



Determinants of industrial property rents in the Chicago metropolitan area[☆]

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ABSTRACT

Urban economists have long understood the theoretical importance of transportation infrastructure and accessibility on the location choice of households and firms. We utilize a readily available data set of transaction rents in the Chicago metropolitan area to investigate the determinants of industrial property rents. Among the factors considered are proximity to transportation infrastructure, characteristics of the property, the term structure of lease agreements, and local attributes of the neighborhood. Empirical results suggest property, lease, and local demographics play important roles in determining rents. Despite the fact that industrial property tends to locate very close to rail lines and interstate highways, transportation infrastructure has much less influence. There is evidence that there is an upward sloping lease term structure premium and that the premium varies over time. The model is also used to develop a constant quality rent index for the Chicago commercial property market. Compared to average rents and asking rents, the estimated constant quality index shows a smaller run up in rents from 2003 through 2008 and a larger drop off in rents through the end of 2011.

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1. Introduction and motivation

Urban location models emphasize the importance of accessibility in firm and household location choices. Transportation expenditures and logistic costs account for 4.8% and 7.7% of gross domestic product (GDP), respectively,² making transportation a central component of total costs for most businesses and an important component of GDP for the nation as a whole. In this paper, we study the industrial property market in the Chicago metropolitan area. The dominant form of industrial property in Chicago is warehouses, which are quintessentially transportation hubs. They function as the location where goods are collected from input sources and distributed to retail locations or to other firms. In fact, approximately one third of all US rail freight originates in, passes through, or terminates in Chicago. In terms of container volume, Chicago is the fourth largest handler behind Hong Kong,

Singapore, and Shanghai (Dijohn, 2010). In terms of square feet of leasable space in the Chicago metropolitan area, industrial property is much larger than office space or retail space. According to CoStar market reports, industrial property was 1,116,416,637 square feet, office property was 461,145,884 square feet, and retail property was 511,142,814 square feet of rentable space in the fourth quarter of 2012. Clearly, warehouses and associated industrial properties are especially important components of the economy for cities like Chicago and their surrounding areas.

In this paper, we examine how property, location, and lease characteristics determine rents for industrial property in the Chicago metropolitan area. The paper contributes to current knowledge on the determinants of property rents by including a detailed examination of the value of different attributes of industrial properties using a hedonic regression analysis. We observe the clustering of industrial property around airports, rail lines, and interstate highways and ask whether there is any rent premium associated with this clustering. We also observe a variety of lease terms (i.e., the length of the lease contract). Empirical tests are conducted to evaluate the lease term structure premium and its stability over time. Finally, the hedonic findings are used to derive a constant quality rent index, which can be compared with the information that is typically used by market participants.

Commercial brokers and brokerage firms provide extensive information to potential clients on property availability, market conditions, and prospective rents at different locations. Brokerage real estate firms such as Cushman and Wakefield are a common source of rents that landlords offer tenants at the beginning of negotiations. This is often

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² According to the Council of Supply Chain Management Professionals (CSCMP), expenditures on transportation were \$688 billion (4.8% of GDP) and the cost of logistics was \$1.1 trillion (7.7% of GDP) in the United States in 2009 (<http://cscmp.org/press/fastfacts.asp>).

referred to as the “asking rent”. In addition, brokers often post listings on a centralized web site such as CoStar, which also reports average rents for all transactions. However, does this information accurately reflect market conditions? One limitation of inter-temporal comparisons of average rents is that the average property may change qualitatively over time. We find that compared to the constant quality rents derived in this paper, average asking rents and average transaction rents overstated the increase in rents when the market was expanding and subsequently missed the timing of the peak of the real estate market cycle. This divergence can have implications for policies and programs targeting industrial properties, industrial–urban development, and the efficiency of industrial property markets.

2. Relevant literature

The role of rents in the urban environment and the capitalization of those rents into prices have been the subject of ongoing research for many decades. Indeed, von Thünen showed the link between agricultural land prices and proximity to markets in his book *The Isolated State*, in 1826. The hedonic method was first used by [Waugh \(1928\)](#) to model agricultural markets, and it was further enhanced by [Lancaster \(1966\)](#) as well as [Griliches \(1967, 1971\)](#). [Rosen \(1974\)](#) formalized a two-stage model to derive implicit market demand functions and many subsequent studies have examined the role of both structural and site location attributes on property values. Recognizing that there are no explicit market values for specific characteristics (e.g., floor size) of certain goods or services (e.g., rental properties), hedonic pricing reveals the implicit prices for each individual attribute from the observed market value of the asset. In the context of leased space, the rental rate represents the value the renter places on the physical attributes of the space and building, the attributes of the location, and the attributes of the lease as well as the supply of these attributes in the market.

