

Commercial Real Estate in a Nation of Lockdowns

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Abstract: When the COVID-19 virus began to spread across the United States in early 2020, the decision to restrict citizen mobility and economic activity to contain its effects was left to the state and local governments. This created a staggered environment of restrictions throughout the nation which ultimately had varying consequences for local markets. We exploit the disparate nature of government-implemented COVID-19 restrictions to test performance outcomes across commercial real estate markets. Using quarterly data on a large sample of commercial properties, we examine how Covid lockdown restrictions impacted performance in terms of valuations and income, particularly for the five largest property types – Apartments, Retail, Office, Industrial, and Hotels. In general, we find that government restrictions negatively impacted the performance of apartment, retail, and office properties, with retail suffering more than apartments, and office suffering more than retail. In contrast, government restrictions positively impacted the performance of both industrial and hotel properties.

1. Introduction

As the COVID-19 global pandemic unfolded, the U.S. federal government allowed state and local authorities to implement lockdowns and restrictions, which included “shelter-in-place” orders, mask mandates, limits on gatherings, and closing of schools, workplaces, and public transportation, to name a few. Given the irregularity in the number and severity of cases across the U.S., these directives were quite different in terms of stringency and length of implementation. Therefore, the economic effects of COVID-19 were markedly fragmented across industries and local markets. In this study, we analyze the impact of Covid policy stringencies in local markets on commercial real estate (CRE) performance using a panel of property-level data obtained from the National Council of Real Estate Investment Fiduciaries (NCREIF).

While other studies focus on Covid outcomes, including the number of cases and/or deaths in a local area (Ling et al. 2020; Wen et al. 2022), we focus on how local Covid policy restrictions impacted commercial real estate assets. These constraints had direct economic impacts within regions of the U.S. that were distinctly different than in other parts of the country. While restrictions should have theoretically been motivated by the containment of COVID-19, there are also strong correlations to political party affiliation and geolocation (Hallas et al. 2022).

We employ several county-level measures to capture the restrictiveness of Covid policies. The first measures are indices produced by the Oxford Covid-19 Government Response Tracker (OxCGRT) that are proxies for the level of government response and degree of health and containment in each district (Hale et al. 2022).¹ The indices allow us to quantify the extent of

¹ Data and an explanation of the Index can be found here: <https://github.com/OxCGRT/covid-policy-tracker>

restrictive activity in each location. In addition, we examine specific containment and closure policies from the OxCGRT, which include: state-mandated shelter-in-place days, days that the workplace was closed, days that schools were closed, and days that public transportation was closed, among others. Covid restrictions were aimed at reducing the movement and interactions of people in public places, so we also gather data from Community Mobility Reports published by Google.² These reports capture cell phone mobility data around office locations and retail centers. We create variables that total the number of days when mobility is 25-50 percent below baseline levels.

Our property-level data come from the NCREIF Property Index (NPI) database spanning Q1 2017 – Q2 2023. From these data, we are able to draw meaningful conclusions about how restrictions impacted CRE values and returns during and after the pandemic. Each property in the database reports quarterly appraised values and income, allowing us to examine the impact of lockdown stringencies within markets in different parts of the country. We also examine performance across property types. Given the disparate effects of Covid restrictions on different sectors of the economy, we expect distinct outcomes by type of CRE property – Apartments, Retail, Office, Industrial, and Hotels.

Our results demonstrate that, overall, county-level Covid restrictions had a negative impact on commercial real estate returns. Both indexes from the OxCGRT, most of the containment and closure policies, and all four mobility measures are associated with losses at the property-level. These losses are primarily found in the value of the property, rather than its ability to produce income. As we expect, property type is a significant factor in our results. Apartments, retail, and office all experienced a decline in returns, with office faring worse than

² These data are available from: <https://www.google.com/covid19/mobility/>

apartments and retail. Industrial properties and hotels were helped by the nature of Covid restrictions as their values increased throughout the sample period.

The COVID-19 literature thus far has used mostly cross-sectional transaction-based data (D'Lima et al. 2022; Rolheiser et al. 2022) or utilized stock returns for Real Estate Investment Trusts (REITs) as proxies for real asset performance (Ling et al. 2020; Chong and Phillips 2022). Ghosh et al. (2022) analyze transaction data from Real Capital Analytics, finding that the work-from-home (WFH) shift can be blamed for a drop in CRE prices in urban areas, especially in transit-oriented cities or places where WFH is easier.

In a study of commercial real estate activity in major Florida metropolitan areas, Wen et al. (2022) demonstrate that the effects of Covid-19 (measured by cases and deaths) were positive for industrial properties, and negative for office and retail initially, but these property-types rebounded relatively quickly. Florida is likely one of the outlier states, given its comparatively lax restrictions to the rest of the nation, which is why we examine property data across all states. We also do not have to rely on transaction-based data because NCREIF continually monitors property returns on a quarterly basis. Transaction activity might not be reflective of true market values, especially during times of economic distress. Another novel contribution of our study is our focus on government restrictions during the onset of COVID-19. Other studies, with the exception of D'Lima et al. (2022), have utilized Covid deaths and cases to capture the severity of economic outcomes, but as we demonstrate, restrictions on citizen activity were equally important.

2. Methodology

Our empirical analysis exploits variations in county-level government responses to the COVID-19 pandemic across the United States. These restrictions were primarily state directives with local governments, in some cases, having the ability to impose more severe constraints. To analyze how these policies have impacted commercial real estate valuations and income returns, we implement the following OLS panel-data model using quarterly property-level NPI data:

$$\mathbf{Performance}_{i,t} = \beta_1 \mathbf{Restriction}_{c,t} + \theta \mathbf{X}_{i,t} + \delta \mathbf{Z}_{c,t} + \gamma_i + \vartheta_t + \varepsilon_{i,t} \quad (1)$$

Where:

$\mathbf{Performance}_{i,t}$ is equal to: (1) percentage total return (appreciation + income), (2) percentage appreciation return, or (3) percentage income return for property (i) during quarter (t).

$\mathbf{Restriction}_{c,t}$ is one of our focal explanatory variables measuring COVID-19 restriction severity or citizen mobility in county (c) in quarter (t).

$\mathbf{X}_{i,t}$ is a vector of time-variant property-level control variables from the NCREIF database at each property (i) in quarter (t). These follow prior studies of CRE returns (Ghosh and Petrova 2017; Fisher and Rutledge 2021) and include: property age, property age-squared, and occupancy percentage (percent leased).

$\mathbf{Z}_{c,t}$ is a vector of county-level COVID-19 control variables in county (c) in quarter (t) that include: a running total of the number of COVID-19 reported cases and the number of COVID-19 reported deaths. The severity of Covid's impact was significantly different across counties in the U.S. which effected real estate activity (D'Lima et al. 2022).

γ_i is a vector of indicators (fixed effects) for each property, which is included to account for unobserved time-invariant property characteristics.

ϑ_t is a vector of quarter-year indicators (fixed-effects), which is included to control time-varying economic differences, such as inflation, interest rates, GDP growth, etc.

All standard errors are clustered at the property level.

