The Making of a National Mortgage Market and Its Effects on American Cities

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First Version: November 2024
This Version: July 2026

Abstract

How does a persistent change in mortgage rates affect homeownership, home prices, construction, and household formation? We study the government-led revolutions in mortgage financing that took place in the U.S. between 1933 and 1940, which created a national mortgage market facilitating mortgage capital to move from the financial centers to the rest of the country. By digitizing city-level census data and a new sample of loan-level data, we show that differences in mortgage rates across cities went from nearly 300 basis points to just over 80 in only six years. In the decades following the housing policies, cities where mortgage rates declined as a result of the integration of mortgage markets saw higher growth in rates of homeownership and housing construction. House prices moved only modestly, and we estimate highly elastic supply curves, in stark contrast with estimates from more modern data. Households that, due to these policies, faced lower costs of homeownership in their youth had more children and had them earlier.

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Introduction

How does a persistent decline in mortgage rates affect cities and households? This paper studies the developments that occurred in U.S. mortgage markets between 1920 and 1940, documenting and exploiting a unique episode in U.S. history where city-level mortgage rates changed rapidly, persistently, and heterogeneously across cities.

Today, prospective U.S. homeowners face mortgage rates that are mostly identical across space (Hurst et al., 2016); up until the 1930s, however, a prospective American homeowner would have faced radically different mortgage conditions depending on where he or she lived. Through newly digitized city-level data on mortgage rates, we document that, in 1920, mortgage rates in cities such as Boston, Buffalo, and New York were all below 5.8 percent, but in cities like Dallas, San Antonio, and Tampa they stood above 7.8 percent.

Yet, by 1940, differences in mortgage rates across cities had dwindled significantly. Rates in Boston, Buffalo, and New York were around 5.3 percent, and around 5.7 percent in Dallas, San Antonio, and Tampa. Moving beyond these six cities, we show that the differences in mortgage rates across cities (henceforth, "regional mortgage spreads") eroded in the span of just six years. Differences between low- and high-rate cities went from 300 basis points (bps) in 1920 and 1934, to just over 80 bps in 1940, and remained low thereafter. Building on this fact, this paper studies what precipitated the narrowing of these regional mortgage spreads, as well as its macroeconomic consequences on American cities and families.

Our results are based on two data series we construct from newly-digitized data that trace mortgage conditions between 1920 and 1950, described in Section 1. The first is a long-run city-level panel of mortgage interest rates across 266 American cities in 1920 and 1940, which allows us to study mortgage conditions for a large set of cities. For subsets of these cities, we also observe mortgage rates in 1934, 1950, and 1960 to 1970, from additional newly-digitized sources. The second is a sample, collected by the National Bureau of Economic Research (NBER) throughout the 1940s, of 22,371 individual mortgage loans underwritten between 1920 and 1947, which we digitize in full, extending Ghent (2011) and Rose (2011) who digitized it for New York City, and which allows us to construct yearly series on mortgage conditions at the regional level.

First, we provide several pieces of evidence that the rapid decline in regional mortgage spreads was caused by the federal housing policies implemented in the period 1932-38. Section 2 describes

the institutional context and the policy background. Prior to the policies, local lenders with little to no access to national financial markets, such as Building and Loan associations (B&Ls) and non-institutional lenders (builders and individuals), were responsible for more than 70% of mortgage lending.[1] This created substantial segmentation across space, partly explaining the differences in mortgage rates across cities as differences in the relative demand and supply of mortgages. The federal housing policies effectively removed geographical barriers to the flow of financial capital by extending national financing to local lenders, and by establishing government insurance and a national secondary market for mortgages.[2]

Section 3 documents our main convergence fact and provides five separate pieces of evidence that point to the unique role of the federal housing policies in eliminating the geographic segmentation in mortgage markets. First, the mortgage rate dynamics were consistent with a supply shock to city-level credit: a city where mortgage rates were one percentage point higher in 1920 would see its mortgage rates decrease by .78 percentage points by 1940 and, concurrently, its mortgage quantities expand by approximately 60 percent over the same period, both in absolute terms as well as relative to home values.

Second, the bulk of the convergence was concentrated in the years when the federal housing policies became active. Through the individual mortgage-loan data, we show that regional mortgage spreads were relatively constant until 1934 and then promptly narrowed by 1939. This timeline is confirmed in a subsample of cities with data from 1934: the majority of the cross-sectional convergence between 1920 and 1940 in these places occurred in 1934–40 rather than in 1920–34.

Third, the convergence was unique to mortgage markets. We compare the evolution of mortgage rates on average and across space to that of interest rates across all types of commercial lending. We document that, in 1920, states with high mortgage rates also had high commercial lending rates, and that, between 1920 and 1934, the narrowing of mortgage and commercial rates

[1] In addition to B&Ls (responsible for roughly 30% of mortgage lending) and individuals and non-institutional lenders (40%), commercial and savings banks also participated in mortgage lending (20%). These banks at the time also had minimal access to national markets, and were heavily restricted from branching across space. Life Insurance Corporations (LICs) were the only lenders with a national footprint, but accounted for less than 10 percent of the market and faced high costs in maintaining long-distance portfolios (Grebler et al., 1956; Fishback et al., 2019). We note that Building and Loan associations came to be known as Savings and Loan later on during the period we study, but we keep referring to them as B&Ls for clarity.

[2] Specifically, the government established the Federal Home Loan Bank Board (FHLB), which extended financing to local B&Ls at the same price everywhere, effectively equalizing their marginal cost of financing. It introduced government insurance through the Federal Housing Administration (FHA) and a secondary national market for mortgages through the creation of Fannie Mae (FNMA), which also facilitated integration on the asset side by allowing lenders to more easily sell mortgages nationally.

occurred at a similar pace. By 1940, however, mortgage markets displayed essentially no regional segmentation, while commercial lending markets retained substantial regional differences.

Finally, we shed light on the mechanisms through which the policy intervention led to the rapid convergence in regional mortgage spreads. In particular, if the initial mortgage interest rate spreads predominantly reflected greater lending risk, rather than an unmet demand for mortgages, we would expect the Federal Housing Administration (FHA) and its practice of insuring mortgages to play an outsized role in this convergence, especially if the pricing of insurance did not take into account place-based differences in risk, as is likely the case today (Hurst et al., 2016).

We show that, though popular, the introduction of the FHA cannot explain all of the convergence in mortgage differentials.[3] In particular, our individual mortgage-loan sample shows that the largest degree of convergence occurred within loans made by the most geographically constrained lenders, B&Ls, which also made minimal to no use of FHA insurance. Conversely, we see little to no convergence for rates charged by the national LICs, which relied on FHA insurance for 75 percent of their mortgages.

Finally, we find that prior to the federal interventions, mortgage rate differentials were correlated with relative imbalances in the supply and demand of capital from households, as predicted by local demographics. In 1920, cities with a higher fraction of younger households, which held more mortgage balances than savings (i.e., were net debtors), relative to older households, which were net lenders, had higher mortgage interest rates, consistent with an environment of market segmentation where pulling liquidity from national markets into capital-scarce cities is increasingly expensive (Becker, 2007; D'Amico and Alekseev, 2025). By 1940, however, these local demographic imbalances were completely uncorrelated with local mortgages, coherently with national, rather than local, mortgage market clearing.

The second part of the paper turns to the real effects of these revolutions in mortgage finance. In Section 4, we rely on a difference-in-differences strategy where we compare the outcomes of cities that, because of the federal policies, experienced a greater reduction in mortgage rates, relative to the average city. We use each city's initial mortgage interest rate to proxy for the extent of the affordability shock, since a city that had a 100 bps higher mortgage interest rate in 1920 would

[3]Establishing quantitatively how much of the convergence in rates was due to insurance as opposed to a reshuffling of financial capital across space is beyond the scope of this paper, as our main application simply uses the entire policy package as a shock to mortgage conditions.

experience a 78 bps larger decline by 1940.[4] In all models, we control for city-level demographic and economic characteristics that could be correlated with initial mortgage lending conditions.

Further, we leverage the fact that the impressive degree of convergence was unique to mortgage markets, and we add the pre-policy commercial lending rate as a control, which is available at the state-level from Bodenhorn (1992). Since both initial commercial lending rates and initial mortgage rates proxy for capital scarcity, controlling for commercial lending rates helps us mitigate some of the omitted variable bias from initial economic conditions—such as unobserved differences in levels of economic development—that are likely to be correlated with both initial capital scarcity and higher subsequent growth. We find that, conditional on controls, cities with initially high mortgage rates did not experience differential pre-trends in homeownership. Our results satisfy the parallel trends assumption even in models where we control just for census region fixed effects and the commercial lending rate.

In terms of semi-elasticities, a persistent 100 bps decline in mortgage rates, instrumented using 1920 mortgage rates, is associated with a 3.2 percentage point increase in homeownership between 1930 and 1950 and a 5 percent increase in the number of families living in the city. Surprisingly, home prices move very little, and the coefficient is indistinguishable from zero. We corroborate the strong effect on building activity and the relatively muted effect on house prices using yearly data on house prices and new building permits for a subsample of cities (Federal Reserve Bank of Philadelphia, 2024).[5] Using this data, we can estimate supply elasticities of housing and owned-housing ("tenure supply", as in Greenwald and Guren, 2025) well above estimates from modern times, suggesting that in the 1940s and 50s, the US housing sector could accommodate, quite strongly, a large increase in demand.

In Section 5, we build on this evidence to study the effect of greater homeownership on fertility, a relationship which has been the focus of a growing literature and public debate. We extend the difference-in-difference strategy described above by exploiting cross-cohort variation in terms of women's exposure to the policy, in addition to city-level variation. Using the cross-section of female spouses to the heads of households in the 1950 Census, we compare different cohorts of women, based on whether their fertility window lied before vs. after the mortgage affordability

[4]We use the interest rate in 1920, rather than in 1934, because we observe 266 cities in 1920 and 42 in 1934. Rates in 1920 and 1934 are extremely correlated, with a correlation coefficient of .92.

[5]The price data have been used in Lyons et al. (2026). We thank Allison Shertzer and Ronan Lyons for generously sharing with us data on permits for those same cities.

shock, in cities where mortgage rates were higher vs. lower before the policy. Relative to older cohorts in the same city, and relative to the same difference for the average US city, women living in cities where mortgages became more affordable during their fertility window had more children overall and did so at younger ages. In particular, we estimate that having a 100 bps lower mortgage interest rate over the childbearing years of female spouses is associated with having .13 more children and having one's first child .74 years earlier.

This paper relates to several strands of the literature. Our results on the integration of the US mortgage market relate to the large historical literature that studied differentials in the cost of borrowing across space and the one that studied the US mortgage market in an historical perspective (see Rose and Snowden, 2026 for a comprehensive outline).[6] We contribute to this strand by tracing out the evolution of mortgage differentials across U.S. cities and the impact of the federal housing policies of the 1930s on their convergence.[7]

The evidence that more affordable mortgages translated into a persistent change in homeownership, with close to no effects on prices, contributes to the empirical literature that studied the effect of cheap credit on real estate markets, especially to work explicitly focusing on both prices and quantities (Greenwald and Guren, 2025, henceforth GG).[8] By leveraging a host of identifi-

[6]This literature, which mostly focused on the "National Banking Era" (1863-1913), highlighted how regional differentials evolved in response to changes in market power and state-level regulation (Sylla, 1969; James, 1976a,b), risk (Rockoff, 1977; Bodenhorn, 1992, 1995; Gendreau, 1999), as well as to the development of national capital markets (Davis, 1965; Sylla, 1972; Smiley, 1975; James, 1978; Smiley, 1981; Sushka and Barrett, 1984; Smiley, 1985; Sushka and Barrett, 1985; Redenius, 2006) and the level of aggregate nominal rates (D'Amico and Alekseev, 2025). A subset of this literature has focused especially on mortgages, both farm (Eichengreen, 1984, 1987; Snowden, 1987; Snowden, 1995) and residential (Grebler et al., 1956; Schaaf, 1966; Ostas, 1977). Beyond the focus on regional differentials, a rich literature studied the historical evolution of the US mortgage market (for instance, Grebler et al., 1956; Klaman, 1961; Snowden, 1988; Snowden, 1997; Snowden, 2007; Snowden, 2014; Green and Wachter, 2005; White et al., 2014; Price and Walter, 2019).

[7]In this, we relate to work that studied household and real estate finance in the wake of the Great Depression (Snowden, 2010; Fishback et al., 2011, 2013; Fishback et al., 2020; Fishback et al., 2022b, 2023; Ghent, 2011; Courtemanche and Snowden, 2011; Rose, 2011, 2014; Rose and Snowden, 2013; Chambers et al., 2014; Aaronson et al., 2021; Quincy, 2024; Chambers et al., 2014).

[8]This finding also relates to the rich literature that sought to identify the dramatic rise in U.S. homeownership rate from 44 percent to 62 percent between 1940 and 1960 (see Fetter, 2014 for a comprehensive review, as well as Chambers et al., 2014; Fetter, 2016; Fishback et al., 2020; Collins and Niemesh, 2025; Collins and Margo, 2011 discuss differences by race). A paper related to ours is Fetter (2013), who employs an individual-level RDD around veteran status eligibility to estimate that GI Bill mortgage subsidies explain about a quarter of the ownership increase for affected cohorts. We complement these results by providing *macro*-level evidence. Mortgage subsidies boosted homeownership even at a level of aggregation, the city, where prices could respond and most other market-level spillovers were operating. Furthermore, our results on homeownership shed light on an earlier period than the one traditionally studied by most of the literature. The increase in homeownership in cities where mortgage rates declined is already apparent by 1940, and then stays constant thereafter. Quincy (2022) also studies homeownership in a similar period, focusing on the effects of a large transfer to WWI veterans.

cation strategies in the literature (Loutskina and Strahan, 2015; Di Maggio and Kermani, 2017; Mian and Sufi, 2022), GG find very large responses of price-rent ratios to credit expansions and very small responses in homeownership, owing to a small elasticity of supply of owner-occupied homes, what they term "tenure supply". We find the opposite result, both in terms of homeownership and price-rent ratios (indicating elastic tenure supply) and in terms of housing units and prices (indicating elastic overall housing supply). A large rise in demand was met with almost no offsetting movement in prices, translating in higher homeownership and supply of new units. Our estimate of the steepness of the tenure supply curve (the price elasticity), for instance, is just .51, less than one-seventh of GG's preferred estimate of 3.8.[9] That is, our result suggests that housing supply in the US in the 1950s was much more elastic than today, relating to the recent debate on the role of housing supply elasticities and housing affordability (Gyourko and Molloy, 2015; Glaeser and Gyourko, 2018; Molloy, 2020; Glaeser and Gyourko, 2025; Lyons et al., 2026).[10]

The second set of our results relate to a rapidly growing literature and public debate on the effects of high costs of homeownership on fertility (Hacamo, 2021; Cumming and Dettling, 2024; Fazio et al., 2025; Dettling and Kearney, 2025). In particular, we complement evidence by Dettling and Kearney (2025), who show that states with higher issuance of government-backed mortgages experienced greater increases in birth rates between 1935 and 1957. Our results employ a fundamentally different empirical strategy and point to a similar conclusion. We also focus on all mortgages, in addition to government-backed ones, and explicitly relate fertility outcomes with changes in mortgage rates.[11] Our results also highlight effects on "tempo", as we find that women more exposed to cheaper mortgages not only have more children, but have them earlier. Finally, by showing both the effects on homeownership and on fertility within the same empirical analysis, our results suggest an explicit tie between homeownership and family formation (in line with Fazio et al., 2025).[12]

[9] In addition to the papers cited above, other papers empirically studied the effects of cheap financing on house prices (e.g., Glaeser et al., 2012; Favara and Imbs, 2015; Gete and Reher, 2018; Mian and Sufi, 2022; Adelino et al., 2025). Most of these results point at large price responses.

[10] While our demand shock originated in a crisis, where many units became vacant, the rise in homeownership persists well after 1940 and was also met with an increase in the supply of new units, suggesting that our results are unlikely to be driven by an existing housing stock that was above demand.

[11] Similarly to Dettling and Kearney (2025), we also find the effects to be concentrated on whites, and we find the same heterogeneity also for the effects on homeownership. This result is consistent with non-whites suffering restricted access to finance and with the literature's understanding of the *de-facto* racial bias in the implementation of some of the federal policies in the mid-century (Jackson, 1980; Hillier, 2003; Woods, 2012; Rothstein, 2019; Winling and Michney, 2021; Anders, 2023; Fishback et al., 2023; Althoff and Szerman, 2026).

[12] Other related papers investigated the link between cheaper mortgages and fertility. Hacamo (2021) demonstrates

1 Data

1.1 City-Level Series

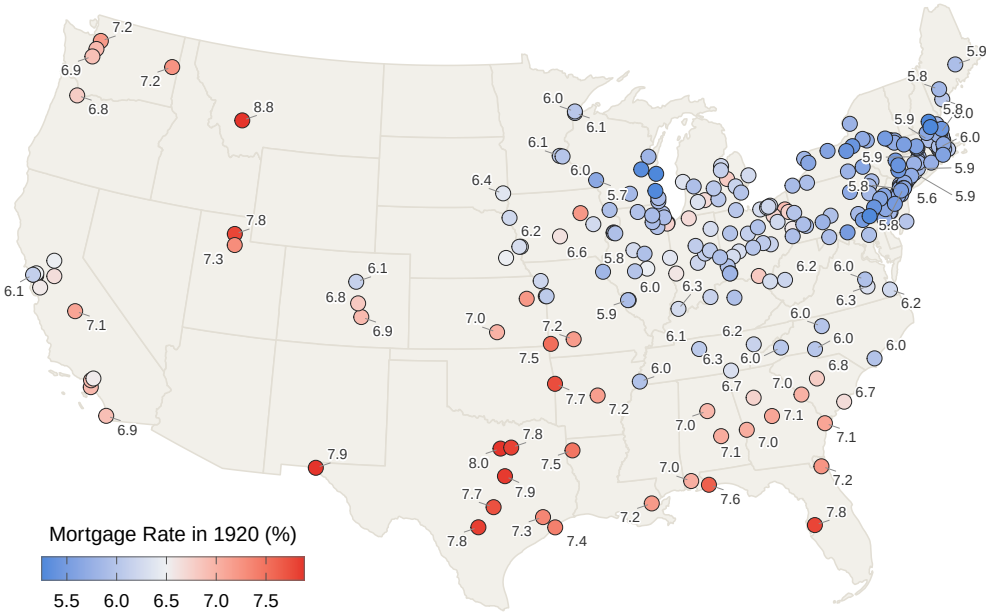
We assemble several data sources. The backbone of this analysis is a city-level panel of mortgage interest rates for 266 of the largest cities in the U.S. in 1920 and 1940, assembled by digitizing Table 38 of the 1920 Census special report on non-farm mortgages (U.S. Census Bureau, 1923) and Table 8 of the 1940 Housing Census (U.S. Census Bureau, 1943). The 1920 special report collected information through questionnaires to the owners of mortgaged homes and provides city-level averages on the value of mortgaged homes, amount of outstanding mortgage debt and rate of interest for cities with more than 25,000 people in 1920. Unfortunately, there is no city-level data for 1920 on loan-to-value ratios at origination, amortization, maturity, or the share of mortgages by each type of lender. The 1940 Housing Census obtained information on home financing as part of the census of owner-occupied nonfarm dwelling units in structures without business and containing no more than 4 dwelling units.[13] Figure 1 shows a map of the 266 cities in our main sample.

For a subset of 42 cities (out of the 266), we supplement this two-period panel with an additional time stamp of mortgage conditions in 1934 using the Financial Survey of Urban Housing (Wickens, 1935). The survey obtained reports (through interviews and over mail) from owner-occupants on value, amount of indebtedness, source of loan, and interest rate from 5 to 30 percent samples of the families in each city. This dataset provides a snapshot of mortgage conditions on the eve of the roll-out of the biggest housing policies; hence, for these 42 cities we have data in the

that young households exposed to mortgage market deregulation in the early 2000s saw increased likelihoods of buying a home and having children. Cumming and Dettling (2024) find that declines in mortgage interest rates following policy rate reductions during the Great Recession in the U.K. and U.S. led to higher birth rates in households with adjustable mortgages. Fazio et al. (2025) use random variation from Brazilian housing credit lotteries to show that young adults who obtain housing see a significant increase in the probability of having children. Other papers studied the relationship between house prices and fertility, beyond changes in credit condition (see, for instance, Clark, 2012; Lovenheim and Mumford, 2013; Dettling and Kearney, 2014; Couillard, 2026).

[13] We note that mortgage data for 1920 were obtained for all owner-occupied nonfarm homes, whereas the 1940 data are restricted to those in 1- to 4-family dwelling structures without business. We expect that the 1940 figures are a slight understatement of the actual number of mortgaged homes, but as argued in census documents, "the difference is not large enough to invalidate comparisons of the figures with those obtained in earlier censues." (U.S. Census Bureau, 1943). We also note that whereas the 1920 report aggregated data at the city-level, the 1940 report is at the county-level. For cities contained within a single county (98 percent), we assume that the county-wide average interest rate was the average at the city-level. For cities contained within multiple counties (2 percent), we take the average of the county-wide interest rates as the average at the city-level.

Figure 1: Map of Cities in Main Analysis Sample



Notes. This figure maps the location of the 266 cities that form our main analysis sample. Each city is colored according to its mortgage rate in 1920, reported in the labels.

immediate pre- and post-periods of the housing policies.[14]

Finally, we add two data sources to follow mortgage rates beyond our main study period. For 1950, we digitize data on interest rates from the 1950 Census of Housing (U.S. Census Bureau, 1952) for a different and smaller subset of 26 cities. For 1960 to 1971, we digitize physical copies of the semi-annual financial statements of B&Ls published by the Federal Home Loan Bank Board between December 1960 and June 1971, available for 136 metropolitan areas. Appendix A.4 describes the sources, digitization, and construction of this series.

We rely on many additional data sources to supplement our analysis of these cities. From the City and County Data Books (Haines and Inter-university Consortium for Political and Social Research, 2010), we collect socio-economic and demographic characteristics, such as total population, fraction of city residents who are white, U.S.-born, or male; the average manufacturing wage and number of manufacturing establishments. Key economic controls are the amount of New Deal relief spending at the city level, retail sales per capita in 1929 and growth in retail sales per capita

[14]The actual samples contain 287 cities in 1920, and 52 in 1934, but we limit our panel to cities that appear in all years and for which we have non-missing demographic and economic variables.

between 1929 and 1933 (Fishback et al., 2003), and the amount of World War II military spending in each city (Brunet, 2024). We also rely on the average commercial lending rate at the state level over time measured as the total amount of interest and charges on all loans made by commercial banks divided by the total amount of loans (Bodenhorn, 1995).

1.2 Individual Mortgage Loans

A key limitation of our city-level series is that, while spanning the entire U.S. at a granular level, the data are over long horizons, and the only mortgage characteristics available are the mortgage interest rates and loan-to-value (LTV) ratios. To supplement our analysis, we digitize 22,371 individual mortgage loans made between 1920 and 1947 sampled in a survey conducted by NBER in the 1940s. The survey was made in response to the paucity of disaggregated data on nonfarm mortgage investment and constituted the empirical backbone of several volumes published by the NBER in the 1950s (Saulnier, 1950; Harriss, 1951; Fisher, 1951; Behrens, 1952; Grebler, 1953; Morton, 1956). Its primary purpose was to obtain a random sample of individual mortgages to study the characteristics of the nonfarm mortgage loans made by major institutional lenders and to describe the lenders' experience with such mortgages since 1920.

