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Distortions in a segment of the commercial office market: the case of medical office buildings

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ABSTRACT

This article examines the U.S. market for Medical Office Buildings (MOB), a segment of the office market that has received little attention in the academic literature. Our attention is directed towards the impact of Certificate-of-Need (CON), a set of state level distortionary public laws that regulate health services planning. With respect to real estate, we find CON regulations increase rents and sales prices medical office building (MOB) rental rates. What makes these findings particularly interesting is that none of the states that currently have CON legislation in place have any language restricting MOB development. The empirical findings suggest that there is a supply constraint due to CON that has a distortionary effect on the MOB market.

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Introduction

Prior to the COVID-19 pandemic, the demand for medical office space in the U.S. had been brisk and given the growing importance of medical facilities, it will likely continue during the next ten years as the 65-plus age cohort grows by another 17 million (O'Hara & Caswell, 2013). Between 2005 and 2016 medical office building inventory grew 50% to 41,000 nationwide, with 22 million square feet under roof. Furthermore, the mandated usage of insurance exchanges, or whatever derivative results from efforts directed at 'repeal and replace,' will likely boost medical service utilisation across all age cohorts. As of 2017 the Affordable Care Act added 27 million people to the insurance rolls since its inception. Yet, with this growth and anticipated demand there has been almost no academic research on this segment of the office market.

Furthermore, quantifying the impact of this growth on the need for future medical office space has become increasingly elusive. Multiple trends cloud the forecast, such as a growing physician shortage, the retailing of medical services, the industry's consolidation, the evolution of the delivery model, and the globalisation of health-care services. With the COVID-19 pandemic the potential need for reserve hospital space (to prevent a repeat of the 2020 facility shortages) also enters the equation.

Since 2000, the medical office market has shown a range of performance metrics. From 2001 to 2006, a period of generous credit and liquidity, there were extremely low cap rates

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and strong rent growth. The inverse occurred from 2008 to 2010 with the recession and evaporation of credit, but not to the same degree as professional office space. Since 2010, until early 2020, with a stabilising economy, the market has exhibited moderate expansion in the demand for health services, relatively low vacancy rates across the country, and inexpensive capital. Liquidity and credit availability are global factors, so this cyclical trend has been national in scope rather than locally focused. However, as with POBs (professional office buildings), there is extensive locational variation in both rental rates for MOBs (medical office buildings) and in the spread in base rents between MOBs and POBs. This study focuses on the differences in base rental rates for both MOB and POB properties across 12 major US Metropolitan Statistical Areas (MSAs).

This study seeks to examine and explain MSA-specific variation in base rents between MOB and POB office spaces. Public policy induced distortions constrain investment in health services due to restrictive compliance requirements, thereby increasing MOB rents and prices relative to the larger office market in the area (MSA). Our inquiry is guided by the fact that office markets are affected by localised economic and political activities, with particular attention to the impact that non-neutral, or distortionary, public policies have on MOB markets by regulating the overall health services market. Although we focus on medical office facilities in the United States, our approach to analysing policy distortions is easily extended to different property segments, and policy prescriptions.

Properly functioning (or efficient) markets have certain characteristics like equilibrium supply-demand relationships, pricing reflective of costs, and neutrality in public policies. When public policies affect markets in a non-neutral manner they typically result in distortions. State-level Certificate-of-Need, or CON, regulations impose restrictions on investments in medical infrastructure (including buildings) and technology with the goals of reducing the chance of oversupply and ensuring quality care.

The Certificate-of-Need (CON) programme imposes *limits* on health-care services in the interest of reducing costs.[1] CON was part of a nationwide movement originating in the 1950s to expand access to health care that resulted in the federal government enacting the Comprehensive Health Planning Program (CHP) (1966, expanded in 1967). CHP gave rise to the first federal mandate for health-care planning. Although some states have reduced CON regulations, 35 states still have them on the books, and enforced them with various degrees of stringency. We will discuss these regulations in more detail below, but we will argue that they potentially have major impacts on the factor costs of medical buildings and capital.

From the perspective of financial underwriting, MOBs and POBs face dramatically different economic factors that influence cash flows and (ultimately) value. Although a premium on the base rent for MOB properties occurs across all the MSAs tested, we find that the properties in states with CON regulations have significantly higher premiums across all price levels. This finding suggests that a second-order effect from the CON legislation is a constraint on the overall supply of health care facility space that reduces the supply of MOB space, relative to demand. The outcome from this imbalance is higher MOB rent and sales price premiums. Such a policy distortion, while potentially enhancing the returns from MOB investment, threatens the efficiency of the MOB market by possibly raising costs to consumers and third-party payers. In addition to a detailed analysis of rental markets in CON and non-CON states we also present a hedonic model of office sales in the top 50 MSAs (based on population). The results

from this set of models support the rental market findings and indicate that MOB price premium for in CON regulated states is higher than non-CON states. We outline the medical office market and discuss how public policies distort property markets. The data and analysis are presented next with the results from the modelling, and conclusions rounding out the discussion.

Why MOBs are special

Medical office buildings (MOBs) are facilities constructed or converted for medical use. These can include physician office buildings, ambulatory care facilities, surgery centres, medical imaging, health services administration, therapy (physical and psychological), and wellness centres. Utility and pricing for these spaces, like POBs, are typically measured in square feet (Wei, 2012). Unlike hospitals, MOBs are developed and operated by a number of different organisational types such as hospitals or health systems, physician practice groups, and third party institutional investors and managers. The US market for MOBs is a substantial segment of the total office market accounting for roughly 62% of all medical facility space and 4.5 square feet per insured person in the United States (Alexander, 2015).

Numerous MOB market characteristics are either unique or serve to separate MOBs from POBs. Medical office tenants and physician practices typically have longer tenures 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 centres that they view as more convenient or accessible. This '*retailization*' of health care is seen 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 X-Ray machines, oncology treatments, and scanners) that require specific (and expensive) structural components such as lead-lined walls and dedicated disposal. Many health service tenants such as urgent care, x-ray, and lab diagnostics conduct business during evenings and over weekends. Medical tenants typically face greater compliance review for accessibility from the Americans with Disabilities Act. Patient privacy issues can create special circumstances with respect to common entry and landlord access.

