Real Estate Prices During the Roaring Twenties and the Great Depression

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ABSTRACT

Using new data on market-based transactions we construct real estate price indexes for Manhattan between 1920 and 1939. During the 1920s prices reached their highest level in the third quarter of 1929 before falling by 67 percent at the end of 1932 and hovering around that value for most of the Great Depression. The value of high-end properties strongly co-moved with the stock market between 1929 and 1932. A typical property bought in 1920 would have retained only 56 percent of its initial value in nominal terms two decades later. An investment in the stock market index (including dividends) would have outperformed an investment in a typical property (including net rental income), by a factor of 5.2 over our time period.

JEL classification: E32, G01, N12, N92, L85

Keywords: Real estate, price index, Great Depression

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ABSTRACT

Using new data on market-based transactions we construct real estate price indexes for Manhattan between 1920 and 1939. During the 1920s prices reached their highest level in the third quarter of 1929 before falling by 67 percent at the end of 1932 and hovering around that value for most of the Great Depression. The value of high-end properties strongly co-moved with the stock market between 1929 and 1932. A typical property bought in 1920 would have retained only 56 percent of its initial value in nominal terms two decades later. An investment in the stock market index (including dividends) would have outperformed an investment in a typical property (including net rental income), by a factor of 5.2 over our time period.

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1. Introduction

It is often assumed that the Great Depression was associated with both stock market and real estate shocks (e.g., Shiller (2006), Piazzesi, Schneider, and Tuzel (2007)), especially in light of the recent sub-prime financial crisis where parallels with the past are frequently drawn (Reinhart and Rogoff (2009)). Yet empirical evidence on movements in real estate prices is limited for this time period. We construct the first high-frequency real estate quarterly index using transaction prices for Manhattan, a major market in the United States. We use the new data to examine stock market and real estate cycles during one of the most significant crises in U.S. economic and financial history.

We show that the real estate market suffered a sudden and severe downturn in 1929, from which it still had not recovered in 1939. Although Manhattan represents a small geographic area, in 1930 it contained approximately 4 percent of all United States real estate wealth despite having 1.5 percent of the population.[1] Moreover, Long Jr. (1936) writes that between 1919 and 1933, the total value of building plans for Manhattan was "only slightly less than 10 percent of the total for 310 United States cities (Manhattan included) during the same period" (page 183).

To construct our indexes we hand-collected real estate transaction data for Manhattan from the *Real Estate Record and Builders' Guide*, a weekly publication of land, mortgage and building permit listings as well as commentary on the market for real estate. We identified transactions that occurred at market prices. Using over 7,500 market-based transactions we construct nominal and CPI-adjusted real estate price indexes. We also collected various monthly summary statistics on real estate activity for Manhattan and the other New York City boroughs - the Bronx, Brooklyn, Queens and Richmond (which was later renamed as Staten Island) - to serve as robustness checks on the accuracy of our indexes.

[1] In 1930 the assessed value of real estate in Manhattan was $9.9 billion according to the Department of Taxes and Assessments. Wickens (1941) estimates the total real estate of the country to be worth $266.3 billion (page 3).

We employ constant-relative-value and adjacent-period hedonic regression methodologies, making use of all property characteristics that are available to construct indexes with quarterly and annual time dummies. Both approaches minimize the cross-sectional and time series data requirements. Our constant-relative-value hedonic regression specification assumes that the relative prices of house characteristics are constant over time whereas our adjacent-period approach assumes that the relative characteristic prices are the same only over two adjacent time periods. We show that general movements in real estate prices in Manhattan during the 1920s and 1930s are robust to these alternate index construction methodologies.

Our indexes reveal that prices for a typical property reached a local peak in 1926, coinciding with the peak of the Florida housing bubble. They then fell and rebounded to reach their highest peak in 1929, coincident with the high point of the late 1920s stock market run-up. From then prices fell to a new low by 1932 and they did not recover for the remainder of the 1930s. We show that high-value properties were more likely to be synchronized with the stock market between 1929 and 1932 but that overall returns to real estate during the 1920s and 1930s were low. When we account for the net rental income generated in the total return, an investment in the stock market index would have outperformed an investment in the real estate index more than five-fold between 1920 and 1939.

The other time series of real estate activity we collected mimic the patterns of our indexes, providing an independent confirmation of their validity. For Manhattan and the other New York City boroughs we show that as real estate prices rose, builders responded, and new construction activity increased. It then fell back as prices declined. The post-Great Crash decline in the indexes is marked by a sharp rise in foreclosures, which subsequently subsided but remained high for the rest of the sample period. New mortgage lending activity tracks the indexes very closely, confirming that much of the financing for real estate investments came from loans. Finally we also document that the local government did not lower its tax assessments of properties in response to the decline in real estate prices. We show that the typical property sold in the early 1930s had an assessment often more than twice as high as its sale price. This number came down later in the

decade, but assessed values still remained significantly higher than sale prices. Hence, high taxes likely further reduced the attractiveness of real estate as an investment leading to a prolonged slump in real estate prices.

Our paper is related to a long line of research highlighting the significance of real estate and real estate cycles. Wickens' (1941) study opens by stating that "the value of real property exceeds that of any other form of wealth in the United States" (page 1). It provides a variety of descriptive statistics for real estate markets and shows that U.S. real estate wealth declined significantly during the depression years.[2] Long Jr. (1936) and Long Jr. (1939) focus on the relationship between building and business cycles during the nineteenth and early twentieth century. In his extensive analysis of land values in Chicago from 1830 to 1933, Hoyt (1933) documents the decline of real estate prices during the Great Depression. Using more granular data in the form of individual market-based transactions, Atack and Margo (1998) calculate nominal land prices in the business district around New York's City Hall, but their study stops in 1900. Spengler (1930) shows a rise in assessed land values in areas influenced by the subway system in Manhattan, the Bronx, Brooklyn and Queens between 1905 and 1929. Wheaton, Baranski, and Templeton (2009) provide inflation adjusted values of Manhattan commercial property between 1899 and 1999 and calculate negative real gains over the period. Because they use a repeat-sales methodology they are restricted to 86 transactions.

Other studies of real estate at this time include Field (1992), who argues that uncontrolled land development contributed to the severity of the Great Depression. Fishback, Horrace, and Kantor (2001), Wheelock (2008), and Fishback, Lagunes, Horrace, Kantor, and Treber (2009) evaluate the impact of government programs aimed at helping the recovery of real estate markets during the Great Depression. The time period of our study includes the Florida real estate bubble and its collapse, which are described by Shiller (2005) and White (2008). According to White (2008) the real estate bubble of the mid-1920s occurred not just in Florida but nation-wide and its collapse

[2]Methodologically, the study relies mostly on aggregate data series, which include the Census of Population, The Federal Real Property Inventory of 1934, the Financial Survey of Urban Housing, and the Bureau of Labor Statistics reports on Building Permits.

weakened household balance sheets prior to the market crash and exacerbated the recession that followed. Indeed, the effect of the bubble collapse is visible in the United-States-wide single-family home price index of Shiller (2005), the New York City commercial real estate index of Wheaton, Baranski, and Templeton (2009) and the real estate bond price index of Goetzmann and Newman (2009).

The remainder of the paper is structured as follows. Section 2 describes our data on Manhattan real estate transactions. Section 3 explains the construction of real estate price indexes. Section 4 describes the main trends in the indexes and section 5 evaluates the plausibility of the indexes based on other time series of real estate activity we collected. Section 6 documents that real estate taxes were not immediately adjusted down following the drop in real estate prices, further weakening the attractiveness of real estate as an investment. Section 7 concludes.

2. The Data

We hand-collected data on real estate transactions from the professional publication of the New York City agents and builders—the *Real Estate Record and Builders' Guide*. These volumes present data on individual transactions and monthly summaries of real estate activities for all of the New York City boroughs. We collected monthly summaries on new construction, new mortgage loans, and foreclosures for Manhattan, as well as parts of these data for the other boroughs.

For the purposes of constructing price indexes, we randomly collected 30 transactions per month for Manhattan between 1920 and 1939.[3] We focus our efforts on Manhattan because it contained a disproportionate amount of real estate wealth for its population size and particularly

[3]In some months fewer than 30 market-based transactions were available due to the number of foreclosures. In these months we collected as close to 30 market-based transactions as possible and we then added an additional 30 randomly chosen foreclosure transactions per month.

good transactions data exist.[4] We make sure that these transactions are marked as having occurred at market prices rather than being "in-kind" transactions or transactions between related parties.[5] We partition Manhattan into ten neighborhoods (listed in Panel C of Table I). The locations of the neighborhoods are provided in Figure 1.

The transaction records include variables that we include in the constant-relative-value and adjacent-period hedonic regressions. A typical transaction is listed as follows:

> Crosby st, 31 (2:473-28) es abt 130 n Grand, 25x100, 7-sty bk tnt & str. A$13,500-24,000. **18,500**

Here we have the address of the building (the section, block, and lot number are in parentheses), which we subsequently geocoded to get its precise location and zip code (this building is in zip code 10013, which is in the Greenwich Village - Soho area), its orientation (es=east side of the street), 130 feet north of Grand Street, the size of the lot, the number of storeys (7-sty=7 storeys), construction material (bk=brick), building designation (tnt=tenement), assessed value ($13,500-24,000, where the lower figure is the estimated value of just the land and the upper figure is the total estimated value), and we know it had a business store on the first floor (str). The total square footage of the building is computed by multiplying together the lot dimensions and the number of stories (since the lot size was typically very close to the floor size). Finally in bold text, the sale amount the seller received is given, which indicates the fair market price.[6]

[4]Changes in the index cannot be explained by fluctuations in the population of Manhattan, which, according to the Census survey declined by 18 percent during the first decade of our sample and increased by 1.2 percent during the second decade (see also Glaeser (2005), page 10).

[5]In some months only foreclosure transactions were available, so we added these as extra transactions and in some specifications we control for the foreclosure effect in the construction of our price indexes using a foreclosure indicator variable.

[6]We make further effort to include only transactions that took place at market prices by removing observations where the price-to-assessed-value ratio is in the top 99th percentile of the distribution (fearing that the transaction price was too high relative to the true value of the building) or where price is less than 10 percent of the assessed value (to remove the possibility that the transaction occurred between related parties). For that reason, we also remove transactions priced at less than $500. Finally, in order to remove recording or data entry errors, we winsorize transaction prices by setting the prices above the 99th percentile or below the 1st percentile of the distribution equal to their respective boundaries.

