# The Commercial Office Market and the Markup for Full Service Leases

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## Abstract

Because landlords assume all of the operating expense risk, rents for gross leases exceed those for triple-net leases. The markup for gross leases varies between properties and across markets. In this study, we develop a theory explaining the spread between gross and triple-net rents for office space across urban markets. The markup for gross leases is expected to increase with both the average cost real estate services (property operating expenses) and higher uncertainty of those costs, increasing risk aversity of building owners, a decrease in the amount of currently available space, increasing employment growth and decreasing availability of future office space. A multi-stage model is developed with the first stage estimating triple-net rent through its proposed determinants. Stage 2 uses the estimated coefficients from the triple-net rent equations to generate expected rents for gross leases with which we estimate the gross rent markup for each property. Using a data set of 22,972 observations on office properties in 29 different markets for July, 2010, we estimate a model of the determinants of the gross rent markup and find statistically significant evidence supporting each of the posited effects. The contribution of this research is two-fold. First, it explores a topic that is under-represented in the academic literature on real estate economics. Secondly, it is the only research effort to date that explores the differentials between lease structures across a diverse group of metropolitan areas.

**"The Commercial Office Market and the Markup for Full Service Leases"**

## Introduction

Both gross and net leases are commonly used for commercial office space. With a gross lease, a commercial landlord bears all of the risk associated with future operating expenses. With a net lease, the tenant pays a lower rent, but also pays for operating expenses. The spread, or markup, between the gross rent and the net rent for identical space represents the additional rent paid to cover operating expenses. Intuitively, a commercial landlord choosing to use a gross lease seeks a markup that will cover all of the operating expenses for the term of the lease, including a premium that covers the risk of future expense increases.

Any trend and volatility associated with future operating expenses may not be completely mitigated with the markup. For example, looking at a component of operating costs in a study of Chicago using 1991 data, McDonald (1993) finds that 45 percent of property tax differentials across buildings are shifted to the tenants in the form of higher gross rents. Thus, for gross leases in this market for the period studied, 55% of the property tax differentials are absorbed by building owners. In an earlier study, Wheaton (1984) finds that interjurisdictional differences in property taxes (amount paid per square foot) had no effect on gross rents in Boston office buildings.

Given that operating costs vary across geographies, buildings and jurisdictions, it may prove difficult for landlords to recoup all of their operating expenses through a gross lease. But, landlords may be able to reduce operating expenses through efficiencies. The purpose of the paper is to investigate the determinants of the gross lease markup. The next section provides a background. Subsequent sections specify a theoretical model and present the empirical results.

## Background

Landlords are willing to sacrifice rent and tenants are willing to accept a discount in exchange for the tenant's acceptance of the responsibility for uncertain future operating expenses. The difference between the higher rent of a gross lease and the lower rent of a net lease on similar premises reflects a value exchange between the landlord and the tenant associated with the uncertain future operating expenses. This markup to the net lease is likely to exceed future operating expenses as landlord's build in expected inflation and uncertainty. Albert and McIntosh (1989) model the indifference rents between gross and net leases and justify a mark-up that is greater than expected operating expenses.

The shifting of expense risk between the parties to the lease is not without its complications. Under a net lease the tenant has a perverse incentive to either overuse or undermaintain the net leased property because the tenant has no motivation to preserve the property value (Benjamin et al.,1995). Agency costs may exist in leases because the landlord maintains and manages the property but recovers the cost by way of a service charge (Miceli and Sirmans, 1995). Additional complications are induced by contractual features such as expense stops.

Mooradian and Yang (2002) model the tenant's choice between a gross lease and a net lease. Under symmetric information between the parties to the lease, and assuming the landlord can provide services at a lower cost, their model shows that landlords price all leases such that all tenants choose a gross lease. However, with asymmetric information, landlords offer both gross and net leases. In this environment, a smaller proportion of tenants, specifically those with very high utilization of the leased space (higher operating costs), choose a gross lease. The tenant's utilization of the property, which is private information, drives the tenant's choice decision subject to the market power of the landlord.

## Model

In a market for office leases, space is absorbed at the negotiated rent, with contract parameters for the length of lease and services included. Each period begins with an aggregate vacancy which includes a distribution of available space $S$. Periods last a discrete time interval $\Delta > 0$, and the market spans an infinite sequence of such intervals. A potential tenant has space requirements $s^T \in [\underline{s}, \bar{s}]$ for a given construction quality and location within the market. Satisfying these criteria in this period is a fixed number of suitable units $m_S$. Entrance of potential tenants to the market having similar criteria is random, following a Poisson process with arrival rate $\lambda(\dot{e} \mid \underline{s}, \bar{s})$, contingent on changes in local employment from the previous period $\dot{e}$, $\lambda_{\dot{e}} > 0$.

Potential tenants alternate bidding on properties of interest, with the distribution of bids given as $R^T(\lambda, m \mid \underline{s}, \bar{s})$. Each property corresponds with an owner who has initial financial conditions determined by the cost of purchase/development, operating costs, existing contracts, and property vacancy. Owner $i$ has reservation price of $r^i$ for each space; which is the lowest amount the owner would be willing to accept assuming that the tenant agrees to pay all associated expenses. The reservation price of the owner determines the probability of finding a match wherein a tenant signs a contract for the available space. The probability of a match in the current period is $g_0(m_0, \lambda \mid r^i)$, $g_\lambda > 0, g_m < 0$. The rent expectation, given that a match is found in the current period is $\hat{r}_0(R_0^T \mid r^i)$.

