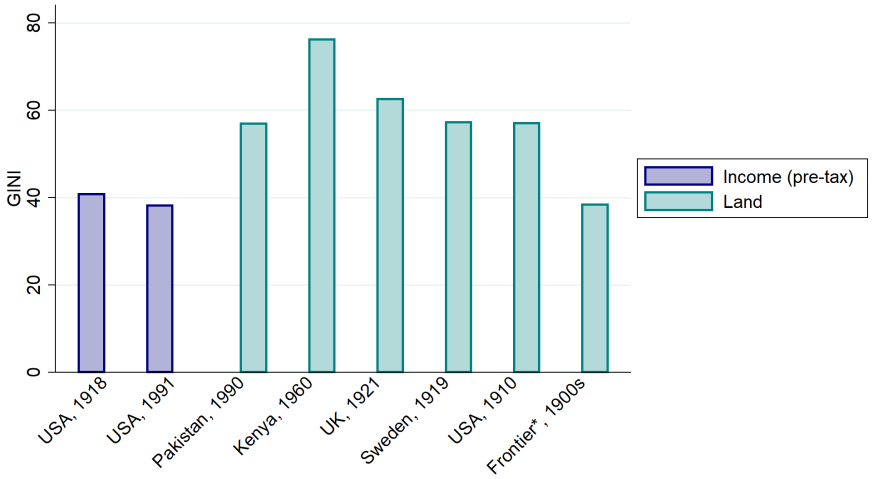
Land Concentration and Long-Run Development in the Frontier United States

Cory Smith

Dartmouth/Univeristy of Maryland

July, 2020

High Land Inequality in Agrarian Economies



Sources: FAO, WDI, Frankema (2009), Atkinson, Hassell, Morelli, Roser (2017), author [two frontier counties]

Three Perspectives on Land Concentration

"[Landlords] grow richer, as it were in their sleep, without working, risking, or economizing."
— John Stuart Mill, *Principles of Political Economy*, (1848)

"In all the modes of occupying the land, the great evil is the smallness of farms"
— Arthur Young, *Travels in France*, (1792)

"The rich [landlords]... in spite of their selfishness... are led by an invisible hand to make nearly the same distribution of the necessaries of life, which would have been made, had the earth been divided into equal portions"
— Adam Smith, *The Theory of Moral Sentiments*, (1759)

How Does Land Concentration Affect Development?

- Three modern perspectives
  - Economies of scale are good (e.g. Allen 1988)
  - Tenancy & contracting problems are bad
    - Sharecropping (e.g. Burchardi et al. 2018)
    - Coercion (e.g. Acemoglu and Wolitzky 2011)
  - "Coasian" World: irrelevant, especially for the US (irrelevant)
- Today:
  - Quasi-random variation from "railroad land grants" policy
  - Concentration increased in alternate square miles of land ("checkerboard")
  - Study effects on land values then & ≈150 years later

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Roadmap & Results Overview

- **Land Concentration** $\rightarrow$
  - Low investment (historically)
  - Low land values (today)
- Mechanisms
  - Tenancy, sharecropping (static)

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Historical Background

Railroad Land Grants Were Important



Areas Allotted for Railroad Land Grants (Miller and Staebler 1999)

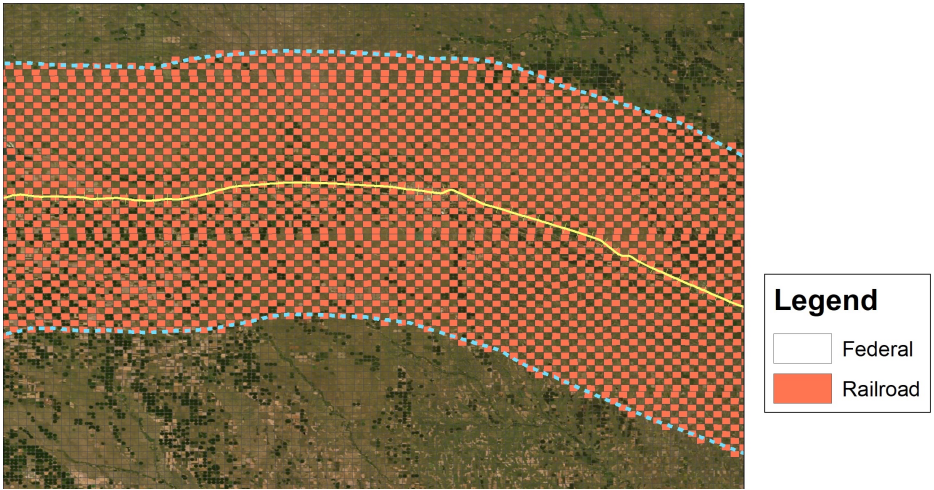
Railroad Grants and Land Concentration

- Federal lands / 1862 Homestead Act:
  - Goal: reduce land monopolization
  - 160 acres max (no large farms)
  - (Nearly) free if you lived on it
  - → Less concentrated land
- Railroad lands:
  - Goal: profit
  - As much land as you wanted
  - ...at market prices
  - → More concentrated land