Table I provides descriptive statistics for our resulting data. We have 7,538 observations in total. (We observe 320 properties being sold twice and 17 being sold three times such as 1453 Amsterdam Avenue, in Central Harlem - Morningside Heights, which sold for $27,750 in February 1931, $26,000 under foreclosure in June 1932, and $18,500 in May 1937.) Foreclosures are identified clearly in the records as shown in the following example:

111th st, 140-142 W (7:1820-53) ss, 250 e 7 av. 37.6x100.11 5-sty tnt FORECLOS A$36,000-60,000. **30,000**

Foreclosure transactions account for a large share of our observations between 1930 and 1935 and we control for these in some of our regression specifications. While Wickens (1941), page 3, calculates that around 1930 most dwellings in the United States had values of under $5,000, we find a much higher median price of $30,000. This reflects the preponderance of multi-family dwellings and commercial buildings in Manhattan. Indeed, most of the transactions in our data involve tenements.[7] Tenements were generally lower-income housing and were defined under New York laws as:

> Any house or building or portion thereof, which is either rented, leased, let or hired out to be occupied, or is occupied, in whole or in part as the home of residence of three families or more living independently of each other and doing their cooking upon the premises, and includes apartment houses, flat houses and all other houses so occupied. (Lyle (1920), page 239).

Tenements were the most prevalent in the neighborhoods of East Harlem (representing 78 percent of transactions there) and Union Square - Lower East Side (76 percent of transactions). Most tenements were constructed out of brick (81 percent), as opposed to 19 percent being built

[7]During the Great Depression, a typical rent for a 3-room, 350 square foot apartment in a tenement was $18 a month. Such apartments typically housed families of 5-6 people. Tenements had only minimal amenities mandated by law. Electricity was added some time in the late 1910s or early 1920s, and even as late as the 1930s, few tenements had central heating and relied on coal stoves for heat.

out of stone, and 61 percent contained a store on the first floor. The median tenement had five storeys, and the tallest in our sample had 11 storeys.

Dwellings were most prevalent in the Upper West Side (63 percent of total transaction in that area) and Washington Heights - Inwood (54 percent of transactions). Only 2 percent of dwellings included a store. Located in more prestigious neighborhoods and with fewer built-in stores than an average tenement, dwellings were simply the high-end apartment buildings. They ranged in height between one and 16 storeys, with the median dwelling being four-stories tall; 50 percent were built out of stone and 49 percent out of brick.

Lofts were most prevalent in Lower Manhattan (representing 49 percent of all transactions observed there) and Greenwich Village - Soho (42 percent). Page (2005) on page 178, describes them as:

> Narrow and tall with long dark interiors, usually built upon one or two 25-foot lots previously occupied by brownstones, the buildings were appropriate for factories or cheap business ventures.

They became more common in the early twentieth century as steel skeletal structures allowed multi-storey buildings to be constructed with large open interior spaces, and were particularly popular locations for garment-related industries. 81 percent of all lofts were constructed out of brick, and 18 percent out of stone. Fewer than 2 percent contained a store. The median loft had five stories, and the tallest in our sample was 16 storeys high.

The "Other" building designation was predominately found in Lower Manhattan (23 percent of all transactions we recorded there), Chelsea - Clinton (15 percent), and Gramercy Park - Murray Hill (12 percent). These buildings ranged in height between 1 and 16 storeys, with the median building of that type being only three storeys high, and 5 percent of the buildings included a store; 11 percent were built out of stone, and 81 percent our of brick. This "catch-all" building

designation was, perhaps, the most heterogeneous and included private houses and commercial buildings.

Almost three quarters of the transactions in our sample are associated with buildings constructed out of brick. The most common type of property sold is a five-story building. One third of the transaction sample are for buildings that had a business store on the first floor. In fact, this feature was the most prevalent in buildings in Union Square - Lower East Side (observed in 65 percent of all transactions there) and East Harlem (52 percent of transactions), perhaps because these neighborhoods contained more tenements, which typically included a store. For the eight other Manhattan neighborhoods, this number was below 32 percent.

Five percent of buildings contained a basement. While being a more common feature in buildings under seven storeys tall, the store could be also found in taller buildings. On the other hand, no building taller than six stories contained a basement in our sample, and this feature was most common in three-storey buildings. Basements were much more common in dwellings (found in 16 percent of all dwellings in our sample) and very rare among other building designations (found in fewer than 1 percent of such buildings).

In terms of height, almost three percent of our transactions are for buildings eight stories and higher. Eight buildings in our sample have 16 storeys, which is about half the height of Manhattan's smallest skyscraper (Barr (forthcoming)).

Panel C of the table presents summary statistics on transaction prices by year. It can be seen that average and median prices, as well as prices scaled by the total squared footage of the building, rose from the beginning of the sample to 1929 and declined from then on. We will see that this pattern is consistent with the indexes that we construct from these transactions data.[8] The percentage of the transactions which are foreclosures are reported in the last column.[9]

[8] In fact, we have experimented with a variety of hedonic regression specifications, including ones where relative characteristic prices are allowed to change in every time period, and always obtained qualitatively similar indexes.

[9] Transactions were flagged as foreclosures by the *Real Estate Record and Builder's Guide* prior to 1930, but where possible we relied on normal market transactions.

The remainder of the data we use were gathered from various sources. The CPI index is from the United States Census Bureau, Statistical Abstract of the United States, No. HS-36. Data on historical stock market returns are provided by G. William Schwert.[10] We obtained all the new building applications filed in Manhattan for each year, from 1920 to 1939 from the Office for Metropolitan History in New York. Not all building permits were carried through to completion and some plans changed in scope after the initial application was filed. The data are, however, recorded net of alterations to existing structures. Aggregate data on stock issuance were collected from the NBER Macrohistory databases.[11]

3. Estimation

3.1. Choice of Methodology

Since a property does not trade most of the time, its value is predominantly unknown. Market transaction prices are the most reliable source of information for valuation and there are three commonly-used methods of constructing price indexes. The first simply computes an average or a median price over all transactions, without any attempt to control for the heterogeneity of sold houses. Examples are the indexes produced by the national Association of Realtors and by the Census Bureau, which report median values of homes sold during a particular time period. The hope is that heterogeneous house characteristics will wash out in large enough samples. A more advanced index of that sort is computed for a specific housing type, such as, for example, a semidetached house of a certain size and quality. But the finer the partition, the greater are the data requirements. The advantage is the ease of computing. The big drawback is that the selection of houses being sold may vary endogenously. For example, if during an economic downturn, more low-cost houses are sold, the index will be weighted down relative to the true value of the housing stock.

[10] http://schwert.ssb.rochester.edu/data.html.

[11] http://www.nber.org/databases/macrohistory/contents/chapter10.html.

The second commonly used index is the repeat sales index. It is estimated based on price changes of the same house between subsequent transactions that are then weighted across houses. Examples are the OFHEO House Price Index and the Case-Shiller National Home Price Index. The big advantage of the repeat-sales index is that it makes the strongest effort to control for the heterogeneity in quality by computing price changes off of the same house. However, this methodology has several shortcomings. It has to be assumed that between transactions, there are no house improvements or deteriorations and no changes in the quality of the neighborhood. Moreover, a great deal of transactions data is lost when all transactions with no prior sale have to be thrown out (Wheaton, Baranski, and Templeton (2009)). Historical estimates of the index will get revised whenever a house that has sold earlier is sold again.[12] In general, repeat-sales indexes require a long time series and a large cross-section of data, otherwise they produce unreliable estimates (Meese and Wallace (1991) and Clapp, Giaccotto, and Tirtiroglu (1991)). Finally, the index may produce biased estimates if the selection of houses that transact frequently is atypical, for example, if such houses tend to be of a higher quality than the general housing stock.

The third index is the hedonic price index. It views a house as a collection of priced services and sums up these prices to obtain the value of a house. Examples of priced services are the square footage of the house, the quality of the neighborhood, the number of bathrooms, bedrooms, etc. The Census Bureau Constant Quality Index is an example of such an index. This methodology has many advantages. Most importantly for us, it makes the most efficient use of the data and thus minimizes data requirements (Diewert (2007)). Hedonics allow for the quality of the house to remain constant and for the index level to reflect the value of a hypothetical house with the typical characteristics of the housing stock. Computed this way, changes in the index will most accurately capture changes in the value of housing wealth. One potential drawback is the need to collect information on the multitude of house attributes that influence the value of the house, and these data may be unavailable. However, due to the high level of collinearity in house

[12]The change in price for that house influences the index for the entire period between the two subsequent sales. This problem can be mitigated by a large cross-section of observations. The problem can be also addressed by adjusting the methodology.

characteristics Butler (1982) suggests that "approximate correctness" can be achieved with fewer inputs than is generally thought.[13]

Since our dataset is limited in both the time series and the cross-section, it makes the most sense to use the constant-relative-value hedonic methodology of constructing price indexes. Using this approach, a time series of price changes can be constructed in two ways: (1) by running hedonic regressions and computing the value of a representative house in every period, or (2) by running a pooled regression and employing time dummies to capture the time change in prices. Unlike the first method, the second is less flexible in that it assumes that the prices of house characteristics remain constant over time. However, this approach offers an important advantage in that it conserves degrees of freedom and reduces data requirements. We also construct indexes using the adjacent-time-period hedonic regression approach, which fixes the relative prices of house characteristics only in adjacent time periods.

3.2. The Hedonic Approach

The hedonic regression literature has yet to reach a consensus on the best specification for the pricing regression. The discussion centers on what types of house characteristics should be included, whether house prices should be converted to logged values and/or scaled by square footage, whether or not continuous house characteristics should also be logged, whether regressions should be run every period or pooled with time dummies included, and so on. Diewert (2003) systematically addresses these open questions and offers some suggestions. In particular, he argues that the log-price specification will more likely result in more homoscedastic errors. Since we are going to be running pooled regressions with time dummies in order to conserve degrees of freedom, the additional advantage of the log-price specification is that time dummies would single-handedly capture the time effect on prices. For example, if prices were to dou-

[13] In light of the shortcomings with each type of index, Case, Pollakowski, and Wachter (1991) and Case and Quigley (1991) advocate combining the hedonic and the repeat-sales for a hybrid approach that leads to least bias and most informational efficiency. See also Hoffman and Lorenz (2006), Rappaport (2007) and Diewert (2007) for detailed discussions of different price indexes.

ble from one period to the next, the time dummy in the log-regression would alone absorb this change, while a time dummy in a non-logged regression might be unable to adequately capture the doubling in price.