The survey itself was implemented in two steps. First, a random sample of large institutional holders from three groups (life insurance corporations, commercial banks and Building and Loan associations) was selected. Second, within each selected institution, a random sample of all underwritten individual mortgages was chosen. For each individual mortgage, the institution had to fill out a uniform "mortgage loan card" which collected key characteristics, such as the type of loan (FHA-insured, conventional amortized, conventional non-amortized, etc.), the year loan was made, the contract rate of interest, the contract term, the amount of the loan and the appraised value of the property. Appendix Figure A.1 shows an example of a mortgage loan card for a loan made by a commercial bank. Panel (a) of Appendix Figure A.2 reports the number of loan cards by year and by whether or not they were FHA-insured, and Panel (b) reports the number of loan cards by year and by institution.

The collection of these loan cards is the only available microdata of individual mortgages from this period, and we are the first to digitize it in full (Ghent, 2011; Rose, 2011, have focused on smaller subsets of this data). We note, however, that despite its richness and novelty, there

are potential concerns about the representativeness of the data. First, some commercial banks and savings and loans institutions contained no information on their inactive loans, but such bias concerns are small for the sample of life insurance corporations. In our results, we highlight that mortgage conditions change across all institutions. Most importantly, the sample is limited to large institutions that remained in business during the Great Depression. Under the assumption that the institutions that survived engaged in less risky mortgage lending, we might be understating changes in mortgage spreads with this sample if risk premia narrowed over time or differences in riskiness also converged.

2 Institutional Background

We provide a brief overview of the institutional characteristics of mortgage markets between 1920 and 1950, and summarize the main aspects of the federal mortgage legislation passed over this period. Footnote 6 discusses papers that offer a much richer review of this era.

Mortgage Markets between 1920 and 1933. Mortgage markets in the 1920s and early 1930s were dominated by local lenders. More than two-thirds of the mortgage debt in 1920 was held by local actors: Building and Loan associations (B&Ls), commercial banks and individual investors (Grebler et al., 1956). Most B&Ls had few members, and membership was confined to a single city (Snowden, 1997; Price and Walter, 2019). Commercial banks were prohibited from branching across states or, in many cases, even across cities. Life insurance corporations (LICs), mostly based out of New York or Connecticut, constituted the only significant source of inter-state lending, but they never held more than 15 percent of *all* mortgages prior to 1934 (Grebler et al., 1956) as they faced costs in maintaining large long-distance portfolios and were unwilling to be over-exposed to a single region (Snowden, 2010). The modal mortgage in the years before the housing policies was a non-amortizing 5-year balloon mortgage.[15]

The Policy Intervention. The Great Depression decimated the housing market with a rapid decline in housing prices and spikes in unemployment, causing many households to default on their

[15] An exception to these kinds of loans were those offered by B&Ls, which had been in the business of offering a long-term amortizing mortgage plan to their members since the end of the 19th century (see Rose and Snowden, 2013, for more details). Mortgages made by B&Ls had on average 83 bps higher interest rates than those made by life insurance corporations and commercial banks, and their terms were six years longer.

mortgages once their terms expired and the entire principal came due. The Federal government responded with a far-reaching policy package aimed at stabilizing the mortgage market.

1. It established the Federal Home Loan Bank (FHLB) system in 1932, which, among other things, acted as a discount facility to B&Ls providing liquidity ("advances") to these local lenders against mortgages pledged as collateral. B&Ls came to be known as Savings and Loan associations (S&Ls), and started being regulated by the FHLB.[16,17]

2. The government also supported mortgage lending done by other institutions, such as commercial banks and life insurance corporations, by founding the Federal Housing Administration (FHA) in 1934 and the Federal National Mortgage Association (FNMA) in 1938. The role of the FHA was to provide insurance on mortgages made by private institutions, while FNMA offered a secondary market on FHA-insured mortgages.[18] Importantly, a second purpose behind the FHA was the recovery of the residential construction industry. In particular, starting in 1938 the FHA offered insurance for mortgage loans with better terms, such as longer durations and lower down payments, only if the loan was for a newly constructed property (Fishback et al., 2022a).

3. The government also set up the Home Owners' Loan Corporation (HOLC) in late 1933, which bought and restructured mortgages from borrowers judged to have defaulted on the loan "through no fault of their own" (Fishback et al., 2019). At the peak of its activity HOLC held up to a fifth of all mortgage loans in the U.S. HOLC restructured all mortgages the same way: increasing the term to 15 years, fixing the rate at 5 percent regardless of location and making them fully amortizing.

3 The Making of a National Mortgage Market

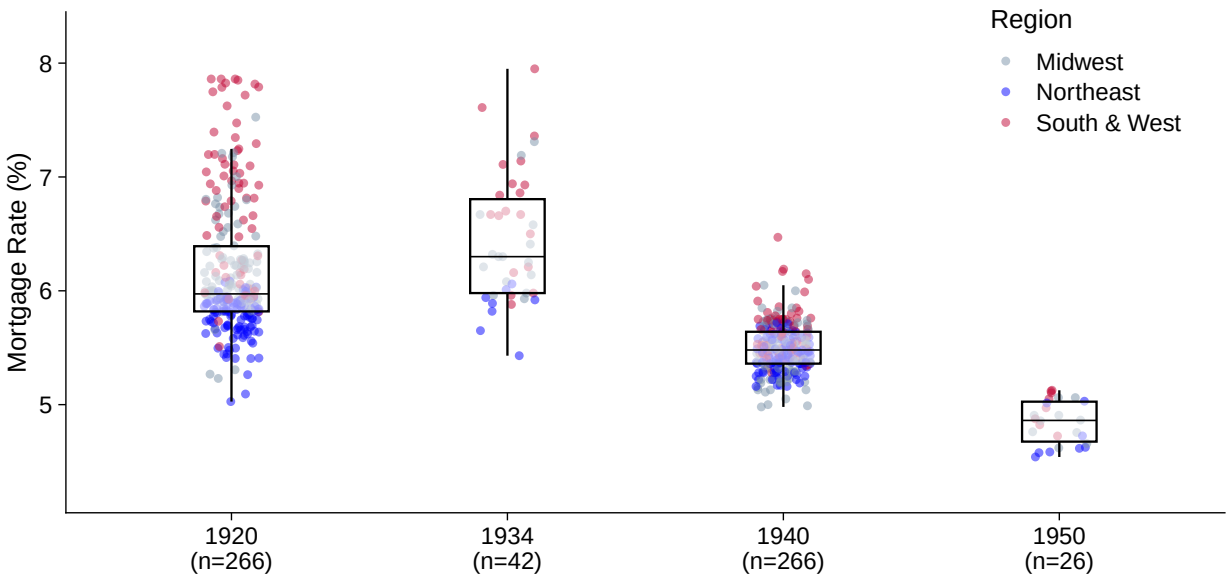
We describe the evolution of mortgage conditions across cities and over time. Figure 2 shows the distribution of average mortgage interest rates across our full sample of 266 cities in 1920

[16]For clarity, we will keep referring to S&Ls as B&Ls.

[17]The government also established the Federal Savings and Loan Insurance Corporation (FSLIC), whose goal was to insure B&L deposits, similar to the role played by the Federal Deposit Insurance Corporation for commercial banks.

[18]FHA insurance for a new mortgage loan was limited to contracts where the underlying project was "economically sound," which was often interpreted as housing with small risk of deterioration in the physical structure and low risk of neighborhood change (Fishback et al., 2022a).

Figure 2: Distributions of Mortgage Interest Rates across Cities, 1920-1950



Notes. This figure plots the distribution of mortgage interest rates across cities for different years. We winsorize the values for two outlier cities that had 1920 mortgage interest rates above the 99th percentile of 7.9 percent. Dots indicate cities, colored by region.

and 1940, and across the subsamples with data available in 1934 and 1950. Mortgage rates varied widely across cities prior to 1934. In 1920, rates ranged between 5.1 percent and 7.9 percent across the full sample. For the subsample of 42 cities in 1920, we observe virtually the same spread across cities, but a slightly higher average (6.4 percent compared to 6.0 percent). By 1934, the spread and the average of these 42 cities had not changed. By 1940, however, the spread in average interest rates had fallen to just over 80 bps (from nearly 300 bps), converging to an average of 5.5 percent, both for the full sample and for the restricted sample.

This compression was persistent. By 1950, spreads across cities remained small, and data focusing on B&Ls only for 1960 to 1971 shows similarly low regional differences (Appendix Figure B.1).[19]

Next, we present five additional distinct pieces of evidence in support of two main conclusions. First, the rapid convergence in mortgage rates shown in Figure 2 was brought on by the federal housing policies discussed in Section 2, and would not have happened under normal market conditions. Second, this convergence partly reflects the easing of barriers to the geographic mobility of financial capital, rather than solely the introduction of federal mortgage insurance through the

[19]The average mortgage rate also declined substantially over this period. This decline was similar to the decline in long-term bond rates, as shown in Appendix Figure B.4.

FHA. In particular, the policies facilitated an inflow of capital to initially high-rate markets that had previously been constrained in their lending capacity.

3.1 High-Rate Cities Received a Positive Supply Shock

We show that the mortgage evolutions of 1920 to 1940 bear the hallmarks of a supply shock, consistent with the federal policies enabling an inflow of capital into initially capital-scarce cities. Figure 3 plots city-level changes in mortgage rates (Panel a) and in mortgage debt (Panel b) between 1920 and 1940, against the 1920 mortgage rate.[20] Panel (a) shows the strong degree of convergence already evident in Figure 2. Cities with a one percentage point higher mortgage rate in 1920 saw their rate decline by .78 percentage points on average. Panel (b) shows that, as prices declined in initially high-price cities, quantities rose, as measured by the increase in outstanding mortgaged debt relative to home values. Cities with a one percentage higher mortgage rate in 1920 saw an approximately 58 percent ($e^{0.46} - 1$) increase in mortgage debt relative to home values.[21]

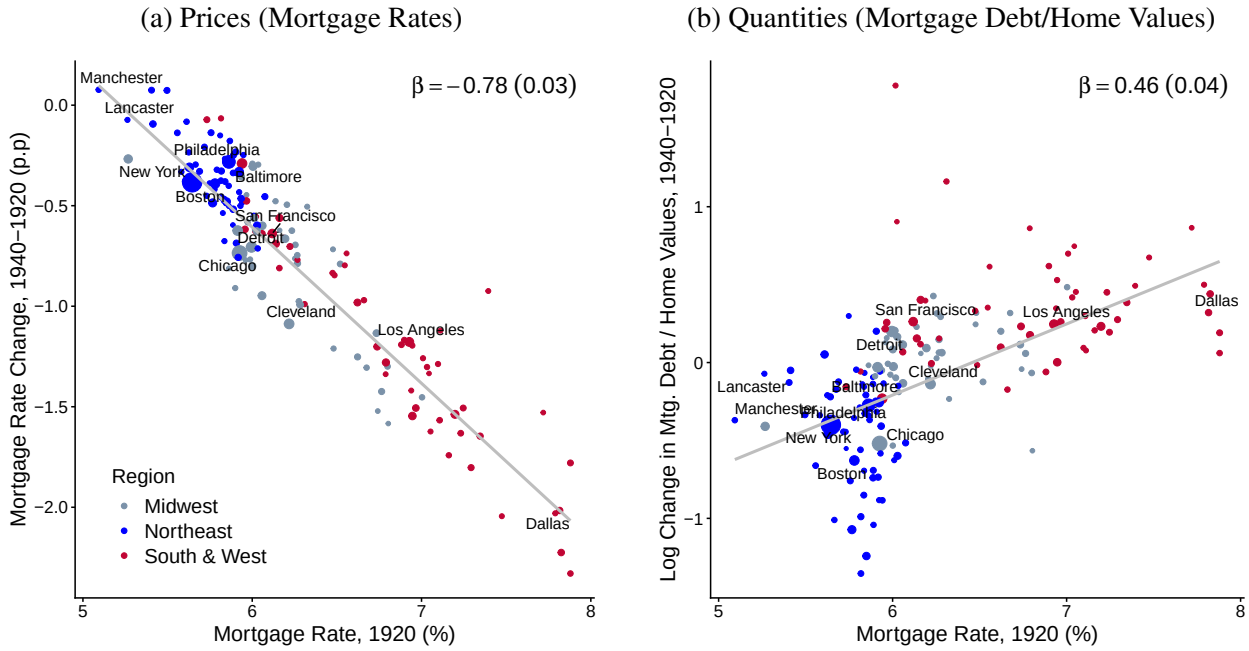
3.2 Most of the Convergence Happened After the Federal Housing Policies

The second feature of the convergence in mortgage rates is its very rapid pace, concentrated in the period 1934-40. Figure 2 already showed that the spread across cities in 1934 is quite similar to that in 1920, implying that most of the convergence was yet to take place. To corroborate this idea, we repeat the exercise of plotting changes of mortgage rates against mortgage rates in 1920 for the two subperiods we have available, 1920-34 and 1934-40, for the sample of cities for which we have data in 1934. Panel (a) of Figure 4 reports the change in rates over the 1920-40 period against the initial rate. We note that the coefficient from the associated bivariate regression is -0.8, almost identical to the -0.78 in Panel (a) of Figure 3, alleviating potential concerns about the representativeness of the smaller sample. The implied annual rate of convergence over the

[20] The sample in both panels is a subset of our full 266-city sample and contains the 149 cities for which we have data on the number of mortgaged homes. These data are available only for cities with more than 50,000 people in 1940, and are necessary to construct the city-level amount of mortgage debt relative to home values (see Appendix Section A.3). Panel (a) of Appendix Figure B.2 plots the analogous figure for the full sample, and shows that the convergence coefficient is identical.

[21] Dividing by home values controls for the possibility that part of the increase in mortgage debt could be capturing house price appreciation, without effectively changing the amount of debt per quantity of purchasable assets. Panel (b) of Appendix Figure B.2 shows that the coefficient is positive and very significant also when using the change in total mortgage debt. For this measure, we can use the full sample of 266 cities.

Figure 3: Changes in Prices and Quantities on Initial Mortgage Rates



Notes. This figure plots changes in city-level mortgage conditions between 1920 and 1940 against the initial mortgage interest rate in 1920 for 149 cities for which we can construct a measure of city-level mortgage debt over all home values (see Appendix Section A.3). Panel (a) plots the change in average mortgage interest rates between 1940 and 1920. Panel (b) plots the log change in outstanding mortgage debt relative to home values between 1940 and 1920. Each panel reports the coefficient from a bivariate regression, where each city is weighted by city population in 1920. The size of each dot is proportional to cities' population in 1920. Colors indicate census regions. Robust standard errors are in parentheses.

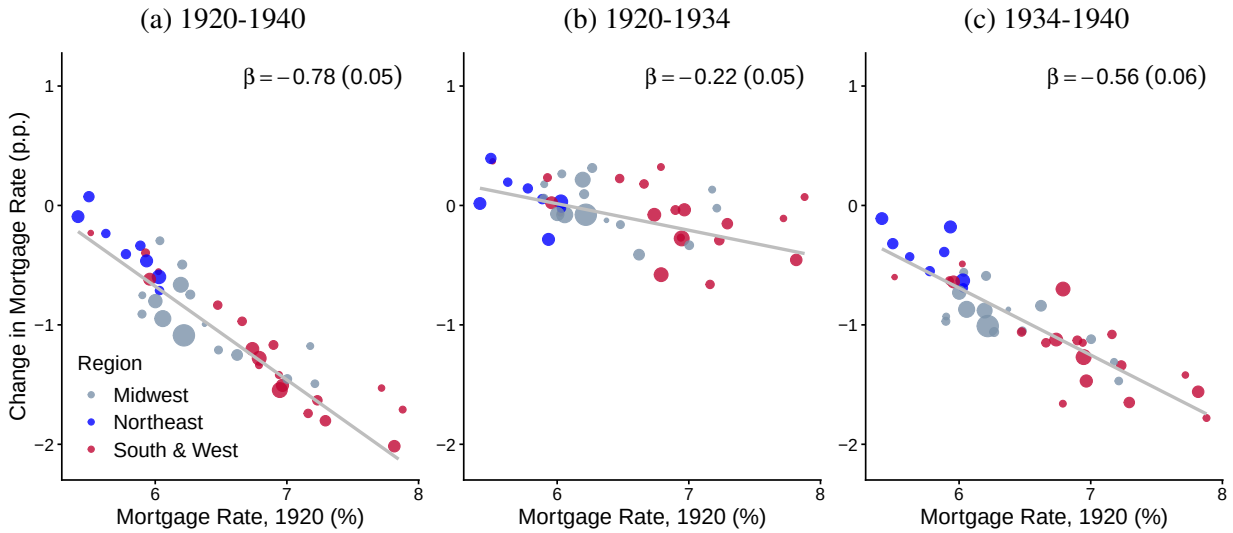
entire time period is 8 percent, but Panels (b) and (c), which plot the rate changes over 1920-34 and 1934-40, respectively, show that the convergence is primarily driven by the shorter later period.[22] The implied annual rate of convergence between 1920 and 1934 is 1.8 percent, which is remarkably close to the 2 percent convergence rate of poor to rich countries—the "iron law" of convergence of Barro (2015). Yet, over 1934-40 the implied annual rate of convergence reaches 14 percent, seven times as large.

Appendix Figure B.3 replicates Figure 4 using quantities on the left-hand side, again defined as total mortgage debt relative to home values. It also shows that all the increase in quantities between 1920 and 1940 that occurred in initially high-rate cities, documented in Panel (b) of Figure 3, is concentrated in 1934–40, rather than in 1920-34.

We provide additional evidence that most of the convergence in rates occurred between 1934

[22]To see how the reported β coefficients translate into rates of convergence, let r_{jt}^M be the mortgage rate in city j and year t, and r^* be a steady state mortgage rate. We denote by ρ the annual rate at which the city converges to its steady state value: $dr_{jt}^M/dt = -\rho(r_{jt}^M - r^*)$. Thus, ρ can be expressed as: $\rho = -\log(1+\beta)/(t-1920)$, where $t = 1934, 1940$.

Figure 4: Change in Mortgage Rates Against Mortgage Rate in 1920, by Period



Notes. This figure plots the change in mortgage interest rates across cities, over different time horizons, against initial mortgage rates in 1920 for the 42 cities with data in 1934. Panel (a) plots the change in mortgage rates between 1940 and 1920 against the 1920 rate. Panel (b) plots the change in rates between 1934 and 1920. Panel (c) plots the change between 1940 and 1934. Each panel reports the coefficient from a bivariate regression weighted by city population in 1920. The size of each dot is proportional to cities' population in 1920. Colors indicate census regions.

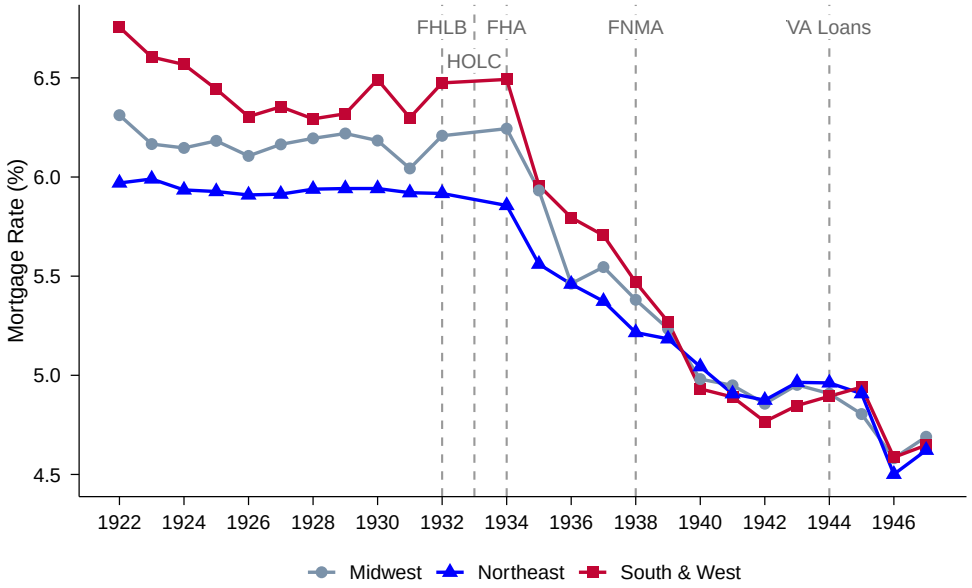
and 1940 using our newly digitized sample of individual mortgage loans, which allows us to track mortgage interest rates at an annual frequency. Given the size of our sample, we aggregate our individual loan cards to the regional level, keeping only observations in states with loan data in at least twenty years between 1922 and 1947 (equal to 98 percent of the full sample of loans made in those years).[23] We use the same regional grouping as in our city-level scatterplots: Northeast, Midwest, and South & West. Figure 5 reports the average mortgage interest rate of new mortgages issued in each year between 1920 and 1947 in each region. The figure shows that differences across regions in mortgage rates remained stable between 1920 and 1934, but went through a dramatic convergence over the ensuing six years, right after the federal housing policies were enacted. Between 1940 and 1947 the regional spread virtually disappears.[24]

This evidence highlights the distinctive role of the period in which the FHLB, FHA, and FNMA were introduced. The pronounced asymmetry in convergence rates across periods casts doubt on more secular explanations, such as gradual catch-up of less developed cities to more developed

[23]Due to the small sample size, we group loans made in 1920, 1921 and 1922 together. We also group the loans made in 1933 under 1934.

[24]Beyond the narrowing of regional spreads, mortgage rates display two interesting features. The average mortgage rate is quite stable between 1920 and 1940, despite large changes in inflation during this period, and it declines substantially after 1934. Both features also occur for other long-term bond rates, as shown in Appendix Figure B.4.

Figure 5: Mortgage Rates by Region



Notes. This figure plots average regional interest rates on newly originated mortgages from the NBER's survey of individual mortgage loans. We aggregate the individual loans to the regional level, and report the average mortgage rate for all loans originated in a given year in a given region. Regions are: Northeast (blue, triangles), Midwest (gray, circles), and the South & West (red, squares). Due to small sample sizes, loans made in 1920–1922 are grouped together, and loans made in 1933 are grouped with 1934.

ones or simple mean reversion.

3.3 Convergence was Specific to Mortgage Markets

Next, to highlight the role of federal housing policies in driving convergence, we compare the degree of convergence in mortgage markets—directly targeted by these policies—to that observed in other lending markets. A key concern is that the convergence we document in mortgage rates could simply reflect convergence in broader economic conditions, other market-driven forces, or mean reversion rather than the impact of policy. To address this, we turn to data from Bodenhorn (1995) on lending rates charged by commercial banks, available at the state level. Commercial banks were active in residential mortgage lending, but their lending rates also capture lending to businesses, farms, and consumers, providing a useful benchmark for overall credit market conditions.[25]

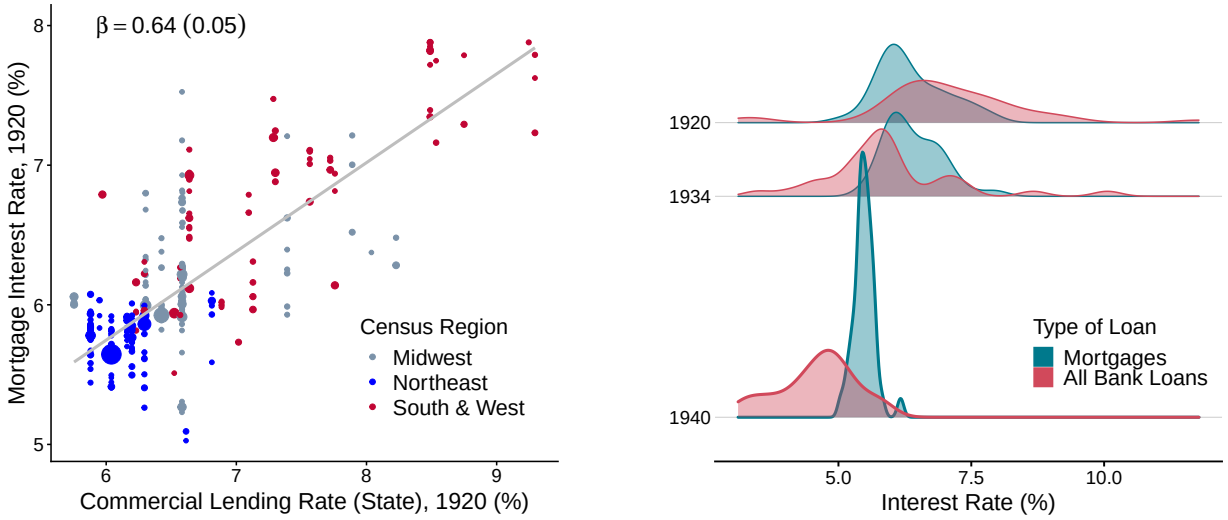
Panel (a) of Figure 6 shows that commercial lending rates and mortgage interest rates are indeed strongly correlated in the pre-period of 1920. The R^2 from the bivariate OLS regression is .6. Yet, the trajectories of these mortgage and commercial rates diverge in the ensuing periods.