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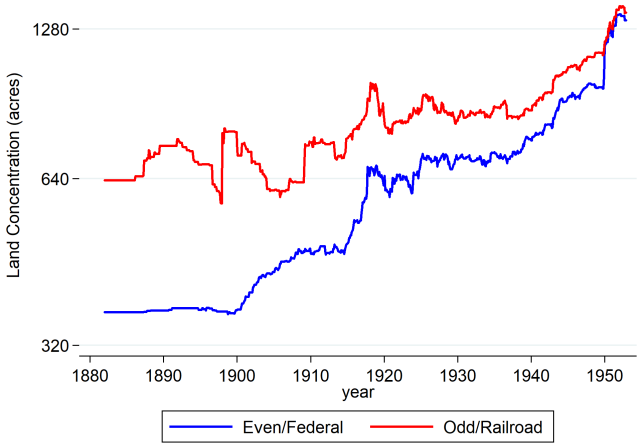
The Railroad "Checkerboard"



Note: Railroad lands in Nebraska; Each pixel is a "section"

Railroad Land Grants Created Large Farms

Figure 1: Land Concentration Over Time, Banner County



Roadmap & Results Overview

- **Land Concentration** $\rightarrow$
  - Low investment (historically)
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- **Mechanisms**
  - Tenancy, sharecropping (static)

Historians: Decreased Intensive Use

"[Landlord] ownership and tenancy did not always result in the best use of the land... [it] forced widespread dispersion of population and placed heavy tax burdens upon farmers whose improved lands could be more heavily assessed than the speculators' unimproved lands." (Gates 1942)

▸ More Quotes

Empirics: Direct Effects

Within the grant boundary, just compare even & odd sections.

$$y_i = \alpha \text{RR}_i + \beta X_i + \varepsilon_i \tag{1}$$

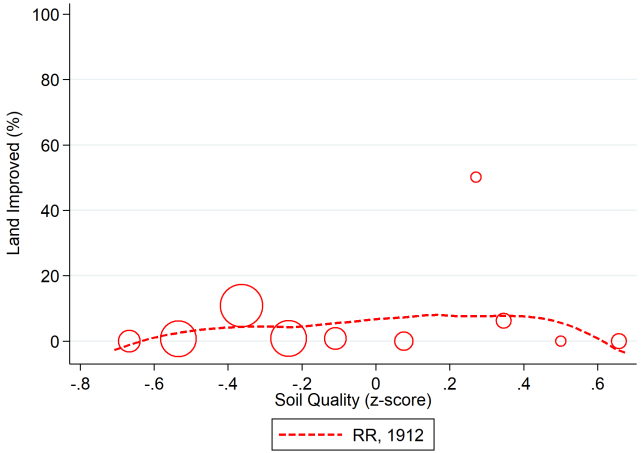
- Assumption: no systematic even/odd square difference
- Unit i is a (non-education) section
- y an outcome
- RR_i is whether the section should have been granted to the railroad (odd-numbered)
- X controls
- Standard errors generally spatial

Table 1: Effects on Investment and Population

	Historical (early 1900s)	Modern (2017)		
	(1) (asinh) Improvements	(2) (asinh) Improvements	(3) (asinh) Value Assessor	(4) (asinh) Value Placebo
RR Effect	-0.77**	-0.23***	-0.044***	-0.0013
	(0.28)	(0.047)	(0.014)	(0.0050)
Sample	Morrill 1912	All 2017	All	Placebo
Geo Controls	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y
SEs / Clusters	Township	Spatial	Spatial	Spatial
N	101	132,463	132,463	230,483
$\mathbb{E}[y]$	\$3.2k	\$1,277k	\$2,185k	\$9,566k