Additionally Diewert (2003) also argues in favor of using logged values of continuous house characteristics if the price is logged. For us, transforming our only continuous variable, the square footage, into logs makes sense because the vast majority of properties being sold in Manhattan are apartment buildings, and one would expect their prices to be proportional to the number of apartments they contain. Hence, some sort of a ratio of price to the square footage of the building would best capture this proportionality.

Suppose, P_{kt} is the market price of property k sold at time t and p_{kt} is its natural logarithm. Furthermore, let us assume that we collect N priced property characteristics for each transaction that fully describe each property and that these characteristics remain invariant through time: $z_k \equiv [z_{k1}, z_{k2}, ..., z_{kN}]$. We use all of the property characteristics described in Table I, as well as the neighborhood dummies.

We run the following regression, pooled over the time series and the cross-section, of properties being sold:

$$p_{kt} = \alpha_t D_t + \sum_{n=1}^{N} z_{kn}\beta_n + \varepsilon_{kt} \tag{1}$$

where D_t is the time dummy taking the value of 1 for the time period t when the property k is sold and zero otherwise.

According to this model, a property κ can be priced at each point of time τ based on its unique characteristics and the estimated prices that these characteristic command:

$$\hat{P}_{\kappa\tau} = exp(\hat{\alpha}_\tau) \times exp(\hat{\beta}_1 z_{\kappa 1}) \times exp(\hat{\beta}_2 z_{\kappa 2}) \times ... \times exp(\hat{\beta}_N z_{\kappa N}) \tag{2}$$

Hence, if prices doubled from time τ to time $\tau+1$, while, as we have assumed, the prices of all property characteristics remained constant through time, this change would be entirely absorbed by the coefficient on the time dummy for $\tau+1$, $\hat{\alpha}_{\tau+1}$, which will be computed to satisfy the equation: $exp(\hat{\alpha}_{\tau+1}) = 2exp(\hat{\alpha}_{\tau})$.

Now suppose that the first priced property characteristic is the natural logarithm of the square footage. Then, the predicted price would be proportional to the total square footage:

$$\hat{P}_{\kappa\tau} = exp(\hat{\alpha}_{\tau}) \times sq.footage_{\kappa}^{\hat{\beta}_1} \times exp(\hat{\beta}_2 z_{\kappa 2}) \times ... \times exp(\hat{\beta}_N z_{\kappa N}) \tag{3}$$

If the relation between prices and square footage is exactly proportional, i.e., the price of a property double the size is twice as high, it would be captured by $\hat{\beta}_1$ being equal to one.

We set the price index equal to the proportional change in the value of the property relative to the initial period. We normalize the initial price to be \$1, and the index, therefore, reports the return on the initial investment. Note that since the price of property characteristics remains constant through time in this specification, the price change of any property is captured entirely by the coefficients on the time dummies. At each point of time τ, the level of the index is, therefore, equal to the ratio of the exponents of the time dummy coefficient at time τ and the time dummy coefficient at time 0, or the exponent of the difference: $exp(\hat{\alpha}_{\tau} - \hat{\alpha}_0)$.[14]

3.3. The Adjacent-Period Approach

The constant-relative-value hedonic regression specification (1) assumes that the relative prices of house characteristics are constant over time. This assumption works well for relatively short time periods, but we also check whether our indexes change if this assumption is relaxed. For example, one of our neighborhoods may have grown relatively more expensive over our 40-

[14] We tried alternative regression specifications and found that the resulting indexes show similar patterns, no matter whether or not transaction prices were scaled by the square footage, whether or not they (or the square footage) were logged, and which descriptive property characteristics were included.

year sample period and house sales in this neighborhood may be unevenly distributed over time. We, therefore, check if our indexes are robust to a specification that does not require that house characteristics have constant relative prices for the entire sample period.

For this purpose, we employ the adjacent-period hedonic regression approach, which assumes that the relative characteristic prices are the same only over two adjacent time periods. The regression of the form of equation 1 is run for every two consecutive time periods, with a dummy variable D indicating the next time period. Once a series of the time dummy coefficients, α_t is obtained, the value of the index in period τ is computed as a product of the exponentials of the time dummies: $\Pi_{t=1}^{\tau} exp(\alpha_t)$.

4. Results

Table II presents the regression coefficients of the quarterly constant-relative-value hedonic regression of the natural logarithm of the transaction price on the building characteristics, specified according to equation (1). The coefficient on the log-value of square footage is only 0.61 rather than 1.00, indicating that each additional square foot of size has a smaller effect on the price increase. This declining effect of square footage on price is consistent with other evidence in the real estate literature. As the square footage of the building base increases, more interior space ends up without a window. If the square footage increase is achieved through adding floors, the square footage on the higher floors may command a lower price due to the lack of elevators and/or additional maintenance of a tall building.

As we mentioned earlier, tenements were apartment buildings that typically housed lower-income families, and, as expected, the other building designations command a premium over tenements, with the "Other" building designation, likely representing office buildings, being the most expensive. Buildings with the store on the first floor tended to sell at higher prices either because having a store truly added value or possibly because the store dummy also captures a convenient location. Buildings with basements commanded lower prices than otherwise similar

buildings possibly because basements were more common in older buildings. Moreover, buildings constructed out of stone and brick were valued higher than buildings constructed from other materials, and stone was slightly preferable to brick.

We also find that, controlling for the total square footage, one-storey buildings commanded a premium over buildings with six stories and up, our comparison group, while three-, four- and five-storey buildings sold at a discount. One explanation is the limited availability of elevators at this time. To compensate for inconvenience, apartments on higher floors were typically rented out at reduced rates.

Turning to neighborhood effects, the areas of Chelsea - Clinton, Grammercy Park - Murray Hill, Greenwich Village - Soho, Lower Manhattan, Upper East and West Sides, and Washington Heights - Inwood commanded a premium relative to Union Square - Lower East Side, our comparison group, while Central Harlem - Morningside Heights and East Harlem were considered to be less attractive.[15]

The annual and quarterly, nominal and CPI-adjusted, real estate price indexes constructed with the constant-relative-value and adjacent-period hedonic regression methodologies are plotted in Figure 2. The corresponding index values are reported in Table A1 and Table A2 respectively.[16] It can be seen that the general movements in the indexes are unrelated to the index construction methodology used.

The indexes show that real estate prices decreased slightly from 1920 Q1 until 1921 Q1, a severe but transitory period of falling prices and output after the First World War. Following a period of high volatility and rising prices, that also coincided with an increase in nationwide construction activity and a real estate bubble in Florida (White (2008)), the indexes fall to a local low in 1928 Q1. If there was a nationwide run-up in house prices leading up to the Florida bubble

[15]It of course possible that these neighborhoods simply contained buildings of differing qualities, and these variations were not adequately captured by the set of characteristics available in our dataset.

[16]It is natural to expect that the CPI-adjusted index should exhibit smaller fluctuations than the nominal index since the CPI basket includes housing costs, and the latter are likely significantly correlated with real estate prices. This pattern can be observed in our plots.

collapse, its effect would have been the most pronounced in Manhattan, where land is scarce and, therefore, spikes in demand would have translated more strongly into spikes in prices (consistent with the model of Glaeser, Gyourko, and Saiz (2008)). After 1926 construction activity in Manhattan and nationwide slowed down (Long Jr. (1936), White (2008), Hoyt (1933)) before rising again during the late 1920s, perhaps because of the increasing reliance on commercial real estate mortgage bonds to finance new construction. Hoyt (1933), writes:

> Cash transactions were becoming less frequent... the illusion of the rising markets was sustained by trades of one type of property for another, in which the price was padded by both parties. The high level of values was also supported by first-and second-mortgage loans, so that owners could borrow up to 80 percent of the peak value of their property... (page 265).

The stock market crashed in the fourth quarter of 1929, and this is when the real estate indexes start to decline, albeit at a slower pace.[17] The constant-relative-value hedonic real estate index declines by only 17 percent in the fourth quarter of 1929, and the larger price drop occurs in the first quarter of 1930 when the index falls by 38 percent. The majority of the decline in our quarterly index (or 67 percent) occurs between 1929 Q3 and 1932 Q4, and from then on, the index rises only by 8 percent until the end of our sample period in the fourth quarter of 1939 (which amounts to less than 1.1 percent per year). Interestingly, a temporary increase in the index is observed in the first quarter of 1933, coinciding with the establishment of the Home Owners' Loan Corporation (HOLC), but this increase is reversed in 1935, concurring with the end of HOLC's lending program.[18] According to our quarterly constant-relative-value hedonic index, the value of $1 invested in the real estate index in the beginning of 1920 would have turned into

[17] A review of real estate activity in the *Real Estate Record and Builders' Guide* on January 4th 1930 reads: "despite the Wall Street upheaval in the Autumn of 1929, general activity of the Manhattan market was not noticeably depressed."

[18] Though HOLC loans were designated for homes worth less than $20,000 and likely not available for the vast majority of the Manhattan real estate, the program helped lending banks recover some of the potential losses and likely, at least temporarily, raised the sentiment about the future of real estate investments.

56 cents in nominal terms or 77 cents when expressed in 1920 dollars (according to the annual index, these numbers are 59 cents and 85 cents, respectively).

Our data and analysis also elaborate on two further characteristics of the real estate cycle. First, in an unreported regression, we account for the price effect of foreclosures by including a foreclosure dummy in equation (1). Campbell, Giglio, and Pathak (2009) show that foreclosures, by forcing a house to be sold quickly, reduce the price by, on average, 32 percent. Since in the early 1930s the number of foreclosures rose, we check whether the foreclosure dummy can explain the price decrease we observe. It does absorb some of the price drop during 1930 Q1 to 1935 Q1, when the number of foreclosures was high. The coefficients on the foreclosure dummy for both CPI-adjusted and nominal sale prices are -0.30 (which is highly significant with the *t*-statistic of -8.13), implying that foreclosures reduced the sale price by 26 percent in our sample. However, including the foreclosure dummy does not affect the ultimate decline in the indexes, which come out almost identical to the indexes constructed without the dummy for the remainder of the sample period.

Second, Figure 3 and the corresponding Table A3 present indexes computed separately for high- and low-end properties. While an article in the *New York Times* on June 14th, 1928, asserted: "it is generally conceded that when the stock market is booming, the realty market suffers," our evidence indicates that the price of high-end properties co-moved considerably more with the stock market than low-end properties between 1929 and 1932. This correlation makes sense from the standpoint that high-end properties were located in areas where a large portion of income was produced on Wall Street. It is also consistent with Ait-Sahalia, Parker, and Yogo (2004) who find a significant correlation during the late 1980s and 1990s between the rents of luxury Manhattan coops and equity returns as households responded to stock market driven changes in their wealth. Despite the lack of a significant run-up in the 1920s, the low-end index was not immune to the price decline, which, in fact, preceded the decline of the high-end index. Both indexes earned a similar return over our sample period.