Federal safe harbour laws were created to provide anti-kickback regulations regarding the landlord-tenant relationship for medical tenants. In essence, anti-kickback laws require leases between healthcare providers and hospital or physician-owned properties to effectively reflect the market rate. Regulators scrutinise leases that appear to be below market and thus resemble forms of compensation, enticement, or subsidy to the tenant. Furthermore, improvement costs (due to the special features required) for healthcare services are often significantly higher than for professional office space. These higher costs are reflected in medical leases that typically run seven to ten years versus the average three to five years for professional office space (Davidson, 2010).

Market efficiency and the certificate-of-need

Analysts recognise that efficient rental markets provide:

- Choices for fully informed tenants with tradeoffs to consider, such as quality or quantity of space, location, amenity set, and price,
- Prices reflecting marginal costs and providing the information on supply, and the value that tenants place on space,
- Competition encouraging efficiency and innovation and incentivising property owners to provide space that tenants value, thereby enhancing the potential for profits, (Federal Trade Commission and U.S. Department of Justice, 2004)
- Market-neutral public policies that stimulate market efficiency and while not favouring one group at the expense of another (Litman, 2006).

Although MOB tenants in urban markets would seem to have abundant options for space, the choice set is substantially reduced by zoning issues, as well as the need for proximity to additional health-care services.[2] profit-maximising tenants must weigh the desirability of sufficient exposure to potential patients against the cost of that prime space. Similarly, attractive options decrease if sites are located far from hospital services. The net result is a set of options that offers fewer desirable, and potentially more expensive (e.g., adjacent to surgery centre, hospital, or population centre) locations. Increased demand for healthcare ensures a similarly increased demand for suitable office space to provide health services.

Certificate of Need, or CON programmes evolved to curtail the construction of unnecessary health-care facilities and the acquisition of costly equipment that purportedly provided little benefit. CON legislation compelled hospitals, and other health-care entities, to acquire *prior approval* from a governmental entity for construction or acquisition of facilities and major capital assets. Efforts to control the growth of health-care facilities and the acquisition of expensive equipment date to the 1946 federal Hill-Burton program. The program provided funds for new hospital construction that were contingent on the adoption of state health plans detailing the processes for evaluating proposed projects (Havighurst, 1973; Lave & Lave, 1974). The Hill-Burton program also encouraged local planning to facilitate the recognition and classification of local needs.

The rationale for such supply-limiting programs was an analytical model then referred to as 'Physician – ' or (later) 'Supplier – Induced Demand' or SID. Early analyses by Shain and Roemer (1959) and Roemer (1961) related increased healthcare costs to increased numbers of facilities summarised by the phrase 'a built bed is a filled bed.' With providers determining the usage of facilities, SID advocates believed that physicians and/or hospitals would order enough usage to fill the new facilities. Subsequent analyses (Conover & Sloan, 1998, for example) spoke of the possibility of a 'medical arms race' with hospitals competing on the basis of breadth of service offerings rather than rather than price. Advocates of capital controls viewed CON as an important way to reduce this presumed excess usage and its attendant costs by limiting the numbers and sizes of facilities. While most health economists have come to agree that the market dominance of managed care, with its relatively well-informed auditors, has reduced the potential for and the magnitude of SID, CON remains a testament to its legacy in health-care regulation.

In 1967 New York became the first state to enact a CON program. Shortly thereafter, Rhode Island, Maryland, and California passed CON legislation. Section 1122 of the 1972 amendments to the Public Health Service Act incorporated controls on capital expansion by health-care facilities through the withholding of Medicare and Medicaid funds for the

interest and depreciation expenses that were associated with unapproved projects. States could designate either their state health planning agency or the Hill-Burton Agency to determine the need for new capital expenditures (National Directory of Health Planning, Policy and Regulatory Agencies, 1999 and 2005).

In 1986, Congress repealed the federal mandate to implement CON regulations to receive funds under the Public Health Service Act. While several states have dismantled their CON laws, as of late 2017, thirty-five states plus the District of Columbia continued to have CON laws in place.

Why should CON impact MOB rents and prices when it does not directly legislate the supply of MOB space? We argue that CON (still) limits the supply and the location of hospitals, and big-ticket medical items, and the people and facilities that serve them. We argue further that proximity to hospitals is important for the location of MOBs, and hence limiting the hospital supply and location also limits the amount of proximate land and hence buildings. One would expect an increase in price for this reason.

Analysts have observed substantial rent-seeking activity to win CONs both to gain monopolistic market power and to cross-subsidise money-losing services. Folland et al. (2010, 412–413) document competition among several provider groups for the right to build a new hospital in Novi, Michigan, a community about 30 miles from downtown Detroit. Transcripts from the Michigan CON hearing board indicate that the competition for the CON had little to do with reducing costs, and more to do with reducing competition and increasing profitability. Novi is a suburban community with a relatively small amount of uncompensated care. The competitors made it clear that they would use the higher profits of suburban services to cross-subsidise money-losing operations in (central city) Detroit.

Most CON evaluations (both academic and practical) have observed modest impacts on health-care costs and/or health-care quality. Advocates contend that CON reduces unneeded procedures, but its impacts on quality of care have been elusive (Conover Christopher & Sloan, 2003; Dobson et al., 2008; Salkever & Bice, 1979; Salkever David & Bice, 1976). Dobson et al. (2008) note that in Illinois CON was used to protect so-called 'safety-net' hospitals that maintain access for the under-served. They argue that the greatest impact might be a delay in the shift of relatively profitable services from the inner city to the suburbs. They find no evidence that 'safety-net' hospitals are financially stronger in CON states than in other states.

