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# Current Issues IN ECONOMICS AND FINANCE

SECOND DISTRICT HIGHLIGHTS

## The Price of Land in the New York Metropolitan Area

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*The price of vacant land in an urban area is a fundamental indicator of an area's attractiveness. However, because the value of vacant land is hard to measure, indirect methods are typically used to gauge prices. A more direct approach to measuring land prices, using a unique data set, reveals that the price of unimproved land in the New York area is high, and rose sharply from 1999 to 2006. The rising trend suggests the underlying strength of the area's economy and the increasing value of the area's productivity and amenities.*

On November 1, 2000, a 3.4-acre parcel of land at 10 Columbus Circle in Manhattan sold for $345 million, or roughly $2,300 per square foot.[1] The parcel is located 1.3 miles from the Empire State Building at the southwest corner of Central Park, and housed an exposition and convention center known as the New York Coliseum. The buyers quickly demolished that complex to make way for construction of the Time Warner Center, a 2.8-million-square-foot, largely commercial development that includes two office towers, a hotel, retail stores, and a parking garage. The Time Warner Center is now one of the most valuable properties in New York.

Physical space is a requirement for all types of economic activity, from housing to manufacturing and service production, making the value of land an important feature of any economy. The high price of the Columbus Circle property reminds us that the price of land in an urban area is a fundamental measure of the area's attractiveness. Moreover, changes in the value of land over time and space can provide insight into a host of important regional and macroeconomic issues. However, because land often comes bundled with a structure—and thus is generally not priced separately in a real estate transaction—its value is difficult to measure.

Although comprehensive data on the price of residential land are sparse, there is a common belief that prices rose sharply in the United States in recent years. Over the ten-year period ending in 2007, the widely cited Office of Federal Housing Enterprise Oversight (OFHEO) measure of home prices almost doubled nationally and rose 160 percent in the New York metropolitan area—substantial increases that suggest a jump in both the price of land and the price of houses.[2] While some of the factors that account for the rapid run-up in residential property prices, such as significant improvements to the housing stock in the form of renovations and additions, reflect the increasing amount of capital *on* the land, other factors—including market optimism, low interest rates, and generally sound economic fundamentals—would also drive up the value of land.[3]

Precise data on land sales have largely been lacking, however, and analysts have turned to indirect methods to measure land prices. Recent studies, for example, have sought to capture changes in the price of residential land as a weighted difference between changes in overall house price appreciation and changes in home construction costs.[4]

[1] Source: CoStar Group (<http://www.costar.com>).

[2] The OFHEO index is a measure of home price appreciation that controls for the quality of units by using a repeat-sale methodology.

[3] See McCarthy and Peach (2004).

In this issue of *Second District Highlights*, we take a more direct approach to measuring land prices. Specifically, we rely on a unique data set—one that, to date, has been used primarily by brokers, developers, owners, and appraisers—to calculate and analyze the price of land in the New York metropolitan area (Box 1).[5] The data set's detailed information on land transactions in the area from 1999 on allows us to identify purchases of vacant parcels of land or parcels with structures that the buyer intends to remove.[6] Isolating these purchases from the larger pool of land transactions is important because in these instances, the asset that the buyer values is strictly the land, not any structure that may be present. Apart from any demolition costs, the price of these properties thus provides a pure measure of the value of a particular location at a point in time. Moreover, because the purchase of land gives the new owner an option to build the optimal structure, subject to local regulations, the price of the parcel reflects the buyer's expected return on the development of the site. Changes in the price of land over time thus potentially offer insight into expectations of the future state of a local economy and the real estate market.

We find that the price of raw, or unimproved, land in New York is very high. Indeed, we estimate that the price of an acre of raw land near the Empire State Building rose sharply between 1999 and 2006 and was more than $90 million in mid-2006.[7] Moreover, proximity to the center of the metro area is extremely valuable, and firms and households are willing to pay a sizable premium to locate in or near Midtown Manhattan.