We then examine the differential impact of COVID-19 policy stringency on performance across property types. To do so, we interact each Restriction measure with an indicator variable for one of four property types: *Retail*, *Office*, *Industrial*, and *Hotel*; we choose the fifth property type (*Apartments*) as our excluded category. For this analysis, we only include properties classified as one of these five types. The model is as follows:

$$\begin{aligned}
 \mathbf{Performance}_{i,t} &= \beta_1 \mathbf{Restriction}_{c,t} \\
 &+ \beta_2 \mathbf{Restriction}_{c,t} * \mathbf{Retail}_i \\
 &+ \beta_3 \mathbf{Restriction}_{c,t} * \mathbf{Office}_i \\
 &+ \beta_4 \mathbf{Restriction}_{c,t} * \mathbf{Industrial}_i \\
 &+ \beta_5 \mathbf{Restriction}_{c,t} * \mathbf{Hotel}_i \\
 &+ \theta \mathbf{X}_{i,t} + \delta \mathbf{Z}_{c,t} + \vartheta_t + \varepsilon_{i,t}
 \end{aligned} \tag{2}$$

Because property-type indicators do not change over time, we exclude the vector γ_i of property indicators (fixed effects) from this model, but add controls for the square footage of the property.

The beta coefficients in eq. (2) capture the effect of COVID-19 restrictions on total, appreciation, and income returns for *Retail* (β_2), *Office* (β_3), *Industrial* (β_4) and *Hotel* (β_5) relative to *Apartments* (β_1).

3. Data and Variable Construction

3.1. The NCREIF Property Index Database

The data for this study come from the proprietary NCREIF Property Index database published by the National Council of Real Estate Investment Fiduciaries (NCREIF).³ The database is an unbalanced panel of commercial real estate properties managed by institutional investment managers on behalf of their clients, which are primarily pension funds and endowments. The data include individual property characteristics, owner characteristics, and several measures of property performance. They begin in 1978 and provide quarterly observations on five primary property types: Apartments, Retail, Office, Industrial, and Hotels. The data are reported to NCREIF by the investment managers and include information on approximately 800,000 properties. For our analysis of COVID-19 policy restrictions, we include all available data on Apartments, Retail, Office, Industrial, and Hotels from Q1 2017 through Q2 2023.

Property characteristics include property type, building age, building location, physical size (Square Footage), percentage leased, appraised value, and performance in terms of income and capital appreciation. NCREIF investors prefer “institutional-grade” properties, which tend to be larger, newer, have a high occupancy, and are located in major MSAs. Owner characteristics include fund type (Open, Open-Diversified-Core Equity (ODCE), Closed, or Separate Account), whether or not a property is partially funded with debt (Levered), whether or not a property is a joint venture (JV) with other investors, and how long the fund has owned a particular property (Holding Period).

³ <https://www.ncreif.org/data/>

The summary statistics for all of our variables are presented in Table 1. The properties in our sample appreciated in value by an average of 1.29 percent per quarter. Meanwhile, income return grew by 1.18 percent per quarter. This puts total return at an average of 2.47 percent for the 221,237 property-quarter observations. Most of the observations in the sample are industrial properties (46.1%). 21.4% are apartment buildings, 17.6% are office, 14.0% are retail, and about 1% are hotels.

3.2 Oxford Covid-19 Government Response Tracker

Our measures of state-level government restrictions throughout the sample period come from the Oxford Covid-19 Government Response Tracker (OxCGRT), which “collects publicly available information on 21 indicators of government response. This information was collected by a team of more than 200 volunteers from the Oxford community and was updated continuously.” (Hale et al. 2021). The database includes daily data at the county-level from January 2020 until the end of December 2022. From these 21 indicators, Hale et al. form four indices that include an index for: all types of government response, containment and health, economic support, and stringency and public information.

We utilize the (1) Government Response and (2) Containment and Health indices for our ***Restriction***_{*c,t*} measures, which document the days and severity of lockdowns in each state, including: school closings, workplace closings, cancelling public events, restrictions on gatherings, public transportation closings, orders to shelter-in-place, and travel restrictions. Each of these elements is recorded each day and measured on an ordinal scale based on the restriction being required, recommended, or neither. For our empirical analysis, we employ these restriction measures on their own and within the indices. The Government Support index also includes data

on: income support, debt/contract relief for households, public information campaigns, testing policy, contact tracing, facial coverings, vaccination policy, and protection of elderly people. The Containment and Health index includes the restrictions on school closings, workplace closings, etc., but adds data on: public information campaigns, testing policy, contact tracing, facial coverings, vaccination policy, and protection of elderly people.

The indexes and their components provide us with a proxy for the severity of restrictions in each state that would have impacted local economic activity. Each index score ranges from 0 to 100, with 100 being the most restrictive. The Government Response (Health and Containment) index has an average value of 49.36 (49.85) in 2020, 50.82 (52.09) in 2021, and 37.39 (39.52) in 2022, reflective of the government's response to the virus.⁴ During the first three months of 2020, the government response to the pandemic was slow, so there were very few restrictions. As our property-level data begin in 2017, the indexes and their components take on a value of zero during the first twelve quarters of our sample period.

For all quarters after 4Q2019, we create eight quarterly county-level restriction variables from the Oxford data.⁵ Appendix Table 1 defines each of these variables and the Oxford variables from which they were created:

Government Response Index (gvt_index): highest prior value of the index at any time.

Based on 16 restrictions on the public's movement.

Containment and Health Index (health_index): highest prior value of the index at any time. Based on 14 health containment restrictions.

⁴ OxCGRT stopped tracking government responses to COVID-19 after 2022

⁵ Prior to 2020, all variables have a value of zero.

Work Closed (work_total): running total of the daily values for **C2M_Workplace_Closing**, the government recommended or required closing of workplaces.

Gatherings Restricted (gthr_total): running total of the daily values for **C4M_Restrictions_on_Gatherings**, the government recommended or required restrictions on gathering of people.

Stay-at-Home (stay_total): running total of the daily values for **C6M_Stay_at_Home**, the government restrictions around people leaving their houses.

Transportation Closed (trns_total): running total of the daily values for **C5M_Close_Public_Transport**, the government recommended or required closing of public transportation.

No Public Events (pblc_total): running total of the daily values for **C3M_Cancel_Public_Events**, the county government restrictions around public events.

Schools Closed (schl_total): running total of the daily values for **C1M_Cancel_School_Closing**, the county government recommended or required closing of schools.

By measuring the running total of daily values, we capture the ongoing, and potentially delayed, impact of COVID-19 policy restrictions. For instance, **C5M_Close_Public_Transport** takes the following values: 0 – no restrictions, 1 - recommend closing (or significantly reduce volume/route/means of transport available), 2 – require closing (or prohibit most citizens from using it). If public transportation had been fully closed for a total of one week since the start of COVID-19 without any other restrictions, then the variable would take a value of 14 (2 x 7).

3.3. Measures of Mobility

We obtain information on mobility from the Community Mobility Reports created by Google which gather data from cell phone activity. For each county and date, Google calculates mobility changes relative to a baseline day – the median during the pre-COVID period Jan. 3 – Feb. 6, 2020. For example, a value of 0.75 indicates that mobility on that day was only 75 percent of the pre-COVID baseline period.

From these data, we create set of four running totals of the number of days that mobility was at least 25 percent or (separately) 50 percent below the baseline period in retail or workplace areas: ***Retail Mobility 25 (ret25_total)***, ***Retail Mobility 50 (ret50_total)***, ***Workplace Mobility 25 (wrk25_total)***, and ***Workplace Mobility 50 (wrk50_total)***.