The health economics and health services literatures basically ignore land costs, usually treating rent and capital costs as fixed costs in performing short-run cost minimisation studies (Folland et al., 2010). An extensive literature search shows no analyses of CON's impacts on medically related land or capital markets. The states with CON in place are noted in Figure 1 (for additional detail see American Health Planning Association, 2016). The regulations vary considerably across those states, but an overarching theme is that CON limits the health-care system from operating as an open, competitive market. As such, we hypothesise that by imposing supply constraints and compliance costs at the construction stage a second-order effect of CON regulations is that they distort the markets, consequently increasing the marginal costs of supply and rents for MOB space. Such reduced, or high cost, supply effects should be observable in the market in higher rents and higher acquisition costs.

Figure 1. CON state map. The data come from the American Health Planning Association, the National Directory of State Certificate of Need Programs, and the Mercatus Centre of George Mason University

Observing distortionary policy effects

Data

In the principle analysis we rely on data from MOB and POB rental offerings provided by the co-star Group Inc. Rental observations from 12 second-tier Metropolitan Statistical Areas provide a comparison between states with and without CON legislation in place.[3] The data represent a snapshot of base rents for June, 2015.[4] With preliminary cleaning, the data consist of approximately 14,285 observed sites. We also provide a supporting analysis, or sanity check, with a similar comparison on MOB sales price premiums. This test is accomplished via a hedonic model across the 50 largest MSAs (based on population) from January 2000 through January of 2020. This secondary analysis is briefly presented after a detailed examination of the rental market.

Table 1 summarises the foundational relationship between MOB and POB rents. The figures represent the average premium on base rents for MOBs across the rent sample comparing MOB premiums in states 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 forms the basis for the hypothesis

Table 1. 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.

that CON legislation adversely influences the supply and demand relationship for MOBs by distorting in the market.

Table 2 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. The last column shows the proportions for each relative to the other. For example, the average rent in Atlanta for a POB is 86% of the average for a MOB (alternatively, the average Atlanta MOB rent is 116% of the POB). Italicised and bolded MSAs are located in CON states. With the exception of the Denver sample, the average MOB base rent is higher than the POB rent. The 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 3 presents the variable names, summary statistics, and descriptions for the variables in the analysis. The dependent variable is the rent differential, *rentdif_%*, and is calculated as the percentage difference between the base rent for the property as reported in co-star and the average base rent within the MSA. co-star also provides the property specific control variables. These include the dichotomous variables for the class of the office building (A, B, 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 age of the improvements and the number of stories and parking spaces. We also include the Energy Star Certification identifier from the co-star data. Research by Reichardt et al. (2012) observed a significant market rent premium for eco-certified office buildings. co-star also reports a subjective condition or overall quality and condition ranking in the form of a five star rating system.[5] All these variables are expected to influence the property rent and ultimately the rent differential.

Table 2. MSA level sample distribution and mean rents for POB and MOB.

MSA	n	Rent	Rent Proportions
Atlanta	*1,865*	*14.61*	*0.86*
	359	*16.92*	*1.16*
Boston	*1,276*	*17.43*	*0.98*
	124	*17.83*	*1.02*
Charlotte	*682*	*16.08*	*0.88*
	180	*18.28*	*1.14*
Denver	895	17.61	1.00
	128	17.59	1.00
Houston	1,115	18.98	0.96
	252	19.78	1.04
Indianapolis	589	14.30	0.90
	114	15.81	1.11
Minneapolis	906	13.45	0.85
	139	15.76	1.17
Orlando	*937*	*15.51*	*0.99*
	179	*15.70*	*1.01*
Phoenix	*1,340*	*17.25*	*0.93*
	384	*18.54*	*1.07*
Pittsburgh	444	15.43	0.98
	49	15.74	1.02
Seattle	*887*	*20.10*	*0.97*
	202	*20.77*	*1.03*
Sacramento	950	18.12	0.95
	289	18.98	1.05

Regions in bold are bound by state level CON Laws.

Table 3. Description and summary statistics.

Variable	Description	Mean	Std. Dev	Min	Max
rentdif %	Difference between observed and median	0.060	0.358	−0.929	3.773
medical	Coded 1 if co-star listed as medical office space	0.167	0.373	0	1
constate	Coded 1 if observation located in a CON State	0.456	0.498	0	1
interaction	Coded 1 if observation is medical in a CON State	0.071	0.257	0	1
class A	Classified as class A	0.107	0.310	0	1
class B	Classified as class B	0.555	0.500	0	1
class C	Classified as class C	0.336	0.470	0	1
gross	Gross base rent	0.385	0.490	0	1
modified	Modified base rent	0.233	0.420	0	1
net	Net base rent	0.104	0.310	0	1
triple net	Triple net base rent	0.265	0.440	0	1
stars	co-star star rating	2.582	0.730	1	5
stories	Number of stories	3.054	4.490	0	76
yearblt	Median year built	1980	27	1750	2017
estar	Energy Star certification	0.017	0.129	0	1
parking	number of parking spaces available	148.094	246.965	1	4500
neighrent7	Median rent for nearest 7 neighbours	16.89	4.64	5.90	48.23
cou unemp	County current unemployment	6.164	1.220	3.50	15.80
cou labour	County labour force	710,958	665,907	510	2,200,000

This table presents the abbreviated variable name, description, and summary statistics for the variables in the models.

In addition to the co-star data, there are also control variables for the location-specific economy. With numerous counties within each of the markets and with each county having its own unique market for office rents, we include two location variables at the county level and a created variable at the neighbourhood level. The US Bureau of Economic Analysis (BEA) provides labour force estimates (size and percent of participants) (*fipslabor*) and unemployment rates by county (*fipsunemp*). To account for the impact that the micro-market or neighbourhood has on rental rates we calculate a variable that represents the median quoted base rent from co-star for the seven nearest neighbours (*neighrent7)* based on the great circle distance. This variable provides a control for high or low-cost submarkets.

The three variables central to the analysis are identified as *medical, constate* and *interaction*. The medical variable is coded one if the space is identified by co-star as a MOB and zero otherwise. Likewise, *constate* is also binary coded 1 if the rental observation is located in a state regulated by Certificate of Need legislation. Finally, the variable *interaction* is coded one if the property is identified as a MOB and is located in a CON state and zero otherwise. Just under seventeen percent of the observations are identified as MOB properties with approximately seven percent of the total observations MOBs located on CON States. The expectation is that MOBs that are located in states with CON legislation will have significantly higher rent premiums after controlling for property and location factors. By extension, this premium represents a distortion that constrain the expansion of medical services.

