Medical Service Quality and Office Rent Premiums: Reputation Spillovers

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Executive Summary

Since the 1990s numerous studies have focused on the determinants of office rental rates and each case examines, if not focuses, on the influence of location amenities in determining rent differentials. Spillovers are a common theme in real estate and urban economics research and yet no such test has been done on hospital reputation and the demand for proximate medical office space. We hypothesize that hospitals with strong reputations for high quality service will represent an opportunity for physicians, and other service providers, to benefit from reputation spillovers, thereby increasing potential revenue/profit. Further, the reputation benefit will be capitalized into the practices' willingness to pay for proximate office locations, thereby driving up the rental rates for nearby space when compared to similar office space elsewhere within the market.

We find that distance from and overall quality ranking of the hospital, both independent and in concert, are significantly linked to the base rents. The greater the distance from a hospital, the lower the rent, even when controlling for the median rent in the proximate neighborhood. The degradation in rent with distance is significantly greater when the hospital is ranked high in service quality supporting the notion that the premium is linked to the high quality hospital and simply a function of the neighborhood. The results are consistent in both ordinary least squares and multilevel models. The findings from this analysis provide important implications for medical office building investors and developers and suggest that potential tenants value, and likely exploit for their gain, locations near hospitals and health centers that reflect a higher level of quality to potential patients/clients.

Introduction

Since the 1990s numerous studies have focused on the determinants of office rental rates (see Clapp, 1990, Glascock et al., 1990, Sivitanidou, 1995 and Bollinger et al., 1998, for examples). All of these cases examine, if not focus on, the influence of location amenities in determining rent differentials. At the same time there has been little work in segmenting the office market according to tenant type. We refer specifically to the factors that influence rental rates for medical specific office space, typically referred to as the medical office building (MOB) (Wei, 2012 and Goodman, Smith, 2017 represent the few academic alternatives).[1] One explanation for the paucity of research on MOBs is the lack of available and accessible data. Additionally, there has been little observed distinction in the literature on the tenants and space requirements for the MOB asset and thus there has been little incentive to segment MOB from the larger office market.

The demand for medical office space will undoubtedly increase given that during the next ten years, the 65-plus age cohort is expected to grow by 17 million individuals (O'Hara and Caswell, 2013). While the non-elderly populace will grow at a more modest pace during the same period, ACA-induced Medicaid expansion, and the mandated utilization of insurance exchanges are expected to increase health care coverage by an additional 27 million people.

The office market over the past decade has seen extremely low cap rates during the "halcyon" years of 2005-06 when credit and liquidity were extensive, the inverse in 2008-10 with the recession and evaporation of credit, and a moderate period of late with a stabilizing economy and relatively "cheap" money. Because liquidity and credit availability are global factors, this cyclical trend has been national in scope rather than locally focused. With this growth comes an increased interest in performance measures for subsets of the office market, more specifically the medical office building market.

[1] There are a number of professional reports that are produced by CBRE, Marcus & Millichap that focus on the MOB market, and most of these are only recently being offered.

Additionally, there has been an increasing interest in subsets of the office market as institutional investors attempt to offset the volatility of office investments on an operating basis (i.e. sharp declines in net operating income during recessions) leading them to alternatives that may exhibit more stability in the income profile.

Similarly, the literature on health service quality is expansive. However, few studies have observed links between service quality and profitability of hospitals or their affiliates. One example is a paper by Adelino, et al. (2015) that examines the relationship between financial constraints and health service quality standards. The analysis tests whether hospitals shift towards more intensive and more profitable treatment options as a result of a financial shock, such as the financial crisis. They conclude that for the sample of nonprofit hospitals they observed, the organizational form combined with the hospitals' internal governance structures shield patients from undesirable shifts in quality in response to financial shocks. We offer a contrary view to the lack of differentiation between MOB and other professional office spaces and, more importantly, to test the impact of a specific amenity, the role that proximity to a hospital with a strong reputation for high quality service has on base rental rates.

We are looking at the potential for spillover effects from hospital service quality ratings. Such location amenities are a common theme in real estate and urban economics research and yet no such test has been done on hospital reputation and the demand by physicians for proximate office space. Relying on secondary data from CoStar and public sources in developing the models, the initial results indicate that although the real estate capital markets are international in scope, the local space market still prevails in the pricing of real property assets. As anticipated, base rents decrease as the distance from a hospital increases and, measures of quality are capitalized into the willingness to pay of tenants. Tenants appear to pay premiums for locations near hospitals with higher quality ratings. We hypothesize that hospitals with strong reputations for high-quality service (provided in part by high-quality affiliated physicians) will represent an opportunity for physicians to benefit in the form of a reputation spillover, thereby increasing potential revenue. Further, this increase in potential revenue is capitalized into the practices' willingness to pay for proximate office locations, thereby driving the rental rates for nearby space. In the remainder of this article we provide support for segmenting medical office markets from the more general professional office sphere when conducting research, and briefly review the literature on office rent determinants. We then provide a conceptual model that the physician practice (potential tenant) faces when considering space in a metropolitan area. Description of the data and the analysis follow along with the results obtained from the models. The conclusion summarizes the outcomes and the implications from the analysis.

Determinants of Office Rents

Research on office rent determinants can be practically allocated into property-specific and geospatial categories. Property specific research is focused on the price elasticity of rent as a function of vacancy, temporal changes in demand for space and the physical characteristics of the property. Hekman (1985), Shilling et al. (1987), Pollakowski et al. (1992), Hendershott (1996), Hendershott et al. (2002) all find an empirical connection between vacancy and rents in office markets. Frew and Jud (1988), Wheaton and Torto (1988) and Sivitanides (1997) also studied the impact of vacancy rates on office rents. Wheaton and Torto (1994) utilize office rent indices to document the persistence of rent/vacancy relationship and Slade (2000) examines the variation in market participants' value of office space amenities during different periods in a market cycle. Clapp (1980) identifies property age as a physical characteristic, along with other locational variables, as significant factors that influence the level of office rents.

Later research continues to verify the significance of property age, including that of Frew and Judd (1988), Wheaton and Torto (1994), Bollinger et al. (1998), and Slade (2000). Also in the early-

1980s, Brennan et al. (1984) identify building size and locational characteristics within the CBD as key factors, and then Chuangdumrongsomsuk and Fuerst, (2017) develop a model of rent determinants between suburban and CBD space . Hough and Kratz (1983), Vandell and Lane (1989), Doiron, Shilling and Sirmans (1992) and Robinson, Simons and Lee (2017) investigated the impact of structural features on rent, and Colwell and Ebrahim (1997) provided a framework for determining the optimal design of an office building. Sivitanidou (1995) and Hui and Liang (2016) show that spatial amenities influence office rents. Glascock, Jahanian and Sirmans (1990) analyzed office rents across different classes of buildings, while Shilton and Zaccaria (1994) provide evidence that office values are a function of building size. Additionally, there is an expanding literature on impacts of "green" design and amenities on rents (see Wiley Benefield and Johnson, 2010, Eicholtz, Kok and Quigley, 2010 and Devine and Kok, 2015 for examples).

