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California

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**Abstract**

The 1920s in the United States were a time of high income and wealth growth and rising inequality, up to the peak in 1929. It was an era of technological innovations such as electrification as well as booms in consumer durables, housing, and asset markets. The degree to which these skill-biased opportunities shaped property wealth inequality depends on how local and macro-level industrial shocks were capitalized into real estate values. We uncover the pattern for California, a state where shocks in oil, housing and stocks were large, and which has annual data on city-level property values and population counts. We show that electricity both increased values and reduced inequality in property values, while other booms had more short-lived and localized effects.

JEL Codes: N12, N33, N92, R31

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The 1920s in the United States were a time of high income and wealth growth and rising inequality, up to the peak in 1929 [Saez and Zucman, 2016, Williamson and Lindert, 1980]. It was an era of technological innovations as well as booms in consumer durables, housing, and asset markets. This leaves open the question of how sectoral innovations impacted the distribution of income and wealth. Workers’ skill and education levels determined whether their labor market outcomes improved alongside these technological shocks [Goldin and Katz, 1998]. The degree to which these skill-biased opportunities shaped wealth inequality depends on how local industrial shocks were capitalized into real estate values [Roback, 1982]. We bring together these literatures on inequality and technological change to highlight the different ways in which local industry shocks impacted the distribution of real estate wealth in the Roaring Twenties.

In contrast to previous work on this setting, which use state or nationally aggregated tax return data, this paper utilizes annual city-level information for one major part of the wealth distribution, real estate property. This necessitates a focus on California where such information is available. California is also the ideal case study because it was at the forefront of many of these decadal trends and had sectoral employment shares reflective of the national economy [Cleland, 1947]. We focus on three main California “boom” sectors—oil, automobiles, and the stock market. And we further look at the more generalized impact of earlier access to cheaper electricity as a boon to manufacturing. We uncover substantial heterogeneity in the impact of exposure to these booms on housing values in terms of city and household real estate gains, with only one boom, electricity, reducing inequality while increasing local growth.

## 1 Background

To link economic trends to wealth inequality, we combine household and city-level data on property values throughout the 1920s to 1920 local-level shock exposure data. We measure wealth in two ways. The first is a city-year panel of property values and population counts from 1919 onwards [Quincy, 2021]. These annual data measure the assessed value of all land and structures owned by non-financial businesses and households. We then use 1930 census home value data to characterize the housing wealth distribution within and across cities after the booms.

We combine these wealth data with both city and worker-level employment data from the 1920 and 1930 censuses [Ruggles et al., 2021]. In order to capture cities’ exposure to booming industries, we report the share of male household heads working in a relevant industry or occupation.<sup>1</sup>

<sup>1</sup>For example, to find men working in the oil industry, we flag all industry codes related to oil extraction, petroleum refining, gasoline stations, and wholesale petroleum and then search the raw industry strings for key terms like “petrol,” “gasol,” and “oil refin” while excluding gas lamp and vegetable oil production.

Finally, we map these city-level data to a linked sample of California household heads in the 1920 and 1930 censuses and manufacturing establishment-level Census of Manufacturing data in 1929 [Abramitzky et al., 2012, Vickers and Ziebarth, 2018].<sup>2</sup>

We use data on the existing electric grid as of 1920 from digitized US Army Corps of Engineers maps, dividing counties into above and below median length of transmission lines per 1,000 square kilometers of land.<sup>3</sup> California was an early adopter of electricity, due to specialization in electricity-intensive industries such as mining, and to the abundance of hydroelectric opportunities (Gray and Kitchens [2018]: 57). Indeed, California ranked second in the nation in 1920 in the electrical share of energy used in manufacturing and first in the nation in the share of manufacturing electricity generated outside of the plant, reflecting the developed electricity system.

Rhode [2001] describes the 1920s as a period of brisk growth for California, with large periodic shocks, particularly in newer industries. Several major components of wealth—durable goods like automobiles, real estate and the stock market—soared during the decade [Olney, 1991, White, 1990, 2014]. Petroleum induced widespread growth more specifically in California [Cleland, 1947]. California agriculture maintained its position as a leading supplier of produce nationwide and created demand for complementary manufacturing.