When a match does not occur in the current period, search continues into the following period with probability $(1-g)$, $0 < g < 1$. In the subsequent period, the supply of office space $m_1$ may change. An owner who considers a bid from a potential tenant must evaluate the possibility of receiving either a higher bid in the current period, or a higher bid in the future, with future rents discounted by the owner's personal discount rate $\delta$, $0 < \delta < 1$. An owner will accept a bid when that bid is higher than the present value of what could reasonably be expected from alternative candidates. Thus, the minimum acceptable rent for an offer where the tenant agrees to pay all associated expenses, described as the triple net (NNN) lease, is characterized by the following series

$$r_{NNN}^i = g_0\hat{r}_0 + \frac{(1-g_0)g_1\hat{r}_1}{1+\delta} + \frac{(1-g_0)(1-g_1)g_1\hat{r}_1}{(1+\delta)^2} + \frac{(1-g_0)(1-g_1)^2 g_1\hat{r}_1}{(1+\delta)^3} + \ldots$$

The cost of services includes the pro rata share of property taxes, insurance, utilities and maintenance, distributed as $C$. The mean $\hat{c}$ and variance $\sigma_C$ for these services is influenced by exogenous factors, including property age, design and material technology. Owners may be willing to accept bids which require them to pay for these services assuming that they are compensated for the average cost of services $\hat{c}$ plus a risk premium $\pi^i(\sigma_C)$ which depends on the owner's aversion to risk, $\pi_\sigma > 0$. In order to accept these terms, the quantities $\hat{c}$ and $\pi^i(\sigma_C)$ must be added to the rate that an owner could reasonably expect without such terms included. The minimum acceptable rent for an owner who commits to paying all associated expenses, considered a full services gross (G) lease, is represented as

$$r_G^i = g_0\left(\hat{r}_0 + \hat{c} + \pi_C^i\right) + \frac{(1-g_0)g_1\left(\hat{r}_1 + \hat{c} + \pi_C^i\right)}{1+\delta} + \frac{(1-g_0)(1-g_1)g_1\left(\hat{r}_1 + \hat{c} + \pi_C^i\right)}{(1+\delta)^2} + \ldots$$

Considering the properties for the geometric convergence series in $\sum_{t=0}^{\infty}\left(\frac{1-g_1}{1+\delta}\right)^t$, the difference between the level of acceptable rents under a gross lease and a triple net lease can be expressed as

$$r_G^i - r_{NNN}^i = g_0\left(\hat{c} + \pi_C^i\right) + \frac{(1-g_0)g_1\left(\hat{c} + \pi_C^i\right)}{\delta + g_1}$$

Equation (3) describes the markup for gross leases $\left(r_G^i - r_{NNN}^i\right)$ as a function of the average cost of services and its variance as well as market conditions, including the probability of a match in current or future periods – influenced by factors for office supply and demand.

The initial result is that the markup for gross leases depends heavily on the expected cost of services. Older properties and those constructed with substandard technology, including low-quality building materials and dated design, are expected to have higher markups for the gross lease.

**Result 1.** The markup for gross leases $\left(r_G^i - r_{NNN}^i\right)$ is increasing with the average cost of services $(\hat{c})$.

*Proof:*

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial \hat{c}} = g_0 + \frac{(1-g_0)g_1}{\delta + g_1} > 0. \qquad q.e.d.$$

Beyond the absolute level for the cost of services, variance in these costs increases uncertainty and leads to larger risk premiums for risk averse property owners. The cost of services varies across geographic markets and is dependent upon a number of factors, including the source of energy, local climate, and the presence of labor unions among other things.

**Result 2.** The markup for gross leases $\left(r_G^i - r_{NNN}^i\right)$ is higher when there is greater uncertainty surrounding the expected cost of operating expenses $\left(\sigma_C\right)$.

*Proof:* $\pi_\sigma > 0$, therefore

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial \sigma_C} = g_0 \pi_\sigma + \frac{\left(1-g_0\right) g_1 \pi_\sigma}{\delta + g_1} > 0. \qquad q.e.d.$$

The level of risk aversion is owner-specific and those with higher levels of risk aversion will insist on higher premiums for carrying the uncertainty in the cost of services. Risk aversion may vary by the proximity of the owner to the property (or sophistication). For instance, local owners often have superior information about the actual cost of property operations leading to lower risk premiums, ceteris paribus. If true, then Result 3 suggests that the markup for gross leases is expected to be higher for out-of-town property owners.

**Result 3.** The markup for gross leases $\left(r_G - r_{NNN}\right)$ is higher for owners that are more risk averse.

*Proof:* Owner *i* is more risk averse than owner *j*, when $\pi^i\left(\sigma\right) > \pi^j\left(\sigma\right)$, $\forall \sigma$.

Therefore, $\left(r_G^i - r_{NNN}^i\right) - \left(r_G^j - r_{NNN}^j\right) = \left[g_0 + \frac{\left(1-g_0\right) g_1}{\delta + g_1}\right]\left(\pi_C^i - \pi_C^j\right) > 0.$ *q.e.d.*

The current amount of space available $(m_0)$ depends on whether the office market is presently overbuilt. Excess office space intensifies competition among property owners and reduces the probability of finding a suitable match. This behavior lowers the acceptable bid amount for a gross lease.

**Result 4.** An increase in the amount of space currently available $(m_0)$ leads to a reduction in the markup for gross leases $\left(r_G^i - r_{NNN}^i\right)$.

*Proof:* $g_m < 0$, $0 < g < 1$, and $0 < \delta < 1$, therefore

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial m_0} = g_m\left(\hat{c} + \pi_C^i\right)\left(1 - \frac{g_1}{\delta + g_1}\right) < 0. \qquad q.e.d.$$

Result 4 considers the static case for the office market, yet many property owners are forward-looking. When employment growth is expected to change in the future, the flow of potential tenants to the market will change. The threshold for an acceptable lease bid is also modified. An increased trajectory for local employment enhances the bargaining power of property owners who become less inclined to accept discounted offers for full service leases. Rejecting a low offer is less costly as conditions improve along with the prospects of finding an alternative tenant.