[25]This comparison is conservative, as there are spillovers across markets within each locality.

Figure 6: Geographic Dispersion of Mortgage Rates and Commercial Lending Rates

(a) Correlation in 1920

(b) Distribution Across States, by Year



Notes. Panel (a) plots the average city-level mortgage interest rate against the state-level commercial lending rate in 1920 for our sample of 266 cities, as well as the coefficient and R^2 from a bivariate regression of the mortgage rate on the commercial rate, weighting each city by its population in 1920. The size of each dot is proportional to cities' population in 1920. Colors indicate census regions. Panel (b) plots the cross-sectional distribution of mortgage interest rates (in blue) and commercial lending rates (in pink) across states in 1920, 1934, and 1940. For the 1934 distribution, mortgage rates are based on the subsample of 42 cities. Commercial lending rates are from Bodenhorn (1995).

Panel (b) plots the distribution across states in commercial lending rates and mortgage rates (where we average city rates at the state level). The distributions show that commercial lending markets displayed greater dispersion than mortgage markets in both 1920 and 1934, although both types of rates exhibited substantial geographic variation. By 1940, however, mortgage rates had become tightly clustered around 5.5 percent, while commercial lending rates continued to differ markedly across states.

Taken together, these patterns indicate that geographic convergence was much stronger in mortgage markets—where the federal government intervened—than in commercial lending markets, which remained highly dispersed. The stark contrast in convergence between the two markets is difficult to reconcile with explanations based solely on aggregate economic convergence, general market forces, or mean reversion, and instead highlights the federal housing policies of the 1930s as the central driver of mortgage rate convergence.

3.4 Convergence Without FHA Insurance

Although the evidence presented above points to the unique role of the Federal policies in driving the convergence, it does not disentangle the different components of the policy package. Part of the convergence might have been driven by the inflow of financial capital into capital-scarce places, through provision of advances at the same rate everywhere by the FHLB, or the creation of a national secondary market for mortgages by the FNMA. Another part may instead reflect the reduction of risk differences across space through federal mortgage insurance under the FHA, if that insurance was not priced differentially across locations.

To distinguish between these two sources of convergence—capital inflows versus risk equalization—at least qualitatively, we use the individual mortgage-loan data to examine the convergence in rates charged by B&Ls, which did not make use of the FHA insurance (as also shown by Rose and Snowden, 2013). Panel (b) of Figure 7 plots the share of newly originated mortgages that received government guarantees under the FHA program (and, after 1944, the VA program) by type of lender. The green bold line (bottom) shows that B&Ls made only limited use of FHA insurance: on average, less than 10 percent of new B&L mortgages were FHA-insured, compared to more than 40 percent for other lenders such as commercial banks and life insurance corporations. Yet, B&L mortgage rates converged dramatically after the introduction of the FHLB. Panel (a) shows that regional spreads were around 250 bps before 1933, and then stabilized to less than 50 bps by the early 1940s.[26] On the other hand, Appendix Figure B.5 shows that the regional spreads for commercial banks and life insurance corporations were much lower.

3.5 Capital Scarcity and Mortgage Rates

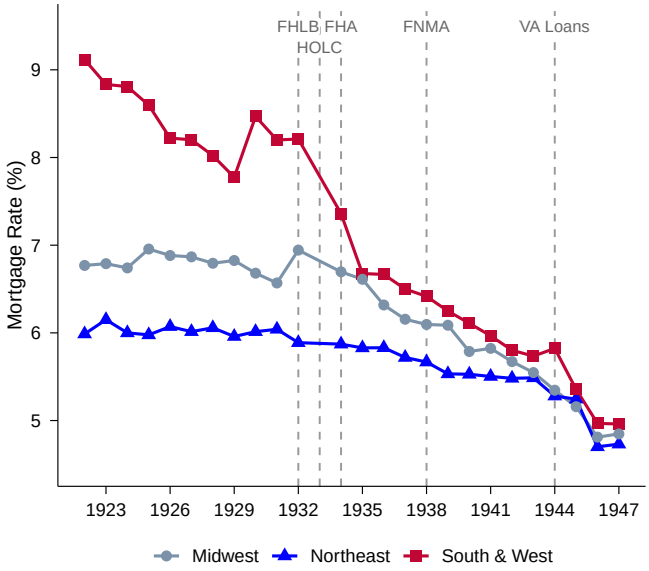
Finally, we show that the relationship between city-level capital scarcity, the difference between the supply of savings and the demand for mortgage borrowing, and local mortgage rates across time is consistent with the integration of mortgage markets. While capital scarcity is strongly correlated with the mortgage rates in 1920, when lending markets were segmented, it exhibits no statistical correlation with the 1940 rates following the implementation of the housing policies.

The idea that local lending rates partially reflect an imbalance between the supply of funds from

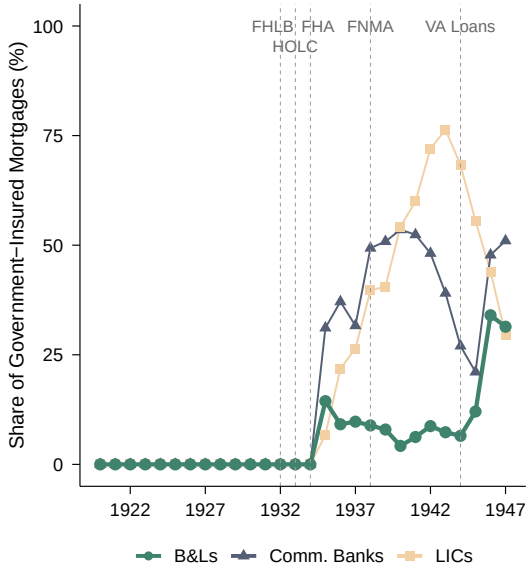
[26] B&Ls did make use of VA guarantees, but these began in 1944, by which time most of the convergence had already occurred.

Figure 7: Large Convergence for B&Ls Despite Minimal FHA Takeup

(a) Rates on New Mortgages by B&Ls, by Region



(b) Take-up of Gov. Insurance, by Lender



Notes. Panel (a) plots average interest rates on newly originated mortgages by Building and Loan associations (B&Ls), separately by region, from our digitization of the NBER's survey of individual mortgage loans. Panel (b) plots the share of newly originated mortgages that were government-insured (FHA or VA) by type of institutional lender: B&Ls, commercial banks, and life insurance corporations.

households to lenders and the demand for mortgage borrowing is supported by qualitative contemporaneous accounts. A 1929 Brookings report, for instance, points to the imperfect geographic mobility of financial capital as a main driver of mortgage rate differences across space:

> The existence of substantial geographical differentials in interest rates not attributable to the character of the security indicates an insufficient fluidity in the movement of loan funds, a defect which may be due to a number of conditions, including differences in the cost of administering loans at a distance. (Gray and Terborgh, 1929)

We measure cities' local capital scarcity by constructing their "net asset position," based on each city's age distribution and following the approach of Auclert et al. (2021). The approach assumes that individuals differ over their age profile in how much assets they hold compared to how much debt they owe. For example, younger households are more likely to be net borrowers, while older households are more likely to be net lenders of funds to the banking sector. Thus, cities with a higher fraction of older households relative to younger households would exhibit a larger supply of funds relative to demand (as in Becker, 2007).

Mechanically, we calculate the local net asset position of each city through the following steps.

We split households into five age bins according to the age of the household head. Using the earliest wave of the Survey of Consumer Finances from 1949, digitized by Kuhn et al. (2020), we measure the national net asset position associated with each age group by estimating the fraction of housing debt held by the average household in each bin and the fraction of assets held by the average household in each bin. The net asset position of each age bin equals the difference between the two.[27] Thus, the sign of each group's net asset position reflects whether households of that age are on average net debtors or net lenders. Its magnitude captures each group's imbalance between its supply and demand of capital. Each city's net asset position in a given period then sums the age-specific net asset positions weighted by the fraction of households in the relevant age group living in that city and period.

Table 1 summarizes the results from regressions of mortgage interest rates on the cities' local net asset positions for the two periods before and after the policy reforms. Columns 1 to 3 show that initial mortgage interest rates in 1920 are strongly negatively correlated with the 1920 net asset position, even when we include a host of city-level controls and region fixed effects in the last specification.[28] Cities where capital was relatively scarce had significantly higher mortgage rates, consistent with market segmentation and limited access to national (or non-local) funds.[29] This significant relationship, though, has disappeared by 1940 (columns 4-6 of Table 1). In line with the integration of regional mortgage lending markets into a national lending market, a city's capital scarcity, as captured by its net asset position, is not predictive of the mortgage interest rate once we introduce even simple regional controls. The initial imbalance between local demand and supply forces has thus become irrelevant in shaping local prices (mortgage rates) once these prices are set on a national market.[30]

[27] For example, households in the lowest age bin held 24 percent of all U.S. housing debt, but only 8 percent of all U.S. assets, resulting in a net asset position of $-.24 + .08 = -.16$. On the other hand, households in the highest age bin held 4 percent of housing debt, but 15 percent of assets, with a net asset position of approximately $-.04 + .15 = .11$. The age bins are: 18-30, 31-40, 41-50, 51-60 and 61+.

[28] The controls include the percent of the city population that is Black, the percent that is U.S.-born, the fraction of state population that is rural, the log of the average manufacturing wage, the log of the number of manufacturing establishments, and the log of the number of manufacturing wage earners, each measured in the same year as the dependent variable (1920 in columns 2–3, 1940 in columns 5–6).

[29] Appendix Table B.2 shows that mortgage rates are correlated with other proxies for capital scarcity: the historical fraction of B&L debtors over all B&L members from 1893, as well as cities with a larger historical fraction of bank deposits over total bank assets from 1904. These results complement other work on geographic segmentation of commercial lending markets by Becker (2007) and D'Amico and Alekseev (2025).

[30] Appendix Figure B.6 shows that these results are robust to using 1920 controls for both 1920 and 1940, to using all financial assets instead of liquid assets, and to giving equal weight to each city. Results are robust also to just using the fraction of older households as a proxy for the relative capital scarcity, as shown in Appendix Table B.1.

Table 1: Local Mortgage Rates and Local Abundance of Savings Relative to Debt, 1920 and 1940

	Dependent Variable: Mortgage Rate in City j in Year t					
	Segmented Markets ($t = 1920$)			Integrated Markets ($t = 1940$)		
	(1)	(2)	(3)	(4)	(5)	(6)
City-Level Net Asset Position$_{jt}$	-1.35^{**}	-1.61^{***}	-2.07^{***}	.13	.30	.09
	(.53)	(.60)	(.52)	(.25)	(.36)	(.26)
Avg. Manufacturing Wage$_{jt}$		$.62^{*}$	.01		$-.11$	$-.07$
		(.32)	(.27)		(.10)	(.12)
Fraction Rural$_{jt}$		$.01^{**}$	.001		$-.004^{***}$	$-.004^{**}$
		(.003)	(.003)		(.002)	(.002)
Region FE			✓			✓
Observations	266	262	262	266	260	260
R^2	.048	.51	.64	.0022	.38	.53

Notes. This table reports WLS regressions of city-level mortgage interest rates on the local net asset position, weighting each city by population in 1920. Columns 1–3 use the 1920 mortgage rate as the dependent variable; columns 4–6 use the 1940 mortgage rate. The net asset position is constructed using each city's demographic age distribution and national net asset positions by age group from the 1949 Survey of Consumer Finances (see main text for details). Controls are added progressively across columns within each panel. Robust standard errors are in parentheses.

4 Effects on Cities: Homeownership, Prices, and City Size

Next, we study how shocks to mortgage rates affect city growth, real estate prices, and construction. A decline in urban mortgage rates due to a higher supply of credit makes homeownership more affordable and morphs into a demand shock to owner-occupied homes in the city. We expect this shock to lead to increases in the rate of homeownership and residential units, as well as housing prices, both in absolute terms and relative to rents; where the relative magnitude of the predicted effects will mostly depend on the elasticity of supply of ownable homes. Such predictions would follow from any supply shock to mortgage credit, and are not tied to this particular historical episode. However, what is unique about the context we study is that the federal housing policies were also aimed at boosting construction: the FHA would primarily insure mortgages on newly-built houses and would even collaborate with property developers to pre-certify that borrowers would have access to FHA insurance. Therefore, we also expect to see an especially robust response in the construction sector.

Our key strategy to study the effects of mortgage affordability is that the size of the change in mortgage rates brought about by the federal policies differed across cities depending on the initial mortgage rate in 1920, as illustrated in Panel (a) of Figure 3. We leverage this heterogeneity and

study whether places that experienced a higher decline in rates also saw greater changes in the outcomes described above.[31]

The main threat to our empirical strategy is that cities that had initially higher interest rates were less economically developed, and rather than capturing the effect of shocks to mortgage affordability, we are estimating the effects of economic convergence across space more broadly. In other words, less-developed cities (that happened to have higher mortgage interest rates) would grow at higher rates by virtue of overall economic convergence forces (as in Barro and Sala-i-Martin, 1992). To address this concern, we employ a battery of controls for these initial characteristics and also evaluate whether cities were on different pre-trends before the policy.

Furthermore, we leverage the fact that the impressive degree of convergence that occurred was unique to mortgage markets, and include the initial level of the commercial lending rate as a key proxy control for unobservables related to capital scarcity (available only at the state level). Since both high initial commercial lending rates and high initial mortgage rates are indication of a capital scarce area, controlling for commercial lending rates helps us mitigate some of the omitted variable bias from initial economic conditions correlated with both initial capital scarcity and higher subsequent growth.

4.1 Event Study Results

We start by employing a dynamic difference-in-differences on homeownership, which we can construct consistently from 1910 to 1960. We compare the difference in homeownership between 1930 (which we consider our base year) and any other year for cities that experienced a higher decline in mortgage rates relative to the average city. In particular, we estimate the following regression equation for each city j and census decade t:

$$Y_{jt} - Y_{j,1930} = \alpha + \sum_{t \neq 1930} \beta_t^M \cdot r_{j,1920}^M + \sum_{t \neq 1930} \beta_t^C \cdot r_{s(j),1920}^C + \sum_{t \neq 1930} \boldsymbol{X}_j \cdot \boldsymbol{\theta_t} + \phi_{tl} + \varepsilon_{jt} \quad (1)$$

[31] Ideally, we would measure the change in the rate between 1934 and a given year t in our sample, but we do not have mortgage rate data for all cities for all years (for example, we only have 1934 data for 42 cities). Section 3, however, shows that the bulk of the convergence occurred between 1934 and 1940, rather than 1920–34, and that the spread remained compressed thereafter. Thus, we use the mortgage rate in 1920 as the independent variable to proxy for the permanent decline in mortgage rates mostly occurring between 1934 and 1940. To directly measure the semi-elasticity of our outcomes of interest to changes in mortgage rates, we also estimate 2SLS regressions where we instrument the post-1934 change in mortgage rates in each city (as measured by the change between 1920 and 1940) with the 1920 mortgage rate.

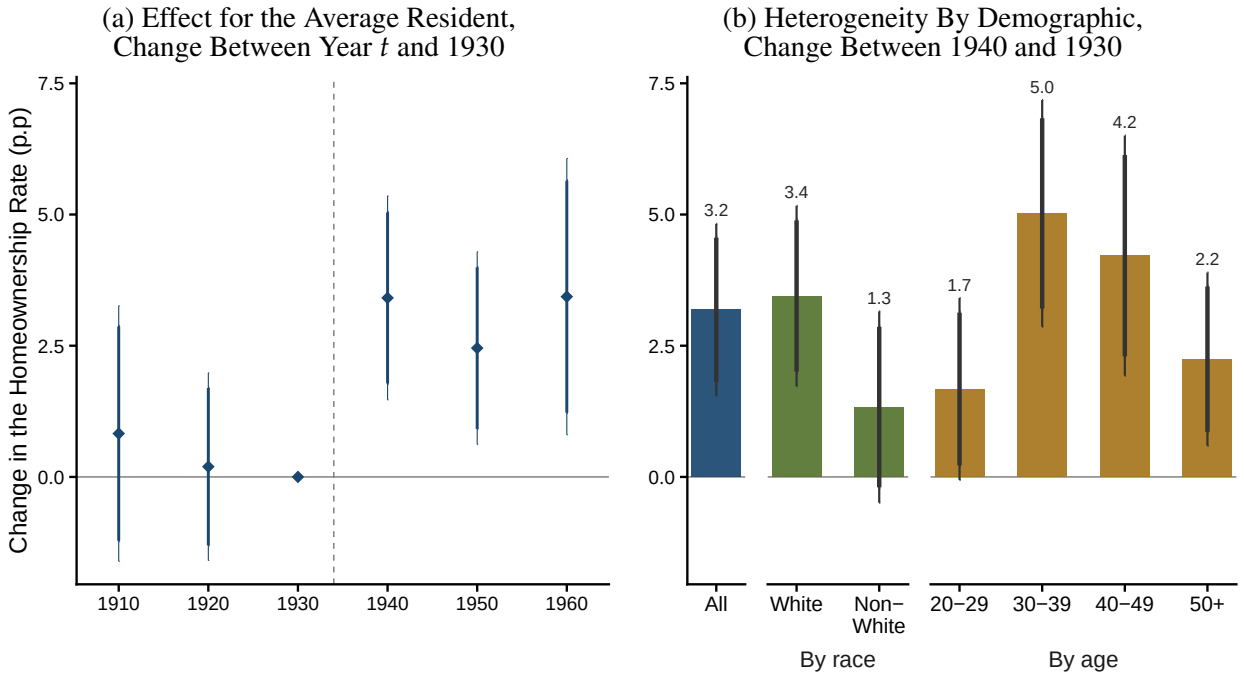
where Y_{jt} is homeownership in city j at time t. $r^M_{j,1920}$ is the mortgage interest rate in 1920, $r^C_{s(j),1920}$ is the state commercial lending rate in 1920, and $\boldsymbol{X}_j$ is a vector of city characteristics in 1930, 1920, and 1910. As anticipated, $r^C_{s(j),1920}$ is an especially reassuring control, as it captures many of the confounders that are associated with low financial development.

In terms of city-level pre-period characteristics, we control for initial demographics in 1930, 1920, and 1910 (percent Black population, percent U.S.-born population, and the fraction of state population that is rural) and levels of economic development in 1930, 1920, and 1910 (the log of average manufacturing wages, the logs of the numbers of manufacturing establishments and of manufacturing wage earners, and the log of total dwellings).[32] We also control for possible differences in the incidence of the Great Depression, using the proxies available from the literature: the change in retail sales per capita, initial retail sales per capita in 1929, and the log amount of New Deal relief grants (see Fishback et al., 2005). We also define a "housing boom" index as the total number of building permits issued in the city between 1921 and 1928 divided by the number of families in 1920 to capture the extent to which the city experienced higher-than-normal construction activity in the years leading up to the Great Depression. We control for shocks to amenities via average January temperatures (Glaeser and Tobio, 2008) and for World War II military spending (see Brunet, 2024). Region-by-year fixed effects ϕ_{tl} are included throughout, which allow us to compare cities within broad regions of the U.S. (Dallas against Houston, and Chicago against Cleveland, rather than Dallas against Chicago) and control for time-varying differential trends across U.S. regions. Appendix Table B.3 reports the correlation between the 1920 mortgage rate and each of these controls, both unconditionally and conditional on all the others. We weigh all observations by city population in 1930 and report heteroskedasticity robust standard errors.

Figure 8 summarizes our results. Panel (a) shows that cities with higher initial mortgage rates experienced significantly higher growth in homeownership after the federal housing policies. A city with a 100 bps higher mortgage rate in 1920 saw an approximately 3.4 p.p. higher increase in the homeownership rate between 1930 and 1940, and the effect remains between 2.5 and 3.4 p.p. through 1960. Importantly, the pre-period coefficients for 1910 and 1920 are close to zero and statistically insignificant, supporting the parallel trends assumption. Appendix Figure B.7 reports the event study under progressively richer sets of controls, showing that patterns are quite stable across specifications.

[32]The manufacturing controls are not available for 1910.

Figure 8: Changes in Homeownership Rate in Cities with a Larger Reduction in Mortgage Rates after 1934



Notes. This figure plots estimates of the effect of the average mortgage interest rate in 1920 on changes in the homeownership rate. Panel (a) plots the coefficients β_t^M estimated in the dynamic regression in Equation (1) of the change in the homeownership rate (in p.p.) between each census year and 1930 on the 1920 mortgage rate. The regression controls for census region fixed effects, the state commercial lending rate in 1920, demographic and economic conditions in 1930 and their 1920 and 1910 values, average January temperatures, and proxies for heterogeneous exposure to the Great Depression, World War II spending, and the 1920s housing boom. Panel (b) plots the coefficients on the 1920 mortgage rate from separate regressions of the change in the homeownership rate between 1940 and 1930 for each demographic group, using the same specification as Panel (a). Group-specific homeownership rates are tabulated by race and age of the household head from the full-count 1930 and 1940 census microdata, for heads aged 20 and older. The Panel (b) sample is held fixed across groups and excludes cities in the bottom decile of the number of non-white households in 1930, for which there are too few non-white households. Numbers above the bars report the point estimates. Thin bars denote 95 percent confidence intervals; thick bars denote 90 percent confidence intervals, based on heteroskedasticity robust standard errors. All regressions are weighted by city population in 1930.

Panel (b) examines which households drove the increase in homeownership, using homeownership rates that we tabulate by race and age of the household head from the full-count 1930 and 1940 censuses (homeownership is not recorded in the 1950 census microdata). Gains in homeownership were far from uniform across households. The effects are concentrated among white household heads and among heads aged 30–39: a 100 bps higher mortgage rate in 1920 is associated with a 5 p.p. higher increase in homeownership among heads aged 30–39. The estimate for non-white heads is smaller and statistically insignificant, consistent with discrimination along racial lines in access to mortgage credit.

4.2 Semi-Elasticity Estimates

To estimate the semi-elasticity of housing market variables to a decline in mortgage rates, we explicitly instrument the change in mortgage rates between 1920 and 1940 with the initial mortgage interest rate in 1920. The first stage results show that the initial rate is highly predictive of the change, with minor variations in the coefficient across specifications.