4.1. Comparison with the Stock Market Index

To further elaborate on real estate and stock market cycles during the 1920s and 1930s, Figure 4 plots market and real estate indexes. To make a fair comparison to the stock market index, which includes dividend distributions, the nominal real estate index plotted includes not only changes in property values, as in the earlier figures, but also net rental income earned. Net rental income is computed as rental income net of taxes, operating costs and capital expenditures.[19] Operating costs include items such as management costs, cleaning, upkeep, water service, heat, public lights, but not capital expenditures.[20]

It is not surprising that the nominal real estate index with the adjustment for the net rental income has a higher total return than the one that does not make the adjustment. According to our estimates, net rental income provided an additional return of 2.5 percent up until 1929. Since rental revenues did not fall drastically but rather declined gradually following the 1929 drop in real estate prices, the net rental revenues rose to almost 6 percent of the market value of the property in the early 1930s but eventually fell to a negative 1.3 percent in 1935. The reason why net income declined to a negative number is because gross rental revenues fell dramatically starting in 1930 but taxes and operating expenses remained steady. This drastic reduction in the profitability of the real estate business is also noted by Hoyt (1933).

A comparison of the stock market and real estate indexes shows that Manhattan real estate prices similarly reached a peak in 1929 Q3 and the real estate downturn coincided with the stock

[19] We estimated net income as follows. We used the data on gross income, real estate taxes, and operating expenses for the years 1928 to 1935, provided by Burton and Burton (1937), who surveyed 54 income-producing properties in Manhattan. Having computed the ratios of these items to the assessed price in 1930, provided by the authors, we estimated these numbers as a fraction of the market value of the property using our price appreciation index for the sample period of the survey. For years that lie outside of the survey time period, we used the ratios for the survey end points (i.e., we used the 1928 ratio for the period 1920-1927, and the 1935 ratio for the period 1936-1939). The survey does not provide an estimate for depreciation, but Bolton (1922) estimates that most buildings would not last over 50 years without a total capital expenditure equal to the initial construction cost, implying a 2 percent per year average capital expenditure. Notwithstanding he argues that the economic life of a building is much shorter than the physical life due to changing fashions and technical innovations that shift the demand towards new construction, we used a conservative estimate of depreciation of 2 percent a year.

[20] Table II of Bolton (1922) provides a detailed description of the various expenses.

market crash. But while the stock market index started rebounding in 1932, the real estate index (despite experiencing a small rebound during the fourth quarter of 1933) fell back to its pre-rebound level during the fourth quarter of 1934.[21] Our indexes reveal that if all rental income was reinvested back into the Manhattan real estate market, an investor who had invested $1 in the beginning of 1920 would have been left with 71 cents at the end of 1939. In comparison, a dollar invested in the stock market, with all dividend payments reinvested back, would have generated $3.68 in the same time period.

5. Are the Indexes Plausible?

The real estate indexes plotted in Figure 2 are consistent with other indicators of real estate activity during the 1920s and 1930s. From Figure 5, it can be seen that peaks and troughs of the real estate and market indexes shown in Figure 4 correspond with movements in new construction (estimated based on construction permits issued) and new share issuance by firms.[22] Based on 10,351 building permits we accessed at the Office for Metropolitan History, the median nominal cost of a new construction fell from $65,000 during the 1920s to $7,500 during the 1930s.

Figure 6 plots new construction numbers based on permits issued that we collected from the *Real Estate Record and Builders' Guide* for the other four New York City boroughs. The figure shows a pattern that is consistent with our real estate index for Manhattan. New construction first slowed down in 1926 (after the Florida bust), but the most significant decline occurred from 1928/1929 to 1932. After that came a slow reversal, with Queens showing the largest increase in new construction in 1938. However, the level of new construction was considerably lower than the pre-Depression boom in all of the boroughs.

[21] Hoyt (1933) also observes that there was a short-lived rebound in the Chicago real estate prices in the early 1930s that later reverted.

[22] However, new construction activity for 1929 may be overstated. According to Long Jr. (1936) the Multiple Dwelling Law that gave a tax break for residential buildings caused a rush for permits in the early months of the year. He claims that the numbers for new buildings in 1929 should be reduced by 228 million to bring them in line with the estimates with the previous years (footnote 4, page 183).

Figure 7 plots the number of foreclosures for Manhattan and the Bronx (these data are not available for the other boroughs). Again this figure is consistent with the indexes. Foreclosures first appeared as summary statistics in the *Real Estate Record and Builders' Guide* in 1929 (before that, the number of foreclosures was not reported as a separate line item). For Manhattan, foreclosures peaked between 1932 and 1933, coinciding with the initial dramatic decline of the index, but then continued at lower rates through the rest of the sample period.

The building frenzy in the 1920s and the large number of foreclosures in the early 1930s likely significantly added to the supply of the available housing stock. Therefore, even when demand eventually rose, the large available supply kept prices low, explaining the long cycle in real estate prices.

Figure 8 shows that lending activity in New York City moved in lock-step with our real estate indexes. It shows the dollar value and the number of new mortgages for Manhattan and the Bronx. The number and the total dollar value of new mortgages increased dramatically during the boom years. The drop in mortgage activity starts in 1926 and reaches the lowest level in 1933. From that point on, it rebounds only very slightly by the end of the sample period.

Finally, our indexes can be compared to those available in the existing literature. Shiller (2005) presents a real estate index for the time period that overlaps with ours. Unlike our index, his index is nation-wide and constructed only for single-family homes. Additionally, it does not use exclusively transaction-based prices but also relies on a 1934 survey which asked owners what their homes were currently worth and the initial purchase price that they paid. However, its general patterns are consistent with our index. The Shiller index also shows a price increase in the early 1920s, and drop in the early 1930s. The only difference is that his index shows another increase by 1940 whereas ours remains flat. Wheaton, Baranski, and Templeton (2009) compute a decade-interval inflation-adjusted index of commercial real estate property values in Manhattan, using the repeat sales methodology. Consistent with our findings, they document a rise in real estate prices between 1919 and 1929 and a large drop between 1929 and 1939, such that the 1939 prices they observe are lower than the 1919 prices. Goetzmann and Newman (2009) present an

index of real estate bond prices and document a roughly 75 percent price drop from the peak in May 1928 to a low in April 1933. The magnitude of the decline is very similar to ours, but one difference is that our Manhattan real estate price index peaks later, in the third quarter of 1929, coinciding with the stock market peak.

6. The Tax Assessments

Our data also allows us to offer a partial explanation for why real estate prices remained low during the 1930s. Hoyt (1933) writes that following the Great Crash and the start of the Great Depression, "most of the burden of local taxes fell upon real estate..." (page 269). Burton and Burton (1937) provide supporting evidence for New York City, calculating that it had "consistently obtained about 65 percent of its entire revenue from real estate through the general property tax—30 percent more than the average taken from that source by all other cities with populations in excess of 100,000" (page 271). The authors show that real estate taxes did not significantly decline when real estate prices and rental incomes in the city dropped in the early 1930s.

We collected data on assessed values for properties sold in Manhattan, which show that these did not drop as fast as did prices. Figure 9 plots the median assessed value to sales price ratio, computed each month (the figures based on quarterly observations, not included, show a very similar pattern). The assessed value for a median property sold fluctuated between 64 and 122 percent of the sale price between January 1920 and December 1929. Notice, that the ratio was at its lowest during the boom years of 1925 to 1929, indicating that the tax authorities did not immediately raise their assessments in response to price increases. Then, in February of 1930, the ratio of the assessed to market value rose to 171 percent of the sale price, with the peak discrepancy coming in August 1931 when the assessed value equaled 359 percent of the market price for the median property sold.

Some of that mis-valuation could be potentially explained by a large number of foreclosures during this period, which, as previously noted, likely occurred at a discount. But since the fore-

closure discount was, on average, equal to only 26 percent, the more plausible explanation is that the local government simply failed to adjust the assessments (and property taxes) down in response to deteriorating market conditions. If taxes remained at their previous levels, the tax burden per dollar of value almost doubled for a median property, possibly furthering the decline in prices.

7. Conclusion

This paper has presented new data on real estate prices in Manhattan, one of the most significant markets in the United States. We have shown that the real estate market crashed suddenly and it suffered through a decline in property values all through the 1930s. A downturn and protracted recovery of this sort meant potentially great losses for mortgage originators.[23] Wickens (1941) estimates that in 1920, total mortgage debt outstanding equaled $9.35 billion (or 10.2 percent of total household wealth). In 1929, it increased to $29.4 billion (which corresponded to 27.2 percent of household wealth). In 1930, total urban real estate was worth $266.3 billion of which $122.60 billion represented urban residential properties, and 51 percent of urban residential properties were mortgaged. In a January 6th 1934 report the *Real Estate Record and Builders' Guide* calculated that in 1932 and 1933 lending institutions in Manhattan repossessed properties with an assessed value of $238.8 million.

It is therefore no accident that Wickens' NBER report of 1941 urged more research in the area: "The Committee recommended the study of real estate financing because of the importance of real estate in national wealth. It is one of the greatest outlets for long term investment by banks, insurance companies, and private investors, and economic stability generally is influenced in a large degree by what happens in real estate. The Committee was of the opinion also that real estate financing had been commonly understressed in the discussions of banking and credit phases of stabilization problems..."

[23] Investigating the relatively recent Savings and Loans Crisis, Case (1991) provides evidence that banks suffered significant losses during the real estate market downturn in Massachusetts between 1987 and 1991.

Our evidence indicates that that the real estate market crash had persistent consequences. It was associated with a halt in new construction activity and a sharp rise in foreclosures. Real estate cash flows rapidly turned negative because expenses remained fairly constant (i.e., taxes, maintenance and capital expenditures) while rental income earned was highly volatile. Contributing to the slow recovery was an oversupply of available housing through the pre-crash construction boom and a large number of foreclosures in the early 1930s. According to the Annual Report on the NYC Property Tax for the fiscal year 2000, the full recovery did not happen until 1960. The report states: "Manhattan assessments grew by only $134.8 million between 1940 and 1950, or 1.7 percent; it was not until 1960 that assessments in Manhattan exceeded their pre-Depression level." Thus, a property owner who would have invested on the eve of the Great Depression would not have recovered the full value of their investment until four decades later. Consistent with evidence presented in Reinhart and Rogoff (2009), we observe that stock market cycles are much shorter than real estate cycles.

