Political Preferences and the Spatial Distribution of Infrastructure: Evidence from California's High-Speed Rail

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Motivation and Research Question

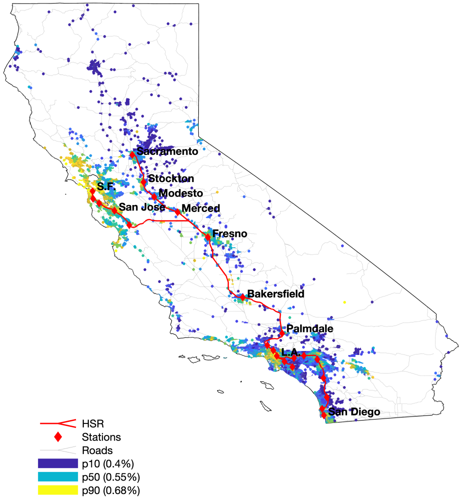
- Transportation infrastructure projects are often massive public investments
- Controversial, create winners and losers
- Many considerations besides the purely economic enter in preferences:
  - People: party line, preferences for public good, environmental concerns ("Political preferences")
  - Policy makers: may favor some constituents over others

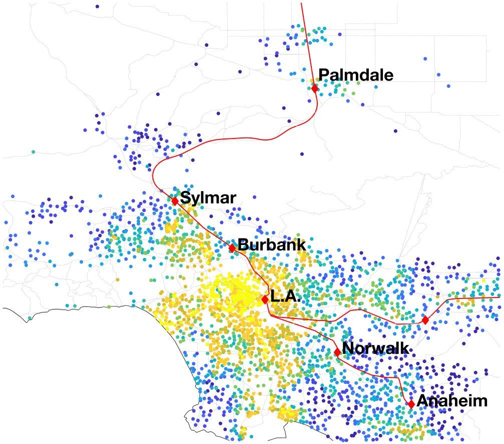
1. **How important are economic vs political components in policy preferences for transport infrastructure?**
2. **How do these preferences, together with distributional concerns, shape infrastructure projects?**

Setting: the California High Speed Rail (CHSR)

- Electric high-speed train connecting urban centers in CA
- Among most expensive projects in US history
- We observe voting across 8k census tracts
- Proposition 1a put on the ballot in 2008
  - Issue bonds for \$10 bn (0.4% CA GDP)
  - Total cost $>$\$40 bn; first segment in 2022
  - $\geq$ 200 mph (SF-LA: 2:40')
  - 24 stations over 800 miles
- Construction began in 2015, many hurdles
  - Central Valley segment (170 miles) by 2030
  - Current Phase-I cost projection: $>$130b

HSR Planned Route and % Yes on Prop 1a





This Paper

1. **Estimate weight of real income vs political component in preferences for CHSR**
   - Develop and estimate model to compute expected income gains
   - Voters were responsive to economic impacts, but swaying votes is costly
     - 0.2%-0.4% gains to increase support by 1 percentage point
   - Political component (e.g. party affiliation) drives 5X more spatial variation in votes than income
   - CHSR would have been approved without preferences for real income
2. **Estimate social planner preferences over demographic groups and votes**
   - Revealed preferences: deviations from observed HSR design define bounds on utility parameters
   - Strong planner's preference for popular approval
   - *Apolitical planner* would have optimally placed stations nearer denser areas
     - 50% larger utilitarian gains than actual CHSR design

Literature Review

- **Real income effects of infrastructure** (summary Redding and Turner 15)
  - Donaldson 12, Faber 14, Donaldson and Hornbeck 16,...
  - Rails: Gupta et al. 21, Severen 21, Bernard et al. 19, Borusyak and Hull 21, Dong et al. 20,...
- **Quantitative spatial models** (summ Redding and Rossi-Hansberg 17) dive into:
  - Commuting: Ahlfeldt et al. 15, Monte et al. 18, Dingel and Tintelnot 21,...
  - Distributional effects: Tsivanidis 19, Balboni et al. 20, Barwick et al. 21,...
  - Optimal Infrastructure Design: Alder 19, Fajgelbaum and Schaal 20, Allen and Arkolakis 21
- **Individual's policy preferences and referenda**
  - Deacon and Shapiro 75,...,Kahn and Matsusaka 97, Gerber and Lewis 04, Wu and Cutter 11, Kendall and Matsusaka 21
  - HSR: Holian and Kahn 13,15
  - Trade: Hicks et al 14, Becker et al 17, Mendez and Van Patten 22
- **Estimation of planner's preferences**
  - PF: Christiensen 81, Bourguignon and Spadaro 12, Jacobs et al. 17, Hendren 20
  - Trade: Goldberg Maggi 99,...
- **Political Economy of Transportation**
  - Brueckner and Selod 06, Glaeser and Ponzetto 18
  - Burguess et al. 15, Alder and Kondo 20