Panels A and B of Table 4 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 (*stars*) applied by co-star 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 to 25% in Sacramento. The markets also vary widely in how leases are structured (gross, net,

Table 4. (A) Summary statistics by MSA.

MSA	Atlanta		Boston		Charlotte		Denver		Houston		Indianapolis	
Obs	2,224		1,400		862		1,023		1,367		703	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
rentdif %	0.0867	0.3704	0.0914	0.4544	0.0740	0.3686	0.0441	0.3511	0.0505	0.3223	0.0324	0.3250
medical	0.1650	0.3712	0.0887	0.2843	0.2007	0.4007	0.1197	0.3247	0.1802	0.3845	0.1532	0.3604
constate	1	0	1	0	1	0	0	0	0	0	0	0
interaction	0.1650	0.3712	0.0887	0.2843	0.2007	0.4007	0	0	0	0	0	0
class A	0.1256	0.3314	0.0723	0.2590	0.1495	0.3567	0.1245	0.3302	0.1657	0.3719	0.1061	0.3082
class B	0.5330	0.4990	0.4855	0.4999	0.5281	0.4994	0.6683	0.4710	0.5658	0.4958	0.5241	0.4997
class C	0.3414	0.4743	0.4412	0.4967	0.3224	0.4676	0.2067	0.4050	0.2679	0.4430	0.3698	0.4830
gross	0.3847	0.4866	0.1915	0.3936	0.4205	0.4939	0.5035	0.5001	0.4593	0.4985	0.4200	0.4938
modified	0.3376	0.4730	0.2284	0.4199	0.2911	0.4545	0.1062	0.3082	0.0976	0.2969	0.2565	0.4369
net	0.0793	0.2703	0.3283	0.4697	0.0749	0.2633	0.0205	0.1417	0.0479	0.2136	0.1412	0.3484
triple net	0.1952	0.3964	0.2457	0.4306	0.2006	0.4006	0.3660	0.4819	0.3952	0.4890	0.1765	0.3814
stars	2.5643	0.7687	2.4744	0.6477	2.6532	0.8032	2.6909	0.7326	2.7729	0.7702	2.3884	0.6579
stories	3.0526	4.6919	2.9322	2.0794	2.6767	4.2524	3.7644	4.8469	4.7240	7.1598	2.6035	3.6013
yearblt	1986	22	1956	45	1985	25	1980	24	1986	19	1975	29
estar	0.0158	0.1248	0.0042	0.0649	0.0126	0.1116	0.0214	0.1449	0.0508	0.2196	0.0077	0.0872
parking	178.6120	304.1128	102.3450	187.1457	117.1281	190.4173	151.4579	183.9221	247.2042	318.0620	131.7608	222.7654
neighrent7	16.6918	4.0626	15.0450	4.0242	16.1807	5.4891	17.3513	6.0847	17.8517	4.6303	18.8899	3.6280
cou unemp	6.9186	0.9827	5.6679	0.9976	6.3461	0.3976	5.6869	0.5195	5.1430	0.2700	6.3125	1.1548
cou labour	325,686	178,640	474,054	249,685	341,908	228,449	274,301	87,212	1,723,788	839,581	304,215	182,358

Table 4. (B) Summary statistics by MSA.

MSA	Minneapolis		Orlando		Phoenix		Pittsburgh		Seattle		Sacramento	
Obs	1,045		1,116		1,724		493		1,089		1,239	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
rentdif %	0.049	0.335	0.061	0.367	0.067	0.348	0.020	0.342	0.037	0.322	0.052	0.320
medical	0.134	0.340	0.161	0.368	0.227	0.419	0.101	0.302	0.185	0.389	0.248	0.432
constate	0	0	1	0	0	0	0	0	1	0	0	0
interaction	0	0	0.161	0.367	0	0	0	0	0.185	0.388	0	0
class A	0.080	0.271	0.082	0.274	0.093	0.290	0.121	0.326	0.093	0.290	0.081	0.272
class B	0.519	0.500	0.508	0.500	0.669	0.471	0.480	0.500	0.625	0.484	0.494	0.500
class C	0.401	0.490	0.410	0.492	0.239	0.426	0.397	0.490	0.282	0.450	0.426	0.495
gross	0.238	0.426	0.266	0.442	0.480	0.500	0.440	0.497	0.350	0.477	0.468	0.499
modified	0.179	0.383	0.374	0.484	0.241	0.428	0.122	0.327	0.124	0.330	0.322	0.467
net	0.200	0.400	0.080	0.271	0.051	0.219	0.341	0.474	0.013	0.114	0.010	0.099
triple net	0.374	0.484	0.277	0.448	0.226	0.419	0.087	0.281	0.510	0.500	0.122	0.327
stars	2.627	0.715	2.474	0.697	2.637	0.679	2.425	0.751	2.546	0.756	2.577	0.652
stories	3.466	4.998	2.056	2.340	2.102	2.727	4.066	5.615	3.669	5.679	1.946	2.225
yearblt	1978	29	1984	21	1990	16	1968	33	1978	25	1990	16
estar	0.020	0.140	0.006	0.079	0.011	0.104	0.003	0.059	0.012	0.110	0.026	0.160
parking	156	237	122	206	153	271	148	380	114	164	107	137
neighrent7	16.26	3.86	14.25	3.02	16.22	3.45	17.92	4.90	19.72	5.31	18.01	3.98
cou unemp	4.726	0.496	6.391	0.601	6.132	0.218	6.187	0.504	5.565	1.074	8.271	1.517
cou labour	400,324	251,979	414,860	228,041	1,862,281	254,216	492,468	236,156	914,306	387,452	476,089	268,368

Summary statistics are segmented by MSA. A number of the location controls are measured at the county level, and the summaries represent the average across all the counties in the MSA.

