessly traded, produced under PC and CRS.

Households and amenities

Households $\max_{jk} U_{jk,m}(c,l) = \nu_{jk,m} B_j \left(\frac{c}{\beta}\right)^{\beta} \left(\frac{l}{1-\beta}\right)^{1-\beta}$ subject to $\frac{w_k}{d_{jk}} = lq_j + c$.

Workers supply 1 unit of labor at wage w_k and consume numeraire c, land l, and neighborhood amenity B_j, and incur commuting costs $d_{ij} \equiv e^{\kappa \tau_{ij}}$.

Neighborhood amenities $$B_j = b_j g(d_F)$$

B contains all amenity sources except access to jobs.

Freeway disamenities. $$g(d_F) = 1 - b_F e^{-\eta d_F}$$

Commute shares and clearing

Equilibrium

Given $\{L_j, d_{jk}\}$, N, parameters $\{\alpha, \beta, \kappa\varepsilon\}$, shifters $\{A_k, B_j\}$.

Prices $\{q_j, w_j\}$ & quantities $\{N_{Hj}, N_{Wk}, L_{Hj}, L_{Wj}\}$:

Labor markets clear through commuting.

Land markets clear in each location.

Total population equals N.

Calibration and estimating freeway disamenities

Calibrated parameters

Non-land shares $\alpha = 0.97; \beta = 0.95.$ Brinkman, '16; Davis&Ortolo-Magne '07; Davis&Palumbo '08; Thorsnes '97

Tranp cost elasticity $\kappa = 0.02.$ Value of commute time $\approx 0.5w$

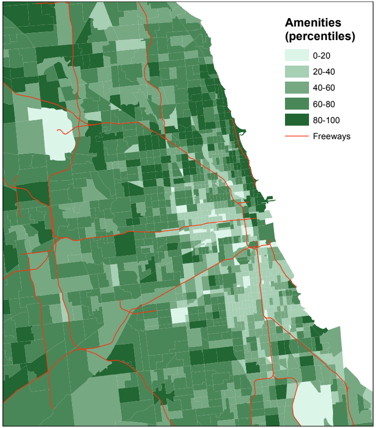
Frechet parameter $\epsilon = 4.$ ARSW '15; MRR '17; Severen '17

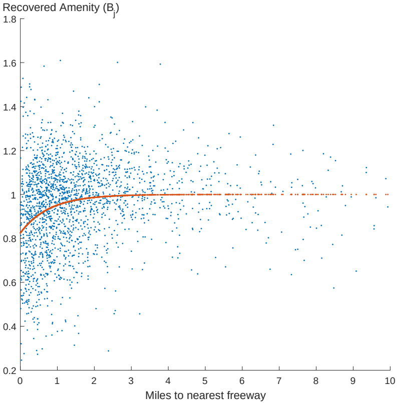
Data — Residents N_{H_j}, Jobs N_{W_k}, Commute times τ_{jk}, Tract areas L_j. CTTP, 2000; Census

Two steps: Recover $\{A_k, B_j\}$. Estimate $B_j = b_j(1 - \hat{b}_F e^{-\hat{\eta} d_F})$.

Details

Recovered amenities $\hat{B}_j$ — freeway disamenities





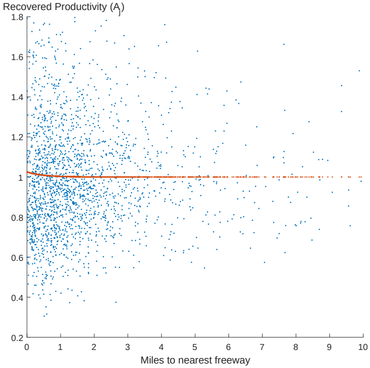
Freeways reduce amenity by 17%; Attenuates by 95% at 2.4 mi.

Superior access but few residents $\rightarrow$ inferior amenities.

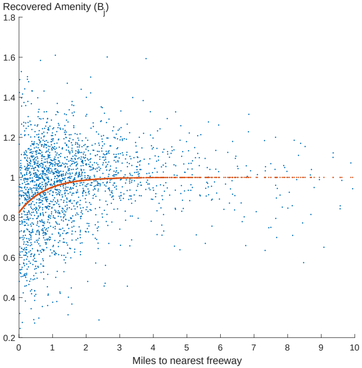
IV: Positive selection on amenity.