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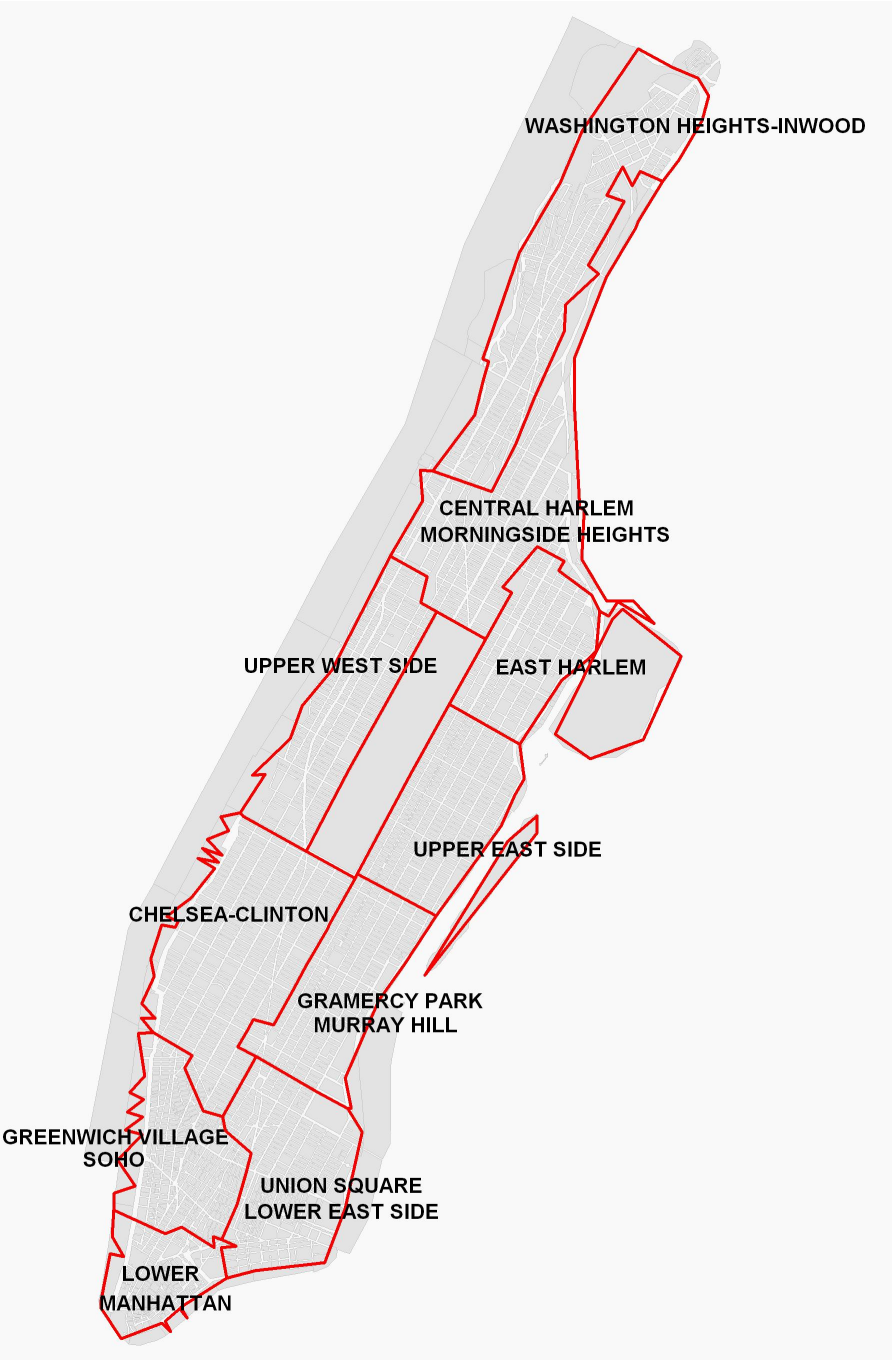
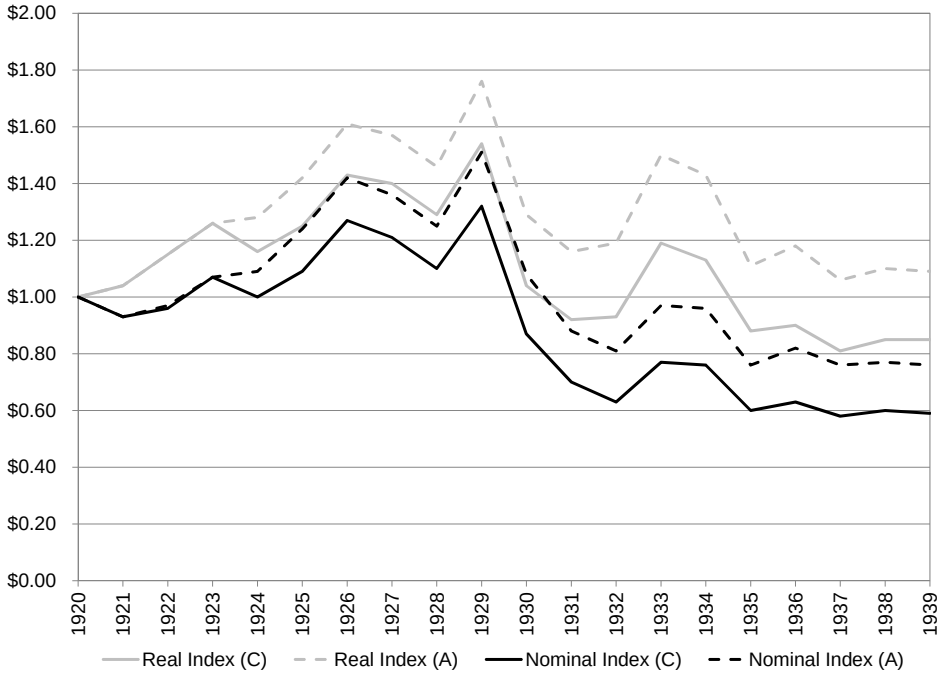
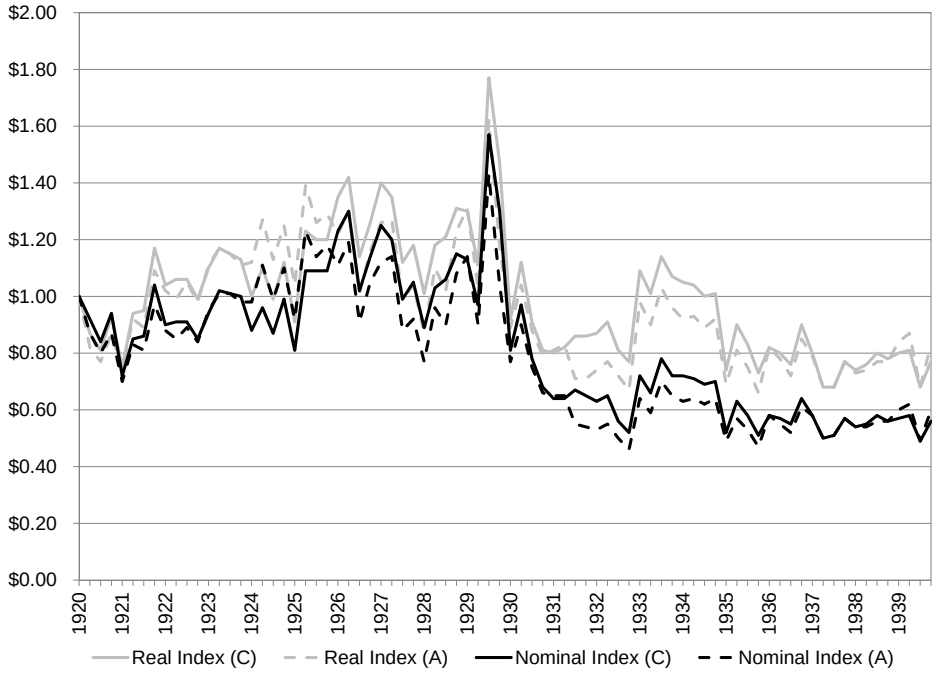


Figure 1. Manhattan Neighborhoods.



(a) The Annual Index



(b) The Quarterly Index

Figure 2. Real Estate Price Indexes. The indexes present the real and nominal values of a dollar invested in Manhattan real estate, computed using the constant-relative-value (C) and adjacent-period (A) hedonic regression methodologies.

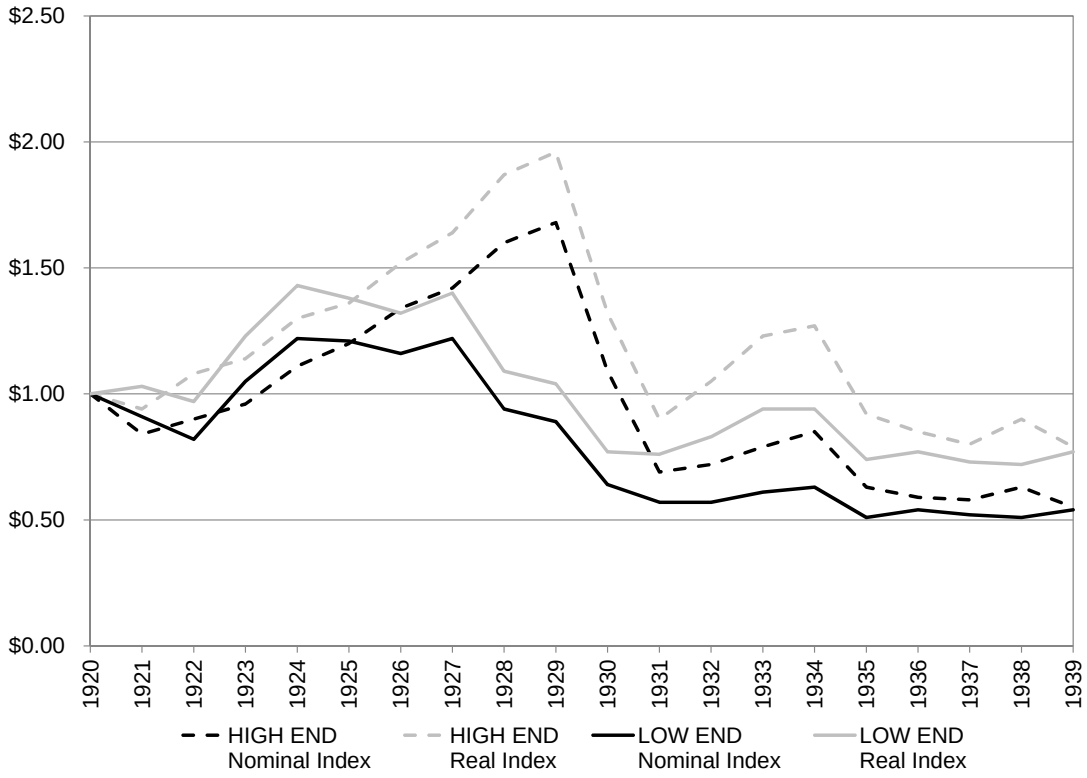


Figure 3. Real Estate Price Indexes: High- and Low-End. The indexes present the real and nominal values of a dollar invested in a Manhattan high-and low-end real estate indexes, computed using constant-relative-value hedonic regression methodology. High-end properties consist of dwellings in Chelsea - Clinton, Gramercy Park - Murray Hill, Upper East Side, and Upper West Side. Low-end properties consist of tenements in Union Square - Lower East Side, Central Harlem - Morningside Heights, and East Harlem.