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. The Energy Star (*estar*) variable, although small, has a wide range with 2.6% of the observations in Sacramento and only 0.42% in Boston. The MSA level variations lend support for respecting the potential for variables to influence rent differently in different MSAs. For example, the mean year built in Boston is 1956 and in Phoenix and Sacramento it is 1990. It is likely that age of the building influences rents in different ways in those markets with tenants in Boston selecting from a pool of older properties on average. This MSA level variation dictates the analytical approach presented in the next section.

Multivariate approach (HLM)

As previously mentioned the database is comprised of individual office base rent offerings. The variables 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 neighbourhood level (e.g., unemployment, hospital location and quality ranking,); and data that reflects variations between MSAs (e.g., CON state). Each observation also has a set of unobserved factors, or amenities, such as undisclosed lease terms that influence the asking rent. One modelling approach might involve a traditional ordinary least squares regression. However, OLS has limitations for this particular analysis. 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. 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.

For this reason, we approach the question by structuring a multilevel regression model (sometimes referred to as Hierarchical Linear Modelling (HLM).[6] Goodman and Thibodeau (1998), Goodman and Smith (2010, 2020), and Crosby et al. (2016) provide examples of this method applied to issues in real estate (housing markets, mortgage default and office properties respectively). We begin with a baseline regression (OLS) to serve as a point of comparison and demarcation as follows:

$$y_f = a_f + b_f x_f + c_f z_f + \varepsilon_f \tag{1}$$

where y_f is the dependent variable of interest *rentdiff_percent,* x_f represents variables subject to HLM (e.g., MSA unemployment) and z_f variables not subject to HLM (e.g., building age) and ε_f is a well-behaved error term. The OLS formulation implicitly assumes constant relationships, and a constant variance in the error term across levels. For illustration assume that the constant a_f varies by MSA and the slope b_f varies by county. We could observe a set of relationships of the following:

$$a_f = g_0' + g_S' S + \varepsilon_a' \tag{2}$$

$$b_f = h_0^{'} + h_N^{'} N + \varepsilon_b^{'} \tag{3}$$

where $\varepsilon_a^{'} and \varepsilon_b^{'}$ are the error terms for the constant and slope substitutions respectively. Another plausible assumption is that the constant varies by county and the slope by MSA suggesting varying intercepts and slopes at both the county and MSA level. Substituting Equations (2) and (3) into (1) results following model:

$$y_f = g_0^{'} + g_S^{'} S + h_0^{'} x_f + h_N^{'} N x_f + c_f z_f + \varepsilon' \tag{4}$$

where $\varepsilon' = \varepsilon_f + \varepsilon_a^{'} + \varepsilon_b^{'} x_f$. Goodman and Smith (2010) use this method very effectively in examining mortgage default. The results from this model utilising maximum likelihood are presented in the next section.

Base rent results

Table 5 presents the multilevel regression results for the rental dataset. The significant LR tests as supported by the 99% confidence χ^2 indicate the model specifications are enhanced by recognising the random effects from MSA and county level factors. The first output is the base case with only the control variables. In most cases the property and location controls are statistically significant with the sign in the expected direction. The coefficients for *class_a* and *class_b* are positive and significantly larger than class c, which indicates that as the property class increases the spread in the base rent increases. The lease structure variables are estimated against the variable *triple net*. The *gross* and *modified* rents are positive and significant as well, with *net* rent not sufficiently different from triple net to have an impact in the base case. *Stars, stories* and *yearblt*, are also positive and significant. Recall, the variable *yearblt* is simply the year of construction so a positive coefficient indicates newer buildings have a higher rent premium (we do not examine depreciation extensively here). Lastly, on the property level variables, neither *estar* nor *parking* are insignificant and both will be inconsistent throughout the remaining iterations.

Regarding the location controls, the county level unemployment (*fipsunemp*) and the size of the labour force (*fipslabor*) are both significant at 95% or more in all four iterations. The variable neighrent7 proxies for the prevailing rental rates in the immediate area and, as expected, positively influences the rent premium and is significant. This first version of the model provides a foundation for the actual tests of distortions where we incorporate the dichotomous *medical, constate*, and *interaction* variables with the expectation that they will increase the premium for MOB.

The second run in Table 5 incorporates the dichotomous *medical* variable. The control variables are generally consistent with the base model and the explanatory power of the model is retained. The focus here is on the coefficient for the *medical* variable. MOB space across most markets commands a premium over POBs, and this is expressed in the results. The coefficient for the *medical* variable shows there is a roughly 15% premium for office space that is designated as *medical* when compared to professional office space, all else being equal and across the entire dataset. As an example, in a market where the average base rent for POB space is 20, USD the base rent for the MOB space is 23. USD

In the third iteration *medical* is dropped and *constate* is added. Note that *constate* is coded 1 if the observation is in a state identified as a *constate* regardless if the observation

Table 5. Multilevel regression tests of medical and CON state impacts on MOB rental rates.