Recovered productivities $\hat{A}_k$ — little effect of freeways

$\hat{A}_k$



$\hat{B}_j$



Estimated disamenity parameters

κ	β	α	ε	b_F	(s.e.)	η	(s.e.)	c_v	b_F/c_v
Baseline									
0.002	0.950	0.970	4.000	0.175	(0.012)	1.284	(0.131)	0.228	0.769
Robustness									
0.001	0.950	0.970	4.000	0.173	(0.012)	1.357	(0.143)	0.228	0.758
***0.004**	0.950	0.970	4.000	0.181	(0.011)	1.147	(0.110)	0.229	0.792
0.002	**0.930**	0.970	4.000	0.165	(0.014)	1.748	(0.218)	0.235	0.701
0.002	**0.970**	0.970	4.000	0.192	(0.009)	0.919	(0.077)	0.224	0.858
0.002	0.950	**0.980**	4.000	0.177	(0.012)	1.285	(0.130)	0.228	0.776
0.002	0.950	**0.960**	4.000	0.174	(0.012)	1.284	(0.132)	0.228	0.764
0.002	0.950	0.970	**2.000**	0.299	(0.015)	0.850	(0.074)	0.385	0.778
*0.002	0.950	0.970	**6.000**	0.125	(0.011)	1.815	(0.226)	0.175	0.716

*—Baum-Snow et al. (2018) $\widehat{\kappa\epsilon}_{Chi} = 0.02$.

Disamenity estimates robust to κ, α, β.

With high ε, workers more homogeneous, so less variation in B required.

Relative contribution of freeway disamenities robust.

Equivalent to 0.77-σ decrease is overall neighborhood amenity distribution.

Effects of Mitigating Freeway Disamenities

Counterfactual experiment

Cap or bury all freeways.

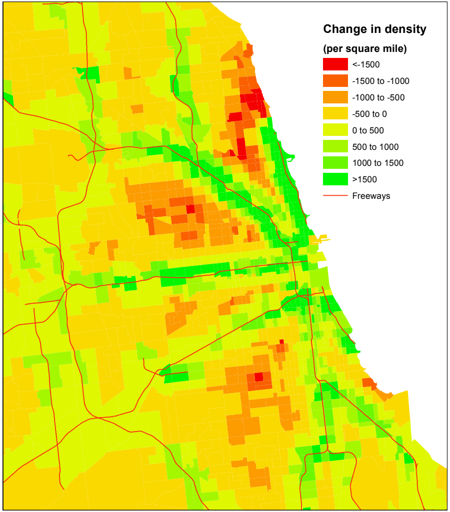
e.g. Big Dig, St. Louis, Philly, Atlanta, Chicago, . . .

Commute costs remain unchanged, but disamenity parameters set to zero.

Goals: Understand equilibrium and welfare effects of freeway disamenities.

Change in population after mitigation

Large *increases in population density* after disamenity mitigation, especially in high-amenity neighborhoods.



Significant role of disamenities in decentralization

Large *centralization* effect.

cf. Baum-Snow (2007): freeways caused 25% decline in central city population; Chicago's population also declined 25% since 1950.

Large welfare costs of disamenities.

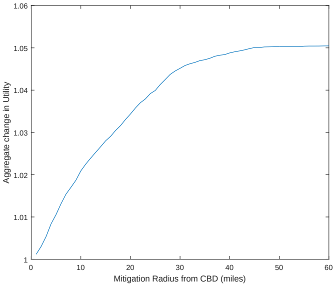
Utility increases by 5%, sensitive to ε.

κ	β	α	ϵ	Utility change[1]	Pop ch. <5mi[2]	Pop ch. city[2]
0.002	0.950	0.970	4.000	**1.051**	**1.206**	**1.080**
0.001	0.950	0.970	4.000	1.048	1.200	1.077
0.004	0.950	0.970	4.000	1.059	1.217	1.086
0.002	0.930	0.970	4.000	1.036	1.167	1.062
0.002	0.970	0.970	4.000	1.075	1.251	1.103
0.002	0.950	0.980	4.000	1.052	1.206	1.080
0.002	0.950	0.960	4.000	1.051	1.206	1.080
0.002	0.950	0.970	2.000	1.130	1.205	1.085
0.002	0.950	0.970	6.000	1.026	1.187	1.069

Closed city (total population fixed).
[1] Ratio of expected utility in counterfactual to original calibration.
[2] Ratio of employed residents in counterfactual to original calibration.