## Land Transactions in the New York Metropolitan Area

Conventional wisdom holds that vacant land is rare in urban areas, particularly in the New York area. Of the 6,186 land sales we examine between 1999 and mid-2006, 623 transactions or roughly 10 percent, were in Manhattan and 1,639, or about 25 percent, took place in the other parts of New York City; the remaining sales took place in northern and central New Jersey. Overall, vacant land transactions occurred throughout the region, with a heavy concentration in the most densely developed areas (see map).

Prices reflect the relative scarcity and desirability of vacant land. In the New York area, the average price of land transactions rose sharply during our sample period (see table). Note, however, that the figures in the table are not adjusted for any characteristics of the land being sold, and thus should be interpreted with caution. For example, as we observe later, the value of land is influenced significantly by its level of preparation for building. If the earlier years of our sample were dominated by sales of raw land and the later ones by more finished parcels, then the figures would overstate the "true" growth in land values over the period by reflecting in part the value of site preparation.

A key feature of a parcel of land typically associated with its price per square foot is distance from the city center—parcels closer to the center are expected to command a higher price. To gauge whether this *distance gradient* is present in our data, we

Box 1
### Data Set and Methodology

Our analysis of land transactions uses "COMPS," a micro data set of commercial real estate transactions produced by the CoStar Group.[a] The CoStar Group compiles the data—including information on both the terms of the sales and the characteristics of the properties sold—from the public records of buildings departments and other government agencies, supplemented by selected field surveys of the properties and by telephone interviews of parties to the transaction. Transactions are added to the data set as they are identified, making the data as timely as possible. Sales below $250,000 are largely omitted. The data set is thus a rich and unique source of detailed information.

Although COMPS covers real estate transactions of many kinds, we restrict our analysis to land purchases—transactions in which the buyer is solely or primarily interested in the parcel of land rather than any structures on it. This set of transactions involves vacant plots or plots with unoccupied structures slated for demolition and replacement by new construction; we exclude any property with occupied structures. Our sample, for the period from 1999 to mid-2006, consists of more than 6,000 individual land transactions in the New York metropolitan area.

The characteristics of the land transactions that we obtain from the data set include the sales price and size of the property, the transaction date, and the exact location (latitude and longitude as well as political jurisdiction) of the property. These data allow us to calculate a price per square foot of land at a particular location at a particular date. In addition, for each transaction, the data set reveals whether the land has been graded, paved, finished, or improved in any way; and what use is planned for the land—for example, residential, commercial, or industrial development; investment; or open space. The data set also includes information on whether the transaction represents an exercise of eminent domain, a condemnation, or an estate or bankruptcy sale.

[a]The CoStar Group is a provider of information services to commercial real estate professionals in the United States and the United Kingdom (see <http://www.costar.com/>).