Utility and Voting

- Utility gain to a voter ω in census tract i if Prop1a passes:

$$\Delta u_{\omega} = \hat{W}(i) + \sum_{k=1}^{K} \tilde{\beta}_k X_k(i) + \varepsilon_{\omega}(i)$$

  - $\hat{W}(i)$: expected annualized gain if Prop1a is approved
  - $X_k(i)$: proxies for political preferences (affiliated democrat, votes in other propositions)

- Assume $\varepsilon_{\omega}(s) \sim \text{EV}(\theta_V)$. Fraction of favorable votes:

$$\ln\left(\frac{v(i)}{1 - v(i)}\right) = \theta_V \hat{W}(i) + \theta_V \sum_{k} \tilde{\beta}_k X_k(i) + \epsilon(i)$$

  - $v(i)$: % vote in favor of CHSR
  - $\epsilon(i)$: unobserved determinants of the vote

Model of Economic Gains

- Develop spatial framework in style of Ahlfehldt et al 15 with CHSR-specific features
- Residents commute and consume a traded good, housing, and # leisure trips
- Firms produce using land, labor, and # business trips
- For each travel purpose, choose destination and transport mode (McFadden 74)
  - {car, public transit (+CHSR), airplane (+CHSR), walk/bike}
  - money and time costs for each route and mode
- (+Land prices and wages, agglomeration and congestion spillovers)
- Incorporate risk of non-completion and assume voter is uncertain about future travel
- Entertain range of assumptions on HSR costs and GE forces

Real Income Measurement in Baseline: Time+Cost Shocks Only

Real income change in tract i conditional on CHSR completion:

$$\hat{V}(i) = \underbrace{\left(\sum_j \sum_m \lambda^C_{i,j,m} \left(\hat{I}_{i,j,m} \hat{\tau}^{-\rho}_{i,j,m} \right)^{\theta_C} \right)^{\frac{1}{\theta_C}}}_{\text{Faster/Cheaper Commute}} \underbrace{\left(\sum_j \sum_m \lambda^L_{i,j,m} \left(\frac{\hat{\tau}^{-\rho}_{i,j,m}}{\hat{t}_{i,j,m}} \right)^{-\theta_L \mu_L} \right)^{\frac{1}{\theta_L}}}_{\text{Faster/Cheaper Leisure Travel}}$$

- $\lambda^C_{i,j,m}$, $\lambda^L_{i,j,m}$: pre-CHSR commuting and leisure-travel shares
- $\hat{I}_{i,j,m}$: change in disposable income due to CHSR tax or commuting cost
- $\hat{\tau}_{i,j,m}$ and $\hat{t}_{i,j,m}$: time and cost savings on best route
- θ_k: substitution across destinations for $k = \{commuting, leisure, business\}$
- ρ: conversion from travel time to income
- μ_k: weights of $k = \{leisure, business\}$ in personal and business expenditures

micro details | with GE

Time Elasticities from Travel Decisions

- **Commuting** (ACS, 2006-2010):

$$\ln \lambda^{C}_{i,j,m} = \nu^{C}_{i,m} + \theta_C \ln\left(w_{i,j} - t^{C}_{i,j,m}\right) - \theta_C \rho \ln \tau_{i,j,m} + \varepsilon^{C}_{i,j,m}$$

  - Yields: $\theta_C \rho = 2.22^{***}$, $\theta_C = 2.97^{***} \rightarrow \rho = 0.75^{***}$
    - In line with Monte et al. 18, Severen 19
  - Younger, more white, college-educated tracts have stronger preference for car ▸ table

- **Leisure and Business Trips** (CAHTS, 2012):

$$\ln\left(\#TRIPS^{k}_{i,j,m}\right) = \nu^{k}_{i,m} + q^{k}_{i,j} - \theta_k \mu_k \rho \ln \tau_{i,j,m} - (1 + \theta_k \mu_k) \ln t^{k}_{i,j,m} + \varepsilon^{k}_{i,j,m}$$

for $k \in \{leisure, business\}$

  - $\mu_L \theta_L \rho = 1.20^{***}$. With $\mu_L = 5.0\%$ (BLS)$\rightarrow \theta_L = 31.99^{***}$
  - $\mu_B \theta_B \rho = 1.65^{***}$. With $\mu_B = 1.5\%$ (GBTA)$\rightarrow \theta_B = 146.98^{***}$
  - Relatively stronger preference for car (air) among leisure (business) travelers