Research addressing geospatial issues focuses on the broader office market, the role of location within a market and spillover impacts from proximate properties. Colwell and Sirmans (1978, 1980), Colwell and Munneke (1997, 1999) and Savini and Aalbers (2016) have examined the structure of urban land prices, illustrating how rents vary depending on a property's distance to the city center. Archer and Smith (1994), finds that downtown office properties play a significant role in local economies and that the future of the central business district as a core node in urban space did not appear to be ending soon (as of the early 1990s). Along this same line, Shilton and Stanley (1999) found a high concentration of Fortune 500 firms in the largest metropolitan cities, although technological changes suggest that firms could reduce costs by migrating away from high-cost city centers. Bollinger, Ihlanfeldt and Bowes (1998) and Albouy and Lue (2015) investigated how locational differences in wage rates, transportation rates and the concentration of support services affect the spatial variation in office rents, they find that these items do contribute to an estimate of rental rates.

Our work intersects both threads of the literature on office-property research with focus on the potential for geospatial spillovers. It extends the understanding of the factors that impact office rents by providing evidence there is a rationale for distinguishing between professional and medical office space.

Segmenting Office Markets

Medical office buildings (MOB) are facilities constructed or converted for medical use primarily for office visits, laboratory tests, and outpatient services. Examples include physician office buildings, ambulatory care facilities, surgery centers, medical imaging, health services administration, therapy (physical and psychological), and wellness centers. Like professional office buildings, utility and pricing for these spaces is typically measured in square feet (Wei, 2012). MOBs are developed and operated by a number of different organizational types including hospitals or health systems, physician practice groups, and third party private/institutional investors and managers. The U.S. MOB real estate market is a substantial segment of the total office market, and accounts for roughly 62% of all medical facility space our roughly 4.5 square feet per insured person in the United States (Alexander, 2015).

Numerous market characteristics serve to separate MOB from other professional office space (POB). Medical office tenants and physician practices typically have longer tenure and relocate less frequently than general office tenants. Seemingly offsetting this, the competition for new patients is steering health service providers to more non-campus sites such as community retail centers that are viewed as more convenient or accessible. This "*retailization*" of healthcare is evident in the increased development of smaller suburban medical office spaces and urgent care clinics. In addition to specific buildout directives, medical tenants frequently rely on potentially hazardous or sensitive materials (e.g. radiation from oncology treatments and scanners, medically sensitive waste such as used needles) that require specific structural components such as lead lined walls, and dedicated disposal. Many health services tenants such as urgent care, x-ray and MRI scans, and lab diagnostics conduct business during evenings and over weekends. Medical tenants typically face greater compliance review for accessibility with the Americans with Disabilities Act. Patient privacy issues (including the need for multiple waiting rooms) can create special circumstances with respect to common entry and landlord access.

According to the American Medical Association, physicians historically represented a cottage industry of small or solo practices. The majority of the approximately 972,376 doctors and residents in the United States still work mainly from smaller, office-based practices. However, during the past several years, the doctor's office has evolved as many doctors merge their offices into larger practices; sell their practice to hospitals, insurance companies, and physician management firms; contract to provide exclusive services to providers such as hospitals; or go to work for larger providers as salaried employees (Kirchhoff, 2013). The experience of physicians is part of a broader trend toward consolidation in health care in addition to the increased costs of administrative compliance required under the Affordable Care Act

Consolidation has the potential to create economies of scale for healthcare providers which can include shared fixed costs, specialization of labor inputs (e.g., use of non-physician personnel), internalization of referrals, exploitation of reputational economies, bulk purchasing, use of internal quality monitoring, and extended patient coverage. At the same time, physician practices can suffer from several types of inefficiencies including inefficient scale (number of physicians, use of non-physicians, and ancillary services), scale diseconomies due to free riding and higher patient travel costs, excessive use of inputs, excessive administrative costs, and failure to use a cost-minimizing mix of inputs and outputs (Pope and Burge, 1992, Casalino et al., 2003, Sarma et al., 2010, Burns et al., 2013). As the consolidation activity continues, lawmakers are watching closely to ensure that further concentration does not result in negative impacts in terms of consumer access, prices, quality of service, and loss of competition.

One outgrowth of physician practice consolidation is the added value created from knowledge and reputation spillovers within the larger practice (horizontally) and across multiple practices (horizontal) and between physicians and hospitals (vertical). The literature on both knowledge and reputation spillovers indicates the importance of proximity as a key factor in the pace and breadth of these benefit transfers (Baicker and Chandra, 2010). We seek to identify such reputation alliances in the health services market. If the hospital reputation is important in a physician deciding where to position their practice, one would expect a higher willingness to pay for office space proximate to hospitals with higher than with lower ratings.[2]

Folland, et al. (2018, P. 259) discuss how hospital quality rankings stack up against patient outcomes. They refer to a study by White et.al (2014) on relationships between hospital prices, various quality indicators and other hospital characteristics. The hospitals with higher price structures are, on average, much larger than low-price hospitals, and have larger market shares. Further, although the more expensive hospitals outperformed low-price hospitals on *U.S. News & World Report* ratings (no low-price hospital was on the list), they generally performed the same or worse on most objective quality indicators e.g., postsurgical death rates and serious blood clots among surgical discharges.

Conceptual Model

We rely on a model used in studies of professional firm location. Early versions of these models (Clapp 1980, and Bollinger et al. 1998) indicate that the ability to meet face to face with suppliers and customers was an important factor in the location decision. Our adaptation assumes that physicians' practices, much like other professional firms, search the metropolitan area for the location that maximizes profit given the set of amenities available at that location including proximity to additional

[2] Not all physician specialist require proximity to the hospital to carry out their practice (e.g. dermatology, or general practitioner), so this directive is a generalization across all disciplines demanding MOB space.

services that are demanded by their clients/patients and the ability of clients to access the location. As such all physicians and physician groups face the following production function:

$$Q = f(OS, K, N, PA, HS, HQ), \quad (1)$$

where, Q = output of medical services; OS = office space; K = utility from depreciable capital either acquired or contracted via the hospital or other provider; N = efficiency of labor inputs; PA = patient access to location, HS = contractual services facilitated by proximity to the hospital or other third party provider and HQ = hospital quality. Patient access is included as an input to represent the fact that medical services are provided in unique combinations depending on the individual client/patient. For a practice to be profitable, the location of the office should be proximate and accessible to a sufficient client base. This is one reason for the *retailization* of health services (i.e. quick med facilities and medical clinics in retail strip centers) that is a growing trend in the industry. Including the hospital services reflects the potential for economies of scale and agglomeration benefits, as well as the availability, if needed, of inpatient healthcare services, closer to the hospital.