Table 2 reports the 2SLS estimates for three outcomes measured as changes between 1930 and 1950: log median home prices, log number of residential dwelling units (as a proxy for the rate of construction, and measured using the number of families), and the homeownership rate. We start by controlling only for region fixed effects; we then add the full set of demographic, economic, Great Depression, and World War II controls, and the state commercial lending rate in 1920. Lastly, we also include the 1921–28 building boom index (see Section 4.1 for details).

We find that a 1 percentage point decline in mortgage rates is associated with little movement in prices. The coefficient on prices ranges from 6 to 7 log points and is statistically insignificant when we add controls. On the other hand, we find positive effects on homeownership and construction across specifications. The increase in dwelling units ranges between 5 and 13 log points, while the homeownership rate increases by 3.2 to 7.1 percentage points. These findings indicate that higher demand for owning a home was met with a robust response from the housing supply sector, suggesting that at the time the supply of homes was quite elastic.

A caveat to these results is that prices and dwelling units are hard to measure consistently over time using census data. Dwelling units do not precisely refer to all units, but rather can be measured only using the number of families in a city. However, to the extent that multiple families shared a single dwelling unit in 1930, which is likely at the height of the Great Depression, the family count overstates the initial stock, leading us to understate the growth in units. More importantly, median home values are not fully comparable across years, as also noted by the Census Bureau. The 1930 census reports value across all owner-occupied homes, whereas the 1940 and 1950 censuses report value only for single-family (one-dwelling-unit) homes. To overcome the data limitations discussed above, we turn to a consistent yearly dataset of housing prices and quantities for 24 cities in our sample.

Table 2: Effect of a 1 p.p. Decrease in Mortgage Rates on Housing Market Outcomes, 1930–1950

	Dependent Variable: City-level change between 1950 and 1930 in								
	Home Prices (logs)			# Dwellings (logs)			Homeownership Rate (p.p.)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$-\widehat{\Delta r}^{M}_{j,1940-20}$ (p.p.)	.06*	.07	.06	.13***	.05*	.05*	7.11***	3.19***	3.19***
	(.03)	(.04)	(.04)	(.03)	(.02)	(.02)	(1.49)	(1.08)	(1.07)
Building $\text{Boom}_{1921-28}$			−.36***			.05			−.08
			(.13)			(.07)			(2.87)
Region FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓	✓		✓	✓		✓	✓
Observations	233	233	233	233	233	233	233	233	233
R^2	.545	.724	.745	.522	.793	.794	.364	.819	.819

Notes. This table reports 2SLS estimates of the effect of changes in mortgage interest rates on housing market outcomes between 1930 and 1950. The endogenous variable is the change in average mortgage rate ($\widehat{\Delta r}^{M}_{1940-20}$), instrumented with the 1920 mortgage rate. Columns (1)–(3) report effects on the log change in median home prices; columns (4)–(6) on log change in number of occupied residential dwelling units; columns (7)–(9) on the change in the homeownership rate in percentage points. All regressions are weighted by 1930 city population. Robust standard errors in parentheses. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

4.3 Evidence from Yearly Data

The data on prices is made available by the Federal Reserve Bank of Philadelphia (2024), and used in Lyons et al. (2026). On quantities, we use data on building permits at the city level collected by Lyons et al. (2026) and shared with us.[33] This data has the unique advantage of reporting consistent and comparable indices for house prices and rents constructed from over 2.7 million newspaper real estate listings (see Lyons et al., 2026 for extensive details on their data). Thus, we can consistently estimate the price, rent, and price/rent ratio semi-elasticities to the persistent change in mortgage conditions we documented; as well as tracing the supply response through permits.

Figure 9 presents results for house prices (Panel a) and a 5-year moving-average of building permits (Panel b), both in log differences from 1934. The left sub-panels plot the raw trajectories for each city, colored depending on the 1920 mortgage rate, on a gradient from blue (low rate) to red (high rate). Bold lines show means for cities with a rate above and below the median mortgage rate in 1920. Before the policy, construction rates were similar across high- and low- rate cities,

[33]The full data actually covers 26 cities. We exclude Tampa Bay from both panels as it was a large outlier for both prices and quantities, both before and after the policy. Charleston, S.C., has incomplete data for permits, and we exclude it from both panels. Adding back these cities does not alter the results as shown in Appendix Figure B.8.

but diverged after the policy. In cities that received a relatively larger inflow of financial capital, we see greater construction growth, at a rate of 50 log points more. Housing prices also went up, but the raw difference was much lower, around 20 log points.

This raw change in prices does not survive adding region fixed effects or other controls, while the large quantity response does, as shown in the right sub-panels. There we report the β^M coefficient from repeated cross-sectional regressions of changes in prices (a.ii) and quantities (b.ii) between year t and 1934, against the mortgage rate in 1920, following Equation (1). We add controls progressively but, given the small sample, we can only add a limited number of controls. We add one control for each group of confounders: New Deal relief grants to control for the incidence of the Great Depression, 1930 manufacturing wages to control for initial economic conditions, and January temperatures to control for shocks to amenities. We also add region fixed effects, to control for broad regional trends. In Appendix Table B.4 we show our results for different permutations of controls.

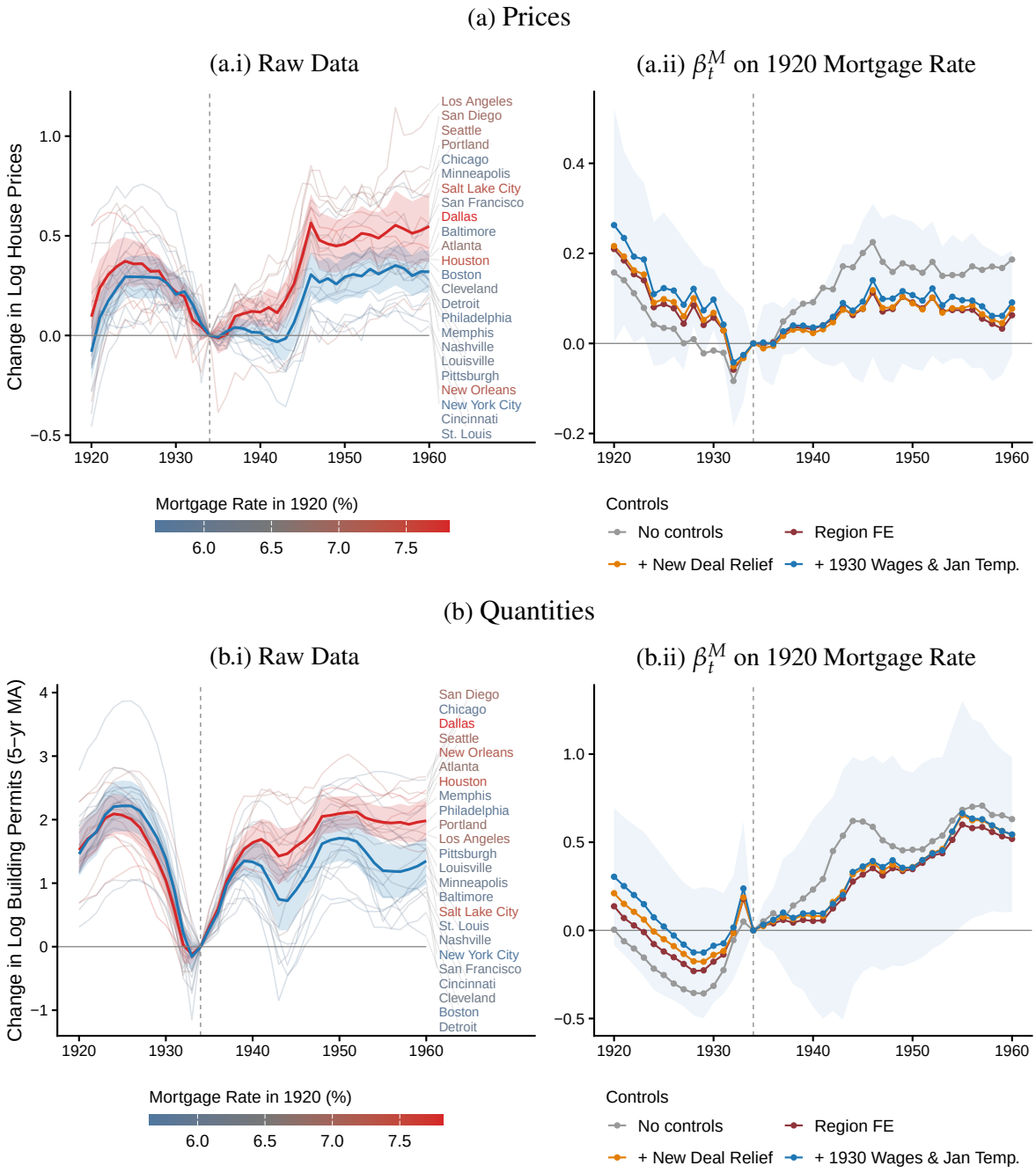
The gray lines show the results from unconditional specifications, which approximately reflect the differences between the red and the blue lines in the left panels. The dark red lines add controls for census region fixed effects, the orange adds New Deal relief, and the blue adds the 1930 manufacturing wages and average January temperatures. Results are quite stable with other permutations of controls, and Appendix Table B.4 reports results by 1950 under many different sets of controls.

The richest specification shows that house prices reach at most a 10 percent appreciation, which is, however, statistically indistinguishable from zero. The results for building permits are more striking: cities with a 100 bps higher initial mortgage rate saw building activity grow approximately 50 percent more between 1934 and the late 1940s.

Table 3 uses this data to summarize the semi-elasticity of prices, the price/rent ratio, total housing units, and the homeownership rate to the persistent change in mortgage rates experienced as a result of the policies we discussed. As in Table 2, we instrument the change in city-level mortgage rates after 1920 with the 1920 mortgage rate and study its effects on local housing markets. For each dependent variable, we report the semi-elasticity estimate without controls, with region fixed effects, and with the full set of controls described in Figure 9. We report heteroskedasticity-robust standard errors in parentheses and wild-bootstrapped p-values in square brackets.

Columns (1) to (6) show the weak response of prices to the shock, both in levels and relative

Figure 9: Changes in House Prices and Building Permits in 24 Cities, by Mortgage Rate in 1920



Notes. This figure shows the evolution of housing prices and building activity for 24 cities with yearly data provided by the Federal Reserve Bank of Philadelphia (2024). Each subfigure has two panels. Left panels plot individual city trajectories of the log change from 1934 in house prices (Panel a) and building permits (Panel b), with cities colored on a gradient from blue to red depending on their 1920 mortgage rate. Cities in red (blue) saw a larger (smaller) reduction in mortgage rates between 1934 and 1940, relative to the average city. Bold lines show group means for cities above and below median 1920 mortgage rate; shaded bands indicate 95 percent confidence intervals around each group mean. Right panels plot the β^M coefficients from repeated yearly cross-sectional regressions of the outcome on the 1920 mortgage interest rate, adding controls progressively: no controls (gray); census region fixed effects (dark red); New Deal relief grants (orange); the log of the average manufacturing wage and average January temperatures (blue). The shaded band around the blue line denotes 95 percent confidence intervals based on robust standard errors. All outcomes are measured in log changes relative to 1934. Building permits are smoothed using a five-year centered moving average. The dashed vertical line marks 1934.

Table 3: Effect of a 1 p.p. Decrease in Mortgage Rates on Housing Market Outcomes, 1934–1950, for the 24 Cities in Lyons et al. (2026)

	Dependent Variable: City-level change between 1950 and 1934 in											
	Prices (logs)			Price/Rent Ratio (logs)			Housing Units (logs)			Homeownership Rate (p.p)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$	.205**	.103	.117	.106	.015	.057	.270***	.185	.155*	6.065**	5.554**	5.498***
	(.08)	(.09)	(.09)	(.09)	(.10)	(.08)	(.06)	(.06)	(.06)	(1.6)	(1.9)	(1.4)
	[.029]	[.383]	[.288]	[.272]	[.875]	[.456]	[.002]	[.107]	[.062]	[.012]	[.035]	[.001]
Region FEs		✓	✓		✓	✓		✓	✓		✓	✓
Controls			✓			✓			✓			✓
$E[Y_{1934}]$	-0.37	-0.37	-0.37	0.11	0.11	0.11	11.90	11.90	11.90	41.25	41.25	41.25
$E[Y_{1950}]$	0.00	0.00	0.00	0.14	0.14	0.14	12.19	12.19	12.19	48.91	48.91	48.91
Observations	24	24	24	24	24	24	24	24	24	24	24	24
R^2	.25	.46	.56	.06	.13	.43	.35	.52	.68	.35	.49	.70

Notes. This table reports 2SLS estimates of the effect of changes in mortgage interest rates on changes in housing market outcomes between 1934 and 1950, for the 24 cities with yearly house price and building permit data used in Figure 9. The endogenous variable is the decline in the average mortgage rate between 1920 and 1940 ($-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$), instrumented with the 1920 mortgage rate, so that coefficients measure the effect of a 1 p.p. larger rate decline. For each outcome, the first column includes no controls; the second adds census region fixed effects; the third further adds the log amount of New Deal relief grants, the log average manufacturing wage in 1930, and average January temperatures. The rows $E[Y_{1934}]$ and $E[Y_{1950}]$ report sample means of the level of each outcome in the base and end year; the base year for the homeownership rate is 1930, rather than 1934, since we need to use decadal Census data. Regressions are unweighted. Robust standard errors are in parentheses; wild-bootstrapped p-values, on which the significance stars are based, are in square brackets. See the main text for additional details on the sample and specification.

to rents: only the unconditional estimate for prices in column (1) is statistically significant, and it does not survive adding census region fixed effects. Columns (7) to (9) show the supply response, defined as the change in residential units relative to the initial housing stock.[34] Cities where mortgages become more affordable see a robust supply response: housing units increase by 15.5 log points (16.8%) with the full set of controls. As in Table 2, columns (10) to (12) also show a strong and very significant increase in homeownership, which rises by 5.5 p.p. and is stable across specifications. As shown in Appendix Table B.4, this pattern of results is quite robust across different sets of controls.

The joint response of prices and quantities also allows us to estimate the slope of the housing supply curve. Under the assumption that the decline in mortgage rates shifted only the demand for homes, leaving the supply schedule unchanged, the ratio of the reduced-form responses of

[34]The census does not provide yearly counts of the housing stock, so we measure the initial stock of residential units at the start of 1934 with the 1930 count of occupied dwelling units described in Section 4.2, to which we add the new residential permits issued between 1931 and 1933. To construct the stock in 1950, we cumulate the permits for new residential units issued from 1934 through 1950.

prices and quantities to the 1920 mortgage rate, $\theta = \beta_P / \beta_Q$, measures the slope of the supply curve: the percentage increase in prices associated with a one percent expansion in quantities. This ratio equals the 2SLS estimate from a regression of the change in log prices on the change in log quantities, instrumenting the quantity change with the 1920 mortgage rate.

Columns (1) to (4) of Table 4 measure quantities with the homeownership rate (in logs) and prices with the price/rent ratio, capturing the supply of owner-occupied homes ("tenure supply", as in GG) over the 1930–40 and 1930–50 horizons, as the homeownership rate is available only in decadal censuses; columns (5) to (8) measure quantities with housing units and prices with real house prices, capturing the overall supply of housing over the 1934–40 and 1934–50 horizons. For each horizon, the first column includes census region fixed effects only, and the second the full set of controls of Table 3.

The estimated slope of the tenure supply curve is small: .37 over 1930–40 and .51 over 1930–50 with the full set of controls, in columns (2) and (4), implying tenure supply elasticities ($1/\theta$) of 2.67 and 1.95. The low slope at the shorter horizon suggests that most of the shift toward owner occupancy had already taken place by 1940. Housing supply is also quite elastic: the slope of the supply curve lies between .56 and 1.00, and it is flatter (more elastic supply) at the longer horizon. Given the small sample and the modest first-stage F statistics, we report 90 percent wild-bootstrapped Anderson–Rubin confidence sets, which are robust to weak instruments. While the sets are wide, we cannot reject a perfectly elastic supply curve ($\theta = 0$) in any column, and all sets except that of column (2) still rule out steep supply schedules. These results are strikingly different from those presented by the extant literature that studied price reactions to credit expansions in modern times (Favara and Imbs, 2015; Gete and Reher, 2018; GG). The preferred estimate of the slope of the tenure supply curve in GG, for instance, is 3.8, more than seven times our corresponding estimate of .51 in column (4), and outside its confidence set. The results on overall housing supply also highlight another difference from GG: the supply of new "ownable"-units, such as single family homes, might have played a role in shaping the increase in homeownership, rather than only a conversion of the existing rental-occupied stock to owner-occupied, which is the dominant margin in their results.

There are two limitations with this analysis that are worth noting. On the one hand, as discussed at the beginning of Section 4, the FHA also directly encouraged residential construction, which might lead us to overstate the supply elasticity. To the extent that its insurance of mortgages

Table 4: Estimated Tenure and Housing Supply Elasticities, 1934 to 1950

	Tenure Supply				Housing Supply			
	$Q = \Delta \log$ homeownership $P = \Delta \log$ price/rent				$Q = \Delta \log$ housing units $P = \Delta \log$ house price			
	1930–40		1930–50		1934–40		1934–50	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β_P ($\Delta \log P$ on r_{1920})	.034	.028	.013	.052	.032	.036	.091	.107
	(.05)	(.04)	(.09)	(.07)	(.04)	(.03)	(.08)	(.08)
β_Q ($\Delta \log Q$ on r_{1920})	.076*	.074**	.099**	.102***	.042**	.035**	.164*	.142*
	(.03)	(.03)	(.04)	(.04)	(.02)	(.02)	(.05)	(.05)
Slope of supply curve ($\theta = \beta_P / \beta_Q$)	.445	.374	.135	.512	.765	1.003	.557	.754
	[−1.3, 2.9]	[−1.2, 4.6]	[−1.1, 3.3]	[−.5, 2.9]	[−1.8, 1.9]	[−2.3, 2.9]	[−.8, 1.0]	[−1.6, 1.2]
Implied supply elast. ($1/\theta$)	2.25	2.67	7.40	1.95	1.31	1.00	1.79	1.33
Region FEs	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓		✓
First-stage F	6.0	6.8	7.1	7.5	4.9	4.2	9.4	8.6
Observations	24	24	24	24	24	24	24	24

Notes. This table reports estimates of the slope of the tenure and housing supply curve, θ, and the implied supply elasticity, $1/\theta$, for the 24 cities of Table 3. The coefficients β_P and β_Q come from separate reduced-form regressions of the log change in prices and quantities on the 1920 mortgage rate. Columns 1–4 report estimates of the tenure supply elasticity, measuring quantities with the homeownership rate and prices with the price/rent ratio, over the 1930–40 (columns 1–2) and 1930–50 (columns 3–4) horizons. The base year is fixed to 1930 as the homeownership rate is available only in decadal censuses. Columns 5–8 report estimates of the housing supply elasticity, measuring quantities with housing units and prices with real house prices, over the 1934–40 (columns 5–6) and 1934–50 (columns 7–8) horizons. Outcomes are constructed as in Table 3, except that the homeownership rate enters in logs. The slope $\theta = \beta_P / \beta_Q$ equals the 2SLS estimate from a regression of the price change on the quantity change, instrumenting the quantity change with the 1920 mortgage rate. For each horizon, the first column includes census region fixed effects only; the second includes the full set of controls of Table 3. Regressions are unweighted. Robust standard errors are in parentheses. Significance stars are based on wild-bootstrapped p-values. Square brackets report 90 percent wild-bootstrapped Anderson–Rubin confidence sets for θ. The first-stage F statistic refers to the excluded instrument in the regression of the quantity change on the 1920 mortgage rate.

on newly-built houses operated through buyers, it represents a demand shock for new units—a movement along the supply curve. However, if there was a residual supply-side component of the policies, which shifted the supply curve, it would bias our estimated supply elasticity upward. On the other hand, the data on permits only captures permits within the corporate city limits. This likely severely understates the overall increase in residential units. Between 1940 and 1950, US homebuilding added 5.65 million new housing units in metropolitan areas. Of these, only 2.4 million were added within the city limits, while 3.25 million were added in the surrounding areas. In proportional terms, dwelling units increased 44.4% in suburbs vs. 19% in central cities. We are thus missing more than half of the overall supply response.

5 Effects on Household Formation

We conclude by studying how cheaper mortgages affected household formation, following a burgeoning literature and recent public debate on the relationship between housing affordability, homeownership, and fertility outcomes (see fn. 12). Our results from Section 4 show that the mortgage rate shock we documented was indeed associated with rising affordability of owning, as attested by the absence of a response in prices and the strong homeownership response. Was it also associated with changes in fertility decisions?

To study this question, we exploit variation across cities and across cohorts of women differentially exposed to the policies, based on whether their childbearing years fell before or after 1934. To illustrate the intuition behind our empirical strategy, consider two sets of women born in two cities: Dallas, which had high mortgage rates before 1934 relative to the average US city, and Boston, which had lower mortgage rates. As we have documented above, rates in these two cities largely converged between 1934 and 1940. Thus, women born in Dallas before 1890 experienced largely higher mortgage rates, compared to women born in Boston in the same years, for the entirety of their fertility window, as they would be 44 years old when the convergence started. Women born in Dallas in 1920, however, would be turning 20 by 1940 and experienced their entire fertility window facing the same mortgage rates as women born in Boston in the same year. By taking the difference-in-difference of these cohorts, and of all cohorts in between, we can partial out time-invariant city-level effects—the fact that fertility in Dallas might be different than that in Boston overall—and cohort-level effects—the fact that fertility choices for women born in the 1890s can be on average different from those born in 1920.

Furthermore, this identification strategy provides two valuable placebos. First, we should see the usual lack of pre-trends: no within-city change in fertility for cohorts that already largely completed their fertility window by 1940, as the policy could not have affected their fertility choices. Second, and more specific to our setting, we should see the effects plateauing for younger cohorts. Any cohort born after 1915 effectively received the same treatment, because convergence was a one-time permanent shock that persistently closed across-cities rate gaps from 1934–40 onwards, as shown in Section 3. That is, relative to a cohort born pre-policy, all cohorts born at any time after 1915 in cities like Dallas enjoyed, at the same rate, more affordable mortgages throughout the entirety of their fertility window. Thus, effects on fertility should be similar for all cohorts born

after 1915. If, instead, women in Dallas were just on a different trend than women in Boston, we should both see evidence of pre-trends and of "post-trends," in the sense that the effect should keep rising even after the effect of our policies on mortgage rates plateaued. The lack of both of these trends would thus reassure us that our results do not come from just comparing women over time in Boston vs. Dallas, but they all come from those specific cohorts that were especially exposed to our policy.

To operationalize this empirical strategy, for each woman observed in the 1950 Census, we use our city-level panel of mortgage rates to compute the average mortgage interest rate she would have experienced over her childbearing years had she always lived in the city where we observe her in 1950.[35] To illustrate these experienced rates, Appendix Figure B.9 plots the resulting mortgage interest rates by birth cohort for four cities in our sample across birth years. For example, a woman born in 1900 who resided in Dallas during her childbearing years would have faced an average mortgage interest rate of about 7.5 percent, while a woman born the same year in Boston would have faced a significantly lower average rate of less than 6 percent. Among women born in 1920, this city-level difference narrows to about 20 bps.