HSR Shock

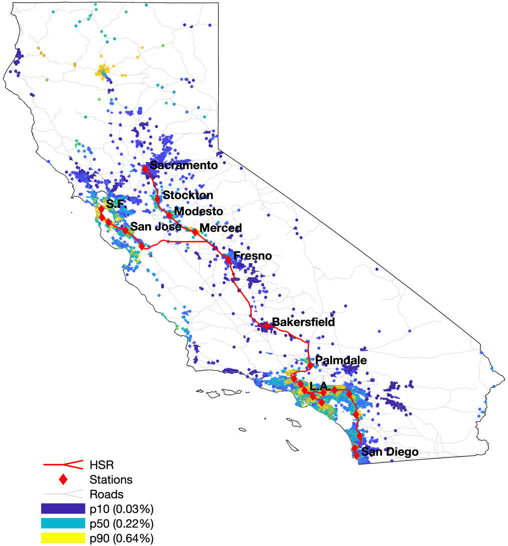
	% Initial Travelers Directly Better Off		Time Gain (among CHSR users)		Cost Change (Pub. Trans. or Air) 2008 CHSR Price		2X Ticket Price	
	Pub. Trans. or Air	+ Car	median	75 ptile	med	75p	med	75p
Commute	1.0%	3.1%	26' (31%)	43' (41%)	-19%	-4%	5%	22%
Leisure	0.5%	14.1%	10' (6%)	33' (25%)	-62%	-42%	-33%	-12%
Business	5.1%	12.7%	9' (4%)	27' (12%)	-63%	-57%	-33%	-25%

Real Income Effects

Case	Annual Gain	2008 USD per worker	Leisure+ Business
Baseline	0.32%	$143.0	0.03%
Full Model	0.65%	$292.4	0.41%
Pessimistic	-0.18%	$-81.9	-0.04%
+ Car	0.60%	$265.6	0.15%

- Baseline: top 10% tracts gain 0.6% to 4.7%
  - bottom 2.7% lose
- Winning tracts: closer to stations, use public transit more, longer commutes
- LA and SF: higher gains
- Fresno, Bakersfield: lower gains

Figure: % Economic Gains



Voting Equation

$$\ln\left(\frac{v(i)}{1-v(i)}\right) = \theta_V \ln \hat{W}_{19}(i) + \underbrace{\sum_{k=1}^{K} \beta_k X_k(i)}_{\theta_V \ln \hat{a}(i)} + \epsilon(i)$$

- Proxies $X_k(i)$ for political preferences:
  - % of registered Democrats and
  - shares of votes in 2008 Prop 10 (Alternative Fuels) and 2006 Prop 1B (Transportation Bond)
- Identification issues
  - $\epsilon(i)$ includes expectational error
  - Placement correlated with unobserved political values
  - Model misspecification
- Instrument for $\hat{W}_{19}$ using randomly placed stations along feasible routes, at 2008 fundamentals

  ▸ alt routes
- Use different models and different restrictions on the sample

Voting Equation

Inst. Var.:	None - OLS				$\ln(\hat{W}_{08})$	Random Station	Random Path
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$log(\hat{W}_{19})$	38.53^a	17.27^a	14.53^a	14.15^a	16.84^a	19.45^a	22.68^a
	(1.76)	(1.26)	(0.98)	(1.03)	(1.23)	(1.68)	(1.80)
Log-odds Dem. Sh.		0.30^a	0.38^a	0.38^a	0.38^a	0.38^a	0.39^a
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Environ.: Prop. 10		1.16^a	2.46^a	2.46^a	2.44^a	2.43^a	2.41^a
		(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Transp.: Prop. 1b		1.54^a	0.82^a	0.83^a	0.82^a	0.81^a	0.80^a
		(0.05)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
Sh. non-White			-0.17^a	-0.17^a	-0.18^a	-0.18^a	-0.19^a
			(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sh. College			0.74^a	0.74^a	0.73^a	0.73^a	0.72^a
			(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sh. Under 30			0.17^a	0.18^a	0.18^a	0.18^a	0.18^a
			(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Log. Dist. Station				-0.01^a	-0.01^a	-0.01	-0.00
				(0.00)	(0.00)	(0.00)	(0.00)
Log. Dist. Rail				0.02^a	0.02^a	0.01^a	0.01^a
				(0.00)	(0.00)	(0.00)	(0.00)
F-stat					803	574	286
Num. Obs.	7861	7861	7861	7861	7861	7861	7861

Note: ^{a} denotes 1% significance level. Robust standard errors in parenthesis. All specifications control for county fixed effects.

→Voters responded to expected real income ▸ alt models ▸ pol covariates only

Cost to Sway 1% of Vote

	θ_V	At Median Tract	90p
Baseline	19.5	0.4%	0.5%
Full Model	17.5	0.4%	0.6%
Pessimistic	41.6	0.2%	0.3%
+ Car	19.2	0.4%	0.6%

Note: table reports θ_V and percentiles of $\frac{1}{\theta_V v(i)^2(1-v(i))}\%$

$\rightarrow$Quite Costly to change votes

Real Income vs Political Component in Preferences

$$\mathbb{E}\left[\Delta u_{\omega}(i)\right] = \ln \hat{a}(i) + \hat{W}(i)$$

	$\sigma_{\Delta \ln a}$	$\sigma_{\Delta \ln \hat{W}}$
Baseline	2.2%	0.4%
Full Model	2.4%	0.4%
Pessimistic	1.0%	0.2%
+ Car	2.3%	0.6%