	Variable	Coefficient	P>|z|		Coefficient	P>|z|		Coefficient	P>|z|		Coefficient	P>|z|	
Fixed	medical				0.1457	0.0000	***				0.1234	0.0000	***
	constate							0.0761	0.0000	***	0.0626	0.0000	***
	interaction										0.0483	0.0000	***
	class_a	0.2587	0.000	***	0.2663	0.0000	***	0.2585	0.0000	***	0.2665	0.0000	***
	class_b	0.0935	0.000	***	0.0893	0.0000	***	0.0934	0.0000	***	0.0898	0.0000	***
	gross	0.1689	0.000	***	0.1886	0.0000	***	0.1689	0.0000	***	0.1882	0.0000	***
	modified	0.0666	0.000	***	0.0745	0.0000	***	0.0662	0.0000	***	0.0746	0.0000	***
	net	0.0114	0.232		0.0242	0.0100	***	0.0120	0.2100		0.0248	0.0080	***
	stars	0.0899	0.000	***	0.0873	0.0000	***	0.0900	0.0000	***	0.0870	0.0000	***
	stories	0.0049	0.000	***	0.0054	0.0000	***	0.0049	0.0000	***	0.0054	0.0000	***
	yearblt	0.0007	0.000	***	0.0005	0.0180	***	0.0007	0.0000	***	0.0005	0.0000	***
	estar	0.0314	0.093	*	0.0459	0.0130	***	0.0314	0.0930	*	0.0445	0.0160	**
	parking	2.23E-05	0.068	*	2.47E-05	0.0390	**	2.23E-05	6.80E-02	*	2.46E-05	4.00E-02	**
	neighrent7	0.0043	0.000	***	0.0040	0.0000	***	0.0043	0.0000	***	0.0043	0.0000	***
	fipsunemp	0.0173	0.009	***	0.0152	0.0180	**	0.0132	0.0180	**	0.0113	0.0380	**
	fipslabor	−8.85E-08	0.001	***	−8.83E-08	1.00E-03	***	−1.61E-07	0.00E+00	***	−1.57E-07	1.00E-03	***
	constant	−1.9391	0.000	***	−1.5423	0.0000	***	−1.9245	0.0000	***	−1.5132	0.0000	***
Random		**SD**			**SD**			**SD**			**SD**		
	MSA constant	0.0292			0.0269			4.50E-12			2.87E-09		
	county constant	0.0809			0.0793			0.0677			0.0652		
	constate							4.50E-12			6.49E-10		
	fipsunemp	3.04E-07			5.45E-09			3.95E-10			4.13E-07		
	fipslabor	8.72E-15			9.40E-15			1.12E-07			1.16E-07		
	Residuals	0.2837			0.2789			0.2838			0.2788		
	LR test	784.65			801.10			764.24			771.92		
	χ^2	0.00			0.00			0.00			0.00		
	n =	14,285			14,285			14,285			14,285		

The four model runs in this table have the same dependent variable (rentdif_%).
The coefficients for the variables *medical* and *interaction* in the second and third run show that there is a premium for MOB office space and that premium is higher in CON states.
*** = 99%, ** = 95%, * = 90%

is a MOB or POB. The coefficient indicates that the overall office market is approximately 7% higher in states with Certificate of Need legislation compared to those that do not have the policy. This result does not respond directly to the hypothesis, but instead is included as part of a set up to the fourth and final version of the model.

The fourth output in Table 5 incorporates the *interaction* variable with *medical* and *constate*. The variable is coded one if the property is classified as an MOB and is located in a state with CON regulations. The coefficient for the interaction variable behaves as anticipated. The results indicate that there is an enhanced premium for medical properties that are located in CON states that significantly exceeds the MOB properties in non-CON states. According to the model output, when we control for the *medical* premium and the overall market *constate* premium MOB properties in states regulated by CON still command an additional 5% premium. This result supports the hypothesis that MOB properties in CON states have higher premiums on their base rents.

Near the bottom of the table is the random effects output from the multilevel model structure. The MSA constant and the county constant are the standard deviations of the random intercepts. The three variables that follow; constate, cou_unemp and cou_labour are the standard deviations of the coefficients for each variable, or a measure of how much the slopes vary on each of the variables. Given this aggregate result we are also interested in how the results change if we separate the data between states with and without CON regulations.

Results from segmented rent

To address this, we divide the data between states with and without CON regulations with the dichotomous *medical* variable included in Table 6. When compared to the models in Table 5, the coefficients for the control variables behave in a similar manner (sign and significance). The coefficient for *medical* indicates that MOB space in a CON state commands a significantly higher premium on the base rent when compared to states without CON: 17.7% versus 11.4%. These results provide decisive evidence that MOB properties in CON states have higher spreads in their rents when compared to the local market in total. While there could be other explanations for this differential, it is likely such factors would be dispersed across CON and non-CON states and not representative of some systematic connection to CON laws. Thus far the data have suggested that tenants in CON states are willing to pay higher premiums for MOB space and we assert this is a result of the constraints placed on the healthcare infrastructure as a result of CON regulation. If this premium is a result of market willingness to pay in the face of constrained supply one might expect this artefact to be further expressed in the willingness to pay of purchasers.

Sales price results

One might argue that as rich as our rental database is, it covers only a limited number of MSAs. While we cannot access rental data for additional analyses, we can turn to sales price data to validate our rental results i.e. that CON regulations influence medical office building markets. To test for a purchase price premium, we rely on another dataset from co-star, a sample of office sales from the 50 largest (based on population) metropolitan

Table 6. Second test of divided data between CON and nonCON states.

	CON State =	1			0		
	Variable	Coefficient	P>|z|		Coefficient	P>|z|	
Fixed	medical	0.1766	0.0000	***	0.1144	0.0000	***
	class_a	0.2638	0.0000	***	0.2582	0.0000	***
	class_b	0.0774	0.0000	***	0.0981	0.0000	***
	gross	0.1892	0.0000	***	0.1847	0.0000	***
	modified	0.0754	0.0000	***	0.0767	0.0000	***
	net	0.0590	0.0000	***	−0.0120	0.3540	
	stars	0.0961	0.0000	***	0.0774	0.0000	***
	stories	0.0058	0.0000	***	0.0051	0.0000	***
	yearblt	3.88E-05	0.8010		0.0013	0.0000	***
	estar	0.0305	0.3680		0.0608	0.0050	***
	parking	0.0001	0.0040	***	6.39E-06	0.6600	
	neighrent7	0.0035	0.0000	***	0.0051	0.0000	***
	fipsunemp	0.0028	0.7730		0.0149	0.0270	**
	fipslabor	−2.34E-07	0.0010	***	−5.04E-08	0.0620	*
	constant	−0.4388	0.0570	**	−3.0205	0.0000	***
Random		**SD**			**SD**		
	MSA constant	6.03E-09			0.0168		
	county constant	3.46E-06			0.0718		
	fipsunemp	0.0067			4.62E-09		
	fipslabor	1.66E-07			1.61E-16		
	Residuals	0.2899			0.2673		
	LR test	359.87			250.10		
	χ^2	0.00			0.00		
	n =	6726			7559		

This table presents regressions of the data segmented between CON and nonCON states with the *medical* variable presenting the average premium for the two subsets, holding all other variables constant at their mean.
*** = 99%, ** = 95%, = 90%

statistical areas (MSAs) covering a period running from January 2000 through January 2020.