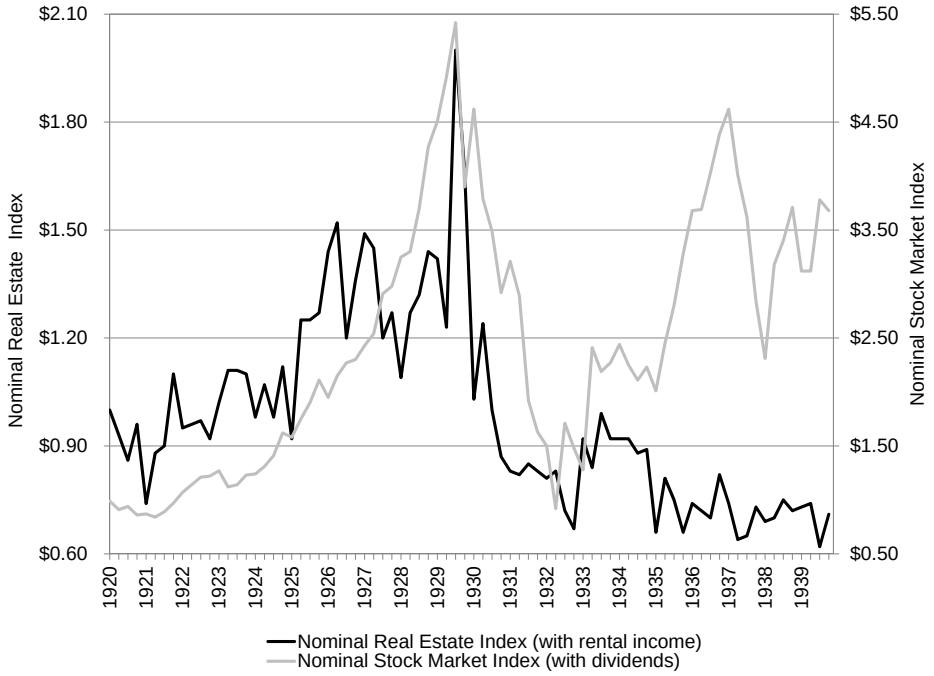


Figure 4. Real Estate and Market Indexes. The indexes assume that investment proceeds (dividends or net rental income) are reinvested back into the index.

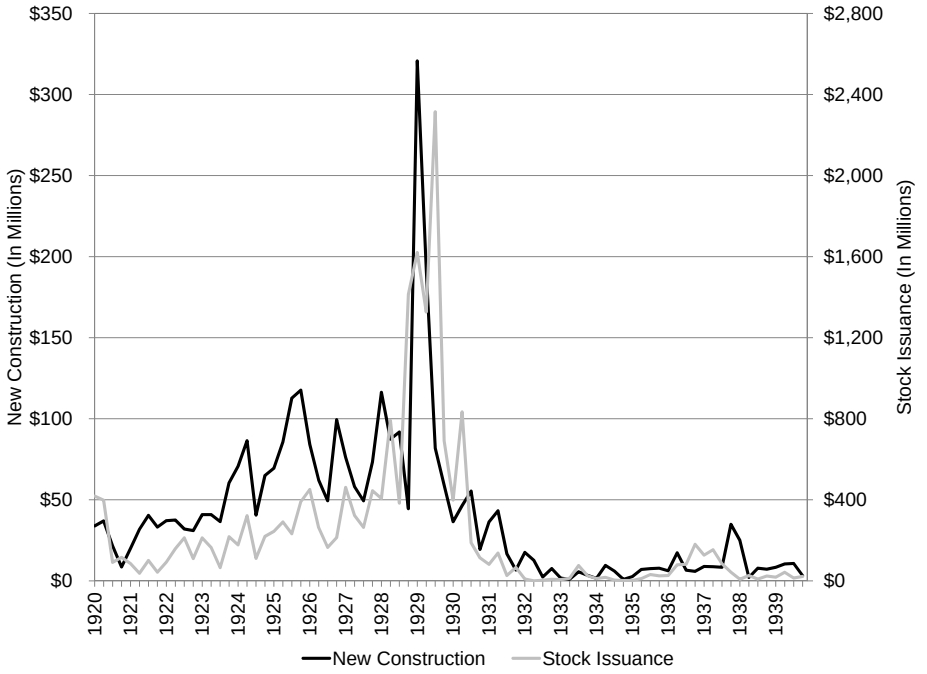


Figure 5. New Stock Issuance and Manhattan Construction Activity. The series are new construction plans for Manhattan and contemporaneous new share issuance activity.

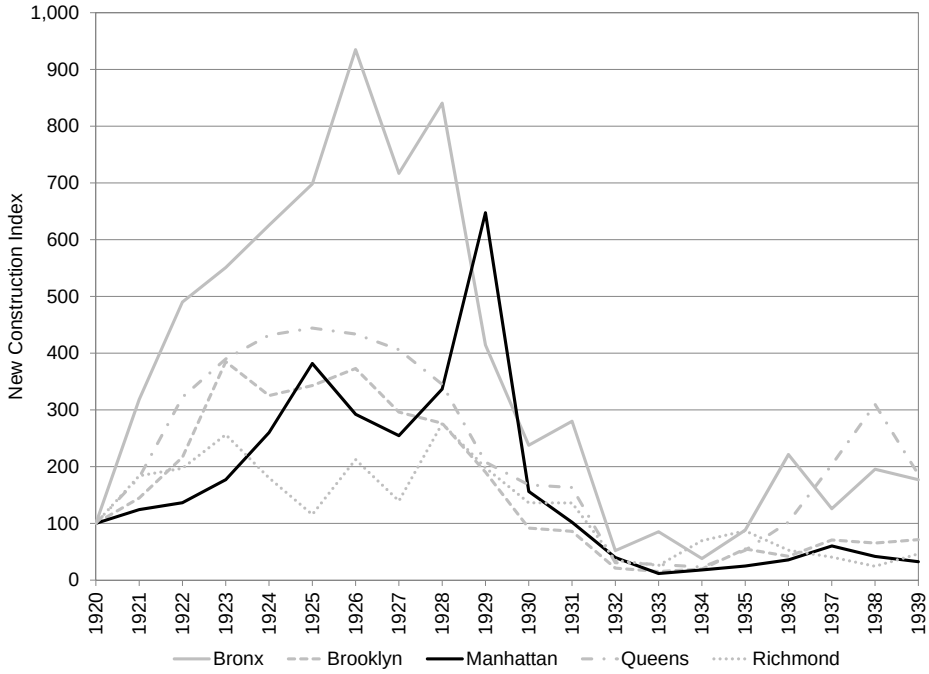
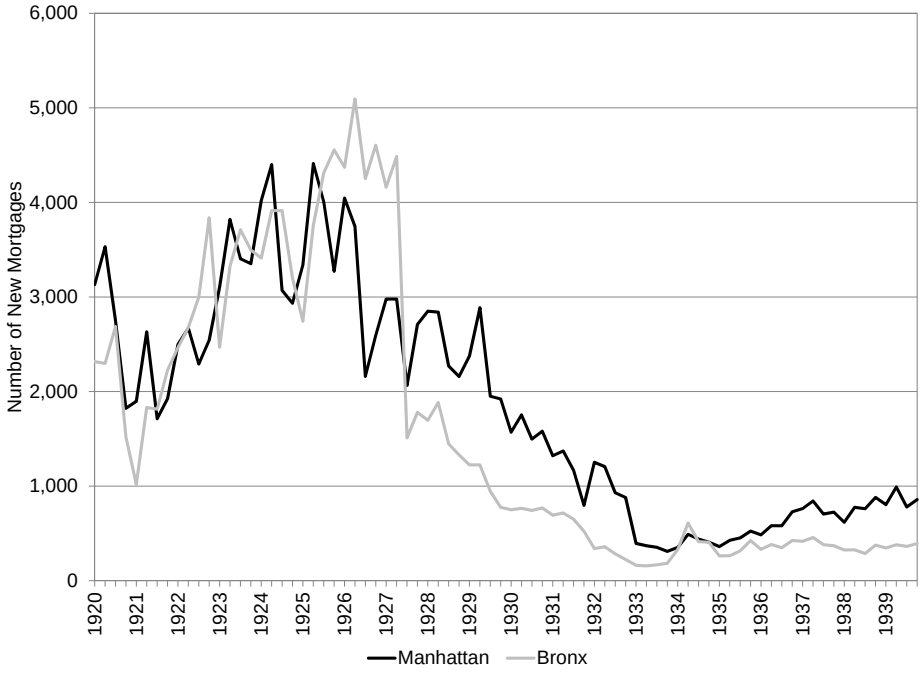
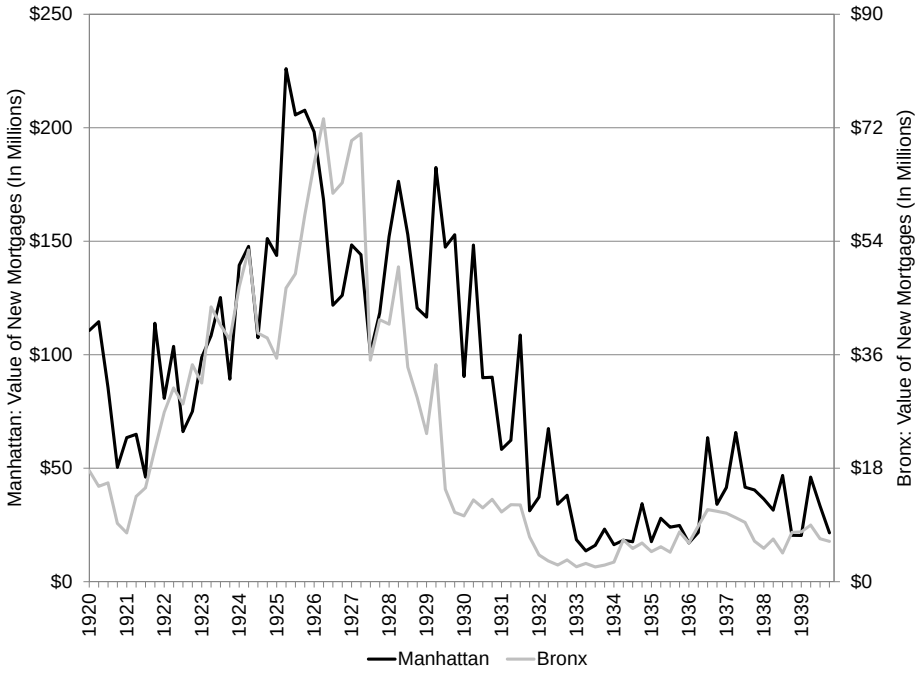


Figure 6. New Construction Activity. The series are new construction plans for Manhattan and the other New York City boroughs.