Note: $\ln \hat{a}(i)$ includes all variables and constants

→ Political component drives much larger fraction of spatial variation in preferences and votes

Real Income vs Political Component in Aggregate Vote

$$v(i) = \frac{\hat{W}(i)^{\theta_V} \hat{a}(i) \exp \epsilon(i)}{1+\hat{W}(i)^{\theta_V} \hat{a}(i) \exp \epsilon(i)}$$

	Aggregate Vote		Loss for
	$\hat{W}$ only	$\hat{a}$ only	50% vote
Baseline	51.4%	51.6%	0.3%
Full Model	52.7%	50.3%	0.1%
Pessimistic	47.9%	54.9%	0.5%
+ Car	52.7%	50.4%	0.1%

Note: actual vote was 52.6%

→ HSR would have passed with uniform real income losses of 0.3% to 0.5%

Economic and Political Drivers of CHSR Design

- Posit social welfare function:

$$\mathcal{W} = \max_{\mathbf{d}\in D} \mathbb{E}\left[\sum_i N(i)\,\Omega(i)\ln \hat{W}(i;\mathbf{d}) + \lambda \sum_i N(i)\,v(i;\mathbf{d})\right]$$

  - $\mathbf{d} \equiv (d_1, .., d_{24})$ are coordinates of 24 stations
  - Pareto weights $\Omega(i)$ a function of {Density, Wage, Share College, Share Non-White}

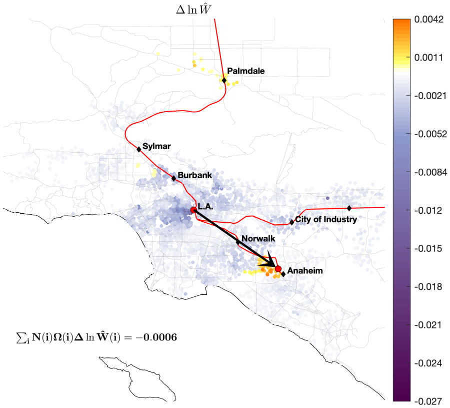
- Alternative designs must yield welfare loss:

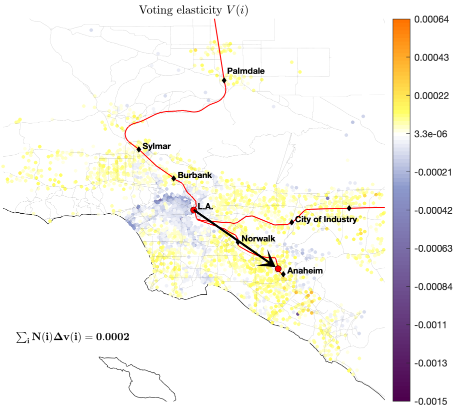
$$\Delta\mathcal{W} \approx \underbrace{\sum_i \Omega(i)\,N(i)\,\Delta\ln\hat{W}(i)}_{\text{Utilitarian Welfare Change}} + \lambda \underbrace{\sum_i \theta_v v(i)(1-v(i))\,N(i)\,\Delta\ln\hat{W}(i)}_{\text{Votes Change}} - \epsilon \le 0$$

  - Deviations that increase votes and reduce utilitarian component $\rightarrow$ Upper bound on λ
    - Decrease votes and increase utilitarian component $\rightarrow$ Lower bound on λ
  - Compute confidence set using modified method of moments (Andrews and Soares, 2010)

Example of Perturbation

Perturbation that reduces aggregate welfare but increases votes:

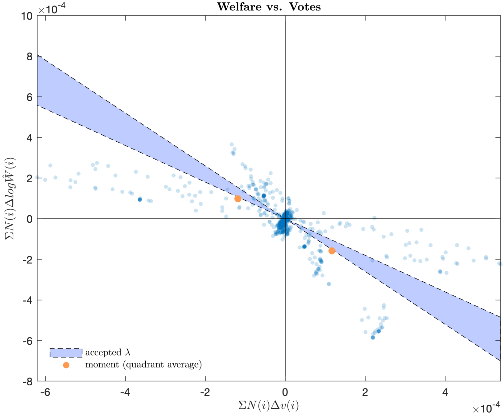




$\Rightarrow$ Not picked by the planner, hence λ cannot be too high

Identification of Preference for Votes

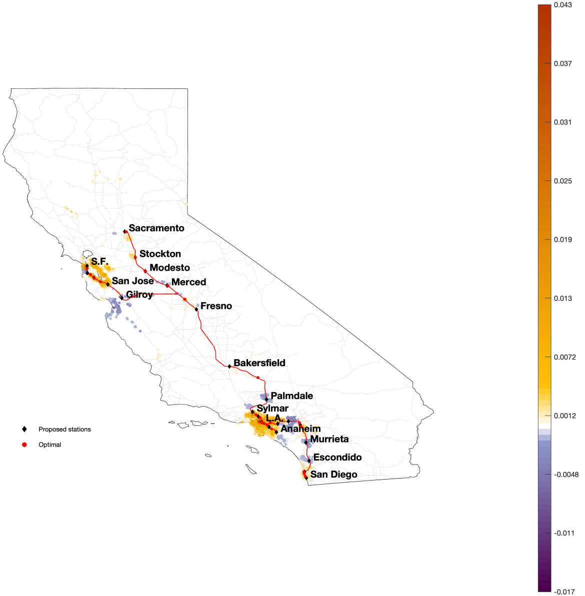
Utilitarian Welfare Change $+ \lambda$Votes Change ≤ 0



Estimate: $\lambda \in [0.46, 2.3]$ without covariates; $\lambda \in [0.61, 1.68]$ with all covariates ▸ table ▸ sets

Apolitical Planner ($\lambda = 0$): Optimal Station Distribution

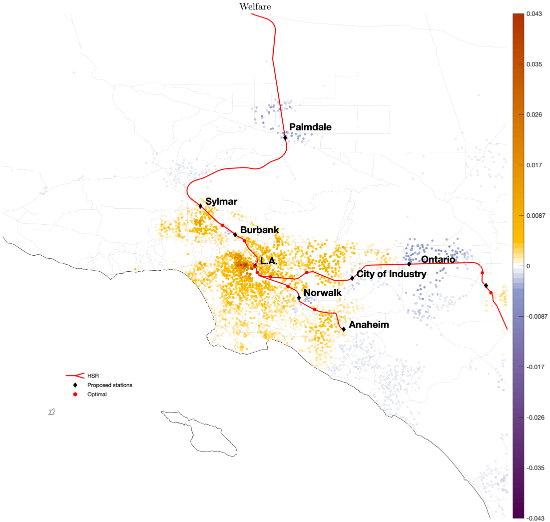
- Utilitarian welfare change:
  - Aggregate: 0.18% (baseline: 0.32%)
  - Across tracts: [-1.70%, 4.25%]
- Vote change:
  - Aggregate: -0.18%
  - Across tracts: [-14.15%, 3.79%]
- Top quartile of density gains: 0.46%
- Bottom quartile of vote elasticity: 0.39%
- Apolitical planner moves stations closer to dense democratic areas



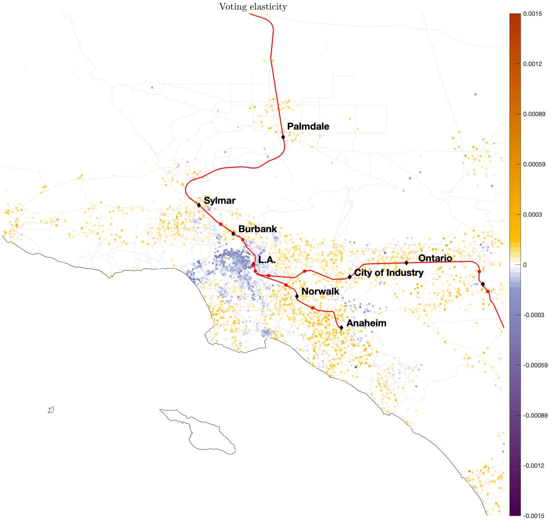
FOCs

Apolitical Planner ($\lambda = 0$): Reallocations towards L.A.

Welfare



Voting Gradient



Conclusion

- How important are political considerations for transport infrastructure policy?
  - We gain insights into individual and planner preferences from the CHSR
- Individuals:
  - Economic gains do matter for policy preferences, but swaying votes is costly
  - Political considerations dominate spatial variation in policy preferences
  - CHSR would have been approved even without promised income gains
- Planner:
  - Strong preference for approval
  - Apolitical planner would have placed stations closer to urban centers

Travel Choices

Resident of census tract i:

$$\max_{\left(j_C, m_C, R^C_{i,j_C,m_C}\right), \left(j_L, m_L, R^L_{i,j_L,m_L}\right)} \frac{B_i}{r_i^{\mu_H}} \left(\frac{y_{i,j_C} - t_C\left(R^C_{i,j_C,m_C}\right)}{d\left(R^C_{i,j_C,m_C}\right)} \varepsilon^C_{j_C,m_C} \right) \left(\frac{B_{j_L}}{t_L\left(R^L_{i,j_L,m_L}\right) d\left(R^L_{i,j_L,m_L}\right)} \right)^{\mu_L} \varepsilon^L_{j,m_L}$$