3.4. COVID-19 Cases and Deaths

One would expect that government restrictions would be more severe in districts that were more adversely affected by the SARS-CoV-2 virus. In order to be able to isolate the effect of restrictions, we include two key public-health measures of the virus' impact in each county. We obtain the daily numbers of COVID-19 cases and deaths from data collected at the county-level by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University. We use these two variable from this dataset to control for the severity of the SARS-CoV-2 virus in local markets each quarter.⁶

⁶ These data are available from: <https://github.com/CSSEGISandData/COVID-19>
Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. The Lancet infectious diseases, 20(5), 533-534.

4. Empirical Results

4.1 Univariate Analysis

To examine the impact of government restrictions on property-level outcomes, we begin with a univariate analysis comparing two groups of properties – those subject to the least number of restrictions and those subject to the greatest number of restrictions. In the final period of our sample, Q2 2023, we split the sample into terciles using the Government Response Index, which captures the highest point of the Index at any point in time throughout the sample. It also includes all of the restriction components that we examine separately in the next section.

We focus on the differences in total property returns between the highest and lowest terciles per the Index. Using average returns each quarter, Figure 1 plots the growth of a \$100 investment in the two groups from the start of 2020 through Q2 2023 for all property types. Properties in the most restrictive counties performed better overall, with a higher total return of six percentage points by the end of the sample period. However, these results are confounded by the large number of industrial properties in the data, which is greater than 40% of the sample.

Therefore, we perform the analysis for the different property types separately – Apartments, Retail, Office, and Industrial.⁷ Figure 2 presents the graph for apartments. Both groups had a positive total return over the period; however, multifamily properties in the least restrictive counties outperformed those in the most restrictive counties by a wide margin. By Q2 2023, performance in the least restrictive counties was 18.7 percentage points (pp) better than in the most restrictive counties. Figure 3 presents the graph for retail properties. The overall returns

⁷ We exclude hotels from this analysis because of a lack of data. Hotels are less than 1% of the full sample of observations.

are also positive for both groups, but the least restrictive group had outperformed the most restrictive group by 7.3pp as of the end of the period.

Figure 4 presents the graph for office buildings. Total returns for office buildings in the most restrictive counties were negative over the period from 2022 – Q2 2023, whereas, in the least restrictive counties, returns remained positive overall. Performance in the most restrictive property group was down 7.1% from the initial investment in 2020. Both groups started to experience declines in Q3 2022 with the pressure of higher interest rates and inflationary forces impacting performance. As of Q2 2023, the difference in returns between the two groups was 13.9pp.

Industrial property performance is reported in Figure 5. Both groups experienced significant growth over the sample period with the most restrictive group up 105.4% and the least restrictive group up 67.5%. The gap in performance between these two groups is rather large and may have been impacted by the greater need for delivered goods in areas where Covid restrictions were more severe. In the next section, we test these outcomes in a multivariate analysis.

4.2. Multivariate Results - All Property Types

To examine how government restrictions affected property performance, we start by estimating a multivariate model using all quarterly property observations within our sample period. We look separately at the percentage total return, appreciation return, and income return. For each dependent variable, we test 12 different specifications where we include separately each of our eight restriction measures and each of our four mobility measures.

4.2.1 Total Return

Table 2 presents the results using the dependent variable total return for all properties i during year-quarter t . In this set of models, four of our restriction measures (*Work Closed*, *Gatherings Restricted*, *Government Index* and *Health Index*) are negative and significant at the 0.01 level. Two more of our restriction measures (*Transport Closed* and *No Public Events*) are negative and significant at the 0.05 level. Each of our four mobility measures (*Retail Mobility 25*, *Retail Mobility 50*, *Workplace Mobility 25* and *Workplace Mobility 50*) are negative and significant at the 0.01 level. Moreover, the negative coefficient on both *Retail Mobility 50* and *Workplace Mobility 50* are approximately three times as large as the coefficients on *Retail Mobility 25* and *Workplace Mobility 25*, respectively, indicating that more severe declines in mobility have much larger effects of property performance.

In general, these results indicate that both the restriction measures and the mobility measure had significant negative impacts on property total returns.

4.2.2 Appreciation Return

Table 3 presents the results using the dependent variable appreciation return for all properties i during year-quarter t . These results are similar to the results in Table 2 for percentage total return. In this set of models, four of our restriction measures (*Work Closed*, *Gatherings Restricted*, *Government Index* and *Health Index*) are negative and significant at the 0.01 level. Two more of our restriction measures (*Transport Closed* and *No Public Events*) are negative and significant at the 0.05 level. Each of our four mobility measures (*Retail Mobility 25*, *Retail Mobility 50*, *Workplace Mobility 25* and *Workplace Mobility 50*) are negative and significant at the 0.01 level. Moreover, the negative coefficient on both *Retail Mobility 50* and *Workplace Mobility 50* are approximately three times as large as the coefficients on *Retail Mobility 25* and

Workplace Mobility 25, respectively, indicating that more severe declines in mobility have much larger effects of property performance.

In general, these results indicate that both the restriction measures and the mobility measures had significant negative impacts on property appreciation returns.

4.2.3 Income Return

Table 4 presents the results using the dependent variable income return for all properties i during year-quarter t . In this set of models, two of our restriction measures (*Work Closed* and *Stay at Home*) are positive and significant at the 0.01 level. None of our remaining six restriction measures are significant at even the 0.10 level. Each of our four mobility measures (*Retail Mobility 25*, *Retail Mobility 50*, *Workplace Mobility 25* and *Workplace Mobility 50*) is positive and significant at the 0.01 level. However, there is little difference in the magnitudes of the coefficient on *Retail Mobility 25* and *Retail Mobility 50* or on *Workplace Mobility 25* and *Workplace Mobility 50*.

In general, these results indicate that both the restriction measures and the mobility measure had contrastingly significant positive impacts on property income returns. It is important to keep in mind that this result is for all properties, regardless of type. We expect that the pandemic had differential effects depending upon property type. For example, demand for industrial properties picked up during the lockdowns as consumers turned to online stores for their needs. In the next section, we drill down into this issue by examining the differential impact of Covid-19 restrictions on property performance by property type.

4.3. Multivariate Results - Property Type Interactions

In this section, we report results for our analysis of how the effect of government restrictions on property performance differs by property type. We interact each of our restriction and mobility measures with indicators for different property types, where the omitted reference category is *Apartment*. We look separately at total return, appreciation return, and income return across Apartments (excluded), Retail, Office, Industrial, and Hotels.

4.3.1 Total Return

Table 5 presents the property-type interaction results using the dependent variable total return for all properties i during year-quarter t . The coefficients on the variable *COVID Restriction* provide results for the omitted property type *Apartment*. Six of our restriction measures are negative and significant at the 0.01 level. All four of our mobility measures (*Retail Mobility 25*, *Retail Mobility 50*, and *Workplace Mobility 50*) are negative and significant at the 0.01 level. In general, these results indicate that both restriction and mobility measures are associated with lower total returns for apartment properties.

The coefficients on the interaction variable *Industrial * Restriction* provide results for the performance of industrial properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Industrial * Restriction* provides information on the absolute performance of industrial properties. Each of the eight restriction coefficients as well as each of the four mobility coefficients are positive and significant at the 0.01 level, indicating that industrial properties performed significantly better than apartment properties. In all cases, the sum of the two relevant coefficients is positive, indicating that industrial property returns were positively impacted by the government restrictions.