Due to the disaggregated nature of our property value data, we provide the first spatial analysis of local real estate booms during the Roaring Twenties. Most of the state experienced growth in average property values over the decade, as displayed in Figure 1. The darker the circle, the larger the growth of per capita real estate values from 1919 to 1929. Light-shaded counties were below the state’s median electricity grid density in 1920. Regionally, gains are largest in southern California, as the historical narrative would suggest. Both the coastal centers of Los Angeles and the San Francisco Bay Area experienced growth, as did the more agricultural area running through the center of the state. However, roughly one-quarter of California cities saw declines. These areas were spread throughout the state, indicating that prosperity was not guaranteed during the 1920s.

## 2 The size and distribution of the boom

In a standard framework, the land value gains from increased labor demand depend on both labor and housing supply elasticities [Roback, 1982]. These booms likely had differential impacts on housing and other variables, however. The gains from stock market employment depend on potential shifts between financial and real estate assets, for example. Electricity would be expected to have the longest-lasting impact on productivity and thus housing values, and it may have increased home ownership and values at the lower end of the distribution if production worker wages increased, which we find evidence for below.

<sup>2</sup>We match 19 percent of possible 1920 male California residents above the age of 20 using the NYSIIS-conservative matching criteria in Abramitzky et al. [2012].

<sup>3</sup>See Gaggl et al. [2021] for full details.

Oil booms also affected production workers, but did not alter the value of housing amenities, potentially lessening the degree to which they were capitalized into real estate. Unlike electricity, the automobile shock also lowered transit costs, creating new amenities through the rise of suburbs.

We therefore examine these shocks' role in local housing markets separately in a cross-city empirical framework. Specifically, we regress changes in city housing and employment outcomes from 1920 to 1930,  $\Delta Y_c$ , on a variety of 1920 observable city characteristics,  $X_c$  and 1920 sectoral shock exposure,  $BOOM_c$ :

$$\Delta Y_c = \beta_0 + \beta_1 BOOM_c + \gamma X_c + \epsilon_c \quad (1)$$

We control for 1920 population shares of white households, farm residents, self-employment, any employment, homeownership, and literacy, as well as average 1920 household head age to isolate the correlation between a given boom and 1920s city growth. Except for the power grid variable, defined above, each 1920 exposure measure is defined using the share of employed male household heads working in that sector. Standard errors are clustered at the county level. The capitalization of these 1920s sectoral shocks into local booms varied greatly by the type of shock. Across all three panels of Table 1, there is no evidence that the level of auto sector employment correlated systematically with any measures of 1920s city growth. Although a crucial part of the Roaring Twenties, these results indicate that the auto shock did not differentially alter housing markets through the employment channel.

In contrast, cities with more oil sector employment saw a shift towards non-tradable employment from 1920 to 1930. The effects of oil boom exposure are noisy and statistically insignificant in real estate in Panels A and B. Together, these results are consistent with commodity sector employment benefiting local economies through increased consumption without shifting housing demand. The distributional effects of oil booms therefore depend on the pass-through from heightened non-tradable production to service worker incomes.

Having stock market-oriented workers in 1920 lowered both overall property values per capita and housing inequality. A reduction in property values' average and dispersion suggest a reallocation out of real estate for those who already owned homes, reducing housing demand through the substitution effect, lowering prices, and making home purchases more affordable for others. If anything, stock market employment reduced non-tradable employment, leaving open the question of who benefited from these lower housing prices.

Only one innovation, electricity, induced both higher average property value growth and lower inequality. It appears that electricity boosted housing demand without creating non-tradable sector externalities, as may be expected from its use in both consumer durables and production.

Table 1: City Growth and Local Booms in the 1920s

Boom type:	Autos	Oil	Stocks	Power Lines
<i>A: Property values</i>				
$BOOM_c$	-3.927 (3.914)	0.827 (0.695)	-20.75 (12.35)	0.258 (0.136)
<i>B: Housing Gini</i>				
$BOOM_c$	-0.491 (0.387)	0.0796 (0.128)	-3.878 (0.935)	-0.0412 (0.0217)
<i>C: Non-tradable labor</i>				
$BOOM_c$	0.106 (0.305)	0.115 (0.0547)	-0.275 (0.867)	-0.0258 (0.0162)
Shock mean	0.02	0.10	0.00	0.33
N	211	211	211	211

Sources: Quincy [2021], Gaggl et al. [2021], Ruggles et al. [2021], and authors' calculations. Standard errors clustered at the county level. Control variables in each regression of 1920s growth on a given shock are 1920 population shares of white households, farm residents, self-employment, any employment, homeownership, and literacy, as well as average 1920 household head age. Except for power lines, shock exposure is the city's male household head employment share in 1920 for each sector. Power lines are measured per 1,000 square km at the county level. Per capita property value growth measured from 1919 to 1929. Gini coefficients calculated using Archsmith [2022] on all non-farm non-group quarters homes in 1930. Non-tradable labor refers to the change in transportation, trade, and services employment shares between 1920 and 1930.