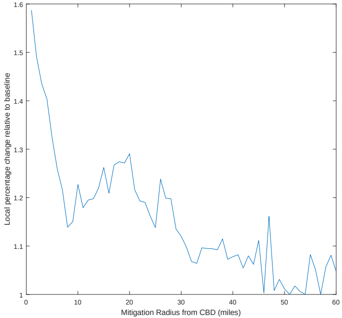
Welfare gains from mitigation concentrated downtown

Average utility increases more with mitigation in central vs. outlying areas.



$\Delta \mathbb{E}[U]$ when mitigation only for locations $< x$ miles from city center.

Population increases more with mitigation in central vs. outlying neighborhoods.



ΔN_{H_j} when mitigation only for locations $\in [x-1, x]$ miles from city center.

Downtown benefits in part reflect greater *treatment intensity* and *population density*.

Helps explain why freeway opposition is concentrated downtown.

Central mitigation projects could provide net benefits

Costs of burying freeways

Boston's Big Dig: \$15B for 1.5 miles (included new 3-mile section and tunnel).

Denver, Atlanta, Pittsburgh: \$320m–\$667m per mile. Excludes transition costs.

Benefits

Burying 47 miles of freeway within 5 miles of Loop yields 1% utility gain.

Wage equivalent is \$3.1B per year or \$66m per mile per year.

Using discount rate of 7 percent, lifetime benefit of \$938m per mile.

Decomposing Freeway Disamenities

Land use exclusion

In each tract, combine length of highway with standard width.

$\approx$0.5% of land in Chicago metro and 2% of land within 5 miles of downtown.

Re-estimate freeway disamenities assuming land use exclusion.

Negligible impact on utility and decentralization.

Barrier effects

Endogenous amenities ARSW (2015)

$$B_j = b_j \left(\sum_{j'=1}^{J} e^{-\rho \tau_{jj'}} \left(\frac{N_{R_j}}{L_j} \right) \right)^{\chi}$$

Barrier effects reduce B by increasing $\tau_{jj'}$

$$\tau_{jj'} = \tau^*_{jj'} + c_{b,jj'}$$

$\chi = 0.144$ and $\rho = 0.738$ ARSW (2015)

$\hat{c}_{b,jj'} = 2$ minutes for trips < 3 miles. Cross-sectional regression of $\tau_{jj'}$ on $1(highway)$, o/d/nsew FE

Decomposition suggests barrier effects drive freeway disamenities

	Total mitigation	No barrier effects	No land-use exclusion
$\Delta E[U]$	1.051	1.030	1.001
Δ pop. < 5mi from center	1.206	1.154	1.002
Δ city pop	1.080	1.059	1.001
Δ emp. < 5mi from center	0.998	0.999	1.000
Δ city emp.	0.998	0.999	1.000
Δ total rent	1.045	1.046	1.001
Δ rent 2 mi from highways	1.083	1.085	1.001

Conclusion

Freeway disamenities are important for understanding welfare and spatial structure

- The freeway revolts.
- Long-run decline of central neighborhoods near freeways.
- Today, low populations in freeway-adjacent neighborhoods.
- Large spatial scale of barrier effects.

Large spatial and welfare costs to urban Interstate construction

- There may have been other costs.
- Freeways were allocated to less white, less educated neighborhoods.
- Increased skepticism ended the era of infrastructure mega-projects.

Surprise

Consensus and growing federal support up to 1956

DiMento & Ellis, 2013

"Parkway ambience" in concepts by Le Corbusier et al.

State highway officials had only rural experience.

Mumford: "beneficent liberators of urban dwellers."

City planners, mayors thought freeways would revive downtowns.

The revolts surprised planners

State highway departments "believed they had to finish the entire mileage within the 13-year funding framework . . . No one anticipated the urban battles ahead so no one thought 'I better build my urban segments right away before anyone starts fighting them.'

Weingroff, 2016

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Policy changes following the revolts

1958	At least 1 public hearing, economic impact study.
1962	"Local cooperation."
1966	Oversight by new DOT. Environmental protection. Historical preservation.
1967	First Transp. Sec'y Alan Boyd became "most effective national spokesman for the freeway revolt." Mohl, 2004
1968	More environmental and historical regulation. Relocation assistance & replacement housing.
1970	More environmental regulation. More relocation assistance.
1973	De-designation of 190 planned miles. Exchange federal funds for other transp. projects.