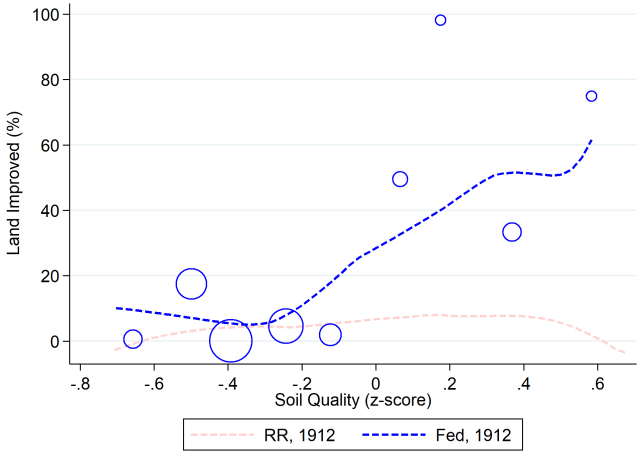
Historically: Landlords Didn't Invest

Figure 2: Land Improvement in Morrill County, Nebraska



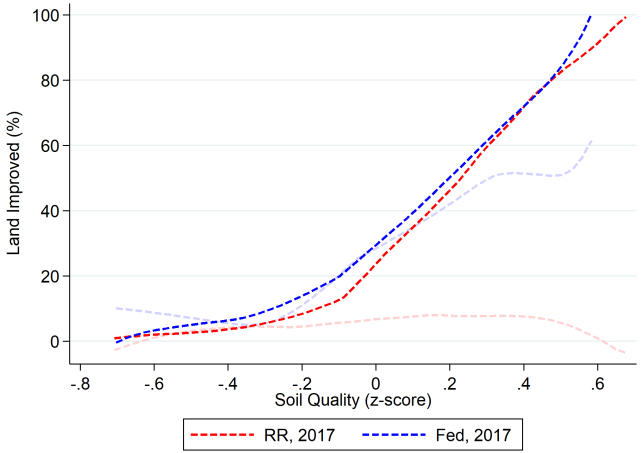
Historically: Small Farmers Did Invest

Figure 2: Land Improvement in Morrill County, Nebraska



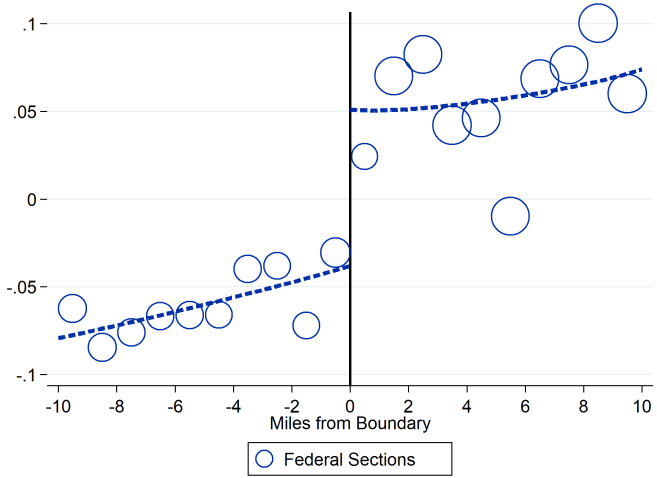
Today: Similar to Small Farmers' Choices

Figure 2: Land Improvement in Morrill County, Nebraska



RR Grant Policy Negatively Impacted Nearby Land

Figure 3: (asinh) Total Property Value, Residuals



Roadmap & Results Overview

- **Land Concentration** $\rightarrow$
  - Low investment (historically)
  - Low land values (today)
- **Mechanisms**
  - Tenancy, sharecropping (static)

Historians: Land Concentration → Tenancy

"The concentration of land ownership in large holdings is favorable to landlordism and tenancy."
— Bureau of Agricultural Economics, 1923

"[One landlord] purchased 160,000 acres which he... rented to tenants... He refused to make improvements upon his land... The result, of course, was that the buildings and fences were wretchedly poor and [his] lands came to be considered the 'most forlorn-looking estate in Illinois.' " (Gates 1941)