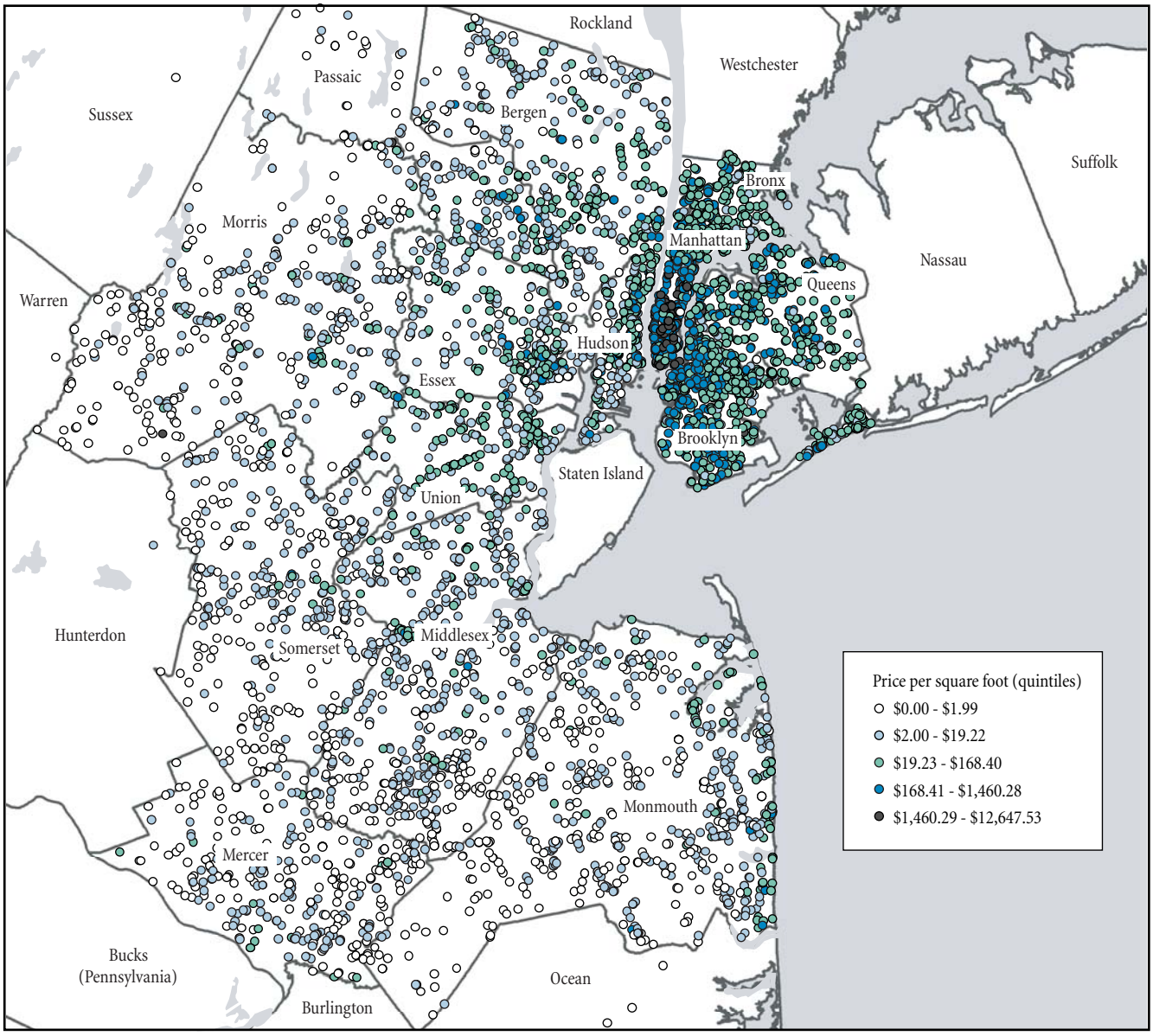
[4] See Davis and Heathcote (2007) and Davis and Palumbo (2006).

[5] For this article, we define the New York metro area as four boroughs of New York City—the Bronx, Brooklyn, Manhattan, and Queens—and ten counties in northern and central New Jersey. We exclude Staten Island, the fifth New York City borough, because transaction data are unavailable.

[6] The earliest year for which there is adequate coverage of land transactions is 1999; we end the sample period at June 30, 2006.

[7] Note that because our sample period ends in 2006, we do not address the effects of the current turmoil in the housing market.

Location and Price of Land Transactions in the New York Metro Area, 1999 through Mid-2006




Source: Federal Reserve Bank of New York, based on an analysis of CoStar Group data, April 2008.

Note: The New York metro area considered is the region defined in footnote 5.

plot the price per square foot of land and the distance, in kilometers, from the center of the New York metropolitan area (Chart 1). We designate the Empire State Building as the center because it is the site of the most intensive land use in the region, with 2.8 million square feet of office space on less than two acres, or 87,120 square feet, of land. The chart indeed shows a generally inverse, nonlinear relationship between price and distance from the city center, with prices highest very close to the Empire State Building. The chart also suggests a wide and growing variation in prices at any given distance from the city center.[8] While the chart, like the table, does not control for any characteristics of the transaction, the land, or the land's surroundings, it is interesting to note that the distance gradient is evident even when one does not account for any of these factors.

[8] Because the area described at a given distance from a fixed point grows as distance grows, we would expect variation to increase with distance. Not surprisingly, local conditions, and thus prices per square foot, are also more variable at greater distances from the city center.