We estimate the following regression for each woman i, observed in city j in 1950 and born in year b:

$$Y_{i,j,b} = \delta_j + \psi_b + \beta^M_{h(b)} * r^M_{1920,j} + \Gamma * \mathbf{W}_{i,h(b)} + \Xi_{h(b)} * \mathbf{X}_j + \varepsilon_{i,j,b} \tag{2}$$

where δ_j are city fixed effects, ψ_b are birth-year fixed effects, and $h(b)$ groups women into five-year birth cohorts, from 1890–1894 (the omitted cohort) to 1925–1929. The coefficients of interest, $\beta^M_{h(b)}$, capture how the effect of the city's initial mortgage rate, $r^M_{1920,j}$, varies across birth cohorts. As in Section 4.1, we control for the 1920 commercial lending rate of each woman's state of birth, $r^C_{1920,s(i)}$, also interacted with the birth cohorts, to account for confounders correlated with initial capital scarcity. Individual controls $\mathbf{W}_{i,h(b)}$ include the woman's education level and the household's occupation-score quartile, both interacted with the birth cohorts. Finally, we control for the same set of baseline city-level characteristics $\mathbf{X}_j$ included in Section 4.1, interacted with the birth cohorts dummies. Given the focus on fertility in this section, we also add to these controls the fraction of women in 1930, and the fraction of population aged 20–29 in 1920, always interacted with

[35] We assume a childbearing window of 15 to 40 years of age. Appendix A.5 describes how we construct a complete annual time series of mortgage interest rates from 1890 to 1960 for each city. Our main measure takes the simple average of mortgage rates experienced over the fertility window; our results are robust to a weighted average that weights each age by its share of births, as measured in the 1950 census.

the cohort dummies. We weight observations so that each city carries a total weight proportional to its 1930 population, divided equally among the women observed in that city, and we cluster standard errors two-way at the city and birth-year level.

We measure two fertility outcomes: the age at which a woman had her first child and the total number of children. Unfortunately, we can only reconstruct these variables using the number of children living in the household at the time of the census enumeration and the age of the eldest child present in the house, respectively.[36] We restrict our main analysis sample to white women between 20 and 60 years old in 1950, who had been married at least once, and were denoted as the spouses to the household heads, allowing us to focus on more traditional living arrangements and maximize the likelihood that the children listed under that household were born and raised by the women we study.

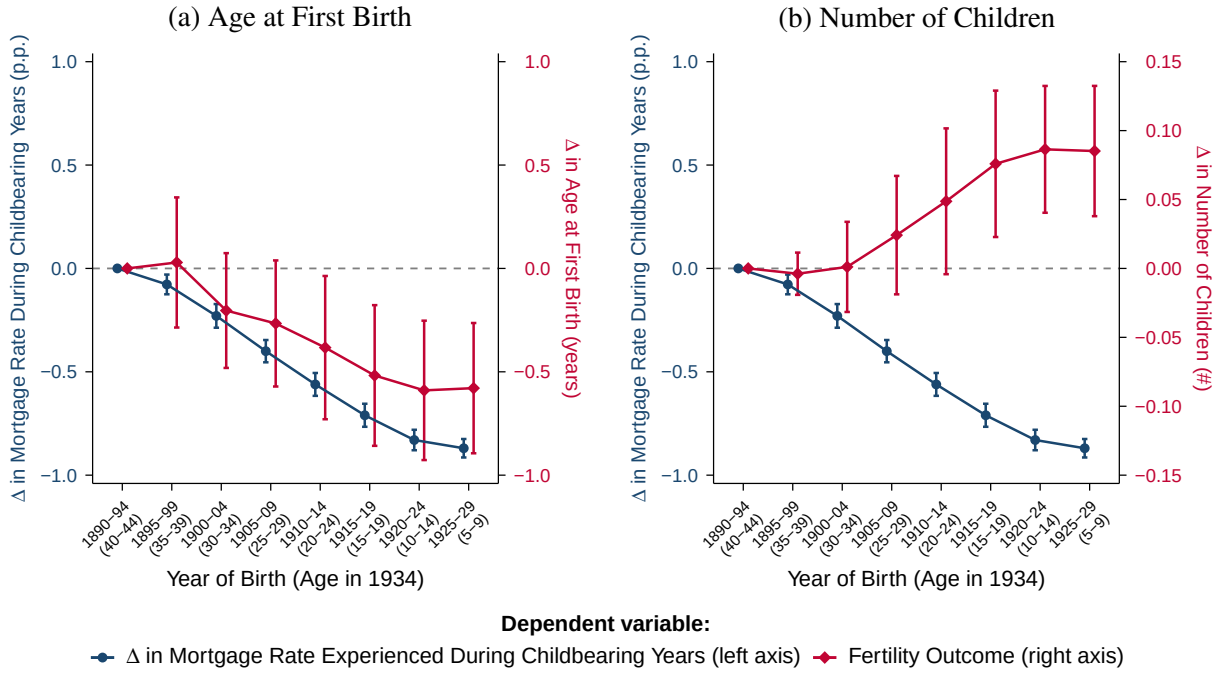
We report the resulting $\beta^M_{h(b)}$ from (2) in Figure 10. In both panels, the blue circles report the coefficients on the mortgage rate experienced over the childbearing years, showing the "first stage" of our design: the fact that women living in cities that had higher interest rates in 1920 experienced relatively lower rates if they were born after 1900, compared to women born in the same city before and relative to the same difference in another city. The coefficients decline monotonically across cohorts, starting from cohorts born in 1900, and plateauing by cohorts born in 1915.

The red diamonds in both panels show that fertility outcomes closely mirror this exposure profile. For the cohorts who had completed all or most of their childbearing years before the policies, the coefficients are small and statistically indistinguishable from zero. Cohorts born in 1915-19 in an initially high rate city, who entered their childbearing years around the time of the policies and saw their rates decrease by 70bps, had their first child .52 years earlier (Panel a) and had .08 more children (Panel b). Panel (a) of Appendix Figure B.10 shows that these effects are robust across different sets of controls. Appendix Figures B.12 and B.14 show that effects are indistinguishable from zero for non-white women, consistent with discrimination limiting access to mortgage credit during this period and in line with the lack of effects on homeownership for this same demographic (Panel b of Figure 8).

To summarize the magnitudes that our cohort estimates imply, Figure 11 plots, for each birth cohort, the coefficient on the fertility outcome (Panels a and b of Figure 10) against the coefficient

[36]These children could include a woman's step-children, but we cannot reconstruct it. We also naturally miss children who moved away from the home.

Figure 10: Mortgage Rates Experienced During Childbearing Years and Fertility Outcomes, by Birth Cohort, for Married White Women Observed in the 1950 Census



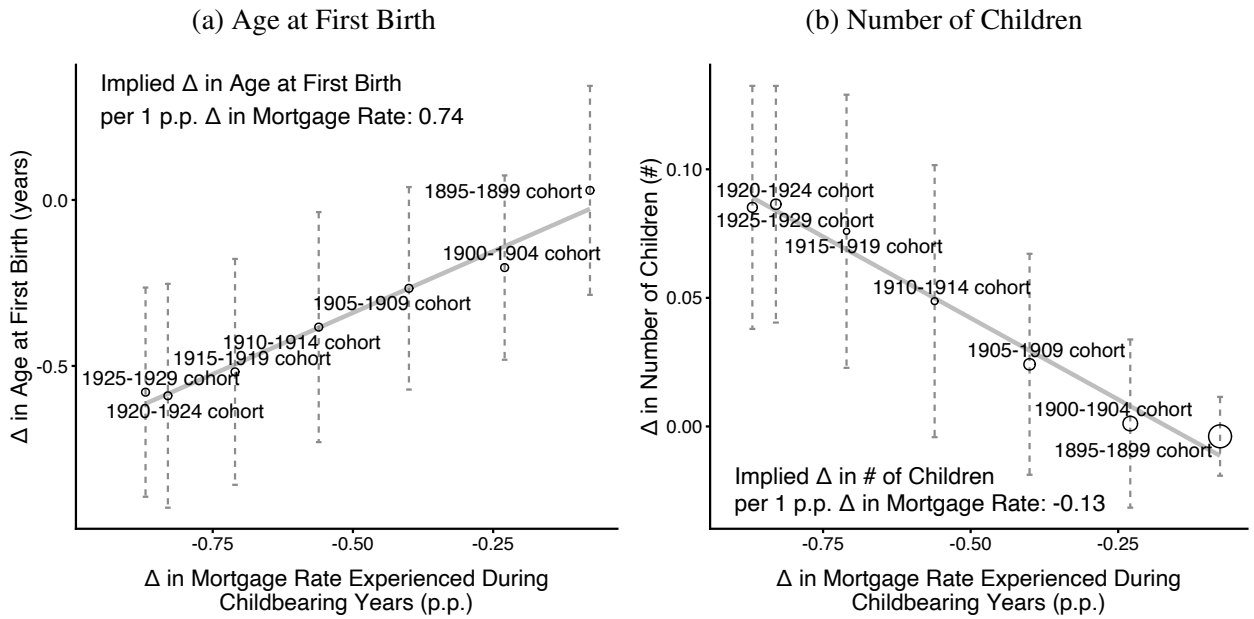
Notes. This figure plots the coefficients $\beta^{M}_{h(b)}$ resulting from estimating equation 2. In each panel, the blue circles report the coefficients on the average mortgage interest rate experienced during the childbearing years (left axis), and are identical across the two panels; the red diamonds report the coefficients on the fertility outcome (right axis): the age at first birth in Panel (a) and the number of own children in the household in Panel (b). The sample consists of married white women born between 1890 and 1929 who are recorded as spouses of the household head in the 1950 census; the age at first birth is measured only for women with at least one own child in the household. Coefficients are normalized to zero for the 1890–1894 birth cohort; the horizontal axis reports each cohort's age in 1934 in parentheses. Regressions are weighted so that each city carries a total weight proportional to its 1930 population. Bars denote 95 percent confidence intervals. Standard errors are clustered two-way at the city and birth year level. See the main text for additional details on the sample and specification.

on the experienced mortgage rate (the blue circles in the same figure). The slope of the fitted line across cohorts scales the reduced-form fertility effects by the corresponding change in experienced mortgage conditions, in the spirit of an indirect least squares estimate.[37] A 100 bps decline in the mortgage rate experienced over the childbearing years implies a first birth .74 years earlier (Panel a) and .13 more children (Panel b).

Importantly, the estimates for each cohort are near the OLS line in gray, which implies that effects on fertility are quite close to being proportional to the change in interest rate experienced by the different cohorts. The lack of a "post-trend", in that effects plateau for younger cohorts, is

[37]Results are coherent with a formal TSLS analysis where we collapse all cohorts and just estimate the effects of a one percentage point change in experienced mortgage rate on fertility outcomes, instrumenting the experienced mortgage rate with the city-level rate in 1920 interacted with cohort dummies.

Figure 11: Implied Effect of Experienced Mortgage Rates on Fertility



Notes. This figure plots the cohort-specific coefficients on the age at first birth (Panel a) and the total number of children (Panel b) from Figure 10 against the corresponding cohort-specific coefficients on the mortgage rate experienced during the childbearing years. Each marker is a five-year birth cohort; the 1890–1894 base cohort is omitted. In both panels, the size of each marker is inversely proportional to the standard error of the estimate on the respective fertility outcome. Dashed bars denote 95 percent confidence intervals for said estimates. The gray line reports the fit from an OLS regression across cohorts, whose slope, reported in each panel, measures the implied change in the outcome per 1 p.p. change in the experienced mortgage rate.

especially reassuring, as it would not be the case if cities with initially higher mortgage rates just happened to be on a different trend.

Appendix Figure B.11 extends the analysis to all white women (regardless of marriage status) and studies whether mortgage exposure affects marriage status. Results are suggestive that cheaper mortgages boost marriage rates, but they are quite noisy and depend on the specific controls we employ. Our identification strategy is not well suited for this dependent variable, because we do not observe the age at which women got married, which is not available in the 1950 census, but only whether they were married at all by the 1950 census.

We close this section by discussing three limitations of our individual-level analysis. First, our exposure measure assigns to each woman the mortgage-rate history of the city where we observe her in 1950, as if she had spent her entire childbearing window there. In practice, some women moved, and the policies themselves may have drawn them toward the initially high-rate cities. Migration of this kind does not invalidate our comparisons, but it changes their interpretation: our estimates capture the change in fertility among the women observed in each city, which include

changes in fertility of incumbent women and changes due to attracting women with preferences for higher fertility. To partially distinguish among the two, we restrict the sample to women who in 1950 lived in their state of birth. Panel (b) of Appendix Figure B.10 shows that results are very similar, indicating that compositional changes do not seem to be the driving force behind our results.

Second, because we reconstruct fertility from the children present in the household in 1950, measurement error differs across cohorts, based on the age at which we observe them in 1950. At one end, the children of older women are increasingly likely to have left the parental home—the main reason we restrict the sample to women no older than 60 in 1950. At the other, women born after 1910 had not yet completed their childbearing years by 1950, so part of the effect on their completed fertility may not yet have materialized. This truncation biases the number-of-children estimates for the youngest cohorts toward zero, which confounds our argument that effects plateau for younger cohorts with measurement error. However, the age at first birth, which typically falls early in the childbearing window, is much less affected by this concern and still plateaus.

For the same reason, for the most recent cohorts we cannot fully distinguish whether the additional children we observe by 1950 reflect a permanent increase in completed fertility or, in part, a shift of births toward earlier ages. Observing the same cohorts at older ages, in the 1960 census, would ameliorate this truncation only by aggravating the problems above: the further from the time of the policies, the more women might have moved and the harder it is to correctly assign to them the mortgage rate experienced during their childbearing years based on the city where they lived. Focusing on the 1950 census, which is also the last for which the full count is available, strikes a balance between these two sources of measurement error.

Finally, the 1950 census microdata contain no information on homeownership,[38] so we cannot directly verify that the women who had more children in response to cheaper mortgages were the same women who became homeowners. The evidence is nonetheless consistent with the homeownership channel: fertility responded precisely for the cohorts and cities in which affordability improved the most, and not at all for non-white women, who were largely excluded from the mortgage market and show no homeownership response at the city level.

[38]The housing questions, including tenure, were recorded on the reverse side of the census schedule, which was never microfilmed; the original paper schedules were later destroyed (see the National Archives' 1950 census FAQs, https://www.archives.gov/research/census/1950/faqs). Homeownership in 1950 can therefore be studied only at the city level, as in Section 4.

Conclusion

Today, the thirty-year fixed-rate mortgage is a hallmark of the American housing market. We use novel data to describe its birth following the federal housing policies of the 1930s and its effects on the development of American cities. The policies revolutionized mortgage financing by effectively creating a national mortgage market that facilitated capital flows to areas that were stunted by scarce local savings.

The inflow of capital was met with a rise in homeownership, construction, and fertility. The relatively more muted effect on house prices suggests that housing supply responded strongly to heightened demand, differently from what would have likely happened today if a similar housing stimulus was to be introduced. One possible way of interpreting this finding is that there is nothing intrinsic in construction that makes as inelastic as it is today. This suggests that studies on the woes of US construction and on housing supply elasticity (Saiz, 2010; Glaeser and Gyourko, 2018; Glaeser and Gyourko, 2025; Goolsbee and Syverson, 2023; Baum-Snow and Han, 2024) are especially valuable, and encourages further research that sheds light on what changed.[39]

The effects on fertility highlight that more affordable mortgages were associated with both a tempo and a quantity effect, enabling households to have more kids and to have them earlier in life. While there are several caveats in extrapolating these results to today, this reinforces the view that there is a link in the US between low costs of owning and larger families (Fazio et al., 2025; Dettling and Kearney, 2025). It also allows us to study the effects of our shock on completed fertility, as we observe some of our cohorts at a time when their lifetime fertility choices were close to be completed.

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[39] Several proposals have been put forth, especially on the role of regulation (Glaeser et al., 2005; Gyourko and Molloy, 2015; Ellickson, 2022; D'Amico et al., 2023).

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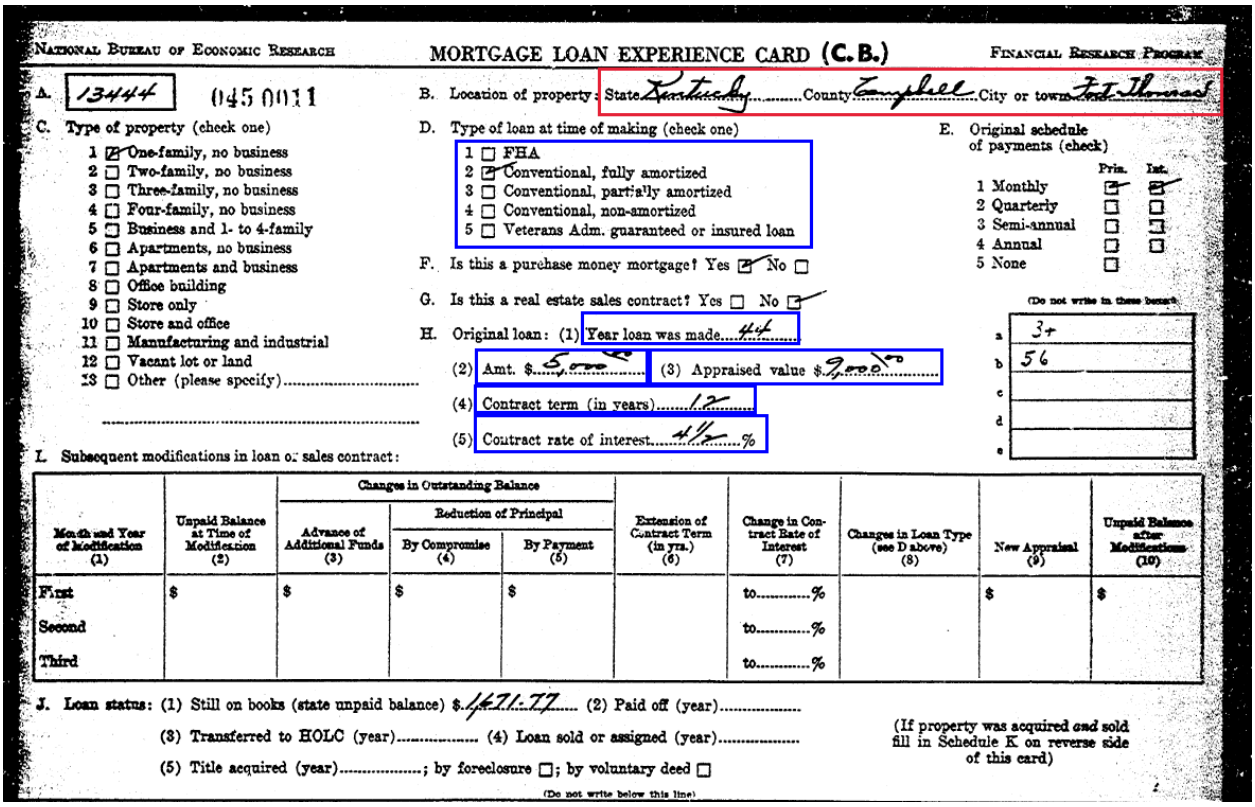
Appendix

A Data Construction

A.1 NBER Mortgage Cards

Figure A.1: Example NBER Loan Card


NATIONAL BUREAU OF ECONOMIC RESEARCH — MORTGAGE LOAN EXPERIENCE CARD (C. B.) — FINANCIAL RESEARCH PROGRAM

A. 13444 045 0011

B. Location of property: State Kentucky County Trigg City or town Ft Thomas

C. Type of property (check one)
1 ☑ One-family, no business
2 ☐ Two-family, no business
3 ☐ Three-family, no business
4 ☐ Four-family, no business
5 ☐ Business and 1- to 4-family
6 ☐ Apartments, no business
7 ☐ Apartments and business
8 ☐ Office building
9 ☐ Store only
10 ☐ Store and office
11 ☐ Manufacturing and industrial
12 ☐ Vacant lot or land
13 ☐ Other (please specify)

D. Type of loan at time of making (check one)
1 ☐ FHA
2 ☑ Conventional, fully amortized
3 ☐ Conventional, partially amortized
4 ☐ Conventional, non-amortized
5 ☐ Veterans Adm. guaranteed or insured loan

E. Original schedule of payments (check)

	Prin.	Int.
1 Monthly	☑	☑
2 Quarterly	☐	☐
3 Semi-annual	☐	☐
4 Annual	☐	☐
5 None	☐	

F. Is this a purchase money mortgage? Yes ☑ No ☐

G. Is this a real estate sales contract? Yes ☐ No ☑

H. Original loan: (1) Year loan was made 44
(2) Amt. $ 5000 (3) Appraised value $ 9000
(4) Contract term (in years) 12
(5) Contract rate of interest 4½ %

(Do not write in these boxes)
a 3+
b 56
c
d
e

I. Subsequent modifications in loan or sales contract:

Month and Year of Modification (1)	Unpaid Balance at Time of Modification (2)	Changes in Outstanding Balance: Advance of Additional Funds (3)	Reduction of Principal: By Compromise (4)	Reduction of Principal: By Payment (5)	Extension of Contract Term (in yrs.) (6)	Change in Contract Rate of Interest (7)	Changes in Loan Type (see D above) (8)	New Appraisal (9)	Unpaid Balance after Modification (10)
First	$	$	$	$		to ...%		$	$
Second						to ...%			
Third						to ...%			

J. Loan status: (1) Still on books (state unpaid balance) $ 1471.77 (2) Paid off (year) .....
(3) Transferred to HOLC (year) ..... (4) Loan sold or assigned (year) .....
(5) Title acquired (year) .....; by foreclosure ☐; by voluntary deed ☐

(If property was acquired *and* sold fill in Schedule K on reverse side of this card)

(Do not write below this line)

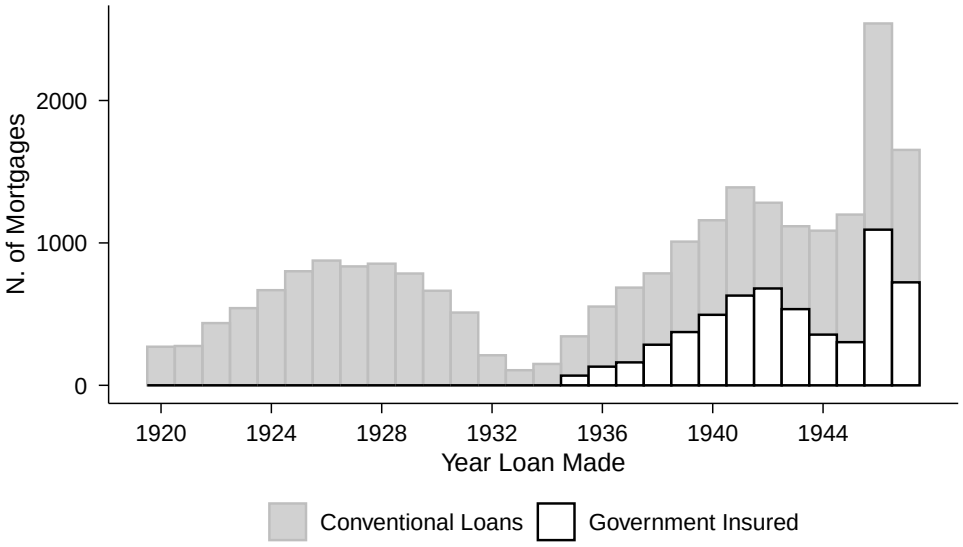
Notes. This figure shows an example of a loan card from the National Bureau of Economic Research's survey on individual mortgage loans. Cards were filled by lenders with information on the location of the mortgaged property, including state, county and town (annotated in red), as well as details on the contract (annotated in blue).