To isolate the degree to which these booms accrued solely to participating households, we turn to a sample of linked California household heads in the 1920 and 1930 censuses. We model 1930 housing values as a function of city, household, and neighborhood characteristics in 1920 using the following specification for 1930 home value for person  $i$  living in enumeration district  $n$  in city  $c$  and working in occupation  $o$  in 1920:

$$Y_i = \beta_0 + \gamma_o + \gamma_n + \beta_1 BOOM_{oc} + \gamma X_i + \epsilon_c \quad (2)$$

$\beta_1$  reflects the home value gains specific to working in a designated booming occupation in a city with higher exposure to that sector. Individual controls include a quadratic in age, marital status, reporting race as white, farm residence, homeownership in 1920, as well as industry, occupation, enumeration district, and state of birth fixed effects. Table 2 reports the results. Again, there appear to be no effects of oil employment, suggesting that historical

narratives linking real estate and oil booms did not differentially accrue to those working in the industry. The finance boom lowered inequality by moving those in the sector up the housing ladder, in marked contrast to auto workers. Unlike the other sectors examined in this

Table 2: 1930 Home Values Depending on 1920s Boom Exposure

Boom type:	Autos	Oil	Stocks	Power Lines
$BOOM_{oc}$	-0.0726 (0.0294)	-0.00382 (0.0126)	0.130 (0.0201)	0.00417 (0.0248)
N	64859	64859	64859	64859

Sources: [Gaggl et al. \[2021\]](#), [Ruggles et al. \[2021\]](#) and authors' calculations. Standard errors are clustered at the county level. Control variables in each regression include a quadratic in age, marital status, reporting race as white, farm residence, homeownership, as well as industry, occupation, enumeration district, and state of birth fixed effects, all measured in 1920. Exposure defined as individual working in boom sector in 1920 in a city with an above median local shock measure.

paper, electricity both decreased inequality, as shown in Table 1, and increased local growth, as seen in Table 3. Because electricity is a general-purpose technology, it is ex ante unclear whether it operated through changes in consumer or producer behavior. We test for producer effects in a two-way fixed effects difference-in-differences regression on establishment-level microdata from the 1929 Census of Manufactures of the form:

$$W_e = \beta_0 + \gamma_h + \gamma_c + \beta_1 ELEC_{hc} + \gamma X_e + \epsilon_c \quad (3)$$

Here,  $\beta_1$  identifies the effect of being a high-electricity usage industry  $h$  in a city  $c$  located in a high-electricity county on the establishment  $e$ 's average daily blue-collar wage, controlling for log annual output. We define industry electricity usage in two ways based on the establishment sample: the industry's average share of energy coming from electricity and the industry's average usage of electric motors. In both cases, it appears that electricity-dependent establishments in places with more developed electricity grids paid higher wages, as seen in Table 3. This indicates that electricity raised average property values and reduced inequality by paying its wage workers more.

Table 3: Average Daily Wages in 1929 Based on 1920 County and Industry Electricity Use

	Motor Use		Fuel Use	
$ELEC_{hc}$	117.2 (34.30)	57.12 (28.49)	313.0 (225.7)	292.8 (213.7)
N	1077	1077	1077	1077
Controls	N	Y	N	Y

Sources: [Vickers and Ziebarth \[2018\]](#), [Gaggl et al. \[2021\]](#), and authors' calculations. Standard errors clustered at the county level. Exposure defined as establishment in high electricity usage industry in 1929 in a county with an above median power line density in 1929. Includes controls for log establishment output and industry and city fixed effects. All establishments in California reporting positive output in 1929 included in sample.

### **3 Conclusion**

In a period of both rising national incomes and widening opportunity gaps, the type of local exposure to technological change mattered for the evolution of property values. By focusing on one state, California, with both disaggregated data and a diverse economy, we contrast how one major source of growth, electricity, increased local wealth and lowered within-city housing inequality during the Roaring Twenties, while other major sectoral innovations did not. The spatial pattern of values and inequality identified here for the first time may be unpacked in future research into the components of population movement, housing supply changes, sectoral spillovers and changing amenities.