**Result 5.** The markup for gross leases $\left(r_G^i - r_{NNN}^i\right)$ is increasing with employment growth $(\dot{e})$.

*Proof:* See Appendix.

The impact of employment growth on leasing rates is evaluated under conditions where the rate of space availability is constant. Supply of office space responds to changing market conditions with a lag to accommodate the planning, entitlement and construction period. Elasticities for the office product vary across markets and across time. Existing owners in supply-constrained office markets experience a bargaining advantage due to limitations on the opportunities for developers to build substitute properties. Conversely, loose office markets are characterized by an increasing rate of available space and correspond with lower markups for full service leases. Restrictions on the supply response mechanism include strictness in permitting and entitlement, land scarcity, and where construction is costly. Each of these factors are expected to contribute to higher markups for full services leases.

**Result 6.** The markup for gross leases $\left(r_G^i - r_{NNN}^i\right)$ is reduced when the rate of future space availability $\left(m_1\right)$ rises.

*Proof:* $g_m < 0$, $0 < g < 1$, and $0 < \delta < 1$, therefore

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial m_1} = \frac{g_m\left(1-g_0\right)\left(\hat{c}+\pi_C^i\right)}{\delta + g_1}\left(1 - \frac{g_1}{\delta + g_1}\right) < 0 . \qquad q.e.d.$$

## Data & Method

The empirical approach involves a sequence of steps. We consider the rent for a triple net lease to be the "basic" rent for office real estate that excludes the cost of services. The cost of services is then paid separately by the tenant. First, we set up and estimate a the triple net rent equation for each market based on property hedonics and controlling for submarkets. The property variables include the log of property age (*Age*), indicator variables for property class (*Class A*, *Class B*), acreage (*Land area*), building height (*Number of stories*), square footage per floor (*RBA per floor*), building occupancy (*Percent leased*), and owner locality (*Out-of-state Owner*), along with office submarket indicator variables. For each of the 29 markets the first stage is estimated for the triple net sample as:

$$\ln(Rent_{NNN}) = \beta_0 + \beta_1 \cdot Class\ A + \beta_2 \cdot Class\ B + \beta_3 \cdot \ln(Age) + \beta_4 \cdot Land\ area + \beta_5 \cdot Number\ of\ stories + \beta_6 \cdot RBA\ per\ floor + \beta_7 \cdot Percent\ leased + \beta_8 \cdot Out\text{-}of\text{-}town\ Owner + \sum \beta_j \cdot Submarket_j + \varepsilon. \quad (4)$$

$Rent_{NNN}$ is a weighted average asking rent for the triple net space available in each property, weighted by the space available.

The initial data include a sample of 22,972 observations for office properties collected from 29 markets in the CoStar® Property database during July 2010. The markets are selected based on joint availability for market variables considered in this study. Table 1 shows the markets that are included in the study, the number of observations in each market, and the percentage of net leases in each sampled market. The CoStar Property database provides extensive property-level data for active listings, including property class, age, size, vacancy, quoted rates, and services included. From the direct services column we are able to distinguish between space marketed as "Full Services Gross" and that marketed as offering "Triple Net" services. Each of the variables used for the triple net rent equation is reported directly by CoStar, with the exception of *Out-of-state Owner*, which identifies observations where the state listed in the property owner's address does not match the state listed in the property address.

Panel A of Table 2 shows the definition of all of the property variables pulled from the CoStar database with Panel A of Table 3 showing summary statistics of these variables broken out by gross or triple net lease.

In the next stage of the analysis, the estimated coefficients from equation (1) are used to generate expected triple net rents to match to the observed gross lease rents. Thus, for a property in the gross lease subset of market *K* with hedonic characteristics *H*, the expected rent for basic real estate services, ie. the triple net rent, is calculated as $\hat{R} = \hat{\beta}_K \cdot H$, where $\hat{\beta}_K$ is the vector of estimated coefficients from equation (1) for market *K*. With the actual rents for the full service gross leases listed as $Rent_{\text{Gross}}$, the markup for services in the gross lease beyond the estimated base rent is measured as the actual gross asking rent minus the expected net rent for the same building:

$$\textit{Services markup} = \ln(Rent_{\text{Gross}}) - \hat{R}. \qquad (2)$$

Since the cost of services should be positive, we only consider observations where *Services markup* is greater than zero.[1]

Next, we merge the data for the estimated cost of services (*Services markup*), including the property hedonics, with data collected for market factors that might influence the estimated cost of services. From the model, the list of relevant factors includes the expectation for the cost of services, uncertainty about the future cost of services, risk aversion by owners, market vacancy rates, employment growth, and supply constraints. The variables used to evaluate each of these effects are shown in Panel B of Table 2 and summarized statistically in Panel B of Table 2, as well as being described below.

As a measure for differences in the expected cost of services across markets, we collect property and loan data from the Bloomberg CMBS database for July 2010. The sample includes data on 7,329 loans secured by office properties in the 29 markets. For

[1] This eliminates 4,020 observations from the gross lease sample.

each market, we calculate *Expense ratio* as the average reported property expenses divided by property revenue. For example, there are 915 active loans secured by office properties in the Bloomberg CMBS database for Los Angeles, and the average calculated expense ratio is 36.7 percent. The highest reported value of *Expense ratio* is 48.8 percent for Houston and the minimum is 34.7 percent for Charlotte.

At the market level, commercial property expenses are a function of several factors of which the most readily available are property taxation rates and electricity costs. *Property tax rate* is calculated as the total dollar amount of state and local government revenues from property tax collections divided by total personal income, collected from the Survey of State and Local Government Finances (2008) reported by the US Census Bureau. This measurement is similar to those used in previous studies, including Helms (1985).[2] The highest value of *Property tax rate* is that of New Jersey, at 5.1 percent; the lowest is for Oklahoma at 1.6 percent. Data for electricity costs are collected from the Department of Energy (DOE) website, which reports the average retail price of electricity in the commercial sector in Table 5.6.B. To proxy for uncertainty in operating expenses, the variable $\Delta$*Electricity cost* measures the change in retail prices of electricity from March 2009 to March 2010.