The coefficients on the interaction variable *Retail * Restriction* provide results for the performance of retail properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Retail * Restriction* provides information on the absolute performance of retail properties. Each of the eight restriction coefficients as well as all four mobility coefficients are negative and significant at the 0.01 level, indicating that retail properties performed significantly worse than apartment properties. In all cases, the sum of the relevant coefficients is negative, indicating that retail property returns were negatively impacted by the government restrictions.

The results for office properties are remarkably similar to those for retail properties except that the negative coefficients are larger in magnitude. The coefficients on the interaction variable *Office * Restriction* provide results for the performance of office properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Office * Restriction* provides information on the absolute performance of office properties. Each of the eight restriction coefficients as well as each of the four mobility coefficients are negative and significant at the 0.01 level, indicating that office properties performed significantly worse than apartment properties. In all cases, the sum of the relevant coefficients is negative, indicating that office property returns were negatively impacted by the government restrictions.

The coefficients on the interaction variable *Hotel * Restriction* provide results for the performance of hotel properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Hotel * Restriction* provides information on the absolute performance of hotel properties. All of the eight restriction coefficients as well as each of the four mobility coefficients are positive and significant at the

0.01 level, indicating that hotel properties performed significantly better than apartment properties. In almost all cases, the sum of the relevant coefficients is positive, indicating that hotel property returns were positively impacted by the government restrictions.

Our results from these regressions highlight the importance of separating the analysis by property type. The negative impact of Covid policy restrictions on CRE returns is concentrated in the apartment, retail, and office sectors, which is muted in the coefficients from Tables 2-4 because of the positive returns in the industrial and hotel sectors.

4.3.2 Appreciation Return

Table 6 presents the property-type interaction results using the dependent variable total return for all properties i during year-quarter t . These results are similar to those presented in the previous section for total return so we will not discuss them in detail. In general, they indicate that appreciation returns for apartment properties were negatively impacted by government restrictions; that retail and office properties were even more negatively impacted; and that industrial and hotel properties were positively impacted by the government restrictions.

4.3.3 Income Return

Table 7 presents the property-type interaction results using the dependent variable total return for all properties i during year-quarter t . The coefficients on the variable *COVID Restriction* provide results for the omitted property type *Apartment*. Six of our eight our restriction measure coefficients are negative and significant at the 0.01 level. One, (*Transportation Closed*) is significant at the 0.05 level. All our four mobility measures (*Retail Mobility 25*, *Workplace Mobility 25*, and *Workplace Mobility 50*) are level and significant at the 0.01 level. In general, these results indicate that restriction and mobility measures had a negative impact on the performance of apartment properties.

The coefficients on the interaction variable *Industrial * Restriction* provide results for the performance of industrial properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Industrial * Restriction* provides information on the absolute performance of industrial properties. Two of the restriction measures (*Gatherings Restricted* and *Stay-at-Home*) are negative and significant at the 0.05 level. Three of the eight restriction coefficients as well as each of the four mobility coefficients are negative and significant at the 0.01 level, indicating that industrial properties performed significantly worse than apartment properties. In all cases, the sum of the two relevant coefficients is negative, indicating that industrial property income returns were negatively impacted by the government restrictions.

The coefficients on the interaction variable *Retail * Restriction* provide results for the performance of retail properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Retail * Restriction* provides information on the absolute performance of retail properties. Each of the eight restriction coefficients as well as all of the four mobility coefficients are positive and significant at the 0.01 level, indicating that retail properties performed significantly better than apartment properties. However, the sum of the relevant coefficients is only positive for three of the restriction measures and all four of the mobility measures, indicating that retail property income returns were positively impacted by the government restrictions in these cases.

The results for office properties are remarkably similar to those for retail properties. The coefficients on the interaction variable *Office * Restriction* provide results for the performance of office properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Office * Restriction* provides information

on the absolute performance of office properties. Each of the eight restriction coefficients as well as each of the four mobility coefficients are positive and significant at the 0.01 level, indicating that the income performance of office properties was significantly better than apartment properties. The sum of the relevant coefficients is positive for three of the restriction measures and all four of the mobility measures, indicating that office property income returns were positively impacted by the government restrictions.

The coefficients on the interaction variable *Hotel * Restriction* provide results for the performance of hotel properties relative to the performance of the omitted category of *Apartment* properties. The sum of the coefficients on *COVID Restriction* and *Hotel * Restriction* provides information on the absolute performance of hotel properties. Each of the eight restriction coefficients as well as three of the four mobility coefficients are positive and significant at the 0.01 level, indicating that the income performance of hotel properties was significantly worse than apartment properties. In almost all cases, the sum of the relevant coefficients is positive, indicating that hotel property income returns were positively impacted by the government restrictions.

5. Summary and Conclusions

In this study, we analyze data on U.S. investment-grade commercial real estate properties during the pandemic to provide new evidence about how government Covid-19 restrictions enacted during the pandemic impacted performance, both overall and by property type. We utilize eight lockdown restriction measures and four lockdown mobility measures, controlling for public-health outcomes in terms of Covid cases and deaths so that we can disentangle the public-health effects from the government-policy effects. In general, we find that both restriction

and mobility measures had negative impacts on property return performance, but primarily through appreciation return rather than income return.

When we examine the performance of different property types, we find that apartment retail and office properties were negatively impacted by restrictions, but that retail suffered more than apartments, and office suffered more than retail. In contrast, the evidence suggests that lockdown measure had a positive impact on both industrial and hotel property values. These results are consistent with anecdotal evidence indicating that office and retail properties were most severely impacted by lockdowns, while industrial properties benefited as people shopped online.

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**Appendix Table 1:
Variables for the Covid Lockdowns**