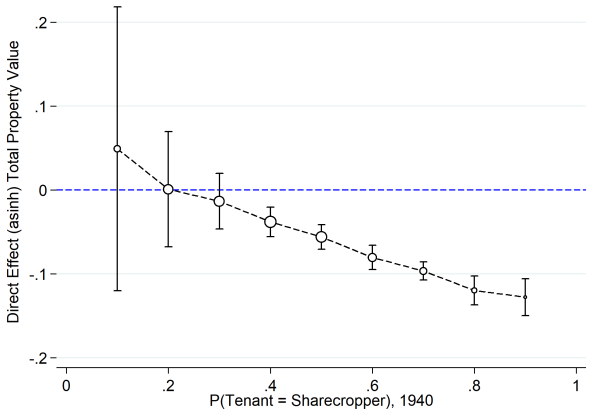
Tenancy Rises in the Grant Area

Table 2: Effects on Owner Distance to Land

	First Owners		Later Owners	
	(1)	(2)	(3)	(4)
	Non-Farm Home (%)	Other State (%)	Other County (%) Early 1900s	(log) Distance 2017
RR Effect	15.7***	10.6***	8.24***	0.037***
	(4.09)	(3.19)	(2.64)	(0.014)
log(RR Distance)	-3.37	4.63**	-60.3	0.099***
	(2.48)	(1.82)	(37.8)	(0.024)
Sample	Lincoln	Lincoln	2 Counties	Non-gov
Geo Controls	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y
SEs / Clusters	Township	Township	Township	Spatial
N	1,239	1,591	614	34,221
$\mathbb{E}[y]$	47%	66%	88%	60 mi

Largest Effects in Sharecropping-prone Areas

Figure 4: Effects on Property Values by Fraction Sharecropping



▸ Exogenous Prediction

Other Channels, Other Cool Things

- Other explanations?
  - ▸ Elite Political Capture
  - ▸ Environmental
  - ▸ Town Formation
  - ▸ Manipulated Grant Boundaries
- Other cool things
  - ▸ Split Parcels
  - ▸ Land Use
  - ▸ Population Attenuation
  - ▸ Owner Characteristics
  - ▸ Investment Subcategories

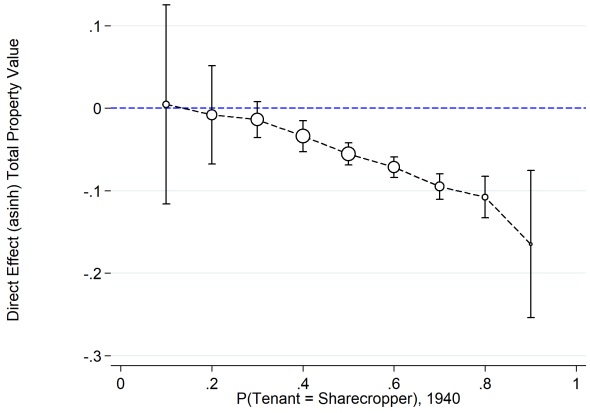
Conclusion

- Natural experiment in the American West
  - Changed land concentration ≈150 years ago
- Economic impact
  - Less intensive, lower-value land use
  - Tenant farming & sharecropping
- Markets resolve differences, but very slowly
- Different view of the American frontier

Appendix

Largest Effects in Sharecropping-prone Areas

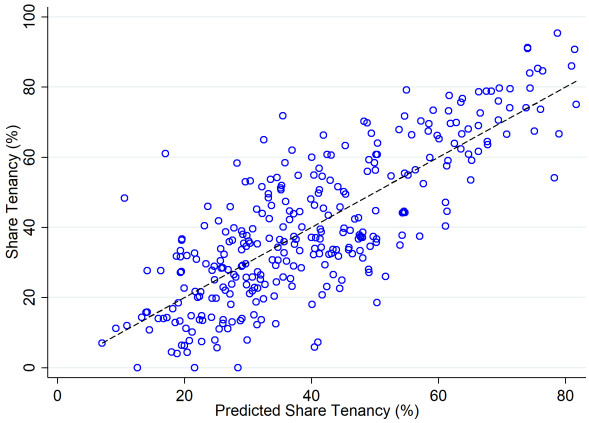
Figure 5: Effects on Property Values by Geography-Predicted Share Tenancy



Back

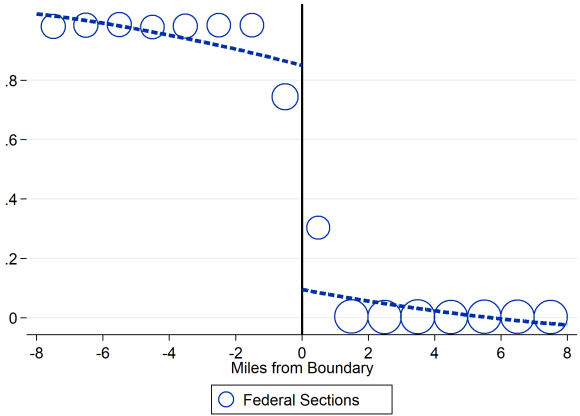
Which Type of Tenancy Matters?