Employment data are collected from the Bureau of Labor Statistics (BLS) website. To focus on employment in the office market, *Employment* measures the 2009 annual employment in the Financial Activities, Business & Professional Services, and Information sectors for each market. *Employment growth* measures the percentage change in employment from 2008 to 2009. The largest drop in employment is the 10.9 percent loss experienced by Detroit.

[2] It was not feasible to separate the commercial property tax burden from the residential tax burden.

Office market conditions are extracted from the Mid-year 2010 CoStar® Office Market Reports, collected for each market. The CoStar Reports provide an extensive summary of current office market conditions, including vacancy rates (*Vacancy*), weighted average asking rents (*Quoted rates*), total rentable building area, and the distribution of lease expiration dates. *Tenant turnover* measures the percentage of existing leases in the office market scheduled to expire in the following year, 2011. The *Tenant turnover* variable is created to use as a control for differences in standard lease lengths across markets. Our expectation is that property owners will have lower markups for services in markets where tenant turnover is high. The percent of leases set to expire in 2011 ranges from 6.7 percent in New York City to 20.8 percent in Orlando with the average for the 29 markets at 13.9 percent.

While rents and vacancy rates characterize the office market equilibrium, the equilibrium price and absorption of space is a function of the relative amount of office space. *Relative RBA* measures the total rentable building area (RBA) in the market divided by the total office market employment in 2009 from BLS. *Relative RBA* ranges from the relative tight office market of Northern New Jersey with just 41.1 square feet per employee to the capacious Raleigh/Durham market with 163.2 square feet per employee.

Supply constraints limit the opportunities for competitors to develop substitute properties thus enhancing the bargaining power of existing property owners. Geographic supply constraints intensify land scarcity and the demand for central location. The variable *Undevelopable* is a recent creation by Saiz (2010) and measures the percentage of undevelopable land in the local market resulting from geographic constraints.

*Undevelopable* ranges from 1.4 percent in the flat and landlocked Indianapolis market to 76.6 percent in South Florida. Another restriction in the supply elasticity of an office market is in the local labor costs and financial feasibility. RS Means (2010) reports location factors for the construction of commercial buildings, including the costs of installation (*Construction costs*). Among other things, installation costs are affected by the presence of labor unions and access to low-cost labor. New York City is the most expensive market at 166.3 percent of the national average, and Raleigh/Durham is the least expensive at 49.4 percent of the national average.

The final step in the empirical analysis examines the impact of property and market variables on the cost of services. In the base model, the price of services should be influenced by the vector of property hedonics (*H*) and differences in the cost of services, rent and vacancies across markets, while controlling for lease maturities. The base model including the property and market factors is:

$$\begin{aligned} \textit{Services Markup} = {} & \beta_0 + \beta_1 \cdot \textit{Class A} + \beta_2 \cdot \textit{Class B} + \beta_3 \cdot \ln(\textit{Age}) + \beta_4 \cdot \textit{Land} \\ & \textit{area} + \beta_5 \cdot \ln(\textit{RBA}) + \beta_6 \cdot \textit{Percent leased} + \beta_7 \cdot \textit{Out-of-state Owner} + \\ & \beta_8 \cdot \textit{Expense ratio} + \beta_9 \cdot \textit{Tenant turnover} + \beta_{10} \cdot \textit{Vacancy} + \\ & \beta_{11} \cdot \textit{Quoted rates} + \varepsilon. \text{ [plus market/submarket variables]} \end{aligned} \qquad (3)$$

As a check for robustness of the services markup equation and to examine the impacts of alternative variables, several alternative forms of equation (3) are specified. First, we substitute *Property tax rate* for *Expense ratio*, in order to consider the impact from direct expenses. Next, to consider expense uncertainty, we replace *Expense ratio* with Δ*Electricity cost*. Then, we replace *Vacancy* and *Quoted rates* with supply and demand factors, including the relative supply of space (*Relative RBA*), *Employment*, *Employment* *growth*, and supply constraints. The variables for supply constraints, *Undevelopable* and *Construction costs*, are highly correlated.

## Results

**The Rent Model:** Table 4 reports the results from the estimation of the rent model using the aggregate sample of data and a summary of individual market models. In Panel A, the first column show the results of a combined sample of gross and net leases with market control variables for all but one of the 29 markets and a binary variable indicating gross leases. The remaining columns show summary statistics for the individual coefficients for model results from 29 individual markets. The results are as expected for a rent model.

The overall quality of the building and its age impact the level of gross acting rents. As perceived quality declines and as the building ages, rents decline. Compared to Class C properties (the omitted class), rents are higher for Class B properties and even higher for Class A properties. Also, *Age* is significant and negative suggesting that older properties generate lower rents. Each of these variables had significant coefficients in at least 75% of the individual market models.

Taller buildings, on average, are shown to earn a modest rent premium. However, across individual market models, the coefficient for *Number of Stories* is significant in less than one-fourth of the models. Similarly, narrower buildings, as measured by rentable building area per floor, achieve higher rents evidenced by the statistically significant and negative coefficient. This variable had a significant coefficient in about one-half of the individual market models. Because the coefficient for *Land area* is insignificant and the size of the building is already controlled with *Number of stories*, we attribute the results for *RBA per floor* to urban density and central location.

Finally, as shown by the significant and positive coefficient on *Percent leased*, the results show that landlords can command higher rents in high occupancy properties. This coefficient is significant in 74% of the individual market models. The direct positive relationship between occupancy and rent is an indication of the influence of the landlord's market power.