Rents are part of a larger structural model where firms must decide whether to own property or rent it while at the same time finding the best location and best lease structure. Similar to many prior research efforts, our research conducts a reduced form approach that analyzes the outcome (the rent level) that incorporates all of these factors.³ Although much of the prior hedonic research has focused on single-family residential property markets, there has been an increase in interest in commercial property values and rents (e.g., [Ambrose, 1990](#); [Brounen and Jennen, 2009](#); [Chegut et al., 2011](#); [Cutter and DeWoody, 2010](#); [Fehribach et al., 1993](#); [Slade, 2000](#); [Munneke and Slade, 2000, 2001](#); [Sivitanidou and Wheaton, 1992](#); [Sivitanidou and Sivitanides, 1995](#); [Sivitanidou, 1995](#); [Jennen and Brounen, 2009](#); [Brunauer et al., 2010](#); [Conroy and Milosch, 2011](#))⁴, and some of that literature examines industrial property rents ([Ambrose, 1990](#); [Sivitanidou and Sivitanides, 1995](#); [Sivitanidou, 1995](#); [Ryan, 2005](#)). Most of these studies rely on a fairly small sample of observations that was accessed through a local brokerage firm. The findings are mixed. For example, [Sivitanidou and Sivitanides \(1995\)](#) examined the determinants of 461 asking rents in

Los Angeles. The results indicate that freeway density, proximity to freeway intersections, and proximity to a major airport all had a positive and significant impact on industrial rents. [Sivitanidou \(1995\)](#) finds similar results on warehouse and distribution asking rents in the Los Angeles area, but she finds differences between large (i.e., more than 45,000 sq. ft.) and small properties (i.e., between 10,000 and 45,000 sq. ft.) properties. Specifically, the impact of proximity to transportation infrastructure (i.e., airports, highways) is more pronounced for larger properties.

Renters will only pay a premium for these types of locations if there is sufficient demand relative to the supply. Major international airports (e.g., LAX (Los Angeles international airport) and O'Hare) are just the types of locations that are likely to have some intrinsic value and are limited in supply. As a result, transportation related firms are likely to compete, bidding against each other to be close to large international airports and as a result, drive up rents. In contrast, interstate highways and railways are much more ubiquitous in most cities and metropolitan areas. Thus, we should expect that the premiums associated with these types of transportation infrastructure may be more muted or may not exist at all.

Finally, a number of studies examine the influence of the lease term structure ([Ambrose and Yildirim, 2008](#); [Bond et al., 2008](#); [Clapham and Gunnelin, 2003](#); [Englund et al., 2004](#); [Englund et al., 2008](#); [Gunnelin and Soderberg, 2003](#)) on property rents. Most of these studies find that there is a positive relationship between the length of the lease term and the rent. However, before the downturn in the early 1990s, long-term rents were lower than short term rents for office space in Stockholm Sweden. In general, the evidence indicates that long-term rents do tend to predict short term rents but they are underestimated. This indicates that market participants may be able to, at least partially, predict future declines in rents. These results imply that a rent index should hold constant not just location and property characteristics but also lease term and potentially other lease attributes.

This paper contributes to these lines of literature by developing a hedonic model of industrial rents in the Chicago metropolitan area, and controlling for a wide range of determinants including characteristics of the property, access to transportation infrastructure, neighborhood features, and the term structure of the lease agreement. The hedonic model is estimated over a recent time period, which includes large macroeconomic shocks to the economy and we develop a constant quality industrial rent index to track changes in rents over the business cycle. The remainder of the paper reviews the hedonic model, presents the data, introduces the empirical results, and provides a discussion of the results and conclusion.

3. Empirical specification and data

We estimate several semi-log hedonic models using an ordinary least squares model (OLS) and a spatial error model (SEM). The specification includes the attributes of the property, the location, and the lease,

$$\ln(r) = \beta X + \gamma \quad (1)$$

where r is the $n \times 1$ vector of observations on the dependent variable (real rent per square foot per year), β is the $k \times 1$ vector of regression parameters to be estimated empirically, X is the $n \times k$ matrix of observation on k explanatory variables, and γ is a $n \times 1$ vector of errors. The vector of explanatory variables X consists of hedonic characteristics of the property (i.e., structural attributes such as building age, drive-ins, parking ratio, etc.), characteristics of the location of each building relative to transportation infrastructure (i.e., distance to the closest airport, rail line, water port, and intermodal points), lease attributes (i.e., the year when the lease is signed, lease type, use, occupancy, and lease purpose) and local neighborhood characteristics (i.e., distance to commuter rail stations, the fraction of the population that is nonwhite, median age, population density, and average household age).

³ A different line of research more explicitly measures the supply and demand for space. For example, [Blank and Winnick \(1953\)](#) developed a model of the relationship between rents and vacancy rates in the housing market and the importance of unoccupied space and rents has been studied extensively, particularly for the US office markets (e.g., [Shilling et al., 1987](#), and [Wheaton and Torto, 1988](#)). There is strong empirical evidence that rents go down when vacancy rates increase and employment decreases and that there is persistence in how rents evolve over time ([Wheaton et al., 1997](#) and [Brounen and Jennen, 2009](#)).

⁴ Commercial property rents have also been studied using different approaches, including first, a structural and stock adjustment framework at a micro or property level (e.g., [Benjamin et al., 1998](#); [Wheaton et al., 1997](#)); second, an error correction model that identifies long-run relationships and short-run dynamic responses to deviations from equilibrium in the same specification at the aggregate level (e.g., [Hendershott et al., 2002a, 2002b](#); [Brounen and Jennen, 2009](#); [De Francesco, 2008](#)); third, repeat-sales transactions (e.g., [Wheaton et al., 2009](#)); and fourth, the Poisson model (e.g., [Anglin, 1994](#); [Williams, 1998](#); [Buttimer and Ott, 2007](#)).

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