**Average Price of Land in the New York Metro Area, 1999-2006**

| Year | Price (Dollars per Square Foot) |
|---|---|
| 1999 | 46.65 |
| 2000 | 55.65 |
| 2001 | 88.94 |
| 2002 | 71.95 |
| 2003 | 103.71 |
| 2004 | 150.63 |
| 2005 | 248.30 |
| 2006 | 366.08 |

Source: Federal Reserve Bank of New York, based on an analysis of CoStar Group data, April 2008.

Notes: Data for 2006 are through June 30. The New York metro area considered is the region defined in footnote 5.

## Determinants of Land Prices

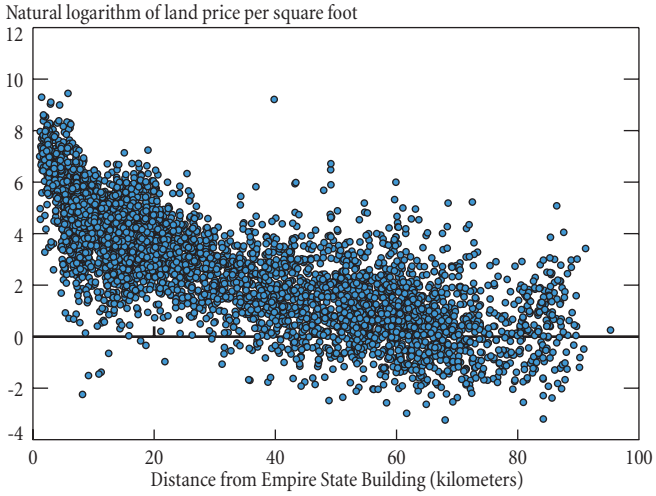
Land brings with it a broad range of attributes, and purchasers of land make bids that reflect their evaluation of these attributes. The set of relevant attributes includes the characteristics of the land, such as its topography and acreage, as well as access to valuable nonland attributes such as jobs, schools, and consumption opportunities. The price of a parcel of land therefore measures not only demand for the land as an input into the production of residential or commercial buildings, but also demand for these nonland attributes. In addition, because land is very durable, its price at any time has a forward-looking component associated with expected future changes in both the supply of these attributes and their value to users.

Vacant land is a unique commodity because, in addition to the attributes described, it offers its owner a low-cost option to build the optimal structure at the optimal time. The value of this option, reflected in the difference in price between developed and vacant land, will rise in times of uncertainty.[9] Recent evidence of an increase in "teardowns"—the process by which developed land can be converted back to vacant land—suggests that the value of this option has also increased in recent years, an idea that we consider later.

### *An Empirical Model of Land Prices*

To analyze the determinants of land prices, we rely on a regression framework that relates the sales price of a particular plot to the attributes of the land and to any special conditions of the sale (Box 2). This framework enables us to isolate changes in the price of raw land over space and time. Specifically, our data on land sales between 1999 and mid-2006 enable us to estimate how the price paid for the land is affected by the property's observable characteristics, including its condition and the county where it is located; details of the transaction, such as whether the land was sold as part of a foreclosure; the expected use of the land—industrial, commercial, or residential; and whether the property had an existing structure.[10] The presence of a structure that will be removed has complex effects on land prices. Because the structure will be costly to remove, its presence should serve to reduce prices. However, the fact that someone has already invested in a structure on a particular plot indicates a particularly good location, implying a higher price. Our location variables—county and distance from the Empire State Building—are imperfect measures of this locational effect. Because the differences among locations are largest near the fringe of the metro area, this locational effect should also grow in distance from the center. Accordingly, as a proxy for the unobserved quality of a location, we also separately estimate the distance effect for properties that have structures present at the time of sale.

Chart 1
Land Prices and Distance of Property from Empire State Building




Source: Federal Reserve Bank of New York, based on an analysis of CoStar Group data, April 2008.

Note: Land prices in the data set range from $.04 to more than $12,000 per square foot.

To account for the fact that the transactions in our data set occurred in different time periods, we include variables in our regression for the year and quarter in which the transaction took place. Estimates of these time effects control for the characteristics of the properties being sold each quarter and thus capture the "pure" increases in the price of land over time. We also control for the distance of the plot from the center of the metro area, the Empire State Building. These estimates provide insight into the usefulness of the land-value data set we have constructed and enable us to isolate the way in which land prices evolve over time and space.