The coefficient for the binary variable *Gross lease* is an estimate of the average price of services across all markets. The results show the average markup to be 18.5 percent. Across individual market models, the average markup is 16.8 percent with a maximum of 32.7%. Our goal is to understand the factors that influence this markup, both at the property level and across markets.

**The Net Rent Model (Stage 1):** Panel B of Table 4 shows the results for the analysis of the rent model using only the triple net lease sample. This model, when estimated individually for each market, is used to create the estimated triple net rent $\hat{R}$ for each property. While we use market indicator variables in the aggregate model, in the individual models we use multiple binary variables to control for any submarket effects. All of the coefficients in the aggregate model are similar in magnitude and have the same sign as those discussed previously in Panel A of Table 4 for the model using the full data set. Notably, the results for the individual markets are somewhat weaker than the similar results estimated using the full data set.

**Determinants of the Premium for the Cost of Services:** Table 5 reports the results from the estimation of equation (3) and its variants (3a through 3d). The first column shows the results of the base model, equation (3), which considers property characteristics, along with market measures, namely the expense ratio, maturing leases (*Tenant turnover*), rent and vacancy.

*Property hedonics:*

Compared to Class C space, the markup for services is reduced by about 2.2 percent for Class A space, and about 1.4 percent for Class B space. The physical characteristics of Class A and B properties, which are typically newer and often built with superior design, technology and materials (especially in the case of LEED-certification), may lead to lower overall building expenses with the expected cost savings shared with the tenants. Also, Class A properties already generate a higher base rent thus making it more difficult for landlords to extract a surplus to compensate them for carrying the cost of services. That is, Class A landlords may bear more of the operating costs when gross leases are used. For Class B and C properties, the tenants may be less sophisticated or they may have such a strong preference for the gross lease that it ends up being overpriced. Class A tenants are more likely to see the equilibrium rent that would make a full service gross lease approximately equivalent to the net lease rent.

The results also show the coefficient for the age of the property to be positive and significant, providing evidence that operating costs increase with building age. This evidence is directly consistent with result 1 from the theory. Older properties are built with materials that may not meet today's standards and are perhaps less efficient, resulting in a higher actual cost of services that is passed on to the tenants in the form of a higher gross rent.

Considering all else that has been controlled, *Land area* seems to proxy for a suburban versus an urban location. The coefficient for *Land area* is positive and significant. Thus, the results suggest that suburban office tenants pay more per square foot for services. This result can also be explained as a tenant-driven market effect in that suburban office tenants may prefer the gross lease more than urban office tenants.

The rentable building area (*RBA*) is a direct measure of property size. The coefficient for ln(*RBA*) is negative and significant. Thus, larger buildings have lower operating expenses per square foot suggesting that economies of scale in operating expenses exist in the office market.

The coefficient for occupancy (*Percent leased*) is positive and significant. This result supports the contention that property owners have added bargaining power when the property is nearly full. Conversely, owners of buildings with vacancy issues are more motivated to give tenants more concessions during the negotiation process (e.g., a gross lease that covers expenses but doesn't compensate for uncertainty or one that does not completely cover expenses). Also, a high occupancy property is one that is more likely to be priced competitively, leaving more room for markups. The coefficient suggests that if occupancy increases by 10 percent, the landlord will markup the cost of services in the gross lease by 1 percent.

The coefficient for *Out-of-state owner* is positive and significant in two of the specified equations. The results are weak to the extent that it is precarious to draw a conclusion on the impact of absentee owners on the markup. Lambson, et al. (2004) find that absentee owners are inclined to pay more for real estate. This may demonstrate their aversion to risk through the application of a lower cost of capital. If these owners are motivated by risk aversion, the motivations would carry through to their lease negotiations. [and support result 3 of the theory]

***Results for market variables:*** The coefficient for *Expense ratio* is positive and significant suggesting that markets with higher average expenses experience higher gross rent markups. This outcome is directly consistent with result 1 of the theory.

High lease turnover in the near future increases the possibility that building occupancy will deteriorate. The negative and significant coefficient for *Tenant turnover* suggests that the uncertainty of the coverage of next year's expenses induced by forthcoming lease terminations reduces the markup as landlords sacrifice negotiating power in the interest of securing a higher occupancy for their buildings. This result supports the notion that landlords have a weaker standing to negotiate the markup when too many tenants have leases set to expire in the next year. This result is similar to that for *Percent leased* at the property level. The price paid for the uncertainty of future expenses is reduced when the uncertainty about future cash flows increases (higher tenant turnover).

The average markup decreases as the market vacancy rate increases as shown by the significant and negative coefficient on *Vacancy*. Also, landlords have reduced bargaining power thus fewer options when negotiating the markup in a more vacant market.

The coefficient for market rents (*Quoted rates*) is negative and significant. Combined with the vacancy result, we see the competition and bargaining present in the market for space. A higher percentage markup is difficult to achieve in the more pricey office markets.

**Alternative Specifications – Robustness Checks:** Several alternative models, using variants of the dependent variables, are estimated to check for the robustness of the results. In the first alternative specification (equation 3a), the variable *Property tax rate* replaces *Expense ratio*. The coefficient for *Property tax rate* is positive and significant, providing additional support for result 1 of the theory. Next, the variable Δ*Electricity cost* replaces *Expense ratio* (equation 3b). The coefficient for Δ*Electricity cost* is positive and significant. In markets where the change in electricity costs is the highest, so are the markups. This result provides support for result 2 of the theory. These two specifications (equations 3a and 3b) reinforce the conclusion that both a higher average cost of services and increased uncertainty of future expenses lead to a higher markup.