- Sharecropping vs. other forms (e.g. cash)
- Observe at county level
- Predict from geographic characteristics, state lat $\times$ lon
- Spatial polynomial, better land $\rightarrow$ more share tenancy
  - Alston & Reid 1982
  - Tenants need more cash



Back

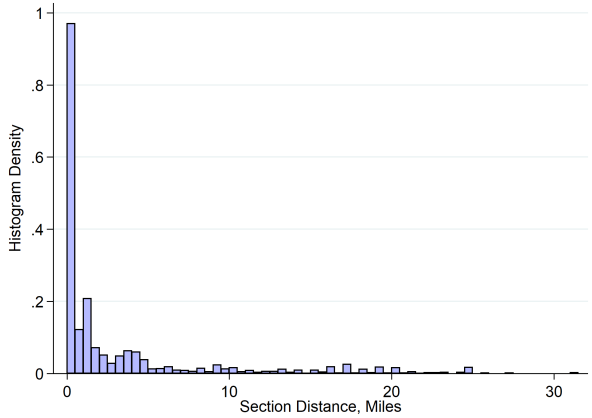
Figure 6: Neighboring Concentrated Land



Back

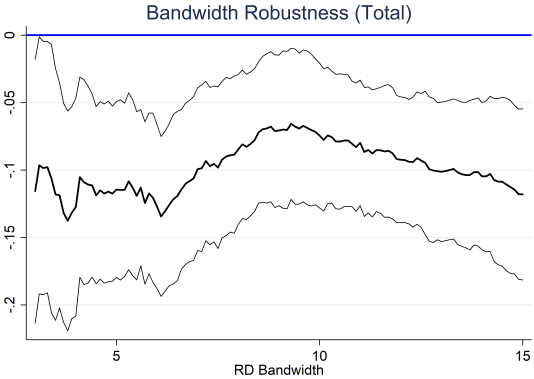
Most Expansions Are Adjacent

Figure 7: Distance of Property Expansions, Banner County

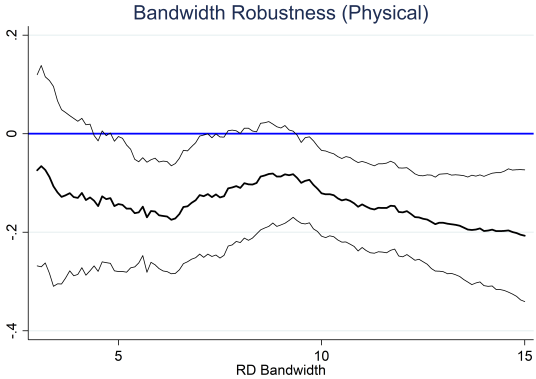


Back

Bandwidth Robustness



(a) BW and Total Value



(b) BW and Physical Investment

Back

Table 3: Spillover Effects on (asinh) Property Values

	(1) Base	(2) County	(3) Donut	(4) All odds
RR Effect	-0.11***	-0.11***	-0.17**	-0.095***
	(0.040)	(0.044)	(0.074)	(0.034)
Geo Controls	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
SEs / Clusters	Spatial	County	Spatial	Spatial
N	23,382	23,382	19,845	25,142
$\mathbb{E}[y]$	\$1,755k	\$1,755k	\$1,806k	\$1,773k

Back

Railroad Lands Facilitated Largeholding

"South of Loup City to the county line, were holdings of such extent that by 1884 they were known as ranches. Most extensive was Barker Estate ranch... [In 1880, they] purchased 3839.52 acres... from the C, B & Q railroad"
("A Brief History of Sherman County, Nebraska," Owens 1952)

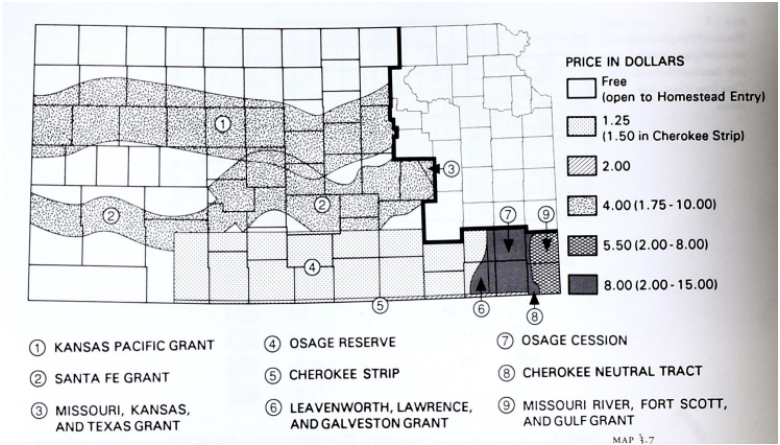
Back

Railroad Lands Attracted the Wealthy

"The asking price [of railroad land] ranged between $2 and $8 per acre, amounts considerably above the traditional preemptive price of $1.25. That the trace of the old railroad grant line is mirrored by the distribution of upper southerners in 1885 is strong evidence that these hard-pressed people chose their new homesites with finances more than politics or other concerns in mind."
(Shortridge 1997 on Kansas)