The findings derived from our model and estimates are consistent with conventional theory on land price determination. Residential property was found to sell for a slightly higher price

[9] See Titman (1985).

[10] Approximately 10 percent of parcels are identified as having an existing structure at the time of sale.

Box 2

## Land Price Model

We estimate the determinants of land prices in the New York metropolitan area by using a straightforward linear regression model of land prices:

$$P_{i,j,t} = c + \gamma_j + \alpha_t + \theta_{j,t} + \varphi_j\, d + \beta_k\, X_{i,k} + \varepsilon_{i,j,t},$$

where the dependent variable, $P_{i,j,t}$, is the natural logarithm of the price paid per square foot for property $i$ of type $j$ in time period $t$; $\gamma_j$ is the price effect for property type $j$ ($j$= commercial, industrial, and residential); $\alpha_t$ is a separate price effect for each quarter ($t$) in our time period ($t$=1999:1-2006:2; 1999:1 is the omitted quarter); $\theta_{j,t}$ is the combined price effect of property type and time ($j$, $t$ combinations are, for example, residential property in 1999:2, residential property in 1999:3, commercial property in 1999:2); $d$ is the distance in kilometers of the property from the Empire State Building and $\varphi_j$ is the effect of distance on the price of type $j$ property; $X_{i,k}$ is a set of $k$ property characteristics and $\beta_k$ is a set of coefficients that summarize the relationship between the sales price and the $k$th property characteristic; and $\varepsilon_{i,j,t}$ is a random error term.

The coefficients on the time dummies, $\alpha_t$, give the change in the average price of vacant land each quarter relative to 1999:1, controlling for the characteristics of the property. Because a potentially large number of property characteristics and interactions exist, we estimated a variety of specifications and used statistical tests to select among them. The variables ($X_i$) and the estimated coefficients ($\beta$) for this preferred specification are presented in the table below. Note that this specification includes time dummies for only the quarter and year of the transaction and does not include interactions of time with the property characteristics. The regression is weighted to control for the possibility that the variability of prices increases with distance from the city center, as explained above.

### Model Estimates: Regression Results for Land Prices in the New York Metro Area

Dependent Variable: Natural Logarithm of Land Price per Square Foot

| | | | |
|---|---|---|---|
| Constant | 6.82 | Characteristics of transaction | |
| | (0.19) | Lot sold as part of expansion plans by buyer | 0.17 |
| Type of property ("commercial land" is omitted category) | | | (0.07) |
| Residential land | 0.09 | Foreclosure transaction | -0.38 |
| | (0.25) | | (0.17) |
| Industrial land | -0.75 | Eminent domain transaction | 0.38 |
| | (0.23) | | (0.18) |
| Condition of property ("unimproved" is omitted category) | | Lot has significant environmental problems | -0.81 |
| Lot is graded | 0.45 | | (0.14) |
| | (0.06) | Lot was not sold on the open market | 0.04 |
| Lot is paved | 0.45 | | (0.06) |
| | (0.09) | Intended use ("private development" is omitted category) | |
| Lot is "finished" | 0.45 | Buyer intends to hold lot for investment | -0.21 |
| | (0.05) | | (0.07) |
| Lot is "fully improved" | 0.38 | Lot is intended for public use | -0.48 |
| | (0.07) | | (0.08) |
| Lot was previously developed | 0.55 | Lot will be held as open space | -1.24 |
| | (0.06) | | (0.08) |
| Lot is currently "partially developed" | 0.55 | Intended use unknown | -0.19 |
| | (0.31) | | (0.07) |
| Lot is platted and engineered | 0.23 | Location | |
| | (0.37) | Natural logarithm of distance from ESB | -0.95 |
| Lot has a structure present | -.11 | | (0.05) |
| | (0.19) | Natural logarithm of distance from ESB * residential land | -0.32 |
| Structure present * natural logarithm of distance from ESB | 0.03 | | (0.04) |
| | (0.07) | | |
| Improvements not available | 0.23 | | |
| | (0.05) | | |

Source: Federal Reserve Bank of New York, based on an analysis of CoStar Group data, April 2008.