After cleaning and coding we are left with a dataset containing over 33,000 transactions. In similar fashion to the rental data we include property level factors provided in the co-star data and controls for MSA location (MSAs coefficients are suppressed in the output, and are available on request). Further, the observations are coded medical if co-star indicates the property is designed as a MOB and we add in controls for the year of sale. The dependent variable is the natural log of the price per foot (*lnppft*). A table of variable descriptions and summary statistics is provided in the appendix.

For this confirmation test we rely on a traditional hedonic model with three iterations with the results presented in Table 7. Across the three versions the variables behave as expected; the coefficients are generally significant with the expected sign. The year dummies represent the market trend that would be expected with a run up through 2009, the dip in 2010 and the rebound through the end of the observation period. The adj-R^2 is stable across all versions explaining 64% of the variation in the dependent variable *lnppft*.

The property specific controls are all significant at the 99% level and have the expected signs. We include both age and age^2 to account for the deterioration in value that occurs with age and the recognition that the rate of depreciation decreases over time. Both class A and class B buildings sell for a higher price per square foot when compared to class C buildings, as expected. co-star has identifiers for properties that are sold under distress, and we include an aggregated variable to represent all the identifiers provided by co-star,

Table 7. Hedonic sales price model: Natural log of price per foot.

Variable	Coefficient	P>|z|		Coefficient	P>|z|		Coefficient	P>|z|	
medical	0.1626	0.0000	***	0.1628	0.0000	***	0.1479	0.0000	***
con_state				−0.0809	0.0020	***	−0.0852	0.0010	***
med_con_inter							0.0264	0.0250	**
age	−0.0071	0.0000	***	−0.0071	0.0000	***	−0.0071	0.0000	***
age2	4.90E-05	0.0000	***	4.89E-05	0.0000	***	4.89E-05	0.0000	***
classa	0.1167	0.0000	***	0.1163	0.0000	***	0.1163	0.0000	***
classb	0.0461	0.0000	***	0.0460	0.0000	***	0.0459	0.0000	***
auct_reo_court	−0.4343	0.0000	***	−0.4341	0.0000	***	−0.4340	0.0000	***
exch1031	0.0415	0.0000	***	0.0415	0.0000	***	0.0416	0.0000	***
starrating	0.1072	0.0000	***	0.1071	0.0000	***	0.1071	0.0000	***
med_pr_ft_zip	0.0020	0.0000	***	0.0020	0.0000	***	0.0020	0.0000	***
pop_2018	2.64E-08	0.0000	***	2.64E-08	0.0000	***	2.64E-08	0.0000	***
year 2001	0.0191	0.2250		0.0196	0.2140		0.0196	0.2130	
2002	0.0609	0.0000	***	0.0610	0.0000	***	0.0611	0.0000	***
2003	0.1039	0.0000	***	0.1043	0.0000	***	0.1044	0.0000	***
2004	0.1645	0.0000	***	0.1651	0.0000	***	0.1649	0.0000	***
2005	0.2611	0.0000	***	0.2611	0.0000	***	0.2611	0.0000	***
2006	0.3331	0.0000	***	0.3332	0.0000	***	0.3332	0.0000	***
2007	0.3857	0.0000	***	0.3859	0.0000	***	0.3856	0.0000	***
2008	0.3791	0.0000	***	0.3790	0.0000	***	0.3792	0.0000	***
2009	0.2561	0.0000	***	0.2561	0.0000	***	0.2565	0.0000	***
2010	0.1337	0.0000	***	0.1332	0.0000	***	0.1334	0.0000	***
2011	0.1752	0.0000	***	0.1754	0.0000	***	0.1754	0.0000	***
2012	0.2180	0.0000	***	0.2182	0.0000	***	0.2183	0.0000	***
2013	0.2697	0.0000	***	0.2698	0.0000	***	0.2695	0.0000	***
2014	0.2848	0.0000	***	0.2855	0.0000	***	0.2855	0.0000	***
2015	0.3574	0.0000	***	0.3578	0.0000	***	0.3580	0.0000	***
2016	0.3415	0.0000	***	0.3419	0.0000	***	0.3420	0.0000	***
2017	0.3561	0.0000	***	0.3558	0.0000	***	0.3560	0.0000	***
2018	0.3875	0.0000	***	0.3881	0.0000	***	0.3881	0.0000	***
2019	0.3834	0.0000	***	0.3834	0.0000	***	0.3834	0.0000	***
2020	0.4293	0.0000	***	0.4295	0.0000	***	0.4299	0.0000	***
constant	3.8607	0.0000	***	3.9416	0.0000	***	3.9428	0.0000	***
n =	33,127			33,127			33,127		
Adjusted R^2	0.637			6379			0.6379		

This table presents the results from a secondary test of the distortionary effects of CON legislation on the MOB market. In this case we consider sales price differentials. The MSA coefficients are suppressed in the interest of page count, but are available on request. A supporting table of summary statistics and variable descriptions is provided in the appendix.
* = 90%, ** = 95%, *** = 99%

auction, foreclosure, REO, court ordered and bankruptcy. Ling and Petrova (2008, 2015) and Holmes and Slade (2001) provide evidence to suggest that properties that sell as part of a 1031 exchange sell at a premium. The coefficient for exch1031 in our model suggests the premium is approximately 4.25% for the observed data. As with the base rent analysis we include the star rating provided by co-star and it is appropriately positive. In addition to the suppressed dichotomous MSA indicators we include a proxy for the micromarket in the variable *med_pr_ft_zip* as well as a metropolitan scale variable to proxy for the generally higher price per foot costs for larger MSA (*pop_2018*). The variables of interest are consistent with the base rent analysis; dichotomous *medical* and *constate* indicators and the interaction variable (*med_con_inter*).