Similarly, our focus on hospital quality is based on the notion that physician profitability is enhanced when the physician is aligned with a hospital having a reputation for high quality service. Of course, the potential benefits are bilateral; reputable physicians will enhance the reputation of the hospital that they serve. This is similar to the case with the academic profession. Highly respected research academics gravitate to highly ranked universities and perpetuate and/or enhance the strong reputation.

The labor input that enters the production function of physician practices is measured in efficiency units. Efficiency units increase as the distance between the practice and the hospital decreases such that

$$N = a(\bar{x})L \quad (2),$$

where *a* represents efficiency, *L* is labor hours and (x) is the average distance to supporting medical facilities. Formulating labor in this manner captures the knowledge and technology exchange that come from both formal and informal interactions between employees in the practice, the hospital and other practices. The idea that physical location and proximity influences labor productivity has a strong presence in the literature both theoretically (Glaeser, 1994) and empirically (Ciccone and Hall, 1996).

With equation (1) we can construct the cost and profit functions for physician office space as the following:

$$C = sOS(jHQ) + cK + eN + tuPA + tvHS \,, \qquad (3)$$

$$\pi = PQ - C \,, \qquad (4)$$

where, *s* represents the unit costs for MOB space, *j* is the anticipated premium to MOB space cost based on the reputation of the hospital, *c* the cost of capital services and *P* the reimbursement for provided medical services *e* is cost per unit of labor efficiency, *t* represents travel costs and *u* and *v* represent distance for customers (patients) and suppliers (hospital).

Assuming the demand for medical services and input prices vary spatially, there are unique demand equations for each of the variable inputs. The demand equation for the variable of interest MOB space (*OS*) at location *i* is expressed as follows:

$$OS_i = f(s_i, j_i, c_i, e_i, t, u_i, v_i, w_i, x_i, R_i), \qquad (5)$$

where w_i is the wage rate, x_i represents additional control variables in the demand for MOB space and R_i is expected revenue. It is hypothesized that the quality or reputation of the hospital creates a spillover effect that will enhance the earning potential of physicians. This increased earning potential is capitalized into a rent premium for proximate office space.

Data and Variables

The principal data are drawn from MOB and POB base rental offerings from the CoStar Group Inc., made available through an academic license agreement. The observations are limited to 12 Metropolitan Statistical Areas. The current sample is driven by data access constraints but remains sufficiently diverse to provide confidence in the external validity of the results. The base rental data represents a snap-shot of asking rents from June 2015. With preliminary cleaning, the data consist of approximately 17,400 observed sites. A valid case can be made that there is variation between the observed base rent and the effective rent that is ultimately derived out of a lease negotiation. However, prior research lends support for relying on the base rent as a proxy for the effective rent. Mills (1992) investigated the dependent-variable specification of the rent determinant model by comparing the present value of rent with the first-year asking rate. Using a measure of goodness of fit, he concluded that the first-year asking rent specification provides slightly superior results. Slade (1997), reexamining the dependent variable specification of the rent-determinant model, has arrived at a similar conclusion, notably that asking rent is a valid dependent variable specification of the rent-determinant model.[3][4]

Table 1 presents the names, descriptions and summary statistics for the variables in the analysis. The key dependent variables are the rent differential and the log of base rent. The variable *rentdif_percent* is calculated as the percentage difference between the base rent for the property as reported in CoStar and the average base rent within the county where the observation is located. *Logrent* is the natural log of the quoted base rent. CoStar also provides the property specific control variables utilized in the models. These include the dichotomous variables for the class of the office building (A, B,

[3] There is potential for bias in the CoStar data with respect to the represented sample identified as MOB properties. For example, many large health care systems have developed multi-function high quality facilities in affluent areas. These are typically leased exclusively to one health care system and will not be listed on CoStar. Additionally, some offices that house suppliers to the healthcare industry are listed in CoStar as MOB properties.

[4] Regarding the limitations on using base rents we also test our results by creating another dependent variable, the spread between the individual observation and the median rent at the county level. The assumption that the spreads on the base rents are indicative of the spread on the actual contract or effective rents appears reasonable based on the results observed in the data.

or C), the quoted rental type (gross, modified, net, and triple net), and if the property is designated as medical. Additional property variables include the year built of the improvements and the number of stories. CoStar also reports a subjective condition or overall quality and condition ranking in the form of a five star (lowest = 1; highest = 5) rating system.[5] All these variables are expected to influence the base asking rent and the rent differential.

We also control for a healthcare specific public policy referred to as the "Certificate of Need" (CON). State-level CON regulations impose restrictions on investments in medical infrastructure (i.e., buildings) and "big ticket" technology. The goals of CON are to reduce the costs associated with an oversupply of health services and to ensure quality care. Goodman and Smith (2018) observe that MOBs located in states with CON legislation have higher than average rent premiums after controlling for the property and location factors. By extension, this premium represents a distortion in the market that constrains the expansion of medical services.[6]

In addition to the CoStar data, there are also control variables for the location-specific economy. There are numerous counties within each of the markets and each county has its own unique influence on office rents; we include a number of location-specific indicators obtained from federal government agencies for the most recent period available. Proxies for quality health care, health care expenditures and overall population health come from the Center for Medicare & Medicaid Services (CMS) (dates vary).[7] CMS provides the physician ratio (*phys_ratio*) for the number of physicians per 1,000 people

[5] CoStar evaluates and rates properties using a five Star scale based on the characteristics of each property type, including: architectural attributes, structural and systems specifications, amenities, site and landscaping treatments, third party certifications, and detailed property type specifics.

[6] A detailed discussion of CON history and influence in the provision of healthcare is available in Goodman and Smith (2018). The regulation (still active in over 30 states) stemmed from a belief that providers would pass along the higher capital costs to consumers and insurers.

[7] CMS is part of the Department of Health and Human Services (CMS.gov).

serving as an indicator of the supply-demand relationship between potential patients and health service providers. The availability and overall quality of area health services is further represented by the variable *low_birth_weight* or the percent of births classified as low weight, and the annual Medicare expenditures by county for 2015. The US Bureau of Economic Analysis (BEA) provides labor force estimates (size and percent of participants) and unemployment rates by county. The county level unemployment rate (*fipsunemp*) controls for local economic conditions. The percent of housing in the county that is vacant has been included to represent high and low cost areas.