Notes: Standard errors are in parentheses. ESB is Empire State Building. The adjusted $R^2$ of the regression is 0.76. A regression replacing the quarterly dummy variables with separate time trends for commercial, industrial, and residential properties yields similar results, with quarterly appreciation rates of 3.4 percent for the commercial and industrial parcels and 5.5 percent for the residential parcels. All regressions also include county dummies. The estimated quarterly dummies are plotted in Chart 2. The New York metro area considered is the region defined in footnote 5.

than commercial property; industrial land commanded a significantly lower price than land designated commercial or residential. Land that was improved—graded, engineered, or finished—was worth more than unimproved land, with the price differential depending on the extent of the improvement. Land with an existing structure sold for less than unimproved land, although the effect was not statistically significant, while land with an existing structure further from the city core sold for more than unimproved land. Although this last finding suggests that the presence of a structure on parcels further from the core proxies for unobserved location quality, the effect is also statistically insignificant.

We also found that land that was known to have environmental problems, that was being purchased for public use or for open space, or that was expected to be held for investment purposes was significantly less valuable than land intended for immediate private development. More surprisingly perhaps, when we controlled for the land's intended use, our calculations showed that land purchased through exercise of the public sector's power of eminent domain sold for a somewhat higher price than land purchased on the open market.[11] Land that was the subject of a foreclosure sold at a discount. Moreover, after controlling for distance from the city center, we found that the county in which the parcel was located had a significant effect on price, suggesting that county-specific factors such as zoning, impact fees, and permit costs play an important role in determining land prices.

Significantly, even after we controlled for all of these features of the property and the transaction, vacant land prices in the New York metropolitan area were seen to decline with distance from the core, and the magnitude of the effect suggests a relatively rapid depreciation. In addition, the price of unimproved land increases sharply over our seven-and-a-half-year sample at all locations for which we have data. Our full analysis, however, suggests that the average price increases reported in the table indeed overstate the actual increases in raw land prices over the period. We now consider these results in more detail.

## Factors Driving New York Metro Area Land Prices

Two factors affecting land prices merit special attention. The first is the strong declining distance gradient that we find. This distance effect is consistent with the conventional economic view that the value of proximity to a central business district is "capitalized" into the price of a parcel of land. The effect is very strong in New York. We estimate that a parcel located five miles from the Empire State Building commands a price that is about twice as high as the price of a parcel ten miles away, all else being equal. This steep distance gradient reflects the unique role that Manhattan plays in the region's economy. Proximity to the center of the region is very valuable, and firms and households are willing to pay a large premium to locate in or near Midtown. The unique features of the region's geography—namely, the city's Hudson River border with New Jersey—also suggest a sharp drop-off in price in the first few miles, as locations near the Empire State Building and within the city can access the core while avoiding a river crossing.[12] The proximity premium is especially high for land to be used for residential purposes, perhaps reflecting the fact that space for residences is relatively sparse in Manhattan and nearby.[13]

A second factor worth noting is that, even after we control for the changing characteristics of the property sold, the price of land rose sharply during our sample period. Commercial and industrial land began the period rather sluggishly, with growth slow or negative until about mid-2003 (Chart 2). As of 2003:1, the price of a square foot of raw land intended for commercial use in Midtown Manhattan was almost precisely the same as in 1999:1. Indeed, the only statistically and economically significant deviations from the 1999:1 price were declines in 2000:4 and 2001:1, quarters that coincide with the onset of a local recession (the shaded band in the chart), and in 2001:3 and 2001:4 in the wake of the September 11 attack on the World Trade Center.[14] In both instances, prices bounced back relatively quickly, and by mid-2002 they had largely returned to their baseline level. Then, in 2003:3, as the local economy began to recover from the recession, commercial and industrial land prices began to rise fairly steadily, and by mid-2004 these differences were statistically and economically significant. Note that there were a number of zoning changes over this period that could have raised the value of commercial and industrial land.[15] At the close of the period, vacant land designated for both commercial and industrial use had more than doubled in value from 1999:1 levels.