Source: DiMento & Ellis, 2013

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The changing allocation of freeways

$$1(f_{g[m]t}) = \alpha_{mt} + Z'_g\beta_t + X'_g\gamma_t + \epsilon_{gt}$$

Regression of tract freeway indicator on persistent and 1950 factors

11% of tracts within half-km of freeway by 1993.

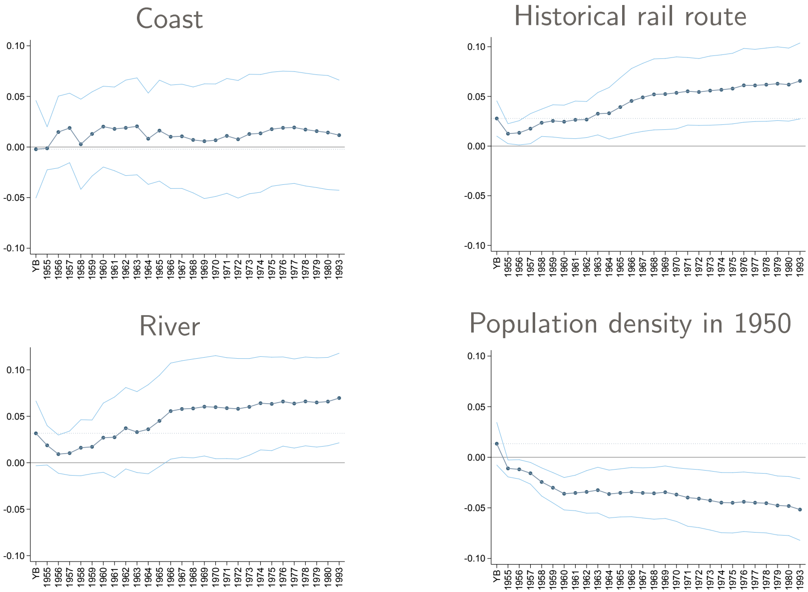
Snapshots of YB plan and 1955, 1956, ...1993.

Natural factors: rivers, coast, ports, slope, rail... Z_g

1950 factors: density, education, race, income/rents. X_g

$\beta_i^t > 0$ or $\gamma^t > 0$ means factor predicts freeway selection.

return



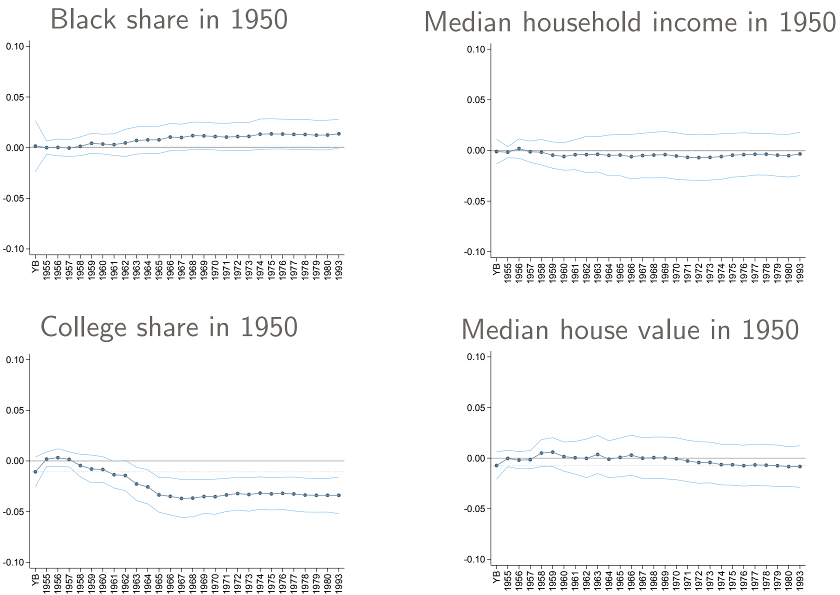
Freeways increasingly selected neighborhoods that were along rivers, along historical rail routes, and less dense in 1950.

return

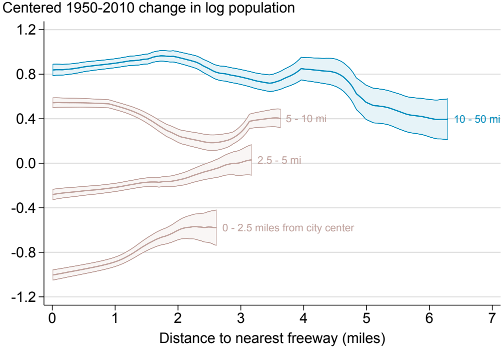
Freeways increasingly selected neighborhoods that were **more black** and **less educated**.