Type	Variable	Comments	Source
<u>COVID Restrictions</u>			
	gvt_index	Index including C1M-C8EV below and: E1- Income Support (Economic), E2- Debt/contract relief for households, H1 - Public Information Campaigns, H2 - Testing Policy, H3 - Contact tracing, H6 - Facial coverings, H7 - Vaccination policy, H8 - Protection of elderly people. <i>We use the previous highest value for this in a given county</i>	Oxford Covid-19 Response Tracker
	health_index	Index including C1M-C8EV below and: H1 - Public Information Campaigns, H2 - Testing Policy, H3 - Contact tracing, H6 - Facial coverings, H7 - Vaccination policy, H8 - Protection of elderly people. <i>We use the previous highest value for this in a given county</i>	Oxford Covid-19 Response Tracker
	C1M_School_closing	1 - recommend closing or all schools open with alterations resulting in significant differences compared to non-Covid-19 operations 2 - require closing (only some levels or categories, eg just high school, or just public schools) 3 - require closing all levels	Oxford Covid-19 Response Tracker
	schl_total	This is a running total of the values for C1M_School_closing (above) per county	
	C2M_Workplace_closing	1 - recommend closing (or recommend work from home) or all businesses open with alterations resulting in significant differences compared to non-Covid-19 operation 2 - require closing (or work from home) for some sectors or categories of workers 3 - require closing (or work from home) for all-but-essential workplaces (eg grocery stores, doctors)	Oxford Covid-19 Response Tracker
	work_total	This is a running total of the values for C2M_Workplace_closing (above) per county	
	C3M_Cancel_public_events	1 - recommend cancelling 2 - require cancelling	Oxford Covid-19 Response Tracker
	pblic_total	This is a running total of the values for C3M_Cancel_public_events (above) per county	
	C4M_Restrictions_on_gatherings	1 - restrictions on very large gatherings (the limit is above 1000 people) 2 - restrictions on gatherings between 101-1000 people 3 - restrictions on gatherings between 11-100 people 4 - restrictions on gatherings of 10 people or less	Oxford Covid-19 Response Tracker
	gthr_total	This is a running total of the values for C4M_Restrictions_on_gatherings (above) per county	
	C5M_Close_public_transport	1 - recommend closing (or significantly reduce volume/route/means of transport available) 2 - require closing (or prohibit most citizens from using it)	Oxford Covid-19 Response Tracker
	trns_total	This is a running total of the values for C5M_Close_public_transport (above) per county	
	C6M_Stay_at_home_requirements	1 - recommend not leaving house 2 - require not leaving house with exceptions for daily exercise, grocery shopping, and 'essential' trips 3 - require not leaving house with minimal exceptions (eg allowed to leave once a week, or only one person can leave at a time, etc)	Oxford Covid-19 Response Tracker
	stay_total	This is a running total of the values for C6M_Stay_at_home_requirements (above) per county	Oxford Covid-19 Response Tracker
	C7M_Restrictions_on_internal_mov	1 - recommend not to travel between regions/cities 2 - internal movement restrictions in place	Oxford Covid-19 Response Tracker
	C8EV_International_travel_contro	1 - screening arrivals 2 - quarantine arrivals from some or all regions 3 - ban arrivals from some regions 4 - ban on all regions or total border closure	Oxford Covid-19 Response Tracker
	confirmedcases	A running total of the number of all COVID cases in a county	Oxford Covid-19 Response Tracker
	confirmeddeaths	A running total of the number of all COVID-related deaths in a county	Oxford Covid-19 Response Tracker
	VARIOUS - Mobility Variables	Change in people visiting places like grocery stores and parks - measured as percentage change from the baseline average mobility in the county	Google Mobility
	ret25_total	A running total of the number of days that mobility is at least 25% below the baseline average in retail areas	
	ret50_total	A running total of the number of days that mobility is at least 50% below the baseline average in retail areas	
	wrk25_total	A running total of the number of days that mobility is at least 25% below the baseline average in work areas	
	wrk50_total	A running total of the number of days that mobility is at least 50% below the baseline average in work areas	

Table 1:
Summary statistics

	N	Mean	Median	Std. Dev.	se(Mean)	p25	p75	min	max
<i>Dependent Variables</i>									
Total return	221,237	2.469	1.531	6.5	.014	.561	3.561	-100	100
Appreciation return	221,237	1.288	.132	6.468	.014	-.451	2.326	-100	100
Income return	221,237	1.181	1.159	.846	.002	.929	1.412	-100	100
<i>Lockdown Variables</i>									
work_total	221,237	4.269	4.32	4.238	.009	0	8.12	0	14.49
gthr_total	221,237	7.739	6.95	7.534	.016	0	15.34	0	27.36
stay_total	221,237	2.73	2.56	2.64	.006	0	5.3	0	9.95
trns_total	221,237	.904	0	1.776	.004	0	1.05	0	8.74
pblic_total	221,237	4.033	3.96	3.918	.008	0	7.67	0	11.65
schl_total	221,237	6.395	5.69	6.363	.014	0	12.47	0	18.13
govt_index	221,237	42.749	68.75	35.14	.075	0	72.4	0	80.21
health_index	221,237	42.148	67.56	34.638	.074	0	71.25	0	82.26
ret25_total	221,237	1.203	.67	1.615	.003	0	1.96	0	9.44
ret50_total	221,237	.207	.06	.525	.001	0	.22	0	8.4
wrk25_total	221,237	2.504	1.64	2.641	.006	0	4.94	0	9.31
wrk50_total	221,237	.508	.18	.939	.002	0	.56	0	8.62
<i>Property Control Variables</i>									
Age	221,237	25.322	22	19.776	.042	13	32	1	164
Age squared	221,237	1,032.291	484	2,016.856	4.288	169	1024	1	26,896
Square footage	221,237	272,132.4	194,936	310,429.88	659.986	101,280	333,632	10,000	7,212,166
Square footage squared	221,237	1.704e+11	3.800e+10	1.073e+12	2.281e+09	1.026e+10	1.113e+11	1.000e+08	5.202e+13
Percent leased	221,237	.939	1	.117	0	.931	1	.001	1
Apartment	221,237	.214	0	.41	.001	0	0	0	1
Industrial	221,237	.461	0	.498	.001	0	1	0	1
Office	221,237	.176	0	.381	.001	0	0	0	1
Retail	221,237	.14	0	.347	.001	0	0	0	1
Hotel	221,237	.009	0	.092	0	0	0	0	1
<i>Covid Control Variables</i>									
Confirmed deaths	221,237	22,334.782	5,724	31,075.388	66.067	0	34,744	0	96,338
Confirmed cases	221,237	1,892,096.6	240,802	3,000,918.6	6,380.068	0	2,488,751	0	11,323,445