Figure 7. Foreclosures. The series are the number of foreclosures in Manhattan and the Bronx from 1929, the first date that they are recorded in the *Real Estate Record and Builders' Guide.*



(a) Number of New Mortgages



(b) Value of New Mortgages

Figure 8. New mortgages. The figures plot the number and the total dollar value of new mortgages for buildings in Manhattan and the Bronx.

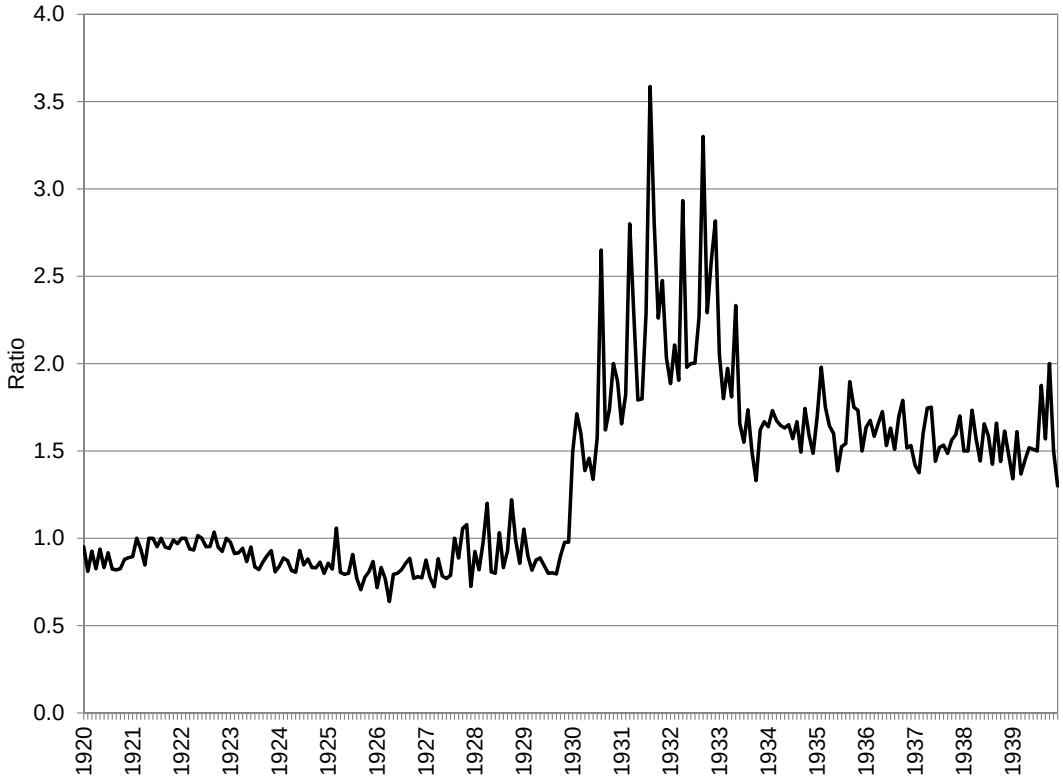


Figure 9. Assessed Value to Sale Price Ratio. The series is the monthly median ratio of the assessed value to sale price for properties sold in Manhattan.

Table I
Sample Description
This table describes the hand-collected transaction sample used in the index construction.

Panel A: Types of Houses

Building designation	
Tenement	52.71%
Dwelling	27.69%
Loft	10.43%
Other	9.17%

Construction material	
Brick	72.14%
Stone	26.65%
Other	1.21%

Additional features	
Store on 1st floor	33.17%
Basement	4.58%

Number of storeys	
1	2.38%
2	3.82%
3	18.73%
4	23.09%
5	37.00%
6	10.66%
7	1.56%
8 and over	2.76%
Total no. obs.	7,538

Panel B: Fraction of Observations by Zipcode

10001	2.52%	10011	4.11%	10021	2.59%	10030	1.92%	10039	0.42%
10002	7.32%	10012	1.94%	10022	2.87%	10031	2.33%	10040	0.32%
10003	4.02%	10013	3.28%	10023	3.52%	10032	1.31%	10044	0.01%
10004	0.52%	10014	2.76%	10024	3.50%	10033	0.89%	10065	1.87%
10005	0.49%	10016	3.57%	10025	3.99%	10034	0.53%	10075	1.55%
10006	0.54%	10017	1.47%	10026	3.50%	10035	3.93%	10128	2.53%
10007	2.02%	10018	1.21%	10027	4.91%	10036	1.99%	10280	0.01%
10009	3.34%	10019	3.04%	10028	2.48%	10037	1.35%		
10010	1.80%	10020	0.13%	10029	6.50%	10038	1.07%		

Panel C: Manhattan Neighborhoods and the Corresponding Zipcodes

Central Harlem - Morningside Heights	10026, 10027, 10030, 10037, 10039	13.00%
Chelsea - Clinton	10001, 10011, 10018, 10019, 10020, 10036	12.11%
East Harlem	10029, 10035	10.43%
Gramercy Park - Murray Hill	10010, 10016, 10017, 10022	9.71%
Greenwich Village - Soho	10012, 10013, 10014	7.97%
Lower Manhattan	10004, 10005, 10006, 10007, 10038, 10280	4.66%
Union Square - Lower East Side	10002, 10003, 10009	14.69%
Upper East Side	10021, 10028, 10044, 10128, 10065, 10075	11.04%
Upper West Side	10023, 10024, 10025	11.01%
Washington Heights - Inwood	10031, 10032, 10033, 10034, 10040	5.39%

Panel D: Sale Price Statistics by Year

	Price			Price/square foot			Percent of
Year	mean	median	st. dev.	mean	median	st.dev	foreclosures
1920	$42,484.46	$25,000.00	$61,900.96	$4.21	$2.67	$5.79	0.00%
1921	$40,095.82	$22,000.00	$62,111.79	$3.89	$2.48	$5.27	0.00%
1922	$43,318.62	$26,250.00	$60,453.64	$3.99	$2.65	$4.84	0.00%
1923	$47,429.89	$28,000.00	$64,410.97	$4.07	$2.69	$5.05	0.00%
1924	$44,373.98	$30,000.00	$46,602.85	$4.21	$3.08	$5.02	0.00%
1925	$60,610.19	$33,850.00	$81,815.41	$4.96	$3.23	$5.20	0.00%
1926	$62,732.08	$35,000.00	$83,834.75	$6.22	$3.79	$7.69	0.00%
1927	$61,495.56	$35,250.00	$76,393.15	$5.65	$3.64	$6.62	0.00%
1928	$65,875.23	$35,500.00	$90,912.66	$5.64	$3.34	$7.70	0.00%
1929	$75,733.53	$40,000.00	$100,976.10	$6.91	$3.82	$8.38	0.00%
1930	$56,437.11	$25,000.00	$86,175.37	$4.18	$2.07	$6.77	49.24%
1931	$51,335.46	$20,000.00	$81,777.72	$3.12	$1.65	$4.23	60.61%
1932	$45,736.64	$20,000.00	$75,643.27	$2.89	$1.61	$4.69	74.19%
1933	$59,694.74	$22,000.00	$97,203.78	$2.90	$1.72	$4.65	98.09%
1934	$57,102.75	$21,000.00	$95,183.79	$3.10	$1.70	$5.78	100.00%
1935	$42,941.29	$20,000.00	$73,950.08	$2.39	$1.69	$2.77	55.38%
1936	$37,400.37	$17,500.00	$66,238.79	$2.81	$1.75	$4.77	0.00%
1937	$29,869.22	$17,500.00	$43,247.65	$2.61	$1.66	$4.87	0.00%
1938	$31,693.69	$15,500.00	$53,855.95	$2.74	$1.53	$5.02	0.00%
1939	$30,307.51	$15,000.00	$42,162.28	$2.29	$1.50	$4.22	0.00%
All	$49,022.87	$25,000.00	$75,317.03	$3.84	$2.22	$5.66	24.94%

Table II

Hedonic Regression Coefficients

This table presents the regression coefficients of the quarterly constant-relative-value hedonic regression (1) of the natural logarithm of the sale price, adjusted by the CPI deflator, on the natural logarithm of the square footage, time dummies, and the building characteristic and location dummies. The time dummies are not reported; standard errors are clustered by date and t-statistics are reported in parentheses. Regression $R^2 = 45.80\%$.

log(sq. footage)	0.61***
	(42.02)
Building designation (comparison group: Tenement)	
Dwelling	0.46***
	(15.21)
Loft	0.46***
	(11.94)
Other	0.68***
	(17.42)
Construction material (comparison group: Brick)	
Stone	0.10***
	(4.52)
Other	-0.44***
	(-5.58)
Additional features	
Store on 1st floor	0.20***
	(7.94)
Basement	-0.19***
	(-3.76)
Number of storeys (comparison group: 6 and over)	
1	0.52***
	(7.76)
2	0.05
	(1.01)
3	-0.38***
	(-10.43)
4	-0.21***
	(-6.57)
5	-0.15***
	(-5.31)
Neighborhood (comparison group: Union Square - Lower East Side)	
Central Harlem - Morningside Heights	-0.07*
	(-1.75)
Chelsea - Clinton	0.60***
	(17.02)
East Harlem	-0.18***
	(-4.81)
Gramercy Park - Murray Hill	0.66***
	(17.11)
Greenwich Village - Soho	0.21***
	(5.09)
Lower Manhattan	0.59***
	(11.56)
Upper East Side	0.57***
	(14.94)
Upper West Side	0.45***
	(11.43)
Washington Heights - Inwood	0.22***
	(4.47)

***,**,* Statistically significant at the 1, 5, and 10 per cent levels, respectively

Table A1

Hedonic Regression Index Values

This table presents the values of a $1 investment in the real estate index computed using the constant-relative-value hedonic methodology.