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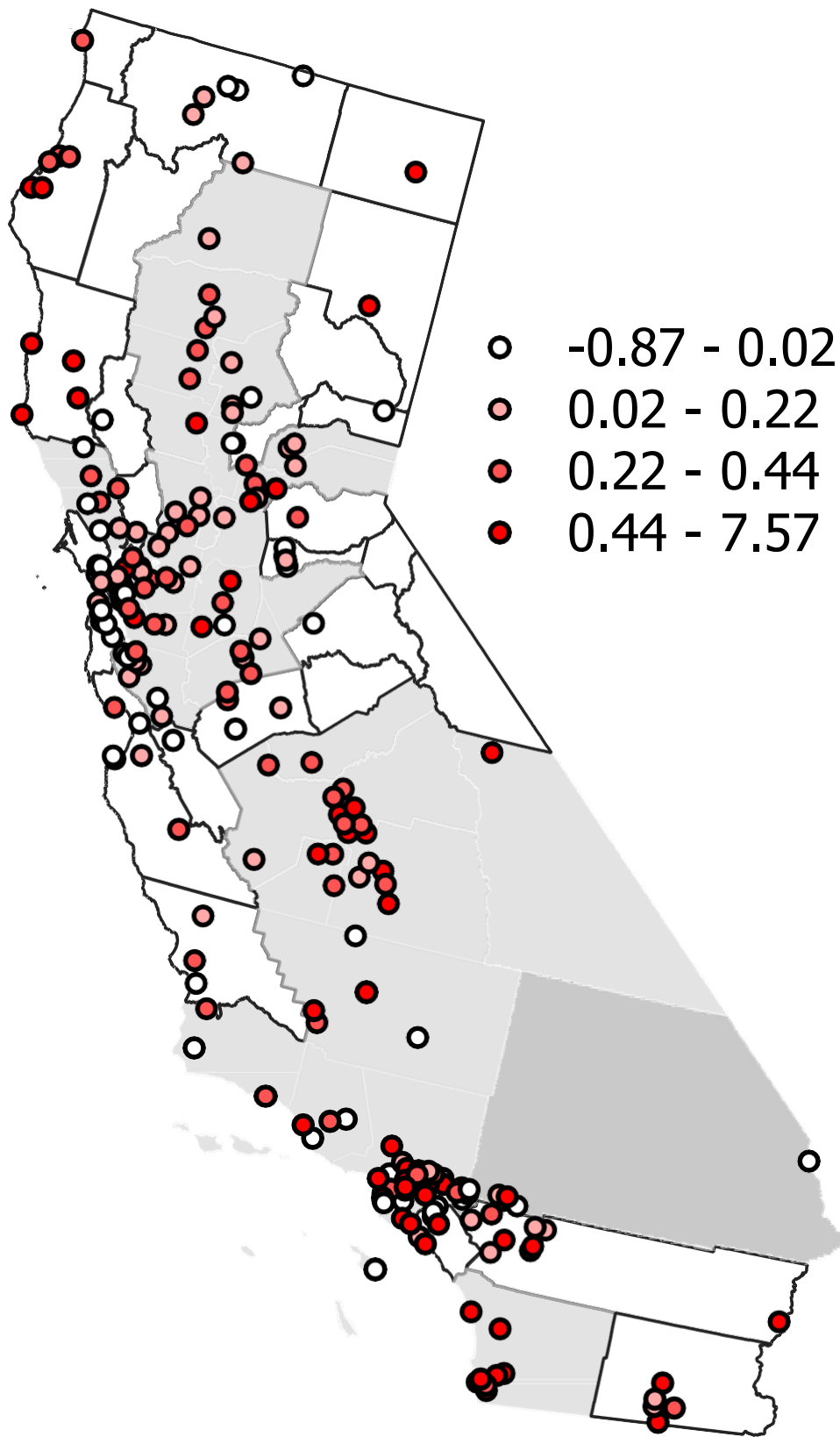


Figure 1: The distribution of property value growth in the 1920s

Each dot corresponds to a given city's growth in per capita property values between 1919 and 1929 as a decimal fraction. Dot colors correspond to each quartile of this variable's distribution. Shaded counties are above the median electricity grid density in 1920. Sources: [Quincy \[2021\]](#), [Gaggl et al. \[2021\]](#), [Minnesota Population Center \[2021\]](#), and authors' calculations..

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