In cleaning the data, we made several minor choices. First, when the original contract rate (field H.5) specified a dynamic schedule (e.g. the lender listed a path for the interest rate as 2 percent for the first 2 years, 3.5 percent for the following 3 and 4 percent for the last 5 years), we recorded the terminal rate. Second, when the interest rate was subsequently modified (recorded in Section I of the card), we retained the original contract rate for consistency, as these modifications reflect ex-post changes rather than initial lending conditions. Third, when dual rates were listed without a path (e.g., 6+7 percent), we recorded the average. Fourth, when a premium was listed alongside the base rate (e.g., 6 percent Premium $\frac{1}{2}$ percent), we included the premium in the recorded rate. However, in the small number of cases (5 out of 23,756) where the FHA mortgage insurance cost was listed separately from the contract rate, we excluded it, as this cost is not consistently reported across FHA-insured loans. Regarding contract terms, demand loans specifying "On Demand" were coded as one-year terms, and partially amortized mortgages specifying both a contract term and an amortization schedule (e.g., "3 yr. 10 yr. amortization") were coded using the shorter contract term. For loans under the share accumulation plan, where repayment was tied to the maturity of the

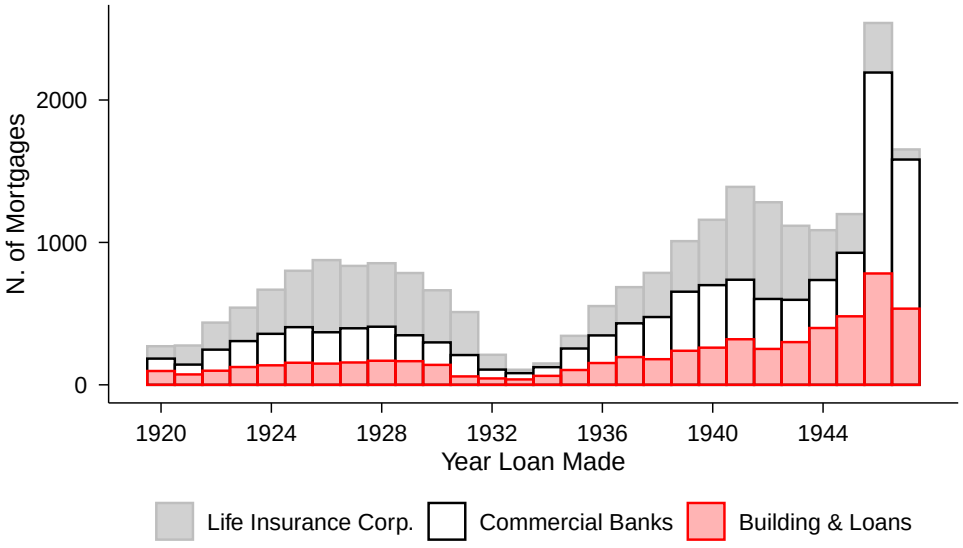
borrower's shares, the expected share maturity was treated as the effective loan duration. In total, observations for which we had to make a judgment call amounted to fewer than 300, representing less than 1.3 percent percent of the sample. Dropping these observations does not alter results.

Figure A.2: NBER Loan Cards Histograms

(a) Number of Loans by Government Insurance



(b) Number of Loans by Holder



Notes. This figure plots histograms of the number of individual mortgage loans from the NBER's survey by the year in which they were made. Panel (a) shows results separately by whether or not the loans were government insured by the FHA, and Panel B shows results separately by holder (life insurance corporations, commercial banks or B&Ls). See Morton (1956) for additional information on the purpose of the survey.

A.2 City-Level Home Values and Rents

We report more details on the construction of home values and rents.

A.2.1 1920.

No data exists on median values and rents. From the special report on non-farm mortgages, however, we have data on the total values of non-farm mortgaged homes and their total number, which allows us to construct the average value of non-farm mortgaged homes.

A.2.2 1930-50

We digitize, for 1930, 1940, and 1950, city-level median values of owner-occupied nonfarm homes and median monthly rents of tenant-occupied nonfarm dwellings. The value is the owner-occupant's estimated current market value of the home, and the rent is the monthly contract rent the tenant has contracted to pay, regardless of whether it includes utilities, fuel, or other services. Both concepts are held fixed across the three decades, except for 1950 values, as noted below.

1930. For the 1930 Census, we take these median rents and values from the Fifteenth Census of the United States: 1930, Population, Volume VI: Families. For cities of 100,000 inhabitants or more, Table 67 reports values (owned nonfarm homes by value) and Table 68 reports rents (rented nonfarm homes by monthly rental). For cities of 25,000 to 100,000 inhabitants both values and rents come from Table 80 (median value or rental of nonfarm homes). As these tables cover all cities of 25,000 inhabitants or more, we obtain data for all 266 cities in our sample.

1940. We use the 1940 Census of Housing, Volume II: General Characteristics, which reports detailed tables for cities of 50,000 inhabitants or more. Values come from Table 85 and rents from Table 87, each reporting the median for both 1940 and 1930. Because these tables cover only cities of 50,000 inhabitants or more, we obtain data for 161 of the 266 cities in our sample.

1950. 1950 values come from the 1952 County and City Data Book (digitized by Haines and Inter-university Consortium for Political and Social Research, 2010). Here the value tabulation differs from the earlier decades, as it is restricted to nonfarm one-dwelling-unit structures without business, whereas the 1930 and 1940 tabulations cover all owner-occupied nonfarm dwellings regardless of structure type. As the data book reports these medians for all cities of 25,000 inhabitants or more, we obtain data for all 266 cities in our sample.

A.2.3 Comparability across years

We do not have data on rents in 1920 and data on values is not comparable with 1930, 1940, and 1950, because it covers only mortgaged homes and we can only construct the average value, while we only have median values for the later years. For 1930, 1940, 1950, however, we can construct a panel with minimal differences across years, which we discuss below.

In terms of definitions of "city", the 1940 Census of Housing uses an "urban" framework, including cities and incorporated places of 2,500 inhabitants or more, rather than the "nonfarm" framework of 1930 and 1950 (1940 Census of Housing, Volume II, Part 1, Chapter 2, p. 2). The two differ only in that the 1940 urban totals also include dwelling units on farms lying within

city boundaries, but such urban-farm units are about one percent of all farm dwellings nationally and are negligible for the large cities in our 1940 sample. Tables 85 and 87 moreover report the 1940 and 1930 medians side by side, the Census Bureau's own cross-decade reconciliation, and the medians are computed on a consistent interval basis across the two censuses, so that they are "statistically comparable" (1940 Census of Housing, Volume II, Part 1, Chapter 2, p. 5).

In terms of concepts, the series for rents is comparable across all three decades. The Census Bureau reports the median contract rent of tenant-occupied units in every year, on an unchanged contract-rent concept. For 1950, we also have data on gross rent (including expenses).

For values, while the 1930 and 1940 median values are comparable as stated by the Census, the Census Bureau notes that the 1950 value data are not strictly comparable with 1940. As anticipated, the 1950 tabulation covers only one-dwelling-unit structures whereas the 1930 and 1940 tabulations include all owner-occupied units (1950 Census of Housing, Volume I, p. XXI).

A.3 City-Level Leverage

We define city-level owner-occupied leverage ratio (OOL) as total outstanding mortgage debt on owner-occupied homes divided by the total value of all owner-occupied homes in the city.[40] For city j this is:

$$\text{OOL}_j = \frac{\text{Total Mortgage Debt}_j}{\text{Total Value of Owner-Occupied Homes}_j} \tag{3}$$

A key challenge is that census data do not report the value of homes that are free from mortgage debt. We observe the number of all owner-occupied homes and how many of those carry a mortgage, as well as the aggregate value of mortgaged homes and outstanding debt, but not the value of unmortgaged homes. We therefore construct OOL as:

$$\text{OOL}_j = \underbrace{\frac{\text{Mortgage Debt on Mortgaged Homes}_j}{\text{Value of Mortgaged Homes}_j}}_{\text{Debt-to-Value of Mortgaged Homes}} \times \underbrace{\frac{\text{Number of Mortgaged Homes}_j}{\text{Number of Owner-Occupied Homes}_j}}_{\text{Fraction Mortgaged}} \tag{4}$$

This expression equals total leverage under the assumption that the average value of mortgaged and unmortgaged homes is the same. While this assumption is unlikely to hold exactly, it is the best available approximation.

1920. For the 1920 Census, we obtain city-level data on the value of all mortgaged homes, the total amount of outstanding mortgage debt, and the number of owned homes that are mortgaged from Tables 31 and 33 of the 1920 Census special report on mortgages (U.S. Census Bureau, 1923). As anticipated in the main text, these tables cover all cities with more than 25,000 inhabitants, yielding data for all 266 cities in our sample.

1934. For 1934 we use the Financial Survey of Urban Housing (Wickens, 1935), which collected reports from owner-occupants on the value, mortgage status, and outstanding debt of their homes. Unlike the 1920 and 1940 censuses, the survey publishes the two components of OOL directly at the city level: the ratio of debt to value among mortgaged owner-occupied properties (Table D3)

[40] Data for non owner-occupied homes is unavailable.

and the fraction of owner-occupied properties that are mortgaged (Table D2). As in 1920, these figures cover all owner-occupied nonfarm properties rather than only 1-family structures. Because the 1934 data are sample estimates for a limited set of cities, our leverage measure is available for 42 cities. Its change relative to both 1920 and 1940 can be constructed for the 34 of these that also have a 1940 leverage measure.

1940. For the 1940 Census, the main county-level table we digitized (Table 8 of the 1940 Housing Census) reports total outstanding debt and total value for 1-family mortgaged owner-occupied properties, but does not report the number of mortgaged homes separately from total owner-occupied homes—a variable needed to construct the fraction of homes that are mortgaged. To obtain this variable, we digitize two additional tables from Volume 4, Part 1 of the 1940 Housing Census: Table 31, which covers cities with more than 100,000 inhabitants, and Table 39, which covers cities with 50,000 to 100,000 inhabitants. These tables report the number of 1-family owner-occupied mortgaged homes, their total value, and their outstanding debt. We combine these with data on the total number of owner-occupied dwelling units from the City and County Data Book (Haines and Inter-university Consortium for Political and Social Research, 2010). Since Tables 31 and 39 are available only for cities above 50,000 inhabitants, our leverage measure can be constructed for 149 of the 266 cities in our sample.

Comparability across years. We note two differences in the construction of OOL across the 1920 and 1940 Census data. First, the 1920 data cover all owner-occupied mortgaged homes, whereas the 1940 data are restricted to 1-family owner-occupied mortgaged properties in 1-to-4 family dwelling structures without business. As noted in footnote 13, census documents argue that "the difference is not large enough to invalidate comparisons of the figures with those obtained in earlier censuses." Second, the 1920 data cover all cities with more than 25,000 inhabitants, whereas the 1940 data from Tables 31 and 39 cover only cities above 50,000 inhabitants. For the change in total mortgage debt—which does not require the fraction-mortgaged component—we can use Table 8 of the 1940 Census and extend coverage to all 266 cities. Figure B.2 shows that results hold in the full sample, using mortgage debt as a measure of quantity.

A.4 Mortgage Rates from S&L Financial Statements, 1960–1971

To extend the city-level mortgage-rate series beyond 1950, we digitize the semi-annual financial statements of savings and loan (S&L, formerly B&Ls) associations published by the Federal Home Loan Bank Board. These statements report balance-sheet and income items—including mortgage interest received and mortgage loans outstanding—aggregated by metropolitan area (SMSA). We collect every available statement from December 1960 through June 1971 from original microreels hosted at the National Archives, which we converted to machine-readable format. The panel contains December statements for 1960–1963, 1965–1967, and 1969–1970 and June statements for 1965–1967 and 1969–1971; 1964 is omitted because the scans are too degraded to read reliably, and 1968 is unavailable. Each cross-section covers between 112 and 130 metropolitan areas, and the compiled panel spans 136 unique metropolitan areas.

For each metropolitan area and period, we compute a simple mortgage interest rate as mortgage interest received divided by mortgage loans outstanding, annualizing June statements. Coherently with the census data (cf. p. 50 of U.S. Census Bureau, 1923), we do not include premiums, commissions, and fees. We keep one observation per city-year, using the December statement

when available and the June statement otherwise, and merge these observations onto the historical city panel by metropolitan-area name and state. Figure B.1 plots the resulting full panel, which retains all digitized metropolitan areas, including those that cannot be linked to a city in the pre-1950 sample.

Four main features distinguish this series from the earlier Census data. First, it reflects only loans held by S&L associations, whereas the Census figures cover all lenders. As shown in Figures 7 and Appendix Figure B.5, regional spreads for S&Ls are much larger compared to other lenders, which leads us to overstate the degree of regional segmentation after 1960, relative to the pre-1950 data. Second, the mortgage rate we can construct is a rough aggregation based on lenders' conditions and income statements, rather than borrowers' responses to the Census. Third, the data is aggregated at the metropolitan area level, which includes all areas around a city, while the Census data covers the city limits only. Finally, it covers a slightly different sample of cities relative to our main sample. Of the 136 metropolitan areas we digitize, 99 have their central city in our main sample, while the remaining 37—mostly in the South and West, such as Phoenix, Miami, and Orlando—do not.

All these differences, especially the first, would push towards exhibiting larger regional spreads either because of higher measurement error or because the sample is selected to cover only local lenders. Yet, Figure B.1 shows that the regional spreads in mortgage rates after 1960 are comparable to those of 1940, and much smaller than those of 1920 and 1934.

A.5 Construction of Annual Time Series of Mortgage Interest Rates

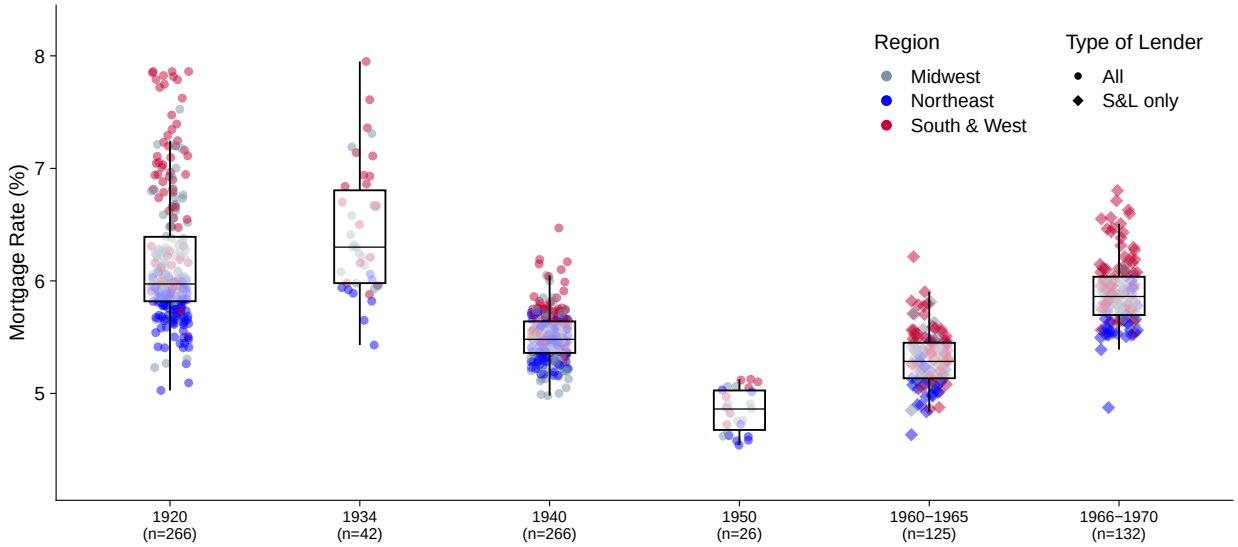
We construct an annual time series of mortgage interest rates at the city level between 1890 and 1960 in a few steps. First, we estimate mortgage interest rates across all 266 U.S. cities for the "anchor" years 1934 and 1950. We run a bivariate regression of 1934 mortgage interest rates on 1920 mortgage interest rates for the sample of 42 cities with available data. Using the estimated coefficients, we predict the 1934 interest rates for all 266 cities in our sample based. The same procedure is then repeated to predict interest rates in 1950 using data from 1940. Next, we linearly interpolate the missing values between the observed or predicted anchor years: 1890, 1920, 1934, 1940 and 1950. The interpolation is done within each interval by assuming a constant rate of change over time, with the exception of the period 1950-1960, where we assume that interest rates remained the same throughout. For example, to interpolate rates between 1920 and 1934, we use the following formula:

$$\text{Rate}_{t,i} = \text{Rate}_{1920,i} + \frac{t - 1920}{1934 - 1920} \cdot (\text{Rate}_{1934,i} - \text{Rate}_{1920,i}) \tag{5}$$

for each year $t \in \{1921, \ldots, 1933\}$, and for each city i. This approach is repeated analogously for the intervals 1891–1919, 1935–1939, and 1941–1949.

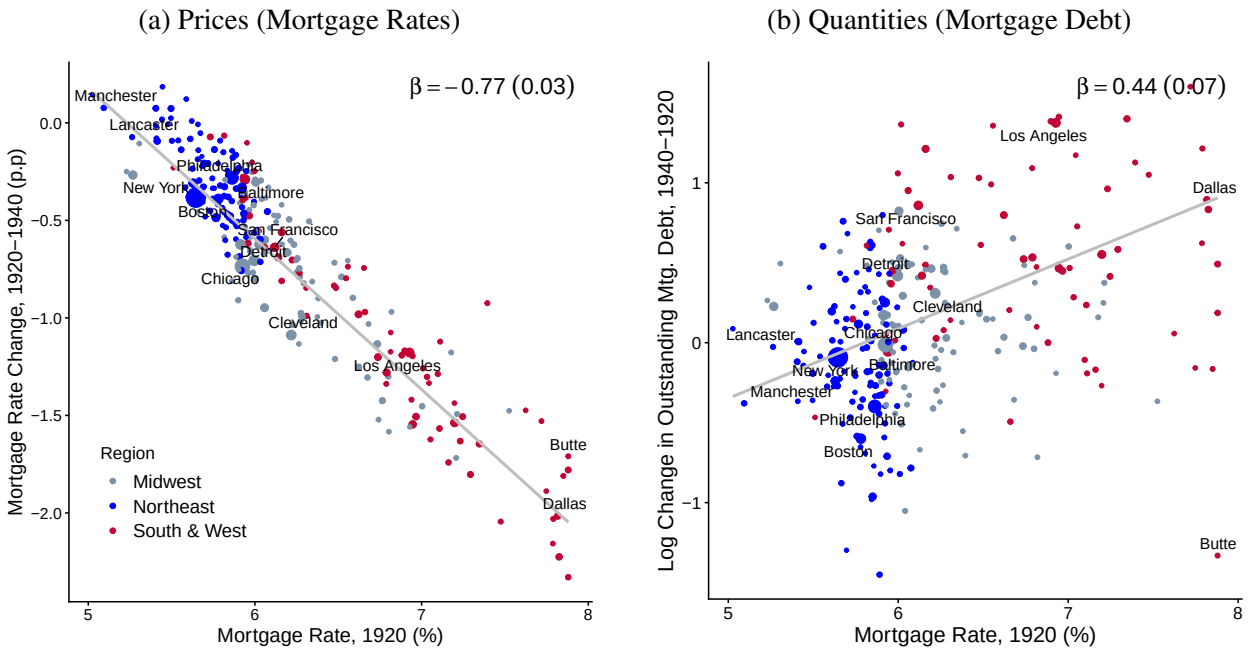
B Additional Figures and Tables

Figure B.1: Distributions of Mortgage Interest Rates across Cities, 1920-1970



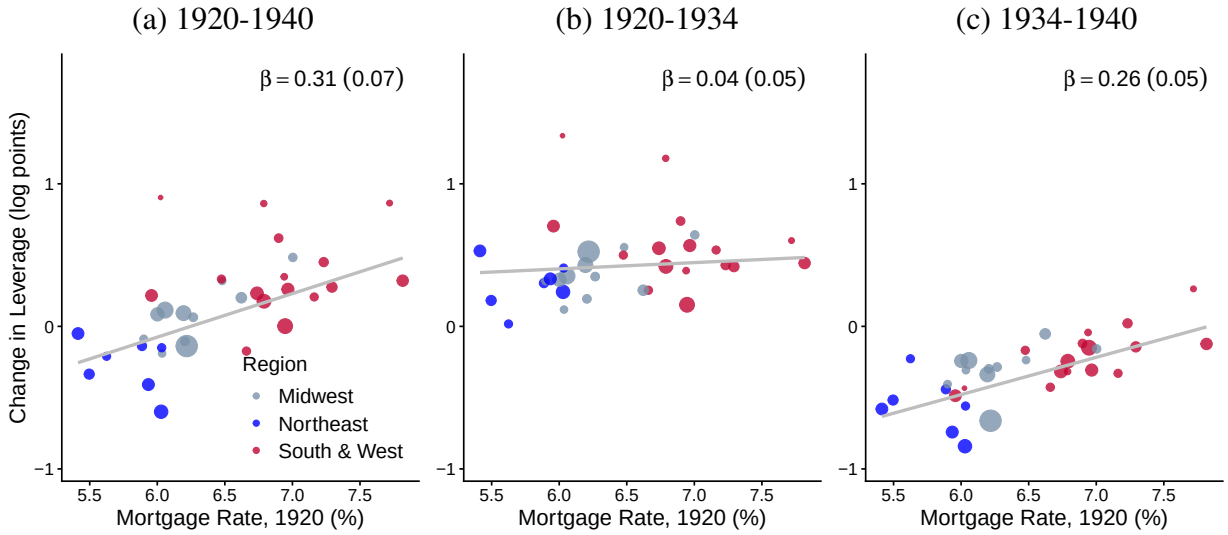
Notes. This figure plots the distribution of mortgage interest rates across cities for different years, extending Figure 2 to 1970. The data for 1920-1950, already reported in Figure 2, comes from the Housing Censuses described in Section 1.1, which cover mortgages by all lenders active in a given city. The data for 1960 onward was collected by digitizing physical copies of the semi-annual financial statements of savings and loan (S&L) associations published by the Federal Home Loan Bank Board, which report mortgage interest income and mortgage loans outstanding by metropolitan area. We measure the city-level rate as the ratio of mortgage interest received to mortgage loans outstanding. Because these statements cover only S&L lenders—rather than all lenders, as in the Housing Censuses—the 1960–1970 observations are drawn as diamonds, while the earlier all-lender observations are drawn as circles. We group years into two sub-periods, 1960–1965 and 1966–1970, and average each city's rate within the window; the years 1964 and 1968 are unavailable. Each point is a city's rate expressed as a deviation in basis points from the cross-city median of its period ($\tilde{r}^M$), and cities are colored by region. Appendix A.4 describes the sources, digitization, and rate construction in detail.