Panel A: Quarterly Index

Date	Real index	Nominal index	Date	Real index	Nominal index
1920Q1	$1.00	$1.00	1930Q1	$0.92	$0.81
1920Q2	$0.87	$0.92	1930Q2	$1.12	$0.97
1920Q3	$0.81	$0.84	1930Q3	$0.91	$0.78
1920Q4	$0.93	$0.94	1930Q4	$0.81	$0.68
1921Q1	$0.75	$0.72	1931Q1	$0.80	$0.64
1921Q2	$0.94	$0.85	1931Q2	$0.82	$0.64
1921Q3	$0.95	$0.86	1931Q3	$0.86	$0.67
1921Q4	$1.17	$1.04	1931Q4	$0.86	$0.65
1922Q1	$1.04	$0.90	1932Q1	$0.87	$0.63
1922Q2	$1.06	$0.91	1932Q2	$0.91	$0.65
1922Q3	$1.06	$0.91	1932Q3	$0.81	$0.56
1922Q4	$0.99	$0.85	1932Q4	$0.77	$0.52
1923Q1	$1.10	$0.94	1933Q1	$1.09	$0.72
1923Q2	$1.17	$1.02	1933Q2	$1.01	$0.66
1923Q3	$1.15	$1.01	1933Q3	$1.14	$0.78
1923Q4	$1.13	$1.00	1933Q4	$1.07	$0.72
1924Q1	$1.00	$0.88	1934Q1	$1.05	$0.72
1924Q2	$1.10	$0.96	1934Q2	$1.04	$0.71
1924Q3	$0.99	$0.87	1934Q3	$1.00	$0.69
1924Q4	$1.12	$0.99	1934Q4	$1.01	$0.70
1925Q1	$0.91	$0.81	1935Q1	$0.74	$0.52
1925Q2	$1.23	$1.09	1935Q2	$0.90	$0.63
1925Q3	$1.20	$1.09	1935Q3	$0.83	$0.58
1925Q4	$1.20	$1.09	1935Q4	$0.73	$0.51
1926Q1	$1.35	$1.23	1936Q1	$0.82	$0.58
1926Q2	$1.42	$1.30	1936Q2	$0.80	$0.57
1926Q3	$1.14	$1.02	1936Q3	$0.76	$0.55
1926Q4	$1.26	$1.14	1936Q4	$0.90	$0.64
1927Q1	$1.40	$1.25	1937Q1	$0.80	$0.58
1927Q2	$1.35	$1.20	1937Q2	$0.68	$0.50
1927Q3	$1.12	$0.99	1937Q3	$0.68	$0.51
1927Q4	$1.18	$1.05	1937Q4	$0.77	$0.57
1928Q1	$1.01	$0.89	1938Q1	$0.74	$0.54
1928Q2	$1.18	$1.03	1938Q2	$0.76	$0.55
1928Q3	$1.21	$1.06	1938Q3	$0.80	$0.58
1928Q4	$1.31	$1.15	1938Q4	$0.78	$0.56
1929Q1	$1.30	$1.13	1939Q1	$0.80	$0.57
1929Q2	$1.11	$0.97	1939Q2	$0.81	$0.58
1929Q3	$1.77	$1.57	1939Q3	$0.68	$0.49
1929Q4	$1.47	$1.30	1939Q4	$0.77	$0.56

Panel B: Annual Index

Date	Real index	Nominal index
1920	$1.00	$1.00
1921	$1.04	$0.93
1922	$1.15	$0.96
1923	$1.26	$1.07
1924	$1.16	$1.00
1925	$1.25	$1.09
1926	$1.43	$1.27
1927	$1.40	$1.21
1928	$1.29	$1.10
1929	$1.54	$1.32
1930	$1.04	$0.87
1931	$0.92	$0.70
1932	$0.93	$0.63
1933	$1.19	$0.77
1934	$1.13	$0.76
1935	$0.88	$0.60
1936	$0.90	$0.63
1937	$0.81	$0.58
1938	$0.85	$0.60
1939	$0.85	$0.59

Table A2

Adjacent-Period Hedonic Regression Quarterly Index Values

This table presents the values of a $1 investment in the real estate index, computed using the adjacent-period hedonic methodology.

Panel A: Quarterly Index

Date	Real index	Nominal index	Date	Real index	Nominal index
1920Q1	$1.00	$1.00	1930Q1	$0.89	$0.77
1920Q2	$0.82	$0.87	1930Q2	$1.04	$0.90
1920Q3	$0.77	$0.80	1930Q3	$0.88	$0.75
1920Q4	$0.87	$0.87	1930Q4	$0.79	$0.66
1921Q1	$0.74	$0.70	1931Q1	$0.81	$0.65
1921Q2	$0.92	$0.83	1931Q2	$0.83	$0.65
1921Q3	$0.89	$0.81	1931Q3	$0.71	$0.55
1921Q4	$1.09	$0.97	1931Q4	$0.71	$0.54
1922Q1	$1.02	$0.88	1932Q1	$0.74	$0.53
1922Q2	$0.99	$0.85	1932Q2	$0.77	$0.55
1922Q3	$1.05	$0.89	1932Q3	$0.72	$0.50
1922Q4	$0.98	$0.84	1932Q4	$0.67	$0.46
1923Q1	$1.11	$0.95	1933Q1	$0.98	$0.64
1923Q2	$1.17	$1.01	1933Q2	$0.90	$0.59
1923Q3	$1.15	$1.01	1933Q3	$1.03	$0.70
1923Q4	$1.11	$0.98	1933Q4	$0.96	$0.65
1924Q1	$1.12	$0.98	1934Q1	$0.92	$0.63
1924Q2	$1.27	$1.11	1934Q2	$0.93	$0.64
1924Q3	$1.13	$0.99	1934Q3	$0.89	$0.62
1924Q4	$1.25	$1.10	1934Q4	$0.92	$0.64
1925Q1	$1.04	$0.92	1935Q1	$0.69	$0.49
1925Q2	$1.39	$1.23	1935Q2	$0.81	$0.57
1925Q3	$1.26	$1.14	1935Q3	$0.75	$0.53
1925Q4	$1.29	$1.18	1935Q4	$0.66	$0.47
1926Q1	$1.22	$1.11	1936Q1	$0.82	$0.58
1926Q2	$1.30	$1.19	1936Q2	$0.78	$0.55
1926Q3	$1.01	$0.91	1936Q3	$0.72	$0.52
1926Q4	$1.16	$1.05	1936Q4	$0.85	$0.61
1927Q1	$1.26	$1.12	1937Q1	$0.79	$0.58
1927Q2	$1.27	$1.14	1937Q2	$0.68	$0.50
1927Q3	$0.99	$0.88	1937Q3	$0.68	$0.51
1927Q4	$1.04	$0.92	1937Q4	$0.77	$0.57
1928Q1	$0.87	$0.77	1938Q1	$0.73	$0.54
1928Q2	$1.10	$0.96	1938Q2	$0.74	$0.54
1928Q3	$1.02	$0.90	1938Q3	$0.77	$0.56
1928Q4	$1.23	$1.08	1938Q4	$0.77	$0.56
1929Q1	$1.31	$1.14	1939Q1	$0.84	$0.60
1929Q2	$1.03	$0.90	1939Q2	$0.87	$0.62
1929Q3	$1.62	$1.43	1939Q3	$0.68	$0.49
1929Q4	$1.18	$1.04	1939Q4	$0.83	$0.60

Panel B: Annual Index

Date	Real index	Nominal index
1920	$1.00	$1.00
1921	$1.04	$0.93
1922	$1.15	$0.97
1923	$1.26	$1.07
1924	$1.28	$1.09
1925	$1.42	$1.24
1926	$1.61	$1.42
1927	$1.57	$1.36
1928	$1.46	$1.25
1929	$1.76	$1.51
1930	$1.29	$1.08
1931	$1.16	$0.88
1932	$1.19	$0.81
1933	$1.50	$0.97
1934	$1.43	$0.96
1935	$1.11	$0.76
1936	$1.18	$0.82
1937	$1.06	$0.76
1938	$1.10	$0.77
1939	$1.09	$0.76

Table A3
Hedonic Regression High- and Low-End Indexes

This table presents the values of a $1 investment in the high- and low-end real estate properties using the constant-relative-value hedonic methodology. High-end properties consist of dwellings in Chelsea - Clinton, Gramercy Park - Murray Hill, Upper East Side, and Upper West Side. Low-end properties consist of tenements in Union Square - Lower East Side, Central Harlem - Morningside Heights, and East Harlem.

	Low-end		High-end	
Date	Real index	Nominal index	Real index	Nominal index
1920	$1.00	$1.00	$1.00	$1.00
1921	$1.03	$0.91	$0.94	$0.84
1922	$0.97	$0.82	$1.08	$0.90
1923	$1.23	$1.05	$1.14	$0.96
1924	$1.43	$1.22	$1.30	$1.11
1925	$1.38	$1.21	$1.36	$1.20
1926	$1.32	$1.16	$1.52	$1.34
1927	$1.40	$1.22	$1.64	$1.42
1928	$1.09	$0.94	$1.87	$1.60
1929	$1.04	$0.89	$1.96	$1.68
1930	$0.77	$0.64	$1.32	$1.09
1931	$0.76	$0.57	$0.90	$0.69
1932	$0.83	$0.57	$1.05	$0.72
1933	$0.94	$0.61	$1.23	$0.79
1934	$0.94	$0.63	$1.27	$0.85
1935	$0.74	$0.51	$0.92	$0.63
1936	$0.77	$0.54	$0.85	$0.59
1937	$0.73	$0.52	$0.80	$0.58
1938	$0.72	$0.51	$0.90	$0.63
1939	$0.77	$0.54	$0.79	$0.55