To account for the impact that the micro market or neighborhood has on rental rates, a variable is calculated that represents the median quoted base rent from CoStar for the seven nearest neighbors based on the great circle distance (*neighrent7*).[8] We also control for office market variations at the county level with the variable *medoffrent* which is the county median, again derived from the CoStar sample.

The two variables central to the analysis are identified as *overall* and *distance1*. The first, *overall*, is the hospital quality/reputation measures and is derived from the Centers for Medicare and Medicaid Services Hospital Compare Database (CMS data). The CMS data are used to rate hospitals based on their compliance with various processes of care. The composite rating "overall" provided by CMS is an aggregate of the performance ratings for specified procedures (e.g. imaging, heart catheterization etc.), and this composite, which ranges from 1 to 5, provides a basis on which hospitals are rated across multiple dimensions on consistency of care. This is our proxy for perceived quality or reputation capital.[9]

[8] Although base rent quotes do not represent actual contract rent or effective rent, it is the best estimate that is available. Further, the focus of the analysis is the spread between MOB and POB asking rents. It is reasonable to assume that the asking base rent spreads are indicative of the actual contract or effective rents.

[9] We have also used the individual quality indicators separately. They tend to move together, leading to multicollinearity issues. One might interpret the summary composite as similar (although not identical) to one derived through factor analysis of multiple attributes.

The second key variable *distance1* is a straight line distance measure, in meters, of each observed office base rent from the nearest hospital in the MSA. The distance variable is a proxy for the influence that proximity to a hospital has on the base rent. We also interact the two variables *overall* and *distance1*. To accomplish this, we recode the overall variable into a dichotomous variable coded 1 if the overall rating is 4 or 5 and 0 if the rating is from 1 to 3. In addition to the variable *overall* we also have controls for hospital ownership in the forms of federal, physician, and proprietary or for-profit, with nonprofit representing the comparison.

A few of the summary measures deserve mention. As exhibited in the CoStar 55% of the office buildings are considered Class B and roughly 11% are Class A. Gross leases account for 37% of the observed office units and 26% are triple-net with the balance listed as modified or net. The mean overall hospital quality rating is 3.31, and 17% of the observations are classified as medical office space. Median office rent ranges from $7.35 to over $29.00.

Table 1 approximately here

Panels A and B of Table 2 segment the summary statistics by MSA. Several variables have similar values across many, if not all, of the MSAs. For example, the average number of stars applied by CoStar sits around 2.50. The majority of properties are classified as class B in all observed MSAs with the minority in class A. However, there are also some key differences worth noting. The variable *medical*, which measures the proportion of observations in the MSA that are classified as medical, ranges from 9% in Boston and Pittsburgh, to 25% in Phoenix. The markets vary widely in how leases are structured (gross, net, triple net, and modified) with *gross* dominating Denver and *triple net* representing over half the observations in Seattle. Such variation illustrates how norms for lease structure differ extensively across MSAs. For the variable *physician ratio*, Boston has the lowest proportion with 901 persons per physician, and Phoenix has the highest at 1,455. Similarly, the percentage of newborns categorized as low birth weight is as high as 9% in Atlanta and just over 5% in Houston.[10]

Table 2A & 2B approximately here

It is widely understood that medical office space rents for a premium over the more general professional office space[11] In order to control for this variation, we include a dichotomous variable coded 1 if the CoStar data indicates the observed space is principally for medical use, otherwise it is 0. Table 3 summarizes the foundational relationship between MOB and POB rents in the sample. It illustrates the average premium on base rents for MOBs across the entire sample for those properties in a state with or without CON legislation. In a secondary comparison after dropping all those properties in counties with less than four observations, the premiums for the abbreviated sample are statistically identical to those obtained from the entire dataset. On average, MOB properties in states without CON command an 8.5% premium over POB properties, while in the states under CON the premium exceeds 23%. This difference in the premium indicates a potential market distortion as a result of CON policy that limits capital responses (to potential market conditions) and forms the basis for including a variable coded 1 if CON legislation is present and 0 otherwise.

Table 3 approximately here

Table 4 breaks this relationship down by MSA. For each MSA the first line is the sample of POB space offerings and the mean annual base rent per square foot for that subset. The second line presents the MOB subsample (rent listings identified by CoStar as medical office space). Italicized and bolded

[10] A similar variation was made with the percentage of the population undergoing diabetes treatment. The portion of the population receiving such treatment is 6% in Denver (Colorado has among the lowest obesity rates in the nation, with obesity being a prime factor in the incidence of diabetes) and over 10% in Indianapolis and Orlando.

[11] This premium is due, in part to a higher cost structure with more plumbing, electrical capacity and other base building enhancements (partitioning) required in MOB space.

MSAs are located in CON states. With the exception of the Denver sample, the average MOB base rent is higher than the POB rent. This premium varies from 1% for Orlando to 17% in Minneapolis. These are means and do not include any controls for other factors that influence the base rent.

Table 4 approximately here

We investigate the determinants of office rents by regressing the quoted asking rent per square foot, and the spread on the asking rent from the prevailing rent in the county on explanatory variables that describe the location, typical leasing provisions and physical characteristics of the facility along with the quality and proximity measures for the nearest hospital.

Empirics

As previously mentioned the database is comprised of individual office base rent offerings. We assume that each observation has a set of unobserved factors, or amenities, such as undisclosed lease terms that contribute to the observed rent. The variables that are utilized in the analysis include data specific to the property (e.g. age, generic lease terms (i.e. gross net), building class, medical office space indicator); data at the county and neighborhood level (e.g. hospital location and quality ranking, average rent in vicinity, health service and socioeconomic characteristics at the county level); and data that reflects variations between MSAs (e.g. median office rent, is the MSA located in a CON state). Base rent offerings are assumed to be given in the independent standard forms as follows:

$$y = X_f b_f + \varepsilon_f \qquad [6],$$

where y represents one of two dependent variables, *logrent* or *rentdiff_percent* and X is a vector of explanatory variables including building attributes and proximity to a health service center (hospital). The disturbance ε represents those unobservable characteristics of the pool of properties that affect the base rent, and the errors are assumed to follow a normal distribution with zero mean and variance σ^2.

In an initial examination with ordinary least squares we control for the variations in area factors by including variables at the county/neighborhood and MSA in a single level model. The results are provided in Table 5.

OLS Results

Reviewing the model estimates in Table 5, the first item of consideration is the stability of the relationships between the dependent and independent variables. In all cases where the coefficient estimates are statistically significant, save for the constant, the sign direction is the same for both dependent variables. This allows for summarizing the control variables in an efficient manner. The property specific variables generally behave as expected. Class A and B properties have a higher spread and rent than do Class C. The coefficient sign for gross rent is positive and the sign for triple-net is negative. CoStar's "star" rating is positive suggesting higher rated properties command higher rents. The variable *stories* indicates taller buildings have higher rents, the coefficient for *yearblt* indicates newer buildings command a premium and, as expected, so do properties identified as suitable for medical use. And, as expected, properties identified as appropriate for medical use also command a premium.