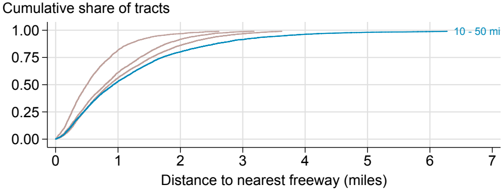
Standardized within metro areas.

return



64 metropolitan areas





	Distance to city center:			
	0–2.5 miles	2.5–5 miles	5–10 miles	10–50 miles
(a) WLS estimates				
Miles to nearest freeway	0.241^c	0.118^c	-0.156^b	-0.072
	(0.076)	(0.034)	(0.075)	(0.059)
Average metro FE ($\bar{\alpha}_.$)	-0.677^c	0.075^b	1.091^c	1.634^c
	(0.049)	(0.033)	(0.091)	(0.099)
R^2	0.026	0.011	0.019	0.008
Neighborhoods	2,312	3,482	5,561	5,173
Metropolitan areas	64	63	56	38
(b) . . . with controls for natural and historical factors				
Miles to nearest freeway	0.165^c	0.076^b	-0.205^c	-0.062
	(0.059)	(0.031)	(0.071)	(0.042)

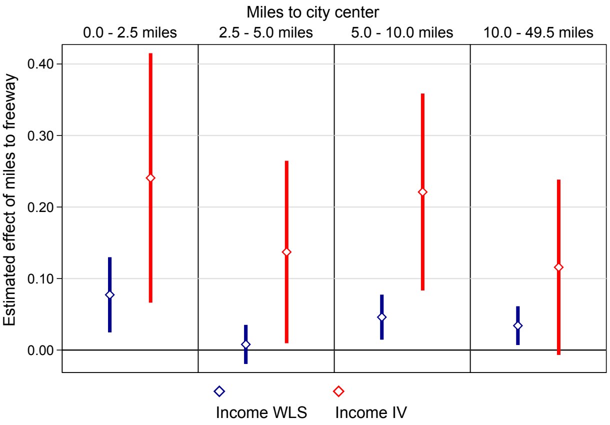
Return

	Distance to city center:			
	0–2.5 miles	2.5–5 miles	5–10 miles	10–50 miles
(a) IV estimates using 1947 inter-city plan and shortest-distance route				
Miles to nearest freeway	1.432^{b}	0.252	0.112	-0.017
	(0.683)	(0.228)	(0.341)	(0.266)
Kleibergen-Paap LM test (p)	0.114	0.006	0.077	0.130
Cragg-Donald Wald (F)	11.2	45.8	56.0	74.6
Kleibergen-Paap Wald (F)	2.3	6.9	3.3	2.6
Hansen J test (p)	0.995	0.946	0.893	0.485
(b) IV estimates using 1898 railroad and pre-1890 exploration routes				
Miles to nearest freeway	0.859^{c}	0.706^{c}	0.724	0.286
	(0.273)	(0.220)	(0.574)	(0.259)
Kleibergen-Paap LM test (p)	0.004	0.004	0.018	0.056
Cragg-Donald Wald (F)	124.8	95.7	40.4	120.7
Kleibergen-Paap Wald (F)	17.0	10.1	4.2	4.3
Hansen J test (p)	0.592	0.092	0.749	0.468
(c) IV estimates using all plan and historical route instruments				
Miles to nearest freeway	0.888^{c}	0.562^{c}	0.368	0.177
	(0.273)	(0.184)	(0.335)	(0.198)
Kleibergen-Paap LM test (p)	0.012	0.003	0.013	0.061
Cragg-Donald Wald (F)	64.2	67.7	47.3	88.9
Kleibergen-Paap Wald (F)	10.7	7.7	3.7	3.4
Hansen J test (p)	0.726	0.125	0.813	0.576

Return

High-income households sorted away from freeways, especially downtown

1950–2010 change in log average household income



Return

Routes were favored that:

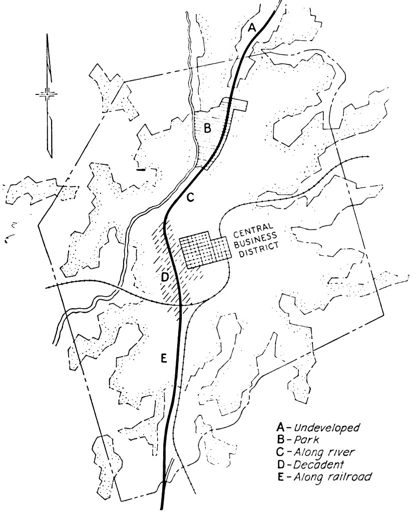
- Penetrated downtown or circumvented cities via beltway.
- Used undeveloped land.
- Linked to other modes such as rail stations and ports.
- Followed forecasted demand.
- Followed topography and physical features such as rivers.
- Were compatible with existing land use.
- National defense.