The first iteration of the model includes only the *medical* dummy variable. The coefficient indicates that across all the observed MSAs MOB office space commands a 17.70% premium. That result is strikingly similar to the rent premium paid by tenants for MOB space in the previous analysis. The second iteration incorporates the *constate* identifier. The coefficient for *constate* suggests that, across the board, office property

prices are approximately 7.80% lower in states with CON regulations. The *medical* coefficient is essentially unchanged. Finally, the third iteration includes *medical, constate* and the interaction variable (*med_con_inter*) representing MOB observations located in a CON state. The constate discount is 8.20%, and the medical premium for all observations is slightly less than 16.00%. For properties located in a CON State there is an additional premium of 2.70%. Although the coefficient for the interaction is not particularly large it is significant and suggests the MOB sales price premium in CON States is higher than in states without CON regulations. These findings provide additional support for the conclusion that CON regulations distort the market and artificially inflate the costs of real property dedicated to providing health services.

These findings are important not only in examining real estate markets but also in understanding health-care costs. As noted above, health economists typically concentrate on wages as the primary variable costs, due to the fixity of hospitals and clinics with respect both to capital and land (building) costs. While building costs are presumably more 'fixed' than labour costs, they are substantial and important in the generation of surpluses (for non-profit providers) or profits. This is particularly important when the premises are being rented (with explicit monthly costs) from an outside party rather than used without explicit factor costs, such as hospital space. Our research shows that CON regulations significantly and qualitatively inflate building costs.

Conclusions

The Centers for Medicare & Medicaid Services (2018) project that health-care costs in the United States will expand at a rate of 5.5% per year over the period from 2020 to 2026, and policymakers are motivated to put forward legislation that seeks to curb those increases. Moreover, U.S. health-care markets depart from textbook models of perfect competition in several ways. Providers receive large portions of their payments (mainly through Medicare and Medicaid) at rates that do not respond to traditional supply and demand variations.

Providers must also treat certain patients regardless of their ability to pay. For example, the Federal Emergency Medical Treatment and Active Labour Act (EMTALA) requires hospital emergency departments to evaluate and stabilise any person that enters the department, regardless of insurance or financial status. Similarly, inner city hospitals must treat all who show up at emergency facilities irrespective of their clinical need for such care, their insurance, or their ability to pay. Many health providers engage in substantial rent seeking activity to win CONs in desirable locations to cross-subsidise money-losing services elsewhere.

All else equal, MOB properties located in states with CON laws command higher rent premiums compared to properties in states that have abolished CON. The expected rent depends on both supply and demand factors. CON creates an environment where supply is constrained, which without a corresponding reduction in demand (inelastic) increases the marginal MOB rents. For a given rate of growth in the demand driver, the expected rental growth rate will likely be higher if supply is restricted by volume and through higher construction cost. Our results show that the MOB markets in CON states represent a policy-constrained equilibrium, and this is a point of potential interest not only to academics, but also to practitioners, policymakers, health systems, and investors

targeting areas for acquisition, development or expansion. Furthermore, we provide an approach to analysing the impact of policy distortions that can be extended well beyond the U.S. healthcare market.

Notes

1. CON regulates the supply of medical facilities and imposes higher compliance costs that are capitalised into the costs of construction.
2. There is substantial literature on the scale economies and network benefits of agglomeration in the healthcare industry. See Baicker and Chandra (2010) for examples.
3. The selection of MSAs is based on the goal of obtaining a representative sample of cities in states with or without CON laws. This sample is sufficiently diverse to provide confidence in the external validity of the results.
4. Although base rent quotes do not represent actual contract rents, or more importantly the effective rents, they are the best estimates available. Further, we focus on the spread between MOB and POB base rents. The assumption that the spreads on the base rents are indicative of the spread on the actual contract or effective rents is reasonable.
5. o-star 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. Bryk and Raudenbush (1992) provide a detailed explanation of the HLM method. The methods are mathematically similar to economists' 'random effects' models.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Data Availability Statement

The principle data for this study can be accessed through a contractual agreement between the academic researcher and CoStar Group, Inc. The corresponding author is contractually prohibited from making the data directly available.

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Appendix

Variable	Description	Mean	Std. Dev	Min	Max
lnppft	Natural log of price per square foot	5.082	0.701	−0.223	11.672
medical	Medical identifier	0.210	0.407	0	1
con_state	CON state dummy	0.558	0.497	0	1
med_con_inter	Medical CON interaction	0.118	0.323	0	1
age	Building age at sale	39.183	25.645	0	269
age2	Age squared	2192.910	3460.068	0	72,361
classa	Class A	0.199	0.400	0	1
classb	Class B	0.553	0.497	0	1
classc	Class C	0.247	0.431	0	1
auct_reo_court	Distressed sale identifier	0.017	0.131	0	1
exch1031	1031 exchange identifier	0.131	0.338	0	1
starrating	co-star star rating	2.799	0.761	1	5
med_pr_ft_zip	Median price per foot by zip by year	199.000	190.613	0.800	9353.290
pop_2018	MSA population 2018	6,260,339	5,353,203	1,130,152	2.00E+07
year sold 2000	Identifiers for each year observed	0.043	0.202	0	1
2001	""	0.038	0.192	0	1
2002	""	0.040	0.196	0	1
2003	""	0.039	0.194	0	1
2004	""	0.050	0.217	0	1
2005	""	0.040	0.197	0	1
2006	""	0.041	0.198	0	1
2007	""	0.052	0.222	0	1
2008	""	0.031	0.174	0	1
2009	""	0.013	0.115	0	1
2010	""	0.020	0.140	0	1
2011	""	0.032	0.176	0	1
2012	""	0.045	0.208	0	1
2013	""	0.054	0.226	0	1
2014	""	0.065	0.246	0	1
2015	""	0.076	0.265	0	1
2016	""	0.078	0.268	0	1
2017	""	0.084	0.277	0	1
2018	""	0.078	0.269	0	1
2019	""	0.077	0.266	0	1
2020	""	0.003	0.058	0	1