- Chooses destination, mode, and route for commuting and leisure

back

Travel Choices

Resident of census tract i:

$$\max_{\left(j_C, m_C, R^C_{i,j_C,m_C}\right), \left(j_L, m_L, R^L_{i,j_L,m_L}\right)} \frac{B_i}{r_i^{\mu_H}} \left(\frac{y_{i,j_C} - t_C\left(R^C_{i,j_C,m_C}\right)}{d\left(R^C_{i,j_C,m_C}\right)} \varepsilon^C_{j_C,m_C} \right) \left(\frac{B_{j_L}}{t_L\left(R^L_{i,j_L,m_L}\right) d\left(R^L_{i,j_L,m_L}\right)} \right)^{\mu_L} \varepsilon^L_{j,m_L}$$

- Consumes residential amenities and pays for housing

back

Travel Choices

Resident of census tract i:

$$\max_{\left(j_C, m_C, R^C_{i,j_C,m_C}\right), \left(j_L, m_L, R^L_{i,j_L,m_L}\right)} \frac{B_i}{r_i^{\mu_H}} \left(\frac{y_{i,j_C} - t_C\left(R^C_{i,j_C,m_C}\right)}{d\left(R^C_{i,j_C,m_C}\right)} \varepsilon^C_{j_C,m_C} \right) \left(\frac{B_{j_L}}{t_L\left(R^L_{i,j_L,m_L}\right) d\left(R^L_{i,j_L,m_L}\right)} \right)^{\mu_L} \varepsilon^L_{j,m_L}$$

- Spends income, net of monetary and utility cost of commuting, with $\varepsilon^C_{j_C,m_C} \sim EV(\theta_C)$
- Disutility from time:

$$d\left(R_{i,j,m}\right) = D_{i,m} \tau \left(R_{i,j,m}\right)^{\rho}$$

back

Travel Choices

Resident of census tract i:

$$\max_{\left(j_C, m_C, R^C_{i,j_C,m_C}\right), \left(j_L, m_L, R^L_{i,j_L,m_L}\right)} \frac{B_i}{r_i^{\mu_H}} \left(\frac{y_{i,j_C} - t_C\left(R^C_{i,j_C,m_C}\right)}{d\left(R^C_{i,j_C,m_C}\right)} \varepsilon^C_{j_C,m_C} \right) \left(\frac{B_{j_L}}{t_L\left(R^L_{i,j_L,m_L}\right) d\left(R^L_{i,j_L,m_L}\right)} \right)^{\mu_L} \varepsilon^L_{j,m_L}$$

- Consumes leisure trips, net of monetary and utility costs of travel, with $\varepsilon^L_{j,m_L} \sim EV(\theta_L)$
- Disutility from time:

$$d\left(R_{i,j,m}\right) = D_{i,m} \tau \left(R_{i,j,m}\right)^{\rho}$$

back

Real Income Measurement: Time+Cost Shocks+GE

- Real income change in tract i:

$$\hat{V}(i) = \underbrace{\left(\sum_j \sum_m \lambda^C_{i,j,m} \left(\hat{r}_i^{-\mu_H} \hat{B}_i \hat{l}_{i,j,m} \hat{\tau}_{i,j,m}^{-\rho}\right)^{\theta_C}\right)^{\frac{1}{\theta_C}}}_{\text{Faster/Cheaper Commute}} \underbrace{\left(\sum_j \sum_m \lambda^L_{i,j,m} \left(\hat{B}_j \frac{\hat{\tau}_{i,j,m}^{-\rho}}{\hat{t}_{i,j,m}}\right)^{-\theta_L \mu_L}\right)^{\frac{1}{\theta_L}}}_{\text{Faster/Cheaper Leisure Travel}}$$

- Wages adjust due to business trips:

$$\hat{w}_i^{1-\mu_B-\mu_{H_Y}} \hat{r}_j^{\mu_{H_Y}} = \hat{A}_i \underbrace{\left(\sum_j \sum_m \lambda^B_{i,j,m} \left(\hat{A}_j \frac{\hat{\tau}_{i,j,m}^{-\rho}}{\hat{t}_{i,j,m}}\right)^{\theta_B \mu_B}\right)^{\frac{1}{\theta_B}}}_{\text{Faster/Cheaper Business Travel}}$$

- + market-clearing (land, labor)
- + spillover conditions (amenities, productivity) back