Back

Historical Literature on Prices

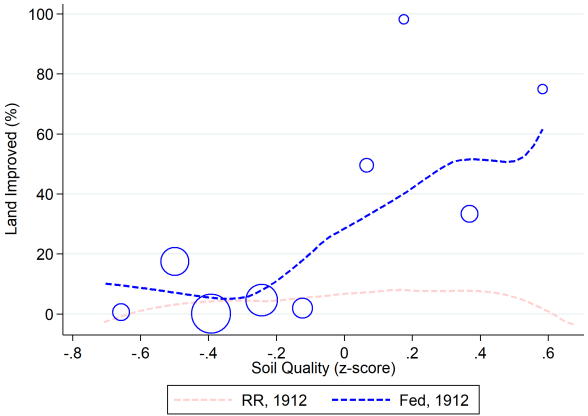


(Source: Shortridge 1997)

Back

Historically: Small Farmers Did Invest

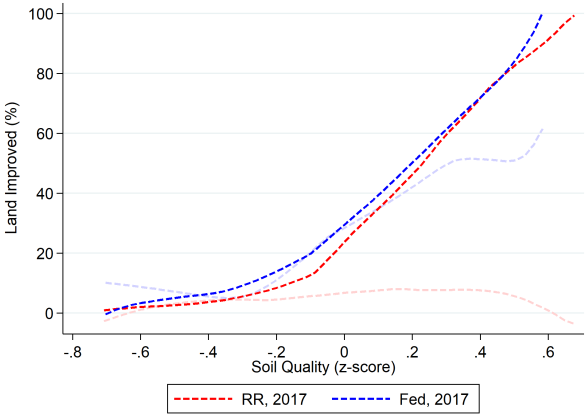
Figure 4: Land Improvement in Morrill County, Nebraska



Back

Today: Similar to Small Farmers' Choices

Figure 4: Land Improvement in Morrill County, Nebraska



Back

Historians: Negative Effects of Elite Capture

"To gain their objectives the speculators [largeholders] were forced to enter politics... They favored grants for railroads and measures to make easier land accumulation. They were influential in local and state governments which they warped to suit their interests." (Gates 1941)

"The successful land dealer of one generation became the banker, the local political oracle, and office holder or the country squire of the next. Scarcely a city or country town in the West but had its first family whose fortune had been made by shrewd selection of lands and their subsequent sale or rental to later comers." (Gates 1942)

Back

...but Results Disagree

Table 4: Impact on Political Outcomes

	Direct			Spillover		
	(1) Public Goods	(2) Tax Time	(3) Officeseeking	(4) Public Goods	(5) Tax Time	(6) Officeseeking
RR Effect	-0.024*	-0.17***	-3.61	-0.0021	-0.080	-4.46
	(0.013)	(0.036)	(5.35)	(0.019)	(0.16)	(4.36)
Sample	NE & KS 1940	Perkins 1900	Morrill 1912	NE & KS 1940	Perkins 1900	Morrill 1912
Geo Controls	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Township FEs	Y	Y	Y			
SEs / Clusters	Spatial	Township	Township	Spatial	Township	Township
N	18,999	531	82	4,064	265	162
N (clusters)	N/A	24	9	N/A	19	16
$\mathbb{E}[y]$	.13	2 yrs	5.5%	.12	2.5 yrs	4.9%

Back

Environmental Characteristics are Balanced

Table 5: Environmental Impacts

	(1) Soil	(2) Elevation	(3) Slopes	(4) Streams
Panel A: Direct Effects				
RR Effect	-0.00045	-0.000098**	-0.0017	-0.00075
	(0.0010)	(0.000050)	(0.0018)	(0.0021)
County FEs	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y
SEs / Clusters	Spatial	Spatial	Spatial	Spatial
N	132,463	132,463	132,463	132,463
N (clusters)	N/A	N/A	N/A	N/A
$\mathbb{E}[y]$	-.046	.34	8.8	.26
Panel B: Spillover Effects				
RR Effect	-0.0065	-0.00081	0.0053	0.010
	(0.0092)	(0.0011)	(0.024)	(0.014)
Area	All	All	All	All
County FEs	Y	Y	Y	Y
Township FEs				
SEs / Clusters	Spatial	Spatial	Spatial	Spatial
N	23,382	23,382	23,382	23,382
N (clusters)	N/A	N/A	N/A	N/A
$\mathbb{E}[y]$	.026	.34	7.1	.22