According to our estimates, vacant land intended for residential use increased even more sharply in value, rising more than five-fold in the New York metropolitan area between 1999:1 and 2006:2. This increase far exceeds the roughly 130 percent jump in residential property prices over the period.[16] The rise in

[11] Note, however, that land purchased through eminent domain and intended for public use is less valuable than land bought for private development.

[12] Technically, we measure the effect of increasing distance within each county, which partially controls for the effect of river crossings.

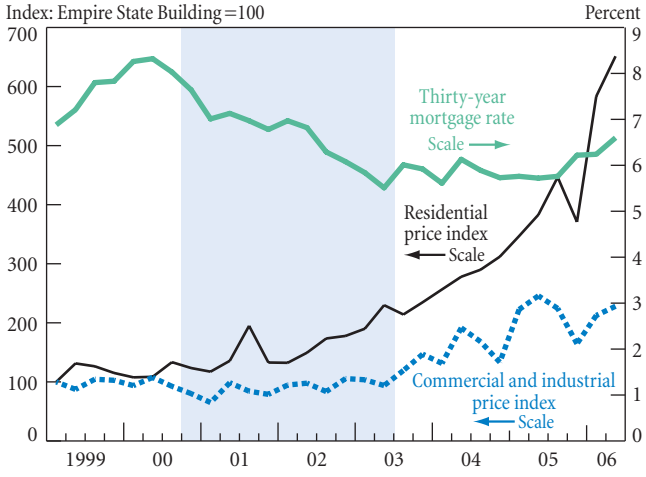
[13] Our finding that land prices decline as distance from the center increases is not a direct test of the validity of the monocentricity of the New York metropolitan area. Indeed, such a test would also involve looking for local peaks in land prices. See Anas, Arnott, and Small (1998).

[14] An index of coincident economic indicators developed by economists at the Federal Reserve Bank of New York shows that a cyclical peak in activity occurred in November 2000 in New Jersey and in January 2001 in New York City; the recovery began in February 2003 in New Jersey and in June 2003 in New York City. The index is available at <http://www.newyorkfed.org/research/regional_economy/coincident_summary.html>.

[15] For a discussion of the shortage of residential space in New York City, see Glaeser, Gyourko, and Saks (2005).

[16] The figure is based on the repeat home sales data reported by OFHEO.

Chart 2
Index of Land Prices in the New York Metro Area




Sources: Federal Reserve Bank of New York, based on an analysis of CoStar Group data, April 2008; Moody's economy.com.

Notes: The New York metro area considered is the region defined in footnote 5. The shaded band indicates the downturn in the New York City economy, which began in 2000:4 and ended in 2003:2.

residential land values began in 2001, somewhat earlier than the increase in commercial and industrial land values, and was more consistent over the period. Rising residential land prices throughout the local recession are consistent with the expected effects of the roughly 150 basis point decline in residential mortgage rates over the period (the thirty-year mortgage rate in Chart 2). Indeed, the only major departure from this steadily rising trend occurred in 2005:4, and was quickly reversed. The relatively flat prices for commercial and industrial land that held until the local economy rebounded in 2003, however, suggest that improved economic growth contributed importantly to the rise in the value of these parcels.

## Conclusion

Our analysis of vacant land transactions in the New York metropolitan area between 1999 and mid-2006 finds that about 10 percent of sales occurred in Manhattan and more than 25 percent took place within New York City. The detailed characteristics of each transaction enabled us to obtain a relatively pure measure of the price of land for residential, industrial, and commercial use, and to demonstrate how the price of land varies over space and time. In particular, we observe a relatively sharp decline in land prices with distance from the Empire State Building, our assumed center of the metropolitan area, and an upward movement in prices over time.

We interpret the rising price of sites for constructing businesses and residences as a key indicator of the strength of the area's economy and the increasing value of the productivity and amenities of a location in the region. Our estimated price trends suggest that the area's desirability for all types of activities increased sharply beginning in mid-2002, as the region emerged from a recession and the disruptions of the September 11 attack on the World Trade Center. The region's increasing land prices also indicate a rise in the perceived value of owning vacant parcels as potential building sites to meet future property demands. The numerous ongoing conversions of existing property throughout New York City suggest that the value of this option may be particularly high in the city.

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