Commuters' Preferences over Transport Modes

$$\ln \lambda_{i,j,m}^{C} = \nu_{i,m}^{C} + \theta_C \ln\left(w_{i,j} - t_{i,j,m}\right) - \theta_C \rho \ln \tau_{i,j,m} + \varepsilon_{i,j,m}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public Transport								
Constant	1.73[a] (0.05)	3.70[a] (0.15)	2.39[a] (0.31)	1.85[a] (0.12)	0.46[a] (0.10)	0.98 (1.55)	-5.32[a] (0.34)	-8.22[a] (1.05)
Sh. Car Owners		-2.31[a] (0.18)						-0.47[b] (0.21)
Sh. Under 30			-1.41[b] (0.64)					-2.91[a] (0.32)
Sh. College-educated				-0.26 (0.25)				-1.46[a] (0.23)
Sh. Nonwhite					2.96[a] (0.24)			1.46[a] (0.18)
Log Median Inc.						0.07 (0.14)		0.59[a] (0.09)
Log Pop. Density							0.95[a] (0.05)	0.70[a] (0.03)
Private Vehicle								
Constant	2.64[a] (0.04)	-0.71[a] (0.13)	3.64[a] (0.27)	3.14[a] (0.09)	2.55[a] (0.07)	0.41 (1.17)	1.24[a] (0.23)	-7.98[a] (0.84)
Sh. Car Owners		4.00[a] (0.15)						4.76[a] (0.19)
Sh. Under 30			-2.20[a] (0.56)					-1.59[a] (0.25)
Sh. College-educated				-1.17[a] (0.19)				-1.07[a] (0.19)
Sh. Nonwhite					0.21 (0.20)			0.20 (0.14)
Log Median Inc.						0.20[c] (0.11)		0.43[a] (0.08)
Log Pop. Density							0.19[a] (0.03)	0.41[a] (0.02)
Num. Obs.	23593	23593	23593	23593	23593	23593	23593	23593

Note: [a] denotes 1% significance; [b] denotes 5% significance; and [c] denotes 10% significance. Robust standard errors are displayed in parenthesis. All specifications are conditional on the estimates $\hat{\theta}_C = 2.97$ and $\hat{\rho}_C = 0.75$.

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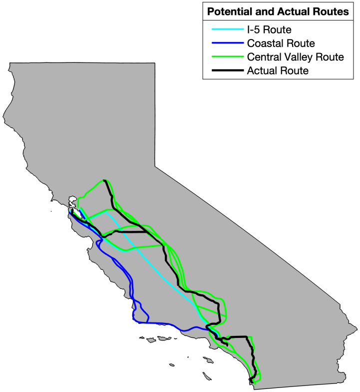
Potential CHSR Routes (1996 Report)



Note: this figure shows a digitization of the three planned routes reprinted in page 113 of part 1 of the 2005 CHSR Environmental Impact Report. Each route includes multiple branches that could be used within a route.

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Alternative Models

Model:	Baseline		Full		Pessimistic		+ Car	
Inst. Var.:	Random Station (1)	Random Path (2)	Random Station (3)	Random Path (4)	Random Station (5)	Random Path (6)	Random Station (7)	Random Path (8)
$log(\hat{W}_{19})$	19.45[a]	22.68[a]	17.51[a]	18.92[a]	41.62[a]	47.20[a]	19.17[a]	23.15[a]
	(1.68)	(1.80)	(1.48)	(1.54)	(3.55)	(3.72)	(1.46)	(2.00)
Log-odds Dem. Sh.	0.38[a]	0.39[a]	0.39[a]	0.39[a]	0.38[a]	0.39[a]	0.40[a]	0.41[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Environ.: Prop. 10	2.43[a]	2.41[a]	2.43[a]	2.42[a]	2.42[a]	2.41[a]	2.46[a]	2.45[a]
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Transp.: Prop. 1b	0.81[a]	0.80[a]	0.84[a]	0.84[a]	0.81[a]	0.81[a]	0.90[a]	0.91[a]
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)
Sh. non-White	-0.18[a]	-0.19[a]	-0.17[a]	-0.18[a]	-0.18[a]	-0.19[a]	-0.18[a]	-0.19[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sh. College	0.73[a]	0.72[a]	0.73[a]	0.73[a]	0.72[a]	0.72[a]	0.75[a]	0.74[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sh. Under 30	0.18[a]	0.18[a]	0.17[a]	0.17[a]	0.18[a]	0.18[a]	0.16[a]	0.16[a]
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Log. Dist. Station	-0.01	-0.00	-0.01[c]	-0.01	-0.01	-0.00	0.01[a]	0.03[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Log. Dist. Rail	0.01[a]	0.01[a]	0.02[a]	0.01[a]	0.01[a]	0.01[a]	0.01[a]	0.01[a]
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
F-stat	574	286	610	311	599	295	394	206
Num. Obs.	7861	7861	7861	7861	7861	7861	7861	7861

Note: [a] denotes 1% significance level. Robust standard errors in parenthesis. All specifications control for county fixed effects. Columns (1) and (2) present baseline estimates. Columns (3) and (4) present results for the model that incorporates general equilibrium effects. Columns (5) and (6) present results for the "pessimistic" model, which assumes a 0.5 probability that the CHSR is completed in 24 years. Columns (7) and (8) present results for a version of the model that allows the CHSR to be a perfect substitute to traveling by car.