In addition to the property specific variables, we have controls for the socioeconomic health conditions in the MSA. The dichotomous MSA controls have varying degrees of significance and this is not surprising. Note, the control value is for Atlanta. The variable *constate* is positively related to both the spread and the logrent, and this is consistent with findings in Goodman and Smith's (2018) test for a premium in medical specific space for properties located in a Certificate of Need State. The neighrent7 variable is positive for both the spread (*rentdif_percent*) and the *logrent* models. The spread model is negatively related to the median rent in the county and the *logrent* has a positive influence on office rent. Higher unemployment, not surprisingly, is a sign of a lower rent market. Both the physician ratio and the percent of housing that is vacant have mixed relevance, but are positive in the spread model. Also, counties with high levels of low birth weight births have lower base rents. Controls for the ownership of the medical facility are also included with a series of dichotomous variables. The coefficients reflect the discount/premium relative to nonprofit ownership, which serves as the omitted variable.

The central focus is on the variables representing distance from the nearest hospital and the quality rating of that facility. The variable *distance1* is negative; suggesting that as observations become further from the hospital both the spread and the base rent are reduced. Keep in mind the small value is due to the scale of measurement (meters). The overall ranking behaves as anticipated, with a 1 km distance increase (holding quality constant) related to a 0.4 percent decrease in rent. In both cases the 1 to 5 ranking is expanded to create 5 dichotomous variables representing the overall quality rank for the nearest hospital (the test facility). The ranking coefficient increases as the rank increases suggesting there is a base rent premium for offices near high quality facilities. Further, the coefficients are not only statistically significant they are material.

Even with both distance and quality are represented, it was considered prudent to include an interaction to cover the joint relationship between the two factors. As previously noted, for this interaction the quality ranking is recoded to equal 1 if the reported rank is 4 or 5 and 0 for all others (1 to 3). Consistent with the two independent measures of distance and quality, the interaction variable provides similar support for the distance/quality decay in office rents, suggesting that the rate of decay is higher for higher ranked facilities.

To provide a context to the results, consider two cases. In the first case there are two offices located in a market where the base rent estimate would be $20.00 for a property located adjacent to a medical facility. Further, assume that space A is located 0.5 km from a health facility with quality rating of 2 and space B is essentially next door to the same facility. Holding all other variables constant at their mean except our distance variables there is a significant, albeit extremely modest impact of less than 1% in the spread and $0.13 per square foot in the base rent. Now consider another example where the two offices are adjacent to health facilities, but space C is next to a facility with rank 2 and space D is the same distance from a rank 4 health facility. In this example the spread is increased by 6.6% for the facility ranked 4 over the facility ranked 2. For the *logrent* model assume that space C has a $20 base rent; holding all variables constant except for the rank variables space D would command a base rent of $21.16 or 5.8% over the rank 2 property. It is important to bear in mind that the premium for medical designation and medical designation within a Certificate of Need State is already addressed in controls.

Table 5 Approximately Here

However, the previous resultsdoes not complete the circle. We know that the distribution of observed office space is subject to conditions endogenous to the MSA and the county, such as supply relative to demand in the area, variations in the quality of surrounding properties, and commute times across MSAs. Including location variables in a single level model does not address all the unobserved biases embedded in the economic conditions of the local/regional market. For this reason, we attempt to control for these unobserved hierarchical variations by converting our OLS structure to multilevel models.

HLR Modeling

Our analysis looks at individual observations within counties, and within particular MSAs. For example, although Pittsburgh, Indianapolis and Minneapolis might be considered similar in terms of socioeconomic characteristics and economic output they are subject to different MSA-level office market conditions and different state level legislation (e.g. Certificate of Need). Similarly, Fulton County and Clayton County, adjacent to one another and located in the Atlanta MSA, have per capita incomes of approximately $37,200 and $18,900, respectively. These differences suggest that MSA and county level variables matter, and further that the endogeniety present in the levels is not respected in a single level model.

While metropolitan and county level indicators can be included in an ad hoc manner, depending on the problem, it is useful to borrow an important analytical framework from the education, evaluation, and health care literatures. School researchers have long recognized that students learn within groups, within classrooms, within grades, within schools, and within school districts. The achievement of students within a particular classroom may be related to the specific teacher, which may be related to attitudes or supervision at the particular school. Bryk and Raudenbush (1992) provide a detailed explanation of the method of multilevel modeling or hierarchical linear modeling (HLM), and Goodman and Thibodeau (1998), as well as Goodman and Smith (2010) provide examples of the method applied to issues in real estate (housing markets and mortgage default, respectively).

We begin our analysis with a baseline set of ordinary least squares regressions to serve as a point of comparison and demarcation. Start with model

$$y_f = a_f + b_f x_f + c_f z_f + \varepsilon_f \qquad [7]$$

f subscripts refer to base rent variables

y_f = appropriate base rent indicator (*logrent* or *rentdiff_percent*)

x_f = variables subject to HLM

z_f = variables not subject to HLM

ε_f = error term.

An OLS formulation implicitly assumes that the relationships are constant either across counties or across metropolitan areas and that the error variances are also constant. Referring to Equation [7], assume arbitrarily that constant a_f varies by MSA and slope b_f varies by county (counties may or may not be nested within a specific MSA).

Then, write coefficients:

$$a_f = g'_o + g'_S S + \varepsilon'_a \qquad \text{MSA} \qquad [8]$$

$$b_f = h'_o + h'_M M + \varepsilon'_b \qquad \text{County} \qquad [9]$$

where ε'_a is the error term in the constant substitution and ε'_b is the error term in the slope substitution.

Substituting [8] and [9] into [7].

$$y_f = g'_o + g'_S S + h'_o x_f + h'_M M x_f + c_f z_f + [\varepsilon_f + \varepsilon'_a + \varepsilon'_b x_f] \qquad [10]$$

Referring to Equation [2], one can assume alternatively that constant a_f varies by county (which again may or may not be nested within a single MSA) and slope b_f varies by MSA.

Similar to above:

$$a_f = g''_o + g''_M M + \varepsilon''_a \qquad \text{County} \qquad [8']$$

$$b_f = h''_o + h''_S S + \varepsilon''_b \qquad \text{MSA} \qquad [9']$$

where ε''_a is the error term in the constant substitution and ε''_b is the error term in the slope substitution.