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Total Prop Return - Work Closed	Total Prop Return - Gatherings Restricted	Total Prop Return - Stay-at-Home	Total Prop Return - Transportation Closed	Total Prop Return - No Public Events	Total Prop Return - Schools Closed	Total Prop Return - Govt Response Index	Total Prop Return - Containment Health Index	Total Prop Return - Retail Mobility 25	Total Prop Return - Retail Mobility 50	Total Prop Return - Workplace Mobility 25	Total Prop Return - Workplace Mobility 50
work_total	-0.174*** (-7.858)											
gthr_total		-0.066*** (-4.234)										
stay_total			0.053 (1.422)									
trns_total				-0.036** (-2.091)								
pblc_total					-0.084** (-2.536)							
schl_total						-0.033* (-1.921)						
gvt_index							-0.016*** (-2.882)					
health_index								-0.025*** (-4.646)				
ret25_total									-0.355*** (-17.795)			
ret50_total										-1.074*** (-23.498)		
wrk25_total											-0.189*** (-4.895)	
wrk50_total												-0.650*** (-25.225)
age	0.350*** (9.346)	0.353*** (9.439)	0.354*** (9.443)	0.354*** (9.440)	0.355*** (9.467)	0.353*** (9.431)	0.353*** (9.425)	0.353*** (9.425)	0.336*** (8.943)	0.325*** (8.681)	0.353*** (9.400)	0.335*** (8.927)
agesquared	-0.003*** (-11.135)	-0.003*** (-11.899)	-0.003*** (-12.011)	-0.003*** (-11.937)	-0.003*** (-12.128)	-0.003*** (-11.809)	-0.003*** (-11.841)	-0.003*** (-11.789)	-0.002*** (-7.865)	-0.001*** (-5.927)	-0.003*** (-11.490)	-0.002*** (-7.778)
percentleased	4.138*** (18.721)	4.163*** (18.834)	4.168*** (18.859)	4.173*** (18.871)	4.166*** (18.859)	4.168*** (18.862)	4.169*** (18.860)	4.166*** (18.846)	4.013*** (18.284)	3.946*** (17.799)	4.158*** (18.848)	3.930*** (17.927)
confirmeddeaths	0.048*** (13.981)	0.051*** (15.039)	0.052*** (15.542)	0.052*** (15.880)	0.055*** (17.355)	0.052*** (14.332)	0.054*** (16.718)	0.054*** (16.740)	0.046*** (14.016)	0.057*** (17.872)	0.051*** (15.573)	0.044*** (13.442)
confirmedcases	-0.032*** (-9.013)	-0.040*** (-11.863)	-0.044*** (-14.535)	-0.045*** (-14.643)	-0.044*** (-14.109)	-0.042*** (-11.654)	-0.045*** (-14.744)	-0.045*** (-14.820)	-0.035*** (-11.112)	-0.047*** (-15.617)	-0.042*** (-13.557)	-0.037*** (-12.034)
Observations	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237
Adjusted R-squared	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.248	0.249	0.247	0.249
YearQtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prop FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This table presents the regression results that examine total property return (appreciation + income) for all properties in the sample period (1Q2017-2Q2023). Standard errors are clustered at the property level. T-statistics are in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 % level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Total Appreciation Return - Work Closed	Total Appreciation Return - Gatherings Restricted	Total Appreciation Return - Stay-at-Home	Total Appreciation Return - Transportation Closed	Total Appreciation Return - No Public Events	Total Appreciation Return - Schools Closed	Total Appreciation Return - Govt Response Index	Total Appreciation Return - Containment Health Index	Total Appreciation Return - Retail Mobility 25	Total Appreciation Return - Retail Mobility 50	Total Appreciation Return - Workplace Mobility 25	Total Appreciation Return - Workplace Mobility 50
work_total	-0.187*** (-8.487)											
gthr_total		-0.069*** (-4.343)										
stay_total			0.037 (0.957)									
trns_total				-0.039** (-2.289)								
pblc_total					-0.081** (-2.421)							
schl_total						-0.032* (-1.874)						
gvt_index							-0.016*** (-2.919)					
health_index								-0.027*** (-4.814)				
ret25_total									-0.387*** (-19.187)			
ret50_total										-1.132*** (-24.496)		
wrk25_total											-0.226*** (-5.933)	
wrk50_total												-0.688*** (-26.141)
age	0.375*** (9.900)	0.379*** (9.998)	0.379*** (10.005)	0.379*** (9.998)	0.380*** (10.025)	0.379*** (9.990)	0.378*** (9.982)	0.378*** (9.983)	0.359*** (9.460)	0.349*** (9.206)	0.377*** (9.948)	0.359*** (9.459)
agesquared	-0.003*** (-12.019)	-0.003*** (-12.773)	-0.003*** (-12.931)	-0.003*** (-12.828)	-0.003*** (-13.003)	-0.003*** (-12.715)	-0.003*** (-12.713)	-0.003*** (-12.678)	-0.002*** (-8.352)	-0.002*** (-6.411)	-0.003*** (-12.246)	-0.002*** (-8.392)
percentleased	2.601*** (12.065)	2.628*** (12.190)	2.635*** (12.220)	2.639*** (12.232)	2.632*** (12.213)	2.634*** (12.217)	2.634*** (12.216)	2.631*** (12.202)	2.464*** (11.519)	2.399*** (11.115)	2.620*** (12.181)	2.381*** (11.154)
confirmeddeaths	0.048*** (14.195)	0.052*** (15.339)	0.053*** (15.957)	0.052*** (16.169)	0.055*** (17.653)	0.052*** (14.636)	0.054*** (17.078)	0.054*** (17.100)	0.046*** (14.133)	0.058*** (18.317)	0.051*** (15.767)	0.043*** (13.584)
confirmedcases	-0.032*** (-8.980)	-0.040*** (-12.066)	-0.045*** (-14.867)	-0.045*** (-14.956)	-0.044*** (-14.434)	-0.042*** (-11.915)	-0.045*** (-15.062)	-0.045*** (-15.141)	-0.035*** (-11.097)	-0.048*** (-16.010)	-0.042*** (-13.691)	-0.037*** (-12.170)
Observations	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237
Adjusted R-squared	0.248	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.249	0.250	0.247	0.250
YearQtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prop FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Robust t-statistics in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												

This table presents the regression results that examine appreciation return for all properties in the sample period (1Q2017-2Q2023). Standard errors are clustered at the property level. T-statistics are in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 % level respectively.

Table 4:

Property Income Return

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Total Income Return - Work Closed	Total Income Return - Gatherings Restricted	Total Income Return - Stay-at-Home	Total Income Return - Transportation Closed	Total Income Return - No Public Events	Total Income Return - Schools Closed	Total Income Return - Govt Response Index	Total Income Return - Containment Health Index	Total Income Return - Retail Mobility 25	Total Income Return - Retail Mobility 50	Total Income Return - Workplace Mobility 25	Total Income Return - Workplace Mobility 50
work_total	0.013*** (2.601)											
gthr_total		0.003 (1.540)										
stay_total			0.015*** (2.889)									
trns_total				0.004 (1.037)								
pblc_total					-0.002 (-0.423)							
schl_total						-0.001 (-0.301)						
gvt_index							0.000 (0.360)					
health_index								0.001 (1.268)				
ret25_total									0.032*** (10.358)			
ret50_total										0.059*** (7.443)		
wrk25_total											0.037*** (6.995)	
wrk50_total												0.039*** (8.641)
age	-0.025*** (-9.580)	-0.025*** (-9.801)	-0.025*** (-9.843)	-0.025*** (-9.755)	-0.025*** (-9.838)	-0.025*** (-9.766)	-0.025*** (-9.802)	-0.025*** (-9.770)	-0.023*** (-9.099)	-0.023*** (-9.044)	-0.025*** (-9.674)	-0.024*** (-9.264)
agesquared	0.000*** (2.693)	0.000*** (3.244)	0.000*** (3.412)	0.000*** (3.115)	0.000*** (3.321)	0.000*** (3.179)	0.000*** (3.262)	0.000*** (3.172)	0.000 (1.274)	0.000 (1.470)	0.000*** (2.642)	0.000* (1.864)
percentleased	1.587*** (23.170)	1.585*** (23.135)	1.583*** (23.093)	1.584*** (23.119)	1.584*** (23.104)	1.584*** (23.134)	1.585*** (23.149)	1.585*** (23.139)	1.599*** (23.412)	1.597*** (23.313)	1.587*** (23.196)	1.599*** (23.350)
confirmeddeaths	0.000 (0.090)	-0.000 (-0.688)	-0.001 (-1.634)	-0.000 (-0.533)	-0.000 (-0.855)	-0.000 (-0.980)	-0.000 (-0.979)	-0.000 (-1.023)	0.000 (0.629)	-0.001 (-1.456)	0.000 (0.112)	0.000 (0.499)
confirmedcases	-0.001 (-1.516)	-0.000 (-0.204)	0.000 (0.546)	0.000 (0.326)	0.000 (0.418)	0.000 (0.472)	0.000 (0.372)	0.000 (0.424)	-0.001** (-2.057)	0.000 (0.773)	-0.000 (-0.932)	-0.000 (-0.932)
Observations	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237
Adjusted R-squared	0.452	0.452	0.452	0.452	0.452	0.452	0.452	0.452	0.453	0.453	0.452	0.453
YearQtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prop FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Robust t-statistics in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												

This table presents the regression results that examine income return for all properties in the sample period (1Q2017-2Q2023). Standard errors are clustered at the property level. T-statistics are in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 % level respectively.