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Alternative Models, Political Covariates Only

Model:	Baseline		Full		Pessimistic		+ Car	
Inst. Var.:	Random Station (1)	Random Path (2)	Random Station (3)	Random Path (4)	Random Station (5)	Random Path (6)	Random Station (7)	Random Path (8)
$log(\hat{W}_{19})$	17.89[a]	23.57[a]	15.94[a]	20.62[a]	39.09[a]	49.63[a]	15.56[a]	20.92[a]
	(1.65)	(1.98)	(1.49)	(1.77)	(3.55)	(4.10)	(1.33)	(2.02)
Log-odds Dem. Sh.	0.30[a]	0.30[a]	0.30[a]	0.30[a]	0.30[a]	0.30[a]	0.31[a]	0.32[a]
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Environ.: Prop. 10	1.16[a]	1.11[a]	1.16[a]	1.11[a]	1.16[a]	1.12[a]	1.16[a]	1.11[a]
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Transp.: Prop. 1b	1.54[a]	1.52[a]	1.57[a]	1.56[a]	1.54[a]	1.52[a]	1.62[a]	1.63[a]
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
F-stat	713	317	732	333	738	328	454	231
Num. Obs.	7861	7861	7861	7861	7861	7861	7861	7861

Note: [a] denotes 1% significance level. Robust standard errors in parenthesis. All specifications control for county fixed effects. Columns (1) and (2) present baseline estimates. Columns (3) and (4) present results for the model that incorporates general equilibrium effects. Columns (5) and (6) present results for the "pessimistic" model, which assumes a 0.5 probability that the CHSR is completed in 24 years. Columns (7) and (8) present results for a version of the model that allows the CHSR to be a perfect substitute to traveling by car.

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Planner's Preferences

Observable	Pareto weight parameters β and λ					
	(1)	(2)	(3)	(4)	(5)	(6)
Density		[0.00, 1.13]				[0.00, 0.16]
Wages			[-0.15, 0.26]			[-0.15, 0.26]
Share college				[-0.13, 0.54]		[0.00, 0.59]
Share non-white					[-0.33, 0.54]	[-0.26, 0.13]
λ (Votes)	[0.46, 2.29]	[0.58, 2.89]	[0.58, 1.53]	[0.62, 1.68]	[0.37, 2.48]	[0.61, 1.68]
Constant	[1.00, 1.00]	[0.98, 1.00]	[0.99, 1.00]	[0.99, 1.00]	[0.98, 1.01]	[0.99, 1.01]

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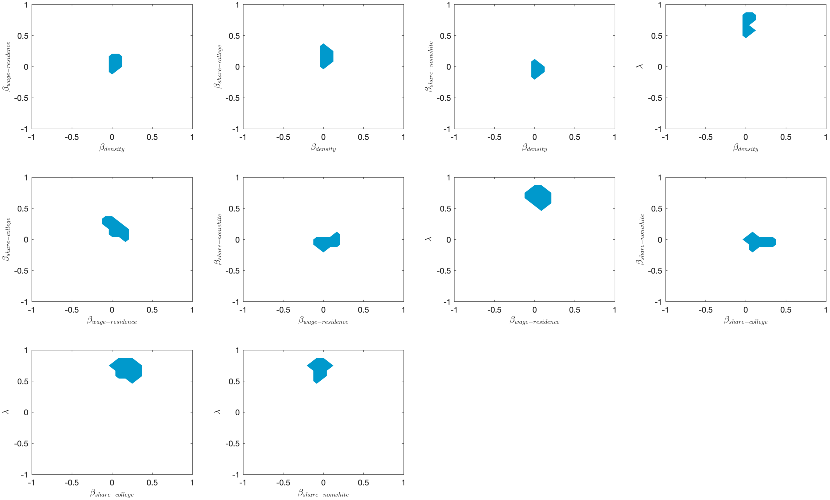
Admissible Sets



Note: Parameters presented with spherical normalization $\sum \beta_i^2 = 1$

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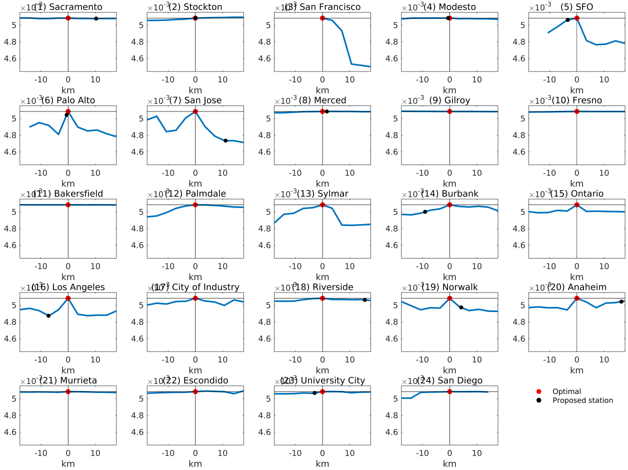
Optimal Station Placement



Note: Parameters presented with spherical normalization $\sum \beta_i^2 = 1$

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