"Criteria for Selection of Interstate System Routes," testimony of CPR C.D. Curtiss, 4/15/1955.

Return

1957 AAHSO Red Book

"The improvement of radial highways in the past stimulated land development along them and often left *wedges of relatively unused land* between these ribbons of development. These undeveloped land areas may offer locations for new radials."



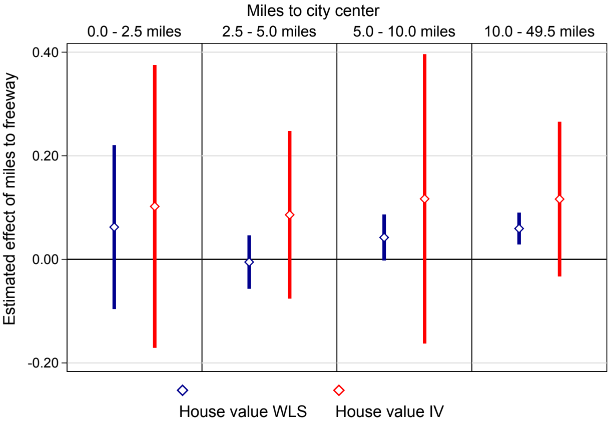
LOCATION OPPORTUNITIES FOR ARTERIAL HIGHWAYS AS RELATED TO LAND USE AND PHYSICAL CONTROLS

Figure B-6

Return

House values increased more farther from freeways

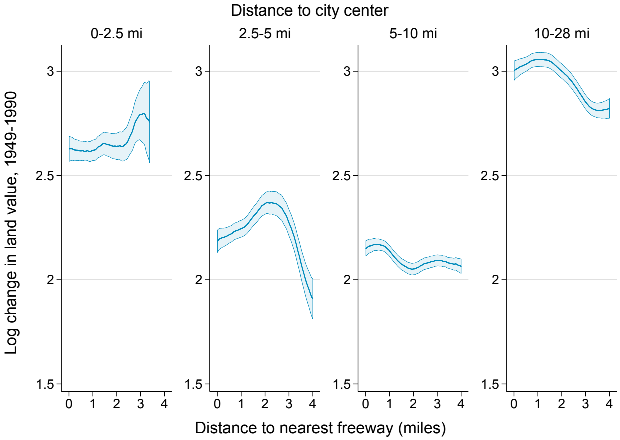
1950–2010 change in log average housing unit value



Nb1. Owner-occupied housing units in single-unit structures only (few d'town units).
Nb2. No measures of housing unit size or quality (limitation of 1950 tract data).

Return

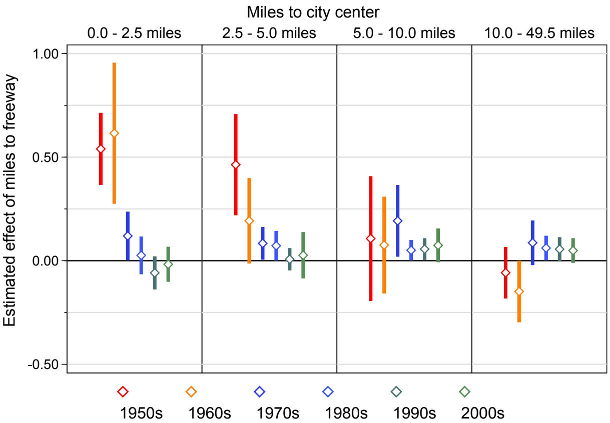
Appraised land value growth in Chicago, 1949–1990



300×300' grid cell-level data from *Olcott's Blue Books of Chicago* (Ahlfeldt & McMillen '14)