Back

Explanations that Don't Work: Agglomeration / Towns

Table 6: Effects on Town Formation

	Direct		Spillover	
	(1) Places	(2) Towns	(3) Places	(4) Towns
RR Effect	0.00034	0.0010*	0.0045	0.00062
	(0.00024)	(0.00059)	(0.0034)	(0.0016)
Sample	RR	RR	All	All
Geo Controls	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Township FEs	Y	Y		
SEs / Clusters	Spatial	Spatial	Spatial	Spatial
N	132,463	132,463	23,382	23,382
$\mathbb{E}[y]$	0.0	0.0	0.0	0.0

Back

How Routes Were Chosen

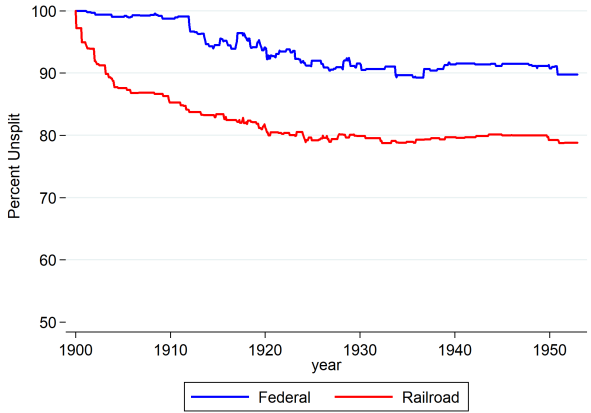
"Although the [Union Pacific] developers argued about how to get out of the Missouri Valley into the loess country intervening between Omaha and the Platte at Fremont, Nebraska, the route was chosen mainly from the viewpoint of cost"

"The characteristics of the country south of the Oregon Trail which led the engineers to favor building the railroad there may be presented briefly. Most important, at least most often cited, was greater directness... Next perhaps was the greater snowfall of the Sweetwater-South Pass line."
(Vance 1961)

◂ Back (formula description) ◂ Back (switchboard)

Indivisibilities: Properties are Rarely Split

Figure 5: Banner County Unsplit 1900 Properties



◂ Back (dynamic results) ◂ Back (switchboard)

Table 7: Effects on Total Property Value (Except Housing)

	(1) (asinh) Value Assessor	(2) (asinh) Value Assessor	(3) (asinh) Value Assessor	(4) (asinh) Value Assessor	(5) (asinh) Value Assessor
RR Effect	-0.035***	-0.035***	-0.033***	-0.034***	-0.041***
	(0.0094)	(0.0088)	(0.0088)	(0.0085)	(0.0094)
RR × Low					0.027***
					(0.0078)
Sample	All	All	All	All	All
State FEs	Y	Y	Y	Y	Y
County FEs		Y	Y	Y	Y
Township FEs			Y	Y	Y
Geo Controls				Y	Y
SEs / Clusters	Spatial	Spatial	Spatial	Spatial	Spatial
N	132,463	132,463	132,463	132,463	132,463
$\mathbb{E}[y]$	$2,185k	$2,185k	$2,185k	$2,185k	$2,185k

◂ Back (value results)

Historically: Fewer, Less Developed Farms

Table 8: Direct Effects on Historic Population, Physical Investment

	Main			Placebo		
	(1) (asinh) Investment	(2) Improved %	(3) (asinh) Farmsteads	(4) (asinh) Investment	(5) Improved %	(6) (asinh) Farmsteads
RR Effect	-0.77**	-9.93**	-0.26***	0.042	-0.45	-0.015
	(0.28)	(4.30)	(0.012)	(0.052)	(0.67)	(0.012)
log(RR Distance)	-20.6*	-184.4	-0.021	-6.42**	-51.1	-0.22**
	(9.59)	(132.9)	(0.013)	(2.88)	(40.5)	(0.10)
Sample	Morrill 1912	Morrill 1912	NE 1940	Placebo	Placebo	Placebo
Geo Controls	Y	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y	Y	Y
SEs / Clusters	Township	Township	Spatial	Township	Township	Spatial
N	101	101	18,999	1,229	1,229	8,836
$\mathbb{E}[y]$	\$3.2k	13%	2	\$2.2k	22%	1.5

◂ Back (investment results) ◂ Back (switchboard)