Next, in equation (3c), variables representing supply and demand factors replace the rent and vacancy variables. The coefficient for *Relative RBA* is negative and significant and supports for result 4 of the theory. This is consistent with the result for *Vacancy* in previous models. A reduction of available space results in higher markups. The coefficient for *Employment* is insignificant. However, the coefficient for *Employment growth* is positive and significant. These results suggest that absolute market size has no influence on the negotiated markup, but a growing demand for space that will likely result in more competitive bidding results in higher markups. This supports result 5 of the theory.[3] It is easier for the landlord to walk away from a potential deal with a tenant who doesn't accept a higher markup when the landlord can anticipate additional bids in the near term. For this study period, actual employment growth is negative in most markets. For the markets with substantial declines in the office

[3] Indeed, we are already picking up the effects of relative employment with the *Relative RBA* variable which divides the space available by total employment.

workforce, landlords accept offers for gross leases with lower markups. The coefficient for *Undevelopable*, which characterizes supply constraints, is positive and significant. The impact of supply constraints is hypothesized in result 6 of the theory. Constrained markets experience more difficulty in adding more supply, limiting the opportunities for competitors to develop substitute properties, in comparison to unconstrained markets.

The final model, shown as equation (3d), uses supply and demand factors in place of rent and vacancy, similar to the previous model (equation 3c). The variable *Construction costs* replaces *Undevelopable* as an alternative measure of supply constraints. The coefficient for *Construction costs* is positive and significant and supports result 6 of the theory. Again, for markets that are more expensive with respect to the costs of substitutable new development experience higher markups.

**Conclusion**

In this study, we consider the determinants of the markup to the gross office lease. Because landlords assume all of the operating expense risk in a gross lease, the rent for a gross lease exceeds that of a triple-net lease on similar space. The markup for gross leases varies between properties and across markets. Using a multi-stage model, where stage 1 estimates the expected net rent for a given property, we then estimate the markup using actual gross rents for the same space and estimate several models to explain the determinants of the markup. The property data used to test the model are from Co-Star and consist of 22,972 observations on office properties in 29 different markets for July, 2010. The markup for gross leases is shown to increase with both the average cost real estate services (property operating expenses) and higher uncertainty of those costs, increasing risk aversity of building owners, a decrease in the amount of currently available space, increasing employment growth and decreasing availability of future office space.

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Table 1: List of Individual Markets Sampled with Number of Properties per Market and the Average Estimated Markup for Each Market

| Market | N | Average Estimated Markup |
|---|---|---|
| Atlanta | 782 | 25.9% |
| Baltimore | 203 | 25.4% |
| Boston | 202 | 31.6% |
| Charlotte | 257 | 23.7% |
| Chicago | 601 | 32.5% |
| Cincinnati/Dayton | 268 | 36.7% |
| Cleveland | 223 | 30.0% |
| Columbus (OH) | 218 | 30.5% |
| Dallas/Ft Worth | 432 | 24.2% |
| Denver | 650 | 25.7% |
| Detroit | 248 | 29.6% |
| East Bay/Oakland | 286 | 31.8% |
| Houston | 631 | 23.4% |
| Indianapolis | 213 | 30.7% |
| Kansas City | 450 | 38.9% |
| Los Angeles | 1,103 | 24.5% |
| New York City | 17 | 39.2% |
| Northern NJ | 162 | 29.6% |
| Oklahoma City | 164 | 28.1% |
| Orlando | 272 | 29.0% |
| Philadelphia | 261 | 29.2% |
| Raleigh/Durham | 286 | 20.4% |
| San Diego | 76 | 19.4% |
| San Francisco | 232 | 44.3% |
| South Bay/San Jose | 242 | 25.8% |
| South FL | 479 | 31.7% |
| St. Louis | 390 | 31.4% |
| Tampa/St | 394 | 27.8% |
| Washington DC | 924 | 25.7% |

**Table 2** Descriptions of the Variables

**Panel A.** Property Characteristics

| Variable | Description | Source |
|---|---|---|
| *Age* | Property age, in years | CoStar Property |
| *Class A* | Equals 1 if property is marketed as "Class A" office space | CoStar Property |
| *Class B* | Equals 1 if property is marketed as "Class B" office space | CoStar Property |
| *Gross* | Equals 1 if quoted rate is for a "Full Services Gross" lease | |
| *Land area* | Lot size, in acres | CoStar Property |
| *Number of stories* | Number of stories | CoStar Property |
| *Out-of-state Owner* | Equals 1 if the property owner address is in a different state than the property | CoStar Property |
| *Percent leased* | Percent of the property that is currently leased out | CoStar Property |
| *Rent* | Weighted average asking rent, per property (for either NNN or Gross leases) | CoStar Property |
| *RBA per floor* | Rentable building area (in 10,000s) per story | CoStar Property |

**Panel B.** MSA Characteristics: 29 Markets

| Variable | Description | Source |
|---|---|---|
| *Construction costs* | Location factors for installation component of construction costs, measured relative to national average of 100 | RS Means (2010) |
| *ΔElectricity cost* | Percentage change in commercial electricity costs per state, 2009-2010 | Department of Energy (DOE) |
| *Employment* | Annual MSA employment (in 1,000s) in the Financial Activities, Business & Professional Services, and Information sectors, 2009 | Bureau of Labor Statistics (BLS) |
| *Employment growth* | Percentage change in *Employment*, 2008-2009 | BLS |
| *Expense ratio* | Market average for (Revenue - NOI)/Revenue for active office property loans | Bloomberg CMBS |
| *Tenant turnover* | Percent of existing leases in the office market scheduled to expire in 2011 | CoStar Office Market Reports (Mid-year 2010) |
| *Property tax rate* | Equals total state and local government revenues from property tax collections divided by total personal income | Survey of State & Local Gov't Finances (Census, 2008) |
| *Quoted rates* | Weighted average asking rent, per market (includes all classes) | CoStar Reports (2010) |
| *Relative RBA* | Total rentable building area in an office market (in 10,000s) divided by total employment, 2009 | CoStar Reports (2010); BLS |
| *Undevelopable* | Percent undevelopable land in the MSA, measured by Saiz (2010) | Saiz (2010) |
| *Vacancy* | Vacancy rate for the office market | CoStar Reports (2010) |