Substituting [3′] and [4′] into [2].

$$y_f = g_o'' + g_M'' M + h_o'' x_f + h_s'' S x_f + c_f z_f + [\varepsilon_f + \varepsilon_a'' + \varepsilon_b'' x_f] \qquad [10']$$

where the errors $\varepsilon'' = \varepsilon_f + \varepsilon_a'' + \varepsilon_b'' x_f$ are estimated using maximum likelihood methods

HLR Results

The results from the HLR models imposed on both *logrent* and *rentdif_percent* are provided in Table 6. There is some variation in the variable set from the OLS models as we sought to obtain the best fit models based on the likelihood ratio test. Where the variables are identical between OLS and HLR the coefficient estimates behave similarly to the results presented in the OLS output. Control variables at the property level representing class (A, B, and C), lease structure (gross, triple-net, etc.), stars, stories, year built, and the medical designation all have the same sign direction of impact and similar estimated values.

At the county/MSA level the variables *neighrent7 fipsunemp*, and an added variable medicare_expend are all significant at 95% or above. Although neighrent7 is stable in sign and coefficient estimate the county level unemployment rate does vary significantly in both value and sign. The variable medicare_expend represents the total dollar of Medicare expenditures by county for 2015. The Medicare variable indicates that the base rent (*logrent*) is higher in counties with higher levels of expenditures and the spread is reduced for increases in Medicare outlays. Additionally, the variable conmed (interaction coded 1 if space identified as a medical office and it is in a CON state) is materially significant even when controlling for the medical office premium. As previously noted this is consistent with prior research (Goodman and Smith, 2018).

The distance and quality measures using the multilevel model also present generally consistent results with the OLS regressions. Both the base rent and spread increase as the quality ranking increases, and as observed in the OLS results both dependent variables decrease as distance from the health facility increases and the rate of decrease is increased when considering the interaction variable *over_dist*. The results provide support for the theory that proximity to a health facility enhances base rent and the spread in base rent, which represents the premium in the observation over the median county rent. Further, the reputation of the health facility as represented by the overall ranking provides a significant and material impact on the rent tenants are willing to pay.

Table 6 Approximately Here

Conclusion

Institutional investor interest in the MOB segment has grown profoundly over the last decade. It is only recently that there has been a recognition that MOBs represent a distinct market with different tenant markets and a similar different set of factors that influence marketability. This research provides one of the first connections between the real estate and the health services literature. The real estate portion recognizes the distinctive nature of medical office buildings. The health services literature has paid literally no attention to the important cost of office space, treating it as either fixed, or not treating it at all. For the health services literature the capitalization of quality and distance on rents, and the importance of CON, through its impact on rents, is path-breaking. [12]

The parameter estimates of distance, quality, and building age capitalization are plausible, and quantitatively similar to those in the housing and office literature. We have subjected our estimates to numerous sensitivity tests and they appear robust to various specifications.

Only recently have analysts recognized that MOBs represent a distinct market with different tenant markets and a different set of factors that influence marketability. In this paper we have identified a relationship between office space rents and proximity to health facilities. Moreover, this positive relationship between health facility proximity and rents (or rent premiums) is enhanced by the

[12] Goodman, in addition to his research in housing and real estate, has co-authored eight editions of the leading health economics text. The "path-breaking" hyperbole is apt in this case.

reputation of the facility. For those tenants that provide health services, a high-quality reputation is an amenity that can spill over into their enterprise. As a result, this amenity is capitalized into the rent that tenants are willing to pay for proximity to, and affiliation with, a higher quality facility.

Our findings should be of interest to investors who seek opportunities to increase margins through rents and or expenses. The results should also be of interest to researchers examining spillover effects from agglomeration and to those engaged in office market research. The groundwork laid by this paper, and Goodman and Smith (2018), provides a foundation for additional analysis in the MOB market. One potentially fruitful dimension would be an examination of the transaction market. Looking at the variations in cap rates, or similar measures, between traditional professional office buildings with the MOB assets may provide further important insights into the market structure of this important sector.

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Table 1: Variable Dictionary and Summary Statistics

Variable	Description	Mean	Std Dev	Min	Max
rentdif_percent	difference from medoffrent	0.060	0.352	-0.93	3.77
logrent	log of annual square foot base rent	2.754	0.374	0.00	4.42
neighrent7	average rent of nearest 7 observations	16.863	4.634	5.90	48.23
distance1	meters to closest healthcare facility	4727.679	3957.096	20.51	46625.70
class_a	classified as class A	0.109	0.311	0.00	1.00
class_b	classified as class B	0.555	0.497	0.00	1.00
class_c	classified as class C	0.336	0.472	0.00	1.00
constate	constate	0.497	0.500	0.00	1.00
gross	gross base rent	0.374	0.484	0.00	1.00
net	net lease base rent	0.099	0.299	0.00	1.00
modified	modified lease	0.222	0.415	0.00	1.00
triple_net	triple net base rent	0.258	0.437	0.00	1.00
stars	CoStar star rating	2.588	0.732	1.00	5.00
phys_ratio	per capita per physician	1179.799	578.328	0.00	11990.00
overall	overall quality rating	3.315	1.088	1.00	5.00
hown_feds	own federal gvt	0.002	0.041	0.00	1.00
hown_physician	own physicians	0.005	0.073	0.00	1.00
hown_propriet	own proprietary	0.182	0.386	0.00	1.00
medoffrent	med rent county	15.906	2.958	7.35	29.28
fipsunemp	unemp county	6.166	1.128	3.50	13.50
stories	number of stories	3.156	4.723	1.00	76.00
yearblt	year built	1980.423	27.659	1750.00	2017.00
medical	coded 1 if medical space	0.167	0.373	0.00	1.00
vacant_housing	cnty % housing vacant	0.180	0.105	0.05	0.57
low_birth_weight	cnty % of births low weight	7.738	1.839	0.00	13.70
over_dist	interaction between overall & distance	2239.584	3442.805	0.00	33656.50
medicare_per_cap	medicare expenditures by county	9854.446	1200.300	7143.51	13041.86