Figure B.2: Changes in Prices and Quantities on Initial Mortgage Rates, 266 Cities



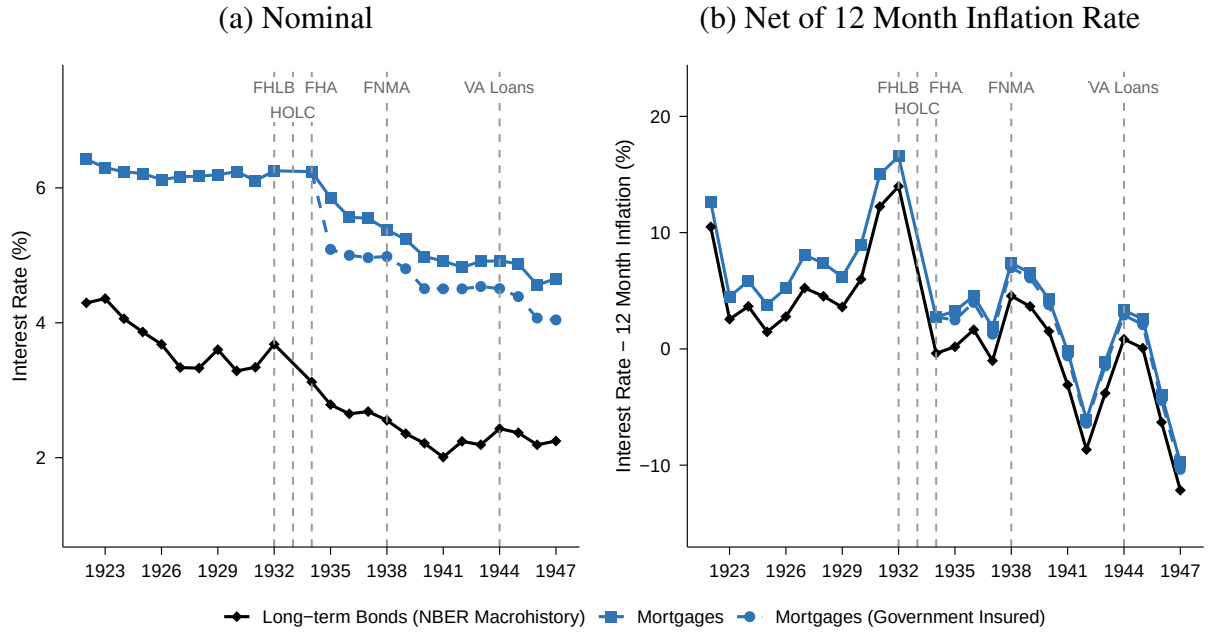
Notes. This figure replicates Figure 3 for a larger sample. Panel (a) plots the change in average mortgage interest rates between 1940 and 1920 against the 1920 rate for 266 cities (identical to Panel (a) of Figure 3). Panel (b) plots the change in total mortgage debt (in logs) between 1940 and 1920 against the 1920 rate. Using total mortgage debt from Table 8 of the 1940 Housing Census, rather than mortgage debt relative to home values, allows us to extend coverage to all 266 cities (compared to 149 in Figure 3, where the fraction-mortgaged component limits coverage to cities above 50,000 inhabitants; see Appendix Section A.3). Each panel reports the coefficient from a bivariate regression weighted by city population in 1920. The size of each dot is proportional toThe size of each dot is proportional to cities' population in 1920 city population in 1920. Colors indicate census regions. Robust standard errors are in parentheses.

Figure B.3: Change in Mortgage Debt Relative to Home Values Against Mortgage Rate in 1920, by Period



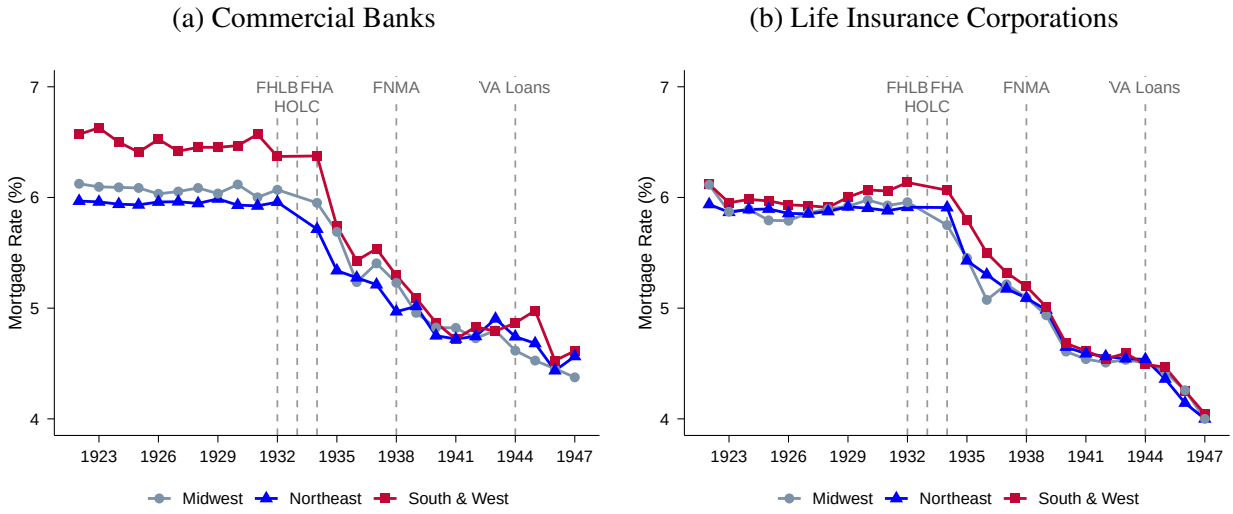
Notes. This figure plots the log change in outstanding mortgage debt relative to home values, over different time horizons, against initial mortgage rates in 1920 for the 34 cities with data on debt relative to home values in 1934. Panel (a) plots the change in mortgage rates between 1940 and 1920 against the 1920 rate. Panel (b) plots the change in rates between 1934 and 1920. Panel (c) plots the change between 1940 and 1934. Each panel reports the coefficient from a bivariate regression weighted by city population in 1920. The size of each dot is proportional to cities' population in 1920. Colors indicate census regions.

Figure B.4: Comparison Between Mortgage Rates and Long-term Bond Rates



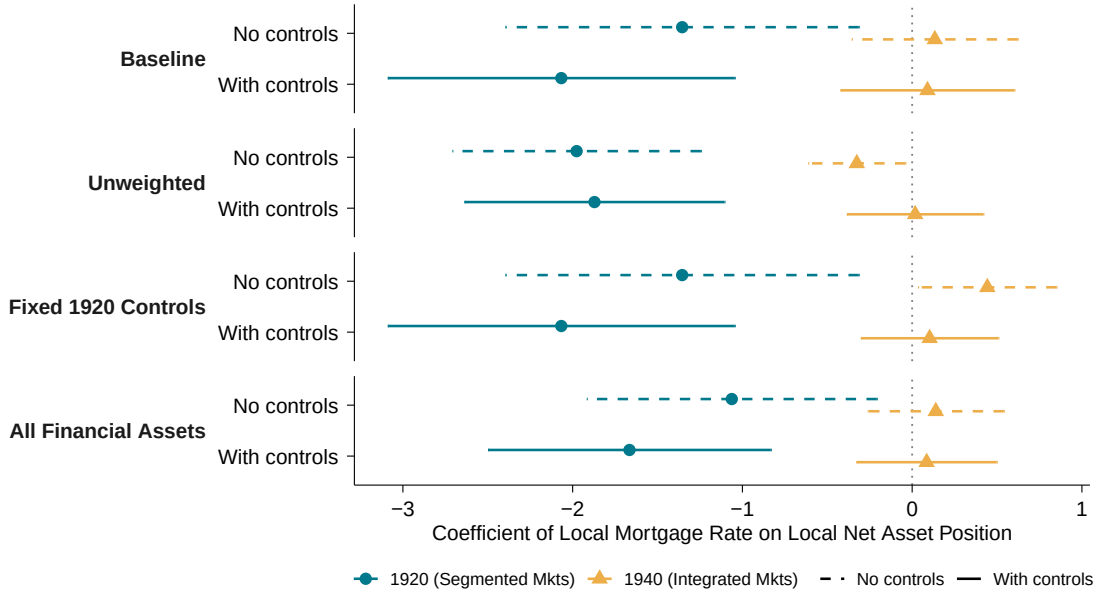
Notes. This figure compares average mortgage interest rates from our NBER loan card sample with long-term corporate bond rates over time. Panel (a) plots nominal rates. Panel (b) plots rates net of the trailing 12-month CPI inflation rate. The mortgage rate series is the average across all newly originated mortgages in our sample in each year.

Figure B.5: Rates on New Mortgages, Commercial Banks and Life Insurance Corporations



Notes. This figure plots average interest rates on newly originated mortgages by region, separately for commercial banks (Panel a) and life insurance corporations (Panel b), from our digitization of the NBER's survey of individual mortgage loans.

Figure B.6: Regression Coefficient of Local Mortgage Rate on Local Abundance of Savings Relative to Debt, 1920 and 1940, Robustness to Different Choices



Notes. This figure plots coefficients from regressions of city-level mortgage interest rates on the local net asset position under alternative specification choices, estimated separately for 1920 (teal circles) and 1940 (yellow triangles). For each specification, the "No controls" row reports the coefficient from a bivariate regression (dashed bars), while the "With controls" row adds the city-level controls and region fixed effects of Table 1 (solid bars). "Baseline" replicates the specification of Table 1, so its estimates correspond to columns 1, 3, 4, and 6 of that table. All regressions weight each city by population in 1920, except in "Unweighted," which gives each city equal weight. "Fixed 1920 Controls" measures the net asset position and the controls in 1920 for both the 1920 and 1940 mortgage rates. "All Financial Assets" constructs the net asset position using all financial assets rather than liquid assets. Bars denote 95 percent confidence intervals based on robust standard errors.

Table B.1: Local Share of Seniors and Local Mortgage Rates, 1920 and 1940

	Dependent Variable: Mortgage Rate in City j in Year t					
	Segmented Markets ($t = 1920$)			Integrated Markets ($t = 1940$)		
	(1)	(2)	(3)	(4)	(5)	(6)
Fraction Households $50+_{jt}$	-2.50^{**}	-3.23^{***}	-3.98^{***}	.43	.57	.16
	(1.01)	(1.09)	(.96)	(.47)	(.64)	(.48)
Avg. Manufacturing Wage_{jt}		$.58^{*}$	$-.01$		$-.11$	$-.07$
		(.32)	(.27)		(.10)	(.12)
$\text{Fraction Rural}_{jt}$		$.01^{**}$	.001		$-.004^{***}$	$-.004^{**}$
		(.003)	(.003)		(.002)	(.002)
Region FE			✓			✓
Observations	266	262	262	266	260	260
R^2	.048	.52	.65	.0072	.38	.53

Notes. This table reports WLS regressions of city-level mortgage interest rates on the local share of household heads with 50 or more years, weighting each city by population in 1920. Columns 1–3 use the 1920 mortgage rate as the dependent variable; columns 4–6 use the 1940 mortgage rate. Controls are added progressively across columns within each panel. Robust standard errors are in parentheses.

Table B.2: Determinants of 1920 Mortgage Rates

	Dependent Variable: Mortgage Rate in 1920				
	(1)	(2)	(3)	(4)	(5)
Demographics, 1920					
Frac. 31-50	-10.38 (3.52)				-4.84 (2.28)
Frac. 51+	-8.44 (2.01)				-7.28 (1.41)
Industry Composition, 1920					
Frac. Agriculture		17.22 (3.87)			7.82 (3.73)
Frac. Mining		2.32 (1.43)			1.08 (1.33)
Frac. Construction		6.94 (3.28)			-1.64 (2.93)
Frac. Manufacturing		-0.29 (0.58)			-0.51 (1.04)
Frac. Transport., Telecomm. & Utlt.		1.81 (0.88)			0.07 (1.39)
Frac. Trade		-6.40 (1.80)			4.02 (2.19)
Frac. Finance & Business		5.73 (4.54)			7.91 (4.59)
Economic Chars., 1920					
Avg. Mfg. Wage (log)			0.17 (0.33)		0.47 (0.29)
Mfg. Estab. (log)			-0.44 (0.16)		-0.12 (0.13)
Farms (log)			0.00 (0.04)		-0.00 (0.03)
Residential Structures (log)			0.49 (0.17)		0.62 (0.13)
Average Occ. Score			-0.03 (0.02)		-0.05 (0.04)
Population (log)			0.00 (0.24)		-0.56 (0.19)
Financial Chars.					
Banking Deposits/Assets, 1904				0.46 (0.27)	0.04 (0.29)
Frac. B&L Members/Popln., 1893				-1.03 (0.63)	-0.49 (0.53)
Frac. B&L Debtors/Members, 1893				1.91 (0.31)	0.19 (0.28)
R^2	0.17	0.38	0.33	0.26	0.66
Cities	218	218	218	218	218

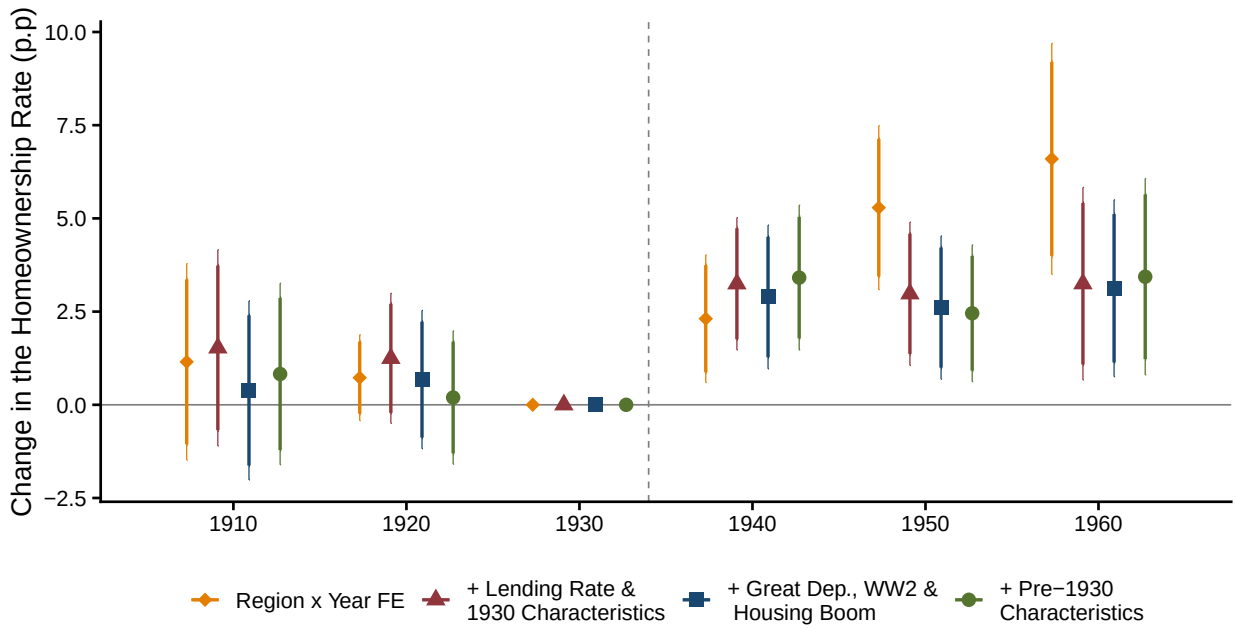
Notes. This table reports regressions of the city-level mortgage interest rate in 1920 on groups of city characteristics. Column 1 regresses on the 1920 age distribution: the fraction aged 31–50 and the fraction aged 51 and older. Column 2 regresses on the city's industry composition in 1920 across the seven industry groups listed in the table. Column 3 regresses on 1920 economic characteristics: the logs of the average manufacturing wage, the number of manufacturing establishments, the number of farms, the number of residential structures, and total population, as well as the average occupational score. Column 4 regresses on historical financial characteristics: the 1904 fraction of bank deposits over total bank assets, the 1893 fraction of B&L members over city population, and the 1893 fraction of B&L debtors over all B&L members. Column 5 includes all groups jointly. All columns use the same sample of 218 cities for which all variables are available. Standard errors are in parentheses.

Table B.3: Correlation with Baseline Controls

	Correlation with Mortgage Rate in 1920	
	Unconditional	Multivariate
Commercial Lending Rate 1920	+0.77 (0.06)	+0.46 (0.08)
Percent Black 1930	+0.33 (0.09)	-0.20 (0.09)
Percent Rural 1930	+0.54 (0.09)	+0.10 (0.10)
Percent US-Born 1930	+0.09 (0.16)	-0.15 (0.06)
Mfg. Estab. (log) 1930	-0.38 (0.07)	-0.97 (0.31)
Avg. Mfg. Wage (log) 1930	-0.35 (0.11)	-0.07 (0.08)
Mfg. Employees (log) 1930	-0.45 (0.07)	-0.56 (0.26)
Residential Structures (log) 1930	-0.26 (0.12)	+0.76 (0.22)
Avg. January Temperature	+0.57 (0.08)	+0.24 (0.08)
New Deal Relief Grants (log)	-0.34 (0.09)	+0.40 (0.23)
Retail Sales Per Capita (log) 1929	-0.05 (0.11)	+0.01 (0.05)
Retail Sales Growth 1929-33	-0.19 (0.09)	-0.04 (0.05)
WWII Military Spending (log)	-0.29 (0.09)	+0.11 (0.07)
1920s Building Boom Index	+0.18 (0.18)	+0.10 (0.05)

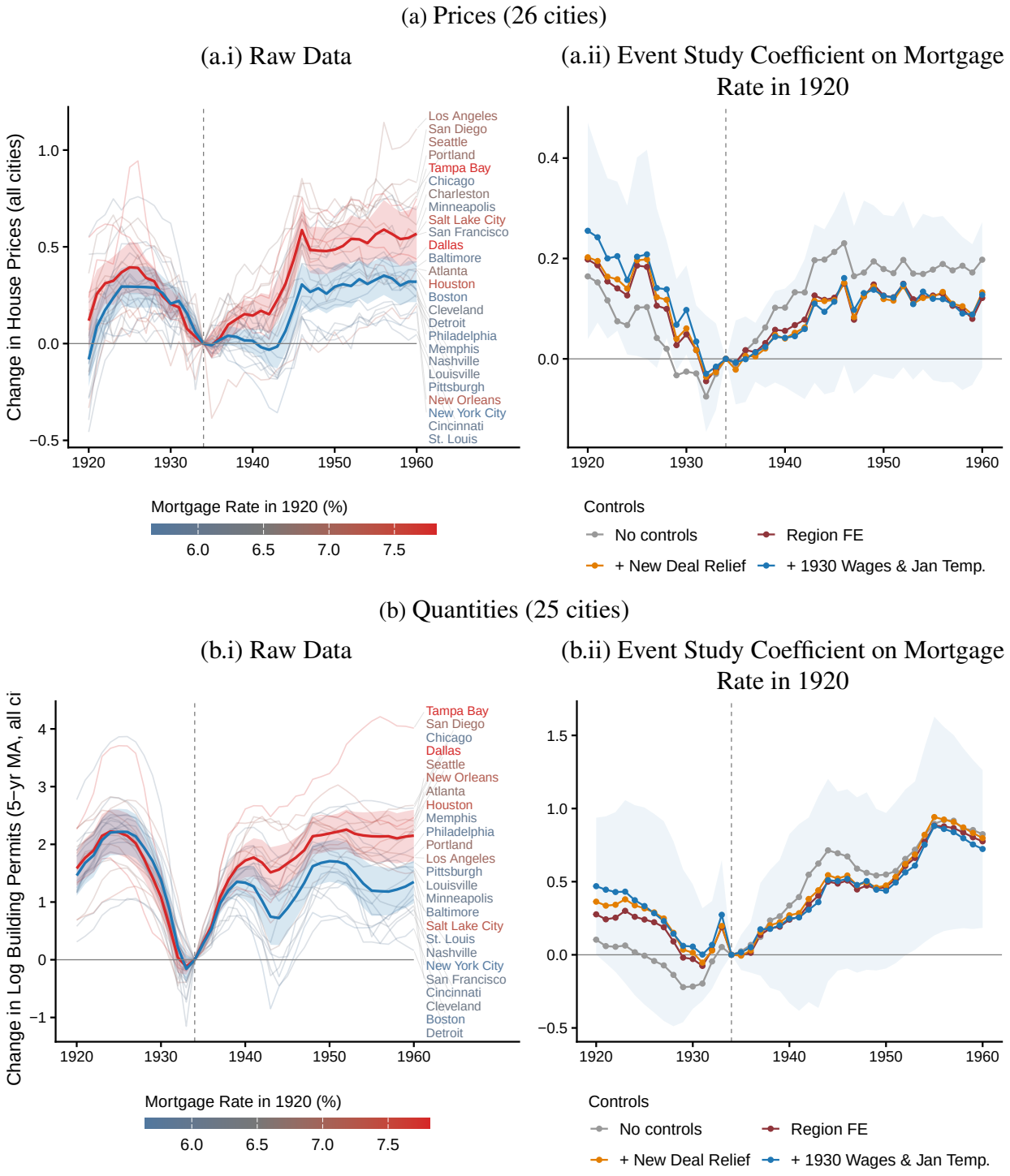
Notes. The table reports correlation coefficients between city level mortgage rates in 1920 and different financial and the different city level variables employed as controls in Section 4 and 5. The first column reports unconditional correlation coefficients from univariate regressions of the city level mortgage rate in 1920 against each variable, with normalized scales. The second reports coefficients from a multivariate regression where all variables are included. Robust standard errors are in parentheses and regressions are weighted by population in 1930.

Figure B.7: Changes in Homeownership Rate and Population in Cities with a Larger Reduction in Mortgage Rates after 1934, by Sets of Controls



Notes. This figure plots the coefficients β^M estimated in the dynamic regression in Equation (1) of the change in homeownership rate between each year and 1930, against the average mortgage interest rate in 1920. Different columns correspond to different sets of controls, as described in Section 4.1. Thin bars denote 95 percent confidence intervals; thick bars denote 90 percent confidence intervals. All regressions are weighted by city population in 1930 with robust standard errors.

Figure B.8: Changes in House Prices and Building Permits in All Available Cities, by Mortgage Rate in 1920



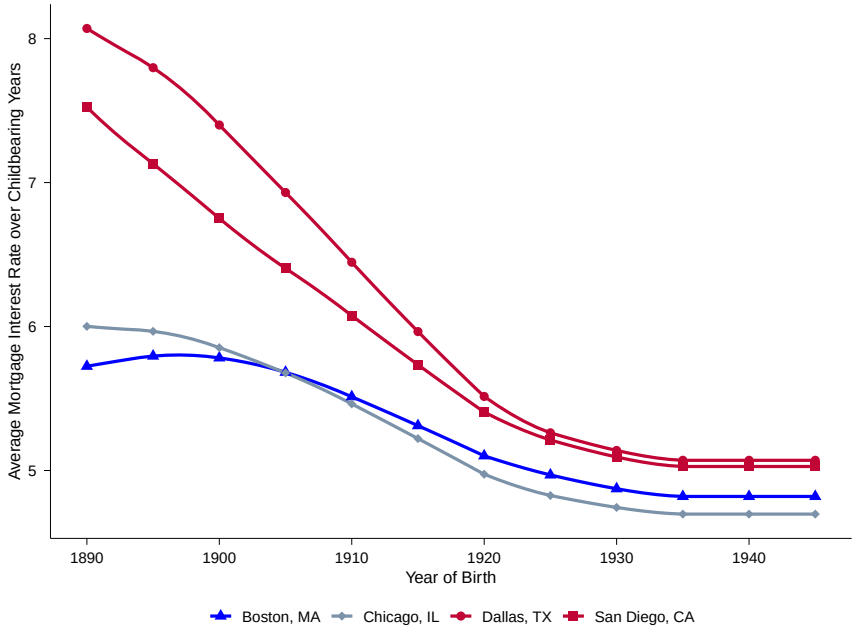
Notes. This figure replicates Figure 9 including all available cities. Panel (a) includes all 26 cities in the Lyons et al. (2026). Panel (b) includes 25 cities, excluding Charleston, S.C., which has incomplete data in 1956-60. Controls and weighting are identical to Figure 9.