**Table 3: Summary Statistics for the Data**

**Panel A.** Property Characteristics

| | NNN Sample 8,286 properties | | Gross Sample 14,686 properties | | |
|---|---|---|---|---|---|
| Variable | Mean | Std Dev | Mean | Std Dev | t |
| *Age* | 31.6 | 29.4 | 35.0 | 24.1 | -5.64 |
| *Class A* | 0.116 | 0.320 | 0.240 | 0.427 | -14.96 |
| *Class B* | 0.556 | 0.497 | 0.511 | 0.500 | 4.08 |
| *Land area* | 7.4 | 301.2 | 6.91 | 281.1 | 0.07 |
| *Number of stories* | 3.12 | 5.92 | 5.14 | 6.78 | -14.42 |
| *Out-of-state Owner* | 0.170 | 0.375 | 0.247 | 0.431 | -8.67 |
| *Percent leased* | 58.2 | 36.0 | 75.3 | 24.3 | -25.00 |
| *Rent* | $16.11 | $7.70 | $20.64 | $8.99 | -24.48 |
| *RBA* | 53,034 | 141,628 | 92,029 | 163,826 | -11.54 |
| *RBA per floor* | 1.46 | 1.88 | 1.65 | 1.67 | -4.86 |

**Panel B.** MSA Characteristics: 29 Markets

| | Mean | Std Dev | Min | Max |
|---|---|---|---|---|
| *Construction costs* | 99.4 | 29.4 | 49.4 | 166.3 |
| *ΔElectricity cost* | -1.56% | 7.61% | -16.92% | 15.98% |
| *Employment* | 560.4 | 550.3 | 114.4 | 2,257.7 |
| *Employment growth* | -5.03% | 2.56% | -11.44% | -0.50% |
| *Expense ratio* | 0.412 | 0.040 | 0.347 | 0.488 |
| *Property tax rate* | 3.36% | 0.75% | 1.60% | 5.09% |
| *Quoted rates* | $22.11 | $6.05 | $14.22 | $42.91 |
| *Relative RBA* | 10.8 | 2.67 | 4.11 | 16.3 |
| *Tenant turnover* | 13.93% | 2.86% | 6.70% | 20.8% |
| *Undevelopable* | 28.26% | 23.61% | 1.44% | 76.63% |
| *Vacancy* | 13.63% | 2.30% | 8.10% | 18.70% |

Table 4: Results for the Model of the Determinants of Triple Net Rents
(Dependent variable =ln(Rent)

**Panel A: Full Sample of Both Gross and Triple Net Lease Data**

| | Full sample | | Summary of Coefficients from Individual Market Models | | | |
|---|---|---|---|---|---|---|
| | Coefficient | *t*-stat | *Mean* | *Maximum* | *Minimum* | *Percent Significant* |
| Constant | 3.059 *** | 222.8 | 2.948 | 5.344 | 2.474 | 100.0% |
| *Class A* | 0.242 *** | 30.2 | 0.214 | 0.386 | 0.000 | 89.7% |
| *Class B* | 0.107 *** | 20.3 | 0.094 | 0.195 | 0.008 | 75.9% |
| *Percent leased* | 1.270E-03 *** | 17.6 | 0.001 | 0.002 | -0.003 | 72.4% |
| *Number of stories* | 0.006 *** | 16.2 | 0.005 | 0.033 | -0.005 | 24.1% |
| *Land area* | 2.520E-06 | 0.4 | 0.023 | 0.652 | -0.008 | 17.2% |
| *RBA per floor* | -0.013 *** | -10.1 | -0.030 | 0.008 | -0.53 | 51.7% |
| ln(*Age*) | -0.062 *** | -22.2 | -0.088 | -0.007 | -0.240 | 89.7% |
| *Out-of-state Owner* | 0.007 | 1.2 | -0.001 | 0.098 | -0.111 | 13.8% |
| *Gross* | 0.185 *** | 39.5 | 0.168 | 0.327 | -0.084 | 96.6% |
| Market indicators: | Included [29 mkts] | | 15.3 | 41 | 2 | |
| Observations: | 22,972 | | 792.1 | 2023 | 60 | |
| $R^2$: | 45.6% | | 39.6% | 71.4% | 13.8% | |

**Panel B: Triple Net Lease Data Only**

| | NNN sample | | Summary of Coefficients from Individual Market Models | | | |
|---|---|---|---|---|---|---|
| | Coefficient | *t*-stat | *Mean* | *Maximum* | *Minimum* | *Percent Significant* |
| Constant | 3.053 *** | 117.6 | 3.258 | 11.332 | 2.573 | 96.6% |
| *Class A* | 0.232 *** | 13.5 | 0.199 | 0.709 | -0.405 | 46.4% |
| *Class B* | 0.093 *** | 9.8 | 0.078 | 0.224 | -0.105 | 48.3% |
| *Percent leased* | 9.712E-04 *** | 8.8 | 0.0006 | 0.0017 | -0.0068 | 44.8% |
| *Number of stories* | 0.007 *** | 9.2 | 0.015 | 0.055 | -0.011 | 20.7% |
| *Land area* | -5.19E-06 | -0.4 | -0.078 | 0.009 | -2.23 | 6.9% |
| *RBA per floor* | -0.023 *** | -10.6 | -0.025 | 0.106 | -0.229 | 41.4% |
| ln(*Age*) | -0.073 *** | -17.1 | -0.153 | -0.001 | -1.451 | 86.2% |
| *Out-of-state Owner* | -0.018 | -1.6 | 0.008 | 0.778 | -0.240 | 20.7% |
| Market indicators: | Included [29 mkts] | | 14.2 | 39 | 2 | |
| Observations: | 8,286 | | 285.7 | 778 | 13 | |
| $R^2$: | 34.0% | | 38.0% | 66.6% | 17.3% | |