Today: Fewer, Less Developed Farms

Table 9: Direct Effects on Modern Population, Physical Investment

	(1) (asinh) Investment	(2) Investment > 0 (%)	(3) (asinh) Housing	(4) (asinh) Non-Housing	(5) (asinh) Pop (NE)
RR Effect	-0.23***	-3.68***	-0.22***	-0.16***	-0.094***
	(0.047)	(1.00)	(0.045)	(0.034)	(0.026)
log(RR Distance)	-0.48***	-4.31***	-0.45***	-0.42***	-0.36***
	(0.049)	(0.71)	(0.052)	(0.044)	(0.026)
Geo Controls	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y	Y
SEs / Clusters	Spatial	Spatial	Spatial	Spatial	Spatial
N	132,463	132,463	121,906	132,463	17,713
$\mathbb{E}[y]$	\$1,277k	43%	\$1,004k	\$412k	18

◂ Back (investment results) ◂ Back (switchboard)

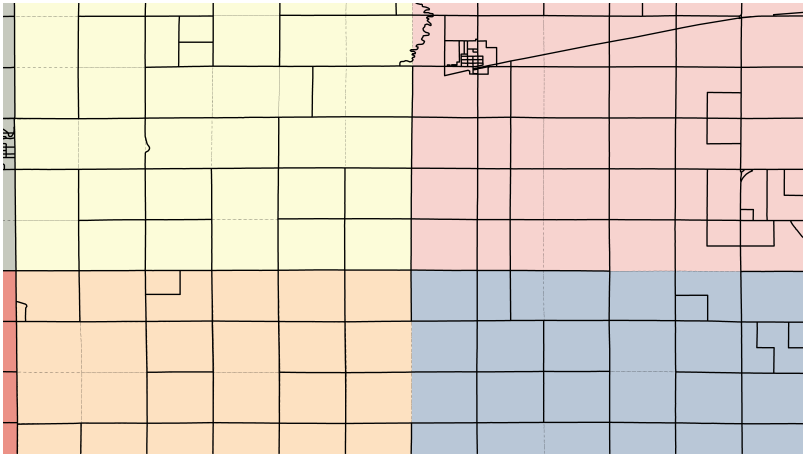
Today: Decreased Intensive Land Use

Table 10: Impacts on Land Use

	(1) Num. Uses	(2) Crop Farm (%)	(3) Grass Farm (%)	(4) (asinh) Value Satellite (ag)
RR Effect	-0.093***	-1.68***	0.49	-0.027***
	(0.022)	(0.50)	(0.92)	(0.0094)
RR × Low	0.089***	1.45***	6.53***	0.052***
	(0.018)	(0.49)	(1.69)	(0.014)
Geo Controls	Y	Y	Y	Y
County FEs	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y
SEs / Clusters	Spatial	Spatial	Spatial	Spatial
N	132,462	132,462	94,571	132,462
$\mathbb{E}[y]$	4.2	40%	81%	3.2%

◂ Back (investment) ◂ Back (switchboard)

Census Blocks



◂ Back (population results) ◂ Back (switchboard)

Adjusting for Census Block Attenuation

$$y_i = [\text{overlap}]_i \times RR_i + \gamma[\text{overlap}]_i + \beta X_i + \varepsilon_i$$

Table 11: Direct Effects on Population

	(1) (asinh) Farmsteads	(2) (asinh) Pop Adjusted	(3) (asinh) Pop Unadjusted
RR Effect	-0.25***	-0.16***	-0.096***
	(0.015)	(0.016)	(0.030)
Blocks		0.45	
		(.)	
log(RR Distance)	-0.030**	-0.34***	-0.35***
	(0.014)	(0.012)	(0.014)
Sample	Nebraska 1940	Nebraska 2000	Nebraska 2000
Geo Controls	Y	Y	Y
County FEs	Y	Y	Y
Township FEs	Y	Y	Y
SEs / Clusters	Spatial	Spatial	Spatial
N	15,550	15,550	15,550
N (clusters)	N/A	N/A	N/A
$\mathbb{E}[y]$	1.1	1.6	1.6

Back

Owner Characteristics Today

Table 12: Modern Owner Characteristics

	(1) (asinh) Land Owned	(2) (asinh) Land Owned	(3) (log) Owner Distance	(4) Company (%)	(5) Government (%)
RR Effect	-0.15	0.041***	0.037***	6.46***	-8.27**
	(0.20)	(0.014)	(0.014)	(2.41)	(3.49)
Sample	All	Non-gov	Non-gov	All	All
Geo Controls	Y	Y	Y	Y	Y
County FEs	Y	Y	Y	Y	Y
Township FEs	Y	Y	Y	Y	Y
SEs / Clusters	Spatial	Spatial	Spatial	Spatial	Spatial
N	131,543	35,670	34,221	131,543	131,543
$\mathbb{E}[y]$	262 mi^2	11 mi^2	60 mi	27%	21%

◂ Back (regressions) ◂ Back (switchboard)