Table 2: Summary Statistics by MSA

MSA	Atlanta		Boston		Charlotte		Denver		Houston		Indianapolis	
Obs	2,673		1,659		1,086		1,404		1,166		786	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
rentdif_percent	0.083	0.356	0.083	0.442	0.062	0.360	0.024	0.348	0.060	0.319	0.029	0.323
logrent	2.644	0.365	2.755	0.417	2.733	0.397	2.805	0.354	2.912	0.308	2.601	0.379
neighrent7	16.704	4.066	15.018	4.024	16.192	5.496	17.343	6.071	17.715	4.549	18.872	3.575
distance1	6086.057	4459.747	5218.652	4351.354	4358.236	3748.838	4080.038	2847.728	4134.033	3635.883	4027.128	3638.121
class_a	0.131	0.337	0.074	0.262	0.153	0.360	0.116	0.320	0.164	0.370	0.104	0.306
class_b	0.533	0.499	0.482	0.500	0.522	0.500	0.669	0.471	0.563	0.496	0.519	0.500
class_c	0.336	0.473	0.444	0.497	0.325	0.469	0.214	0.411	0.273	0.446	0.377	0.485
constate	1.000	0.000	1.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
gross	0.386	0.487	0.182	0.386	0.411	0.492	0.473	0.499	0.442	0.497	0.408	0.492
net	0.073	0.261	0.324	0.468	0.066	0.249	0.020	0.140	0.047	0.212	0.123	0.329
modified	0.318	0.466	0.209	0.407	0.268	0.443	0.103	0.303	0.099	0.299	0.243	0.429
triple_net	0.187	0.390	0.238	0.426	0.183	0.387	0.359	0.480	0.364	0.481	0.165	0.372
stars	2.575	0.771	2.482	0.650	2.650	0.807	2.672	0.738	2.770	0.790	2.370	0.661
phys_ratio	1446.606	942.158	901.197	364.781	1162.934	406.264	1008.332	360.435	1234.795	517.811	905.080	317.303
overall	2.774	1.208	3.312	0.981	3.329	1.160	3.952	0.837	3.377	1.231	3.817	0.801
hown_feds	0.000	0.000	0.016	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
hown_physician	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.074	0.261	0.000	0.000
hown_propriet	0.191	0.393	0.222	0.416	0.162	0.369	0.295	0.456	0.366	0.482	0.191	0.393
medoffrent	13.927	2.472	15.942	3.615	15.660	2.979	17.210	2.740	18.220	1.203	13.941	1.705
fipsunemp	6.926	0.979	5.654	0.996	6.346	0.394	5.687	0.518	5.148	0.244	6.422	1.099
stories	3.129	4.824	2.917	1.954	2.743	4.379	3.928	5.208	5.000	7.867	2.762	3.831
yearblt	1985.848	21.662	1956.896	44.246	1984.574	24.653	1979.202	24.726	1985.242	18.926	1973.991	28.394
medical	0.162	0.368	0.087	0.282	0.200	0.400	0.122	0.327	0.197	0.398	0.156	0.364
vacant_housing	0.226	0.125	0.159	0.145	0.183	0.069	0.254	0.135	0.285	0.046	0.125	0.032
low_birth_weight	9.614	2.070	7.154	1.027	9.008	1.248	8.412	2.745	5.845	1.263	7.727	0.565
over_dist	2004.683	3872.417	1963.024	3578.529	2765.584	3505.806	3201.761	3107.424	2080.901	2995.003	2453.027	3889.843
medicare_per_cap	9472.931	631.541	10753.170	874.241	9019.469	344.308	8970.726	681.945	12595.140	656.058	10128.360	951.924

MSA	Minneapolis		Orlando		Phoenix		Pittsburgh		Seattle		Sacramento	
Obs	1,212		1,240		1,495		591		1,301		1,398	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
rentdif_percent	0.043	0.324	0.057	0.370	0.072	0.336	0.074	0.337	0.031	0.317	0.063	0.313
logrent	2.574	0.319	2.672	0.361	2.820	0.319	2.718	0.395	2.945	0.344	2.880	0.312
neighrent7	16.238	3.922	14.216	3.043	16.078	3.413	18.112	4.956	19.747	5.298	18.070	3.906
distance1	5386.117	4153.276	5457.553	3932.496	3619.207	3327.767	4661.750	3957.170	3348.677	2707.290	4652.577	4314.484
class_a	0.082	0.274	0.071	0.257	0.090	0.286	0.161	0.368	0.096	0.295	0.087	0.282
class_b	0.526	0.500	0.503	0.500	0.671	0.470	0.543	0.499	0.620	0.486	0.505	0.500
class_c	0.393	0.489	0.426	0.495	0.239	0.427	0.294	0.456	0.284	0.451	0.408	0.492
constate	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
gross	0.211	0.408	0.274	0.446	0.438	0.496	0.492	0.500	0.344	0.475	0.512	0.500
net	0.194	0.396	0.077	0.267	0.058	0.233	0.266	0.442	0.010	0.099	0.009	0.092
modified	0.158	0.365	0.350	0.477	0.225	0.418	0.096	0.295	0.115	0.320	0.316	0.465
triple_net	0.370	0.483	0.260	0.439	0.236	0.425	0.071	0.257	0.491	0.500	0.118	0.323
stars	2.673	0.714	2.446	0.683	2.628	0.669	2.582	0.804	2.540	0.756	2.638	0.662
phys_ratio	956.504	456.364	1270.866	262.674	1455.829	535.146	970.230	546.729	977.699	430.072	1388.462	237.966
overall	3.715	0.915	2.863	0.832	3.435	1.114	3.066	0.917	3.554	1.032	3.178	0.833
hown_feds	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
hown_physician	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
hown_propriet	0.000	0.000	0.156	0.363	0.442	0.497	0.000	0.000	0.006	0.078	0.000	0.000
medoffrent	13.204	0.618	14.568	1.958	16.440	0.387	15.080	1.893	19.598	2.967	17.582	1.518
fipsunemp	4.681	0.453	6.438	0.615	6.135	0.227	6.204	0.487	5.544	1.056	8.008	0.664
stories	3.669	5.350	2.101	2.469	2.157	3.083	4.819	6.563	3.716	5.813	2.050	2.420
yearblt	1979.932	27.183	1982.741	21.500	1990.924	16.371	1968.496	33.391	1977.913	25.256	1990.089	15.907
medical	0.131	0.338	0.155	0.362	0.256	0.436	0.091	0.288	0.185	0.389	0.230	0.421
vacant_housing	0.103	0.034	0.240	0.044	0.134	0.011	0.149	0.038	0.152	0.044	0.087	0.018
low_birth_weight	6.621	1.694	8.221	0.813	7.366	0.424	7.025	0.443	6.565	0.048	7.092	0.700
over_dist	3968.814	4353.202	1006.433	2339.632	2227.284	3211.822	2227.785	3600.995	1752.000	2292.075	1720.855	2868.552
medicare_per_cap	9213.446	490.247	10876.570	613.998	9321.625	21.286	10684.220	666.134	8545.991	139.095	9697.613	537.589

Table 3: Comparison of Base Rent Differential or Premium for MOB in states with or without CON legislation

	Total Sample	Without	With
Full Sample	1.1698		
With and without CON required		1.0844	1.2385
Subsample of Counties with >4 observations		1.0857	1.2364

Presents the base rent premium for MOB over POB for the full sample.