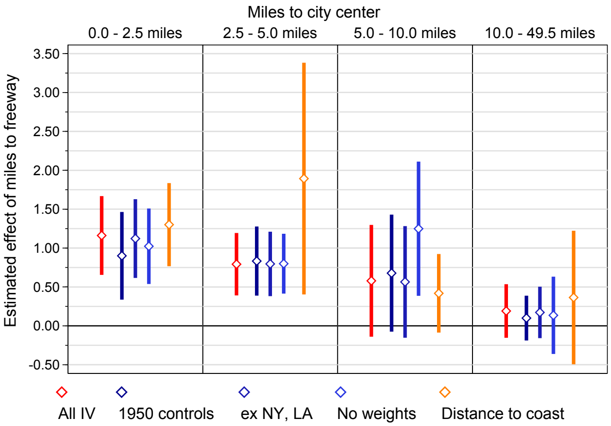
Return

10-year effects most negative in 1950s and 1960s



Return

Coastal proximity predicts negative freeway effect



Return

	CATS jobs by zone, 1955-7[a]	CATS person-trips to work, '56	Census of Business, 1954 2-county[d]	5-county[e]	City	Census of Population, 1950 2-county
Construction	39.2[c]	.	.	.	.	.
Manufacturing	827.6	713	772.1	843.5	615.7	.
Transp., comm., util.	.	173	.	.	.	.
Wholesale trade	125.0[c]	134	143.5	148.0	131.4	.
Retail trade	131.2[c]	327	280.6	304.5	223.5	.
Private services	.	326	.	.	.	.
. . . Finance	88.5[c]	.	.	.	.	.
. . . Selected services[b]	.	.	128.0	134.7	111.8	.
Public administration	.	216	.	.	.	.
Total	1,211.5	1,500	1,324.2	1,430.7	1,082.4	2,036.4

A period (".") indicates employment for the sector indicated by the row title is not reported by the source indicated by the column title. [a]—Average total covered employment over 1955-1957, reported by CATS zone. CATS zones cover nearly all of Cook County; approximately the eastern half of DuPage County, and very small portions of Lake and Will Counties. [b]—Selected services covered by the 1954 Census of Business are: Personal services; Business services; Auto repair services; Miscellaneous repair services; Amusement and recreation Services; Hotels and tourism. [c]—Employment by CATS zone for these sectors reported for only 16 central zones (out of 44); other zones censored for low coverage. [d]—Cook and DuPage Counties. [e]—Cook, DuPage, Kane, Lake, and Will Counties.

Return

	DMATS, 1953	Census of Business, 1954 Wayne co.	Census of Business, 1954 Detroit metro	C. of Pop., 1950 Wayne co.
Construction	42.8	.	.	.
Manufacturing	527.4	445.5	538.2	.
Transp., comm., util.	61.9	.	.	.
Wholesale trade	27.3	46.3	48.5	.
Retail trade	124.3	138.6	171.0	.
Selected services	.	51.0	58.1	.
. . . FIRE	33.4	.	.	.
. . . Personal services	64.0	.	.	.
. . . Professional services	61.8	.	.	.
Public administration	40.0	.	.	.
Total	982.9	681.4	815.8	983.0

A period (".") indicates employment for the sector indicated by the row title is not reported by the source indicated by the column title. ^{a}—Selected services covered by the 1954 Census of Business are: Personal services; Business services; Auto repair services; Miscellaneous repair services; Amusement and recreation Services; Hotels and tourism.

Return

	Chicago			Detroit		
	Distance to city center:			*Distance to city center:*		
	0–5 miles	5–10 miles	10–28 miles	0–5 miles	5–10 miles	10–21 miles
(a) Change in population – OLS						
Miles to freeway	0.403^c	0.140^c	-0.114^c	0.095	0.073	-0.049
	(0.092)	(0.034)	(0.040)	(0.151)	(0.046)	(0.057)
Neighborhoods	263	460	648	105	218	207
(b) Change in population – IV						
Miles to freeway	0.220^a	0.332^c	-0.915^c	0.463	0.153	-0.192
	(0.113)	(0.057)	(0.196)	(0.351)	(0.111)	(0.126)
KP LM test (p)	0.000	0.000	0.000	0.031	0.000	0.000
CD Wald (F)	68.3	59.4	9.5	6.3	12.8	13.9
KP Wald (F)	73.7	69.8	8.5	3.8	12.4	11.2
Hansen J test (p)	0.000	0.000	0.000	0.194	0.082	0.000
(c) Change in employment – OLS						
Miles to freeway	0.112	-0.035	-0.080^b	-0.315	-0.228	-0.053
	(0.210)	(0.036)	(0.033)	(0.595)	(0.201)	(0.176)
(d) Change in employment – IV						
Miles to freeway	0.245	-0.179^c	0.175	0.960	-0.031	0.359
	(0.292)	(0.058)	(0.156)	(1.438)	(0.340)	(0.345)
KP LM test (p)	0.000	0.000	0.000	0.139	0.000	0.000
CD Wald (F)	68.3	59.4	9.5	4.7	11.5	6.8
KP Wald (F)	73.7	69.8	8.5	2.2	9.4	5.9
Hansen J test (p)	0.000	0.000	0.007	0.024	0.670	0.000