Table 5: Alternative Specifications of the Gross Rent Markup Model

Dependent variable = Services aka. Markup

| | Equation (3) | | Equation (3a) | | Equation (3b) | | Equation (3c) | | Equation (3d) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | *t*-stat | Coefficient | *t*-stat | Coefficient | *t*-stat | Coefficient | *t*-stat | Coefficient | *t*-stat |
| Constant | 0.569 *** | 14.2 | 0.521 *** | 14.6 | 0.537 *** | 14.8 | 0.530 *** | 14.7 | 0.404 *** | 10.8 |
| *Class A* | -0.022 ** | -2.5 | -0.024 *** | -2.7 | -0.024 *** | -2.8 | -0.023 *** | -2.6 | -0.027 *** | -3.1 |
| *Class B* | -0.014 ** | -2.4 | -0.014 ** | -2.4 | -0.016 *** | -2.7 | -0.013 ** | -2.2 | -0.014 ** | -2.3 |
| *Percent leased* | 3.306E-04 *** | 3.8 | 3.374E-04 *** | 3.9 | 3.323E-04 *** | 3.8 | 3.108E-04 *** | 3.6 | 3.038E-04 *** | 3.5 |
| ln(*RBA*) | -0.014 *** | -6.2 | -0.014 *** | -6.0 | -0.014 *** | -6.0 | -0.016 *** | -6.9 | -0.015 *** | -6.6 |
| *Land area* | 0.004 *** | 22.0 | 0.004 *** | 21.9 | 0.004 *** | 22.0 | 0.004 *** | 22.1 | 0.004 *** | 22.0 |
| ln(*Age*) | 0.024 *** | 7.3 | 0.023 *** | 7.2 | 0.023 *** | 7.2 | 0.022 *** | 6.7 | 0.018 *** | 5.5 |
| *Out-of-state Owner* | 0.007 | 1.4 | 0.008 | 1.5 | 0.008 | 1.5 | 0.011 ** | 2.0 | 0.013 ** | 2.6 |
| *Expense ratio* | 0.057 ** | 2.5 | | | | | 0.042 * | 1.8 | 0.081 *** | 3.4 |
| *Property tax rate* | | | 0.899 ** | 2.2 | | | | | | |
| *ΔElectricity cost* | | | | | 0.515 ** | 2.4 | | | | |
| *Tenant turnover* | -0.437 *** | -4.5 | -0.508 *** | -5.5 | -0.583 *** | -5.9 | -0.365 *** | -3.9 | 0.055 | 0.6 |
| *Vacancy* | -0.703 *** | -6.4 | -0.780 *** | -6.6 | -0.724 *** | -6.6 | | | | |
| *Quoted rates* | -1.380E-03 *** | -3.2 | -2.190E-03 *** | -4.1 | -1.500E-03 *** | -3.5 | | | | |
| *Relative RBA* | | | | | | | -0.006 *** | -6.0 | -0.004 *** | -4.2 |
| *Employment* | | | | | | | -0.053 | -0.9 | -0.055 | -1.0 |
| *Employment growth* | | | | | | | 0.688 *** | 4.6 | 0.423 *** | 3.2 |
| *Undevelopable* | | | | | | | 0.064 *** | 5.6 | | |
| *Construction costs* | | | | | | | | | 9.285E-04 *** | 9.5 |
| Observations: | 10,666 | | 10,666 | | 10,666 | | 10,666 | | 10,666 | |
| $R^2$: | 5.9% | | 5.9% | | 5.9% | | 6.2% | | 6.7% | |

**Appendix**

*Proof of Result 5:*

Taking the partial derivative of equation (3) with respect to $\dot{e}$ gives

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial \dot{e}} = g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right) - \frac{g_\lambda \lambda_{\dot{e}} g_1\left(\hat{c} + \pi_C^i\right)}{\delta + g_1} + \frac{g_\lambda \lambda_{\dot{e}}\left(1 - g_0\right)\left(\hat{c} + \pi_C^i\right)}{\delta + g_1} - \frac{g_\lambda \lambda_{\dot{e}}\left(1 - g_0\right) g_1\left(\hat{c} + \pi_C^i\right)}{\left(\delta + g_1\right)^2}$$

Rearranging terms results in

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial \dot{e}} = g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right) + \frac{g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right)}{\delta + g_1}\left(1 - g_0 - g_1 - \frac{g_1\left(1 - g_0\right)}{\delta + g_1}\right)$$

$$= g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right) + \frac{g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right)}{\delta + g_1}\left(\frac{\delta + g_1 - g_0\left(\delta + g_1\right) - g_1\left(\delta + g_1\right) - g_1\left(1 - g_0\right)}{\delta + g_1}\right)$$

Which reduces to

$$\frac{\partial\left(r_G^i - r_{NNN}^i\right)}{\partial \dot{e}} = g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right) + \frac{g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right)}{\delta + g_1}\left(-g_1 + \frac{\delta\left(1 - g_0\right)}{\delta + g_1}\right)$$

$$= g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right) - \frac{g_\lambda \lambda_{\dot{e}} g_1\left(\hat{c} + \pi_C^i\right)}{\delta + g_1} + \frac{g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right)\delta\left(1 - g_0\right)}{\left(\delta + g_1\right)^2}$$

$$= g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right)\left(1 - \frac{g_1}{\delta + g_1}\right) + \frac{g_\lambda \lambda_{\dot{e}}\left(\hat{c} + \pi_C^i\right)\delta\left(1 - g_0\right)}{\left(\delta + g_1\right)^2} > 0$$

The equation above is positive since $\lambda_{\dot{e}} > 0$, $g_\lambda > 0$, $0 < g < 1$, and $0 < \delta < 1$.

*q.e.d.*