Table B.4: Effect of a 1 p.p. Decrease in Mortgage Rates on Housing Market Outcomes, 1934–1950, for the 24 Cities in Lyons et al. (2026), Robustness Across Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. *Prices (logs)*								
$-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$	.205**	.103	.053	.077	.049	.114	.117	.117
	(.08)	(.09)	(.06)	(.10)	(.12)	(.10)	(.09)	(.09)
	[.029]	[.383]	[.370]	[.490]	[.701]	[.329]	[.337]	[.288]
Panel B. *Rents (logs)*								
$-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$	.100	.088	.081	.087	.007	.087	.080	.060
	(.06)	(.09)	(.10)	(.09)	(.11)	(.08)	(.09)	(.09)
	[.153]	[.387]	[.517]	[.387]	[.939]	[.367]	[.414]	[.561]
Panel C. *Price/Rent Ratio (logs)*								
$-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$	.106	.015	−.029	−.010	.041	.028	.037	.057
	(.09)	(.10)	(.09)	(.10)	(.13)	(.11)	(.09)	(.08)
	[.272]	[.875]	[.789]	[.929]	[.732]	[.824]	[.691]	[.456]
Panel D. *Housing Units (logs)*								
$-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$	.270***	.185	.150**	.116**	.115*	.201*	.159*	.155*
	(.06)	(.06)	(.04)	(.04)	(.07)	(.07)	(.06)	(.06)
	[.002]	[.107]	[.024]	[.042]	[.095]	[.067]	[.098]	[.062]
Panel E. *Homeownership Rate (p.p.)*								
$-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$	6.065**	5.554**	3.859*	5.063*	4.871**	5.343*	6.019**	5.498***
	(1.6)	(1.9)	(1.6)	(2.1)	(1.9)	(2.3)	(1.8)	(1.4)
	[.012]	[.035]	[.053]	[.057]	[.025]	[.058]	[.016]	[.001]
Region fixed effects		✓	✓	✓	✓	✓	✓	✓
Controls			New Deal & WW2	1920s Boom	Mfg.	Demog.	Jan. Temp.	Baseline
Observations	24	24	24	24	24	24	24	24

Notes. This table reports 2SLS estimates from the specification of Table 3 under alternative sets of controls. The endogenous variable is the decline in the average mortgage rate between 1920 and 1940 ($-\widehat{\Delta r}^{M}_{j,1940\text{-}20}$), instrumented with the 1920 mortgage rate. Panels A, B, C, and D report effects on the log change between 1934 and 1950 in real house prices, real rents, the price/rent ratio, and the stock of residential housing units, respectively. The log change in housing units is computed using the residential building permits issued between 1934 and 1950 relative to the stock of residential units at the start of 1934, itself computed adding the permits issued between 1931 and 1933 to the 1930 count of occupied dwelling units. Panel E on the change in the homeownership rate, in percentage points, between 1930 and 1950. Column 1 includes no controls; column 2 adds census region fixed effects, which all subsequent columns retain. Column 3 adds Great Depression and World War II controls (the log amount of New Deal relief grants, log retail sales per capita in 1929, retail sales growth between 1929 and 1933, and the log of World War II military spending); column 4 the 1920s housing boom index (see Section 4.1); column 5 1930 economic development controls (the log number of manufacturing establishments, log manufacturing employment, the log average manufacturing wage, and the fraction of the state population that is rural); column 6 1930 demographics (the percent of the population that is Black and the percent that is U.S.-born); column 7 average January temperatures; column 8 the baseline controls of Table 3 (the log amount of New Deal relief grants, the log average manufacturing wage in 1930, and average January temperatures). Columns 1, 2, and 8 correspond to the first, second, and third columns for each outcome in Table 3, respectively. Regressions are unweighted. Robust standard errors are in parentheses; wild-bootstrapped p-values, on which the significance stars are based, are in square brackets.

Figure B.9: Average Mortgage Interest Rates over Childbearing Years in 4 Cities

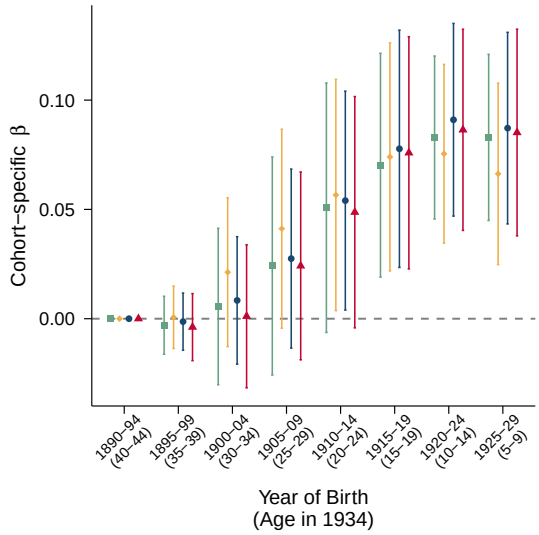


Notes. This figure plots the estimated average mortgage interest rates over the childbearing years (ages 15 to 40) for women in four cities of our sample across birth years. See the main text for the construction of this variable.

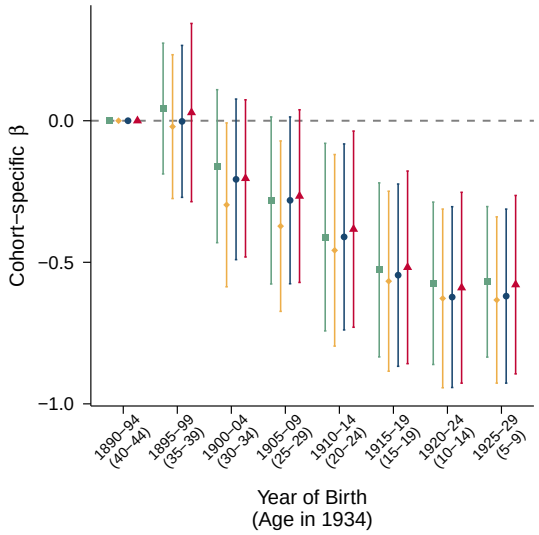
Figure B.10: Cohort-Specific Result, Robustness to Controls and Sample Selection

(a) All Married White Women

(a.1) # of Children



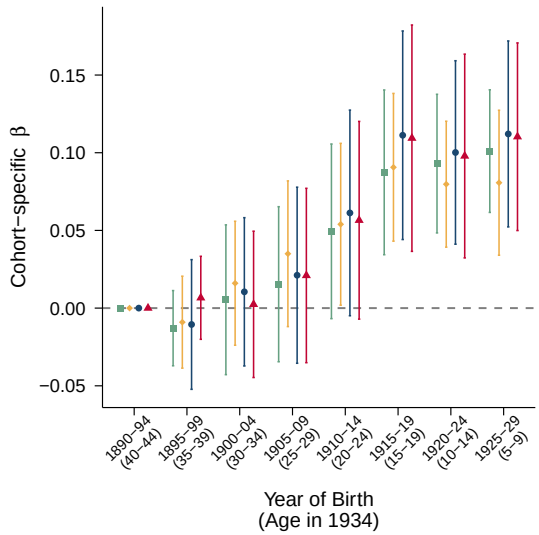
(a.2) Age at First Child



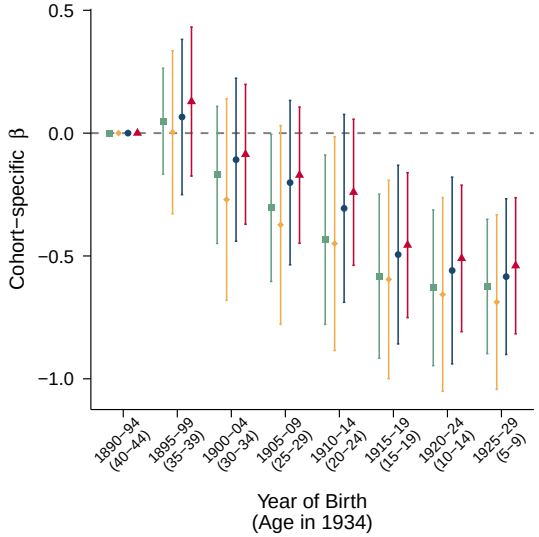
Controls: Region + 1930 Cont. + Pre-1930 Cont. + GD/WWII + Demog. (baseline)

(b) Married White Women Born in the Same State as their 1950 State of Residence

(b.1) # of Children



(b.2) Age at First Child



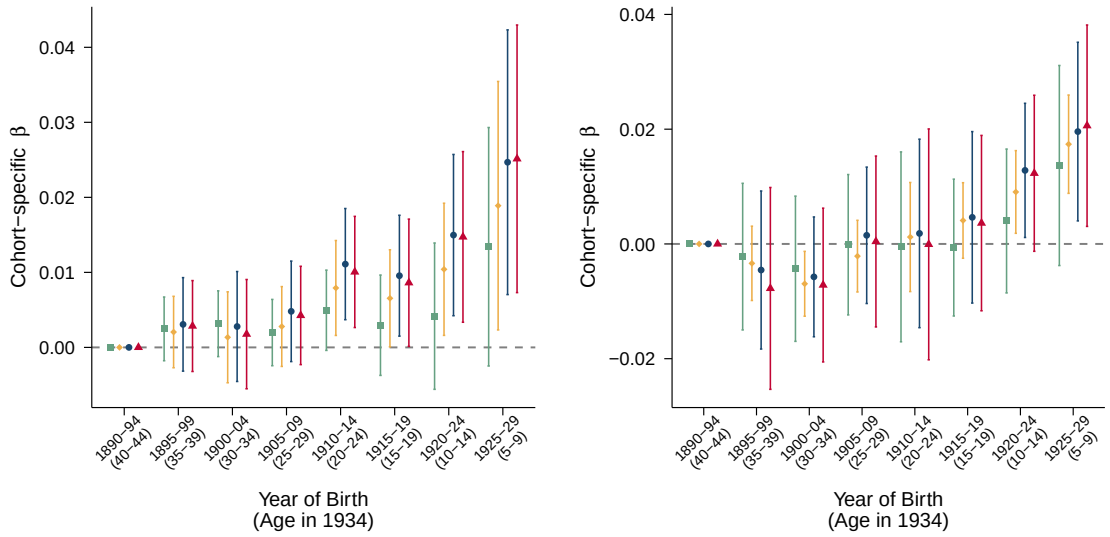
Controls: Region + 1930 Cont. + Pre-1930 Cont. + GD/WWII + Demog. (baseline)

Notes. This figure shows the robustness of the cohort-specific estimates for married white women to the choice of controls and to sample selection. Panels (a.1) and (b.1) plot the coefficients $\beta^{M}_{h(b)}$ resulting from estimating equation 2 with the number of own children in the household as the outcome; Panels (a.2) and (b.2) use the age at first child. Panel (a) includes all married white women in our sample; Panel (b) restricts the sample to women born in the same state as their 1950 state of residence. Each panel overlays four nested control sets, adding controls progressively: census region fixed effects and baseline city controls (green squares); their 1920 and 1910 values (gold diamonds); the Great Depression, 1920s housing boom index, and World War II controls (navy circles); the share of women in 1930 and the share of 20–29-year-olds in 1920 (red triangles), the specification used in Figure 10. See the main text for additional details on the sample and specification.

Figure B.11: Change in the Likelihood of Being Married by 1950 by Cohort, for Women in Initially High-Rate Cities

(a) All White Women

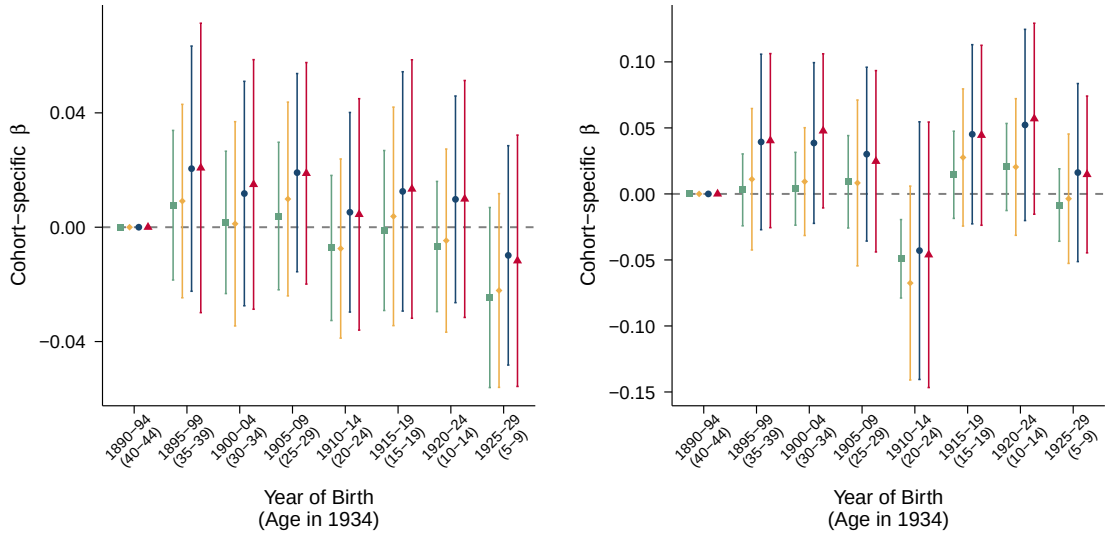
(b) White Women Born in the Same State as their 1950 State of Residence



Controls: Region + 1930 Cont. + Pre-1930 Cont. + GD/WWII + Demog. (baseline)

(c) All Non-White Women

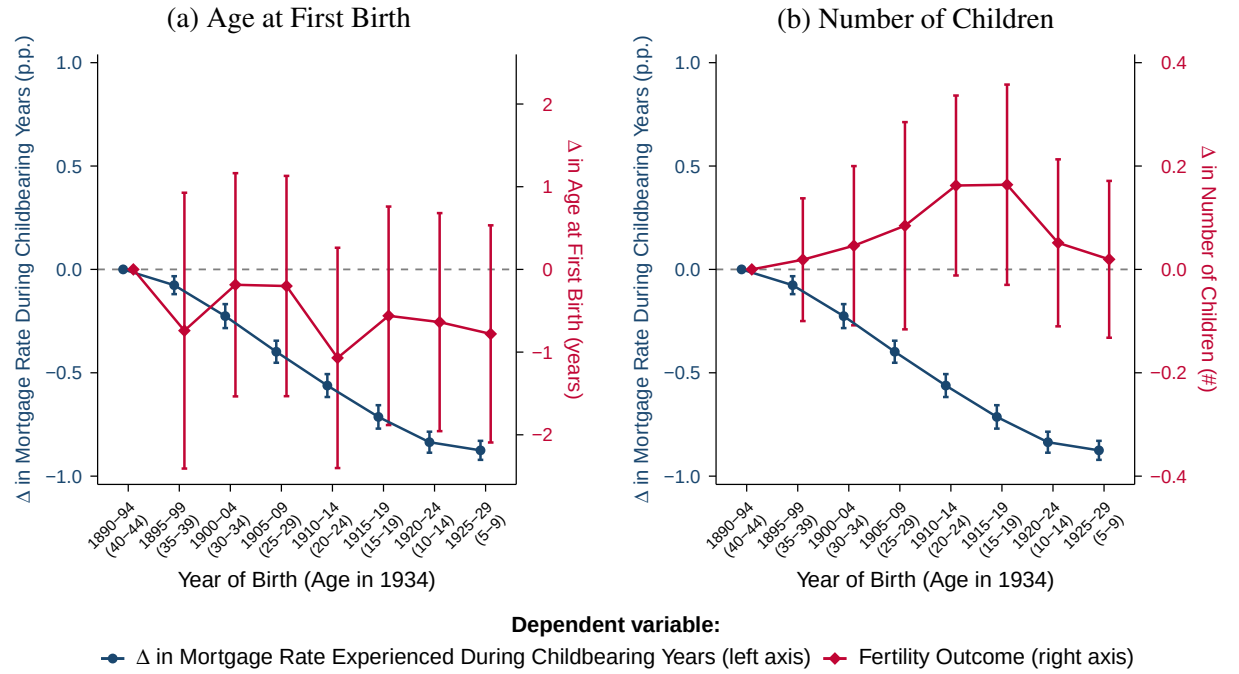
(d) Non-White Women Born in the Same State as their 1950 State of Residence



Controls: Region + 1930 Cont. + Pre-1930 Cont. + GD/WWII + Demog. (baseline)

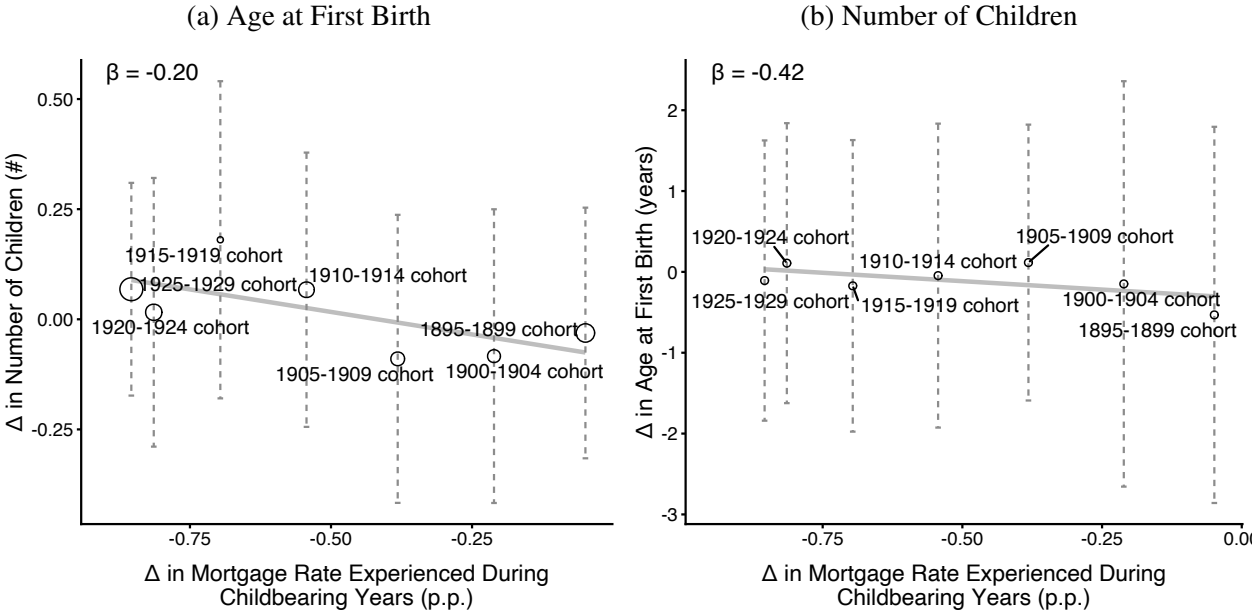
Notes. This figure plots the coefficients $\beta^{M}_{h(b)}$ resulting from estimating equation 2 on an indicator equal to one if the woman is married at the time of the 1950 census. The sample includes all women in our sample cities recorded in the 1950 census and born between 1890 and 1929. Panel (a) uses all white women; Panel (b) restricts the sample to white women born in the same state as their 1950 state of residence; Panels (c) and (d) repeat the two samples for non-white women, restricting to cities with at least 500 non-white women. Each panel overlays four nested control sets. See the main text for additional details on the sample and specifications.

Figure B.12: City-level Mortgage Rate Changes by Birth Cohort and their Effects on Fertility, for Married Non-White Women Observed in the 1950 Census



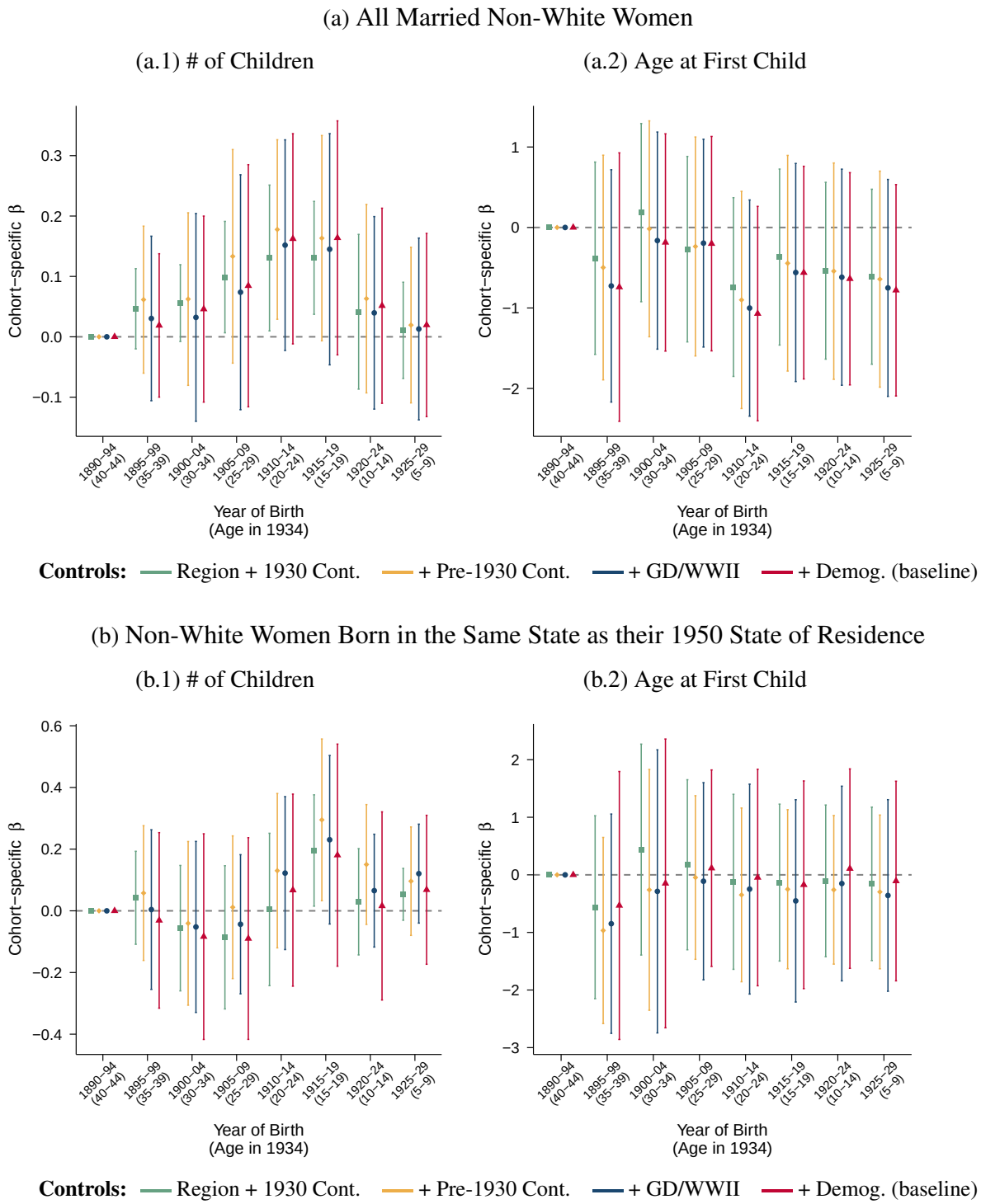
Notes. This figure replicates Figure 10 for married non-white women, restricting the sample to cities with at least 500 non-white women; 156 cities enter the estimation sample. Sample construction, specification, weighting, and clustering are otherwise as in Figure 10.

Figure B.13: Implied Effect of Experienced Mortgage Rates on Fertility for Non-White Women



Notes. This figure replicates Figure 11 for married non-white women, restricting the sample to cities with at least 500 non-white women; 156 cities enter the estimation sample. Sample construction, specification, weighting, and clustering are otherwise as in Figure 10.

Figure B.14: Cohort-Specific Results for Non-White Women, Robustness to Controls and Sample Selection



Notes. This figure replicates Figure B.10 for married non-white women. See the notes to Figure B.10 for more details.