Each panel–column reports a separate regression. Estimated standard errors, robust to heteroskedasticity, are in parentheses. ^{a}—$p < 0.10$, ^{b}—$p < 0.05$, ^{c}—$p < 0.01$. Regressions reported in panel include controls for neighborhood proximity to nearest park, lake, seaport, river, coastline, and city center in miles, and four categories indicating average neighborhood slope.

Return

	1953	1994	
		Full sample	1950 tracts
Sample			
Households	36,226	6,653	4,265
Persons	75,395	14,036	8,282
Trips	250,453	58,733	30,940
Trip distance, miles			
μ (σ)	3.7 (3.5)	5.1 (13.0)	3.8 (4.3)
p50	2.6	2.7	2.2
(p25, p75)	(1.0, 5.4)	(1.0, 6.5)	(0.8, 5.1)
Origin distance to city center, miles			
	8.7 (4.9)	19.7 (14.1)	12.0 (4.8)
Mode			
Car	0.82	0.88	0.87
Transit	0.16	0.02	0.02
Walk	NA	0.06	0.08
Purpose			
to work	0.24	0.20	0.19
to shopping	0.08	0.09	0.09

Return

Commuting shares.

$$\pi_{jk} = \frac{\left(d_{jk} q_j^{1-\beta}\right)^{-\varepsilon} \left(B_j w_k\right)^{\varepsilon}}{\sum_{j'=1}^{J} \sum_{k'=1}^{J} \left(d'_{j'k'} q_{j'}^{1-\beta}\right)^{-\varepsilon} \left(B_{j'} w_{k'}\right)^{\varepsilon}},$$

$$\pi_{jk|j} = \frac{\left(\frac{w_j}{d_{jk}}\right)^{\varepsilon}}{\sum_{k'=1}^{J} \left(\frac{w_{j'}}{d_{jk'}}\right)^{\varepsilon}}.$$

Commuting clearing condition.

$$N_{Wk} = \frac{\left(\frac{w_j}{d_{jk}}\right)^{\varepsilon}}{\sum_{k'=1}^{J} \left(\frac{w_{j'}}{d_{jk'}}\right)^{\varepsilon}} N_{Rj}$$

Residential land demand.

$$L_{Rj} = (1-\beta) \frac{N_{Rj}}{q_j} \sum_{k=1}^{J} \pi_{jk|j} \frac{w_k}{d_{jk}}$$

Return

Solve for wages paid:

$$w_k = \left(\frac{1}{N_{W_k}} \sum_{j=1}^{J} \frac{\left(\frac{1}{d_{jk}}\right)^{\varepsilon}}{\sum_{k'=1}^{J} \left(\frac{w_{k'}}{d_{jk'}}\right)^{\varepsilon}} N_{Hj} \right)^{-\frac{1}{\varepsilon}}$$

Use land-clearing to solve for land rents:

$$q_j = \frac{1}{L_j} \left(N_{W_k} \frac{(1-\alpha)}{\alpha} w_k + (1-\beta) N_{Hj} \sum_{k=1}^{J} \pi_{jk|j} \frac{w_k}{d_{jk}} \right)$$

Recover amenities using commuting prob and spatial eq cond:

$$B_j = \left(\frac{N_{Hj}}{N}\right)^{\frac{1}{\varepsilon}} \left(\frac{\overline{U}}{\Gamma\left(\frac{\varepsilon-1}{\varepsilon}\right)} \right) \left(q_j^{1-\beta}\right) \left(\sum_{k=1}^{J} \left(\frac{w_k}{d_{jk}}\right)^{\varepsilon} \right)^{-\frac{1}{\varepsilon}}$$

Recover productivities using profit max, zero-profit condition:

$$A_k = \left(\frac{w_k}{\alpha}\right)^{\alpha} \left(\frac{q_k}{(1-\alpha)}\right)^{1-\alpha}$$

Return