Table 4: MSA level sample distribution and mean rents for POB and MOB

MSA	n	Rent	Rent Proportions
Atlanta	*2241*	*14.61*	*0.86*
	432	*16.92*	*1.16*
Boston	*1515*	*17.43*	*0.98*
	144	*17.83*	*1.02*
Charlotte	*869*	*16.08*	*0.88*
	217	*18.28*	*1.14*
Denver	1233	17.61	1.00
	171	17.59	1.00
Houston	936	18.98	0.96
	230	19.78	1.04
Indianapolis	663	14.30	0.90
	123	15.81	1.11
Minneapolis	1053	13.45	0.85
	159	15.76	1.17
Orlando	*1048*	*15.51*	*0.99*
	192	*15.70*	*1.01*
Phoenix	*1113*	*17.25*	*0.93*
	382	*18.54*	*1.07*
Pittsburgh	537	15.43	0.98
	54	15.74	1.02
Seattle	*1,060*	*20.10*	*0.97*
	241	*20.77*	*1.03*
Sacramento	1,076	18.12	0.95
	322	18.98	1.05

Regions in bold are bound by state level CON Laws.

Table 5: OLS Results

rentdif_percent_dif	Coefficient	P>|t|			logrent	Coefficient	P>|t|	
neighrent7	0.0042	0.000	***		neighrent7	0.0031	0.000	***
distance1	-3.51E-06	0.000	***		distance1	-3.82E-06	0.000	***
class_a	0.2691	0.000	***		class_a	0.2306	0.000	***
class_b	0.0899	0.000	***		class_b	0.0946	0.000	***
constate	0.0673	0.000	***		constate	0.0515	0.000	***
gross	0.0954	0.000	***		gross	0.1096	0.000	***
triple_net	-0.0843	0.000	***		triple_net	-0.0833	0.000	***
stars	0.0872	0.000	***		stars	0.0930	0.000	***
msa_2	0.1118	0.000	***		_Imsa_2	0.0975	0.000	***
msa_3	-0.0100	0.385			_Imsa_3	-0.0140	0.200	
msa_4	-0.0196	0.102	*		_Imsa_4	-0.0047	0.677	
msa_5	0.0155	0.308			_Imsa_5	0.0471	0.001	***
msa_6	-0.0481	0.001	***		_Imsa_6	-0.0454	0.001	***
msa_7	-0.0333	0.025	**		_Imsa_7	-0.0349	0.013	***
msa_8	0.0342	0.002	***		_Imsa_8	0.0464	0.000	***
msa_9	0.0273	0.026	**		_Imsa_9	0.0440	0.000	***
msa_10	-0.0191	0.213			_Imsa_10	-0.0124	0.393	
msa_11	0.0635	0.000	***		_Imsa_11	0.0639	0.000	***
msa_12	0.0563	0.000	***		_Imsa_12	0.0713	0.000	***
phys_ratio	0.0000115	0.028	**		phys_ratio	-2.68E-07	0.957	
overall_2	0.0019	0.898			_Ioverall_2	0.0132	0.343	
overall_3	0.0345	0.021	**		_Ioverall_3	0.0335	0.017	**
overall_4	0.0683	0.000	***		_Ioverall_4	0.0694	0.000	***
overall_5	0.0703	0.000	***		_Ioverall_5	0.0704	0.000	***
hown_feds	-0.1215	0.041	**		hown_feds	-0.1314	0.019	**
hown_physician	-0.0908	0.009	***		hown_physician	-0.0964	0.003	***
hown_propriet	-0.0149	0.032	**		hown_propriet	-0.0159	0.015	**
medoffrent	-0.0246	0.000	***		medoffrent	0.0367	0.000	***
fipsunemp	-0.0080	0.029	**		fipsunemp	-0.0084	0.015	**
stories	0.0052	0.000	***		stories	0.0043	0.000	***
yearblt	0.0003	0.010	***		yearblt	0.0006	0.000	***
medical	0.1099	0.000	***		medical	0.1086	0.000	***
vacant_housing	0.1126	0.000	***		vacant_housing	0.0301	0.280	
low_birth_weight	-0.0036	0.044	**		low_birth_weight	-0.0030	0.074	*
over_dist	-5.91E-06	0.000	***		over_dist	-5.30E-06	0.000	***
constant	-0.5049	0.019	**		constant	0.6335	0.002	***
R-squared	0.2481				R-squared	0.4129		
n =	16,007				n =	16,007		

This table presents the results from an ordinary least squares model with the dependent variables *rentdif_percent* and *logrent*. The coefficient estimates and t-scores are presented for both models, *** = 99%, ** = 95% and * = 90%.

Table 6: HLM Results

		rentdif_percent			logrent		
	Variable	**Coefficient**	**P>|z|**		**Coefficient**	**P>|z|**	
Fixed	over_dist	-6.67E-06	0.000	***	-5.89E-06	0.000	***
	overall_2	0.0285	0.117		0.0270	0.124	
	overall_3	0.0544	0.004	***	0.0440	0.015	**
	overall_4	0.1120	0.000	***	0.1035	0.000	***
	overall_5	0.1119	0.000	***	0.1047	0.000	***
	distance1	-2.91E-06	0.001	***	-4.26E-06	0.000	***
	class_b	0.0885	0.000	***	0.0959	0.000	***
	class_a	0.2634	0.000	***	0.2276	0.000	***
	medical	0.1171	0.000	***	0.1107	0.000	***
	gross	0.1000	0.000	***	0.1112	0.000	***
	triple_net	-0.0854	0.000	***	-0.0837	0.000	***
	stars	0.0856	0.000	***	0.0912	0.000	***
	stories	0.0053	0.000	***	0.0043	0.000	***
	yearblt	0.0003	0.004	***	0.0005	0.000	***
	neighrent7	0.0036	0.000	***	0.0023	0.017	**
	fipsunemp	0.0243	0.007	***	-0.0254	0.060	*
	medicare_per_cap	-8.31E-11	0.021	**	1.23E-10	0.013	**
	conmed	0.0837	0.000	***	0.0521	0.001	***
	constant	-1.0908	0.000	***	1.2815	0.000	***
		SD			**SD**		
Random	MSA constant	0.0362			0.0803		
	county constant	0.0654			0.1287		
	neighrent7	0.0043			0.0060		
	fipsunemp	1.61E-08			7.15E-07		
	medicare_expend	8.05E-11			8.38E-11		
	conmed	0.1013			0.0538		
	Residuals	0.3003			0.2817		
	LR test	884.10			2467.04		
	Chi2	0.000			0.000		
	n=	16,007			16,007		

This table presents the results from a multilevel model with the dependent variables *rentdif_percent* and *logrent*. The coefficient estimates and z-scores are presented for both models, *** = 99%, ** = 95% and * = 90%.