Table 5:

Total Return - Property Type Interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Total Prop Return - Work Closed	Total Prop Return - Gatherings Restricted	Total Prop Return - Stay-at-Home	Total Prop Return - Transportation Closed	Total Prop Return - No Public Events	Total Prop Return - Schools Closed	Total Prop Return - Govt Response Index	Total Prop Return - Containment Health Index	Total Prop Return - Retail Mobility 25	Total Prop Return - Retail Mobility 50	Total Prop Return - Workplace Mobility 25	Total Prop Return - Workplace Mobility 50
Industrial*Restriction	0.272*** (41.766)	0.152*** (42.757)	0.405*** (39.093)	0.333*** (16.799)	0.288*** (42.117)	0.175*** (41.718)	0.030*** (44.981)	0.030*** (44.696)	0.830*** (40.409)	3.404*** (10.164)	0.359*** (36.128)	0.990*** (28.096)
Retail*Restriction	-0.126*** (-15.505)	-0.074*** (-16.278)	-0.230*** (-18.255)	-0.301*** (-12.200)	-0.142*** (-16.265)	-0.076*** (-14.095)	-0.017*** (-19.145)	-0.017*** (-19.267)	-0.317*** (-11.407)	-0.545*** (-3.749)	-0.170*** (-12.863)	-0.474*** (-8.923)
Office*Restriction	-0.221*** (-28.033)	-0.129*** (-28.687)	-0.386*** (-29.146)	-0.428*** (-19.346)	-0.254*** (-29.441)	-0.150*** (-27.534)	-0.023*** (-27.140)	-0.023*** (-27.108)	-0.381*** (-19.241)	-0.487*** (-7.775)	-0.381*** (-28.959)	-0.508*** (-14.783)
Hotel*Restriction	0.259*** (6.094)	0.135*** (6.020)	0.350*** (5.362)	0.560*** (5.018)	0.264*** (6.056)	0.196*** (7.115)	0.009** (2.316)	0.009** (2.346)	0.812*** (6.183)	3.237*** (11.228)	0.558*** (7.817)	1.597*** (6.913)
COVID Restriction	-0.103*** (-6.275)	-0.128*** (-12.323)	0.006 (0.204)	-0.020 (-1.178)	-0.114*** (-4.779)	-0.047*** (-3.544)	-0.020*** (-4.576)	-0.016*** (-3.452)	-0.399*** (-23.738)	-1.058*** (-21.294)	-0.292*** (-11.913)	-0.722*** (-29.827)
age	0.030*** (15.417)	0.031*** (15.885)	0.032*** (15.831)	0.035*** (15.219)	0.031*** (15.674)	0.030*** (15.251)	0.031*** (16.055)	0.031*** (15.953)	0.026*** (13.221)	0.026*** (11.535)	0.032*** (15.834)	0.030*** (13.908)
agesquared	-0.000*** (-17.741)	-0.000*** (-18.099)	-0.000*** (-18.423)	-0.000*** (-18.487)	-0.000*** (-18.136)	-0.000*** (-17.941)	-0.000*** (-17.935)	-0.000*** (-17.903)	-0.000*** (-14.615)	-0.000*** (-13.074)	-0.000*** (-18.246)	-0.000*** (-15.537)
sqfootage	-0.575*** (-7.733)	-0.590*** (-7.885)	-0.595*** (-7.862)	-0.576*** (-6.590)	-0.598*** (-7.933)	-0.610*** (-8.125)	-0.602*** (-8.217)	-0.606*** (-8.251)	-0.317*** (-4.061)	-0.342*** (-3.956)	-0.527*** (-6.826)	-0.376*** (-4.436)
sqfootagesquared	0.079*** (4.779)	0.081*** (4.891)	0.082*** (4.876)	0.084*** (4.450)	0.083*** (4.950)	0.084*** (5.049)	0.083*** (5.005)	0.083*** (5.022)	0.040** (2.368)	0.048*** (2.737)	0.072*** (4.404)	0.051*** (2.876)
percentleased	5.381*** (29.548)	5.340*** (29.249)	5.409*** (29.624)	7.041*** (36.574)	5.310*** (29.225)	5.469*** (29.768)	5.195*** (28.879)	5.202*** (28.878)	5.609*** (30.527)	6.494*** (33.761)	5.669*** (30.627)	6.380*** (33.737)
confirmeddeaths	0.028*** (10.131)	0.022*** (8.188)	0.024*** (9.416)	0.030*** (11.378)	0.028*** (11.164)	0.029*** (9.838)	0.028*** (11.633)	0.028*** (11.434)	0.025*** (9.889)	0.037*** (15.050)	0.024*** (9.379)	0.022*** (8.661)
confirmedcases	-0.021*** (-6.747)	-0.012*** (-4.136)	-0.019*** (-7.805)	-0.020*** (-8.220)	-0.020*** (-7.689)	-0.022*** (-6.949)	-0.020*** (-8.449)	-0.020*** (-8.438)	-0.017*** (-6.284)	-0.027*** (-10.990)	-0.016*** (-6.297)	-0.013*** (-5.311)
Observations	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237
Adjusted R-squared	0.255	0.257	0.256	0.249	0.257	0.255	0.253	0.253	0.253	0.250	0.253	0.252
YearQtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

This table presents the regression results that examine total property return for all properties in the sample period (1Q2017-2Q2023). The measure of *Restriction* is one of the Covid Restriction measures or Mobility measures described in Appendix Table 1. Standard errors are clustered at the property level. T-statistics are in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 % level respectively.

Table 6:

Total Return - Property Type Interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Total Appreciation Return - Work Closed	Total Appreciation Return - Gatherings	Total Appreciation Return - Stay-at- Home	Total Appreciation Return - Transportation	Total Appreciation Return - No Public Events	Total Appreciation Return - Schools Closed	Total Appreciation Return - Govt Response Index	Total Appreciation Return - Containment	Total Appreciation Return - Retail Mobility 25	Total Appreciation Return - Retail Mobility 50	Total Appreciation Return - Workplace	Total Appreciation Return - Workplace
Industrial*Restriction	0.279*** (43.854)	0.153*** (44.426)	0.411*** (40.926)	0.342*** (18.838)	0.292*** (43.761)	0.178*** (43.377)	0.030*** (46.526)	0.031*** (46.336)	0.863*** (41.809)	3.660*** (9.371)	0.373*** (38.886)	1.014*** (28.495)
Retail*Restriction	-0.170*** (-22.092)	-0.100*** (-23.137)	-0.300*** (-25.304)	-0.386*** (-16.831)	-0.192*** (-23.439)	-0.108*** (-20.967)	-0.022*** (-26.437)	-0.022*** (-26.587)	-0.413*** (-14.959)	-0.707*** (-4.856)	-0.241*** (-19.253)	-0.618*** (-11.455)
Office*Restriction	-0.262*** (-33.246)	-0.153*** (-33.839)	-0.453*** (-34.133)	-0.484*** (-22.805)	-0.299*** (-34.658)	-0.178*** (-32.611)	-0.027*** (-32.865)	-0.028*** (-32.855)	-0.474*** (-23.897)	-0.691*** (-11.283)	-0.445*** (-33.835)	-0.655*** (-19.024)
Hotel*Restriction	0.176*** (5.286)	0.093*** (5.091)	0.228*** (4.295)	0.417*** (5.081)	0.173*** (4.927)	0.135*** (6.074)	0.002 (0.617)	0.002 (0.635)	0.606*** (6.227)	2.542*** (8.253)	0.396*** (6.873)	1.320*** (7.731)
COVID Restriction	-0.047*** (-2.892)	-0.102*** (-9.625)	0.001 (0.052)	-0.002 (-0.112)	-0.069*** (-2.899)	-0.010 (-0.747)	-0.008* (-1.726)	-0.004 (-0.975)	-0.329*** (-19.808)	-0.911*** (-18.587)	-0.238*** (-9.759)	-0.638*** (-26.756)
age	0.023*** (12.229)	0.024*** (12.807)	0.025*** (12.927)	0.027*** (12.257)	0.024*** (12.713)	0.023*** (12.157)	0.024*** (13.005)	0.024*** (12.974)	0.018*** (9.293)	0.018*** (7.836)	0.025*** (12.736)	0.022*** (10.407)
agesquared	-0.000*** (-14.330)	-0.000*** (-14.786)	-0.000*** (-15.321)	-0.000*** (-15.633)	-0.000*** (-14.926)	-0.000*** (-14.648)	-0.000*** (-14.636)	-0.000*** (-14.652)	-0.000*** (-10.427)	-0.000*** (-9.185)	-0.000*** (-14.956)	-0.000*** (-11.831)
sqfootage	3.944*** (21.975)	3.907*** (21.691)	3.977*** (22.076)	5.788*** (29.798)	3.870*** (21.617)	4.013*** (22.198)	3.774*** (21.245)	3.781*** (21.265)	4.239*** (23.143)	5.220*** (26.593)	4.216*** (23.101)	5.089*** (26.707)
sqfootagesquared	0.029*** (10.797)	0.023*** (8.473)	0.024*** (9.347)	0.029*** (11.272)	0.027*** (10.804)	0.031*** (10.624)	0.027*** (11.325)	0.027*** (11.076)	0.027*** (10.438)	0.037*** (14.919)	0.023*** (9.302)	0.022*** (8.866)
percentleased	-0.022*** (-7.276)	-0.011*** (-3.859)	-0.016*** (-6.633)	-0.018*** (-7.141)	-0.018*** (-6.867)	-0.022*** (-7.217)	-0.018*** (-7.366)	-0.017*** (-7.245)	-0.016*** (-6.162)	-0.025*** (-9.976)	-0.013*** (-5.354)	-0.011*** (-4.498)
confirmeddeaths	-0.357*** (-4.762)	-0.375*** (-4.962)	-0.385*** (-5.034)	-0.350*** (-3.901)	-0.381*** (-5.010)	-0.401*** (-5.301)	-0.394*** (-5.325)	-0.396*** (-5.341)	-0.063 (-0.786)	-0.095 (-1.048)	-0.304*** (-3.887)	-0.123 (-1.397)
confirmedcases	0.044*** (2.689)	0.047*** (2.917)	0.049*** (2.988)	0.048** (2.497)	0.048*** (2.950)	0.051*** (3.161)	0.050*** (3.111)	0.050*** (3.104)	0.001 (0.031)	0.009 (0.479)	0.037** (2.276)	0.010 (0.555)
Observations	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237
Adjusted R-squared	0.217	0.218	0.217	0.189	0.218	0.216	0.217	0.217	0.211	0.196	0.209	0.198
YearQtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

This table presents the regression results that examine appreciation return for all properties in the sample period (1Q2017-2Q2023). The measure of *Restriction* is one of the Covid Restriction measures or Mobility measures described in Appendix Table 1. Standard errors are clustered at the property level. T-statistics are in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 % level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Total Income Return - Work Closed	Total Income Return - Gatherings Restricted	Total Income Return - Stay-at-Home	Total Income Return - Transportation Closed	Total Income Return - No Public Events	Total Income Return - Schools Closed	Total Income Return - Govt Response Index	Total Income Return - Containment Health Index	Total Income Return - Retail Mobility 25	Total Income Return - Retail Mobility 50	Total Income Return - Workplace Mobility 25	Total Income Return - Workplace Mobility 50
Industrial*Restriction	-0.007*** (-4.833)	-0.002** (-2.351)	-0.006** (-2.562)	-0.009 (-1.184)	-0.004*** (-2.991)	-0.003*** (-3.241)	-0.000 (-0.647)	-0.000 (-0.916)	-0.033*** (-9.148)	-0.258*** (-4.317)	-0.014*** (-5.581)	-0.025*** (-4.110)
Retail*Restriction	0.044*** (18.366)	0.026*** (18.763)	0.070*** (18.005)	0.085*** (8.543)	0.050*** (19.043)	0.031*** (19.054)	0.005*** (18.441)	0.005*** (18.381)	0.096*** (13.878)	0.162*** (5.075)	0.071*** (17.001)	0.144*** (10.404)
Office*Restriction	0.040*** (22.587)	0.023*** (24.100)	0.067*** (22.971)	0.056*** (6.717)	0.045*** (25.529)	0.028*** (25.217)	0.005*** (24.815)	0.005*** (24.569)	0.093*** (27.769)	0.204*** (20.552)	0.065*** (20.465)	0.148*** (26.216)
Hotel*Restriction	0.084*** (5.644)	0.042*** (5.739)	0.124*** (5.652)	0.145*** (3.717)	0.092*** (5.953)	0.061*** (6.581)	0.007*** (4.623)	0.007*** (4.628)	0.208*** (4.331)	0.701*** (4.877)	0.163*** (6.823)	0.282*** (3.278)
COVID Restriction	-0.056*** (-14.470)	-0.026*** (-15.379)	0.004 (0.582)	-0.018** (-2.232)	-0.044*** (-10.090)	-0.037*** (-15.319)	-0.012*** (-13.530)	-0.011*** (-10.850)	-0.069*** (-25.733)	-0.146*** (-17.128)	-0.055*** (-11.927)	-0.084*** (-22.124)
age	0.007*** (14.206)	0.007*** (13.955)	0.007*** (13.493)	0.007*** (14.046)	0.007*** (13.584)	0.007*** (14.112)	0.007*** (13.887)	0.007*** (13.669)	0.008*** (15.981)	0.008*** (15.232)	0.007*** (14.170)	0.008*** (15.224)
agesquared	-0.000*** (-15.819)	-0.000*** (-15.716)	-0.000*** (-15.233)	-0.000*** (-15.055)	-0.000*** (-15.520)	-0.000*** (-15.831)	-0.000*** (-15.580)	-0.000*** (-15.488)	-0.000*** (-16.985)	-0.000*** (-16.056)	-0.000*** (-15.833)	-0.000*** (-16.403)
sqfootage	-0.216*** (-13.473)	-0.213*** (-13.258)	-0.208*** (-12.948)	-0.225*** (-13.310)	-0.215*** (-13.256)	-0.208*** (-13.049)	-0.206*** (-12.884)	-0.208*** (-12.963)	-0.252*** (-15.172)	-0.247*** (-14.393)	-0.221*** (-13.670)	-0.252*** (-14.856)
sqfootagesquared	0.035*** (8.653)	0.034*** (8.605)	0.033*** (8.608)	0.036*** (8.075)	0.034*** (8.727)	0.033*** (8.358)	0.032*** (8.431)	0.033*** (8.455)	0.040*** (8.669)	0.039*** (8.375)	0.035*** (8.678)	0.040*** (8.470)
percentleased	1.460*** (31.151)	1.455*** (31.140)	1.455*** (31.260)	1.274*** (27.773)	1.463*** (31.234)	1.479*** (31.582)	1.445*** (30.570)	1.445*** (30.538)	1.393*** (29.670)	1.296*** (27.685)	1.476*** (31.632)	1.313*** (28.107)
confirmeddeaths	-0.002*** (-3.825)	-0.001 (-1.403)	0.001 (1.313)	0.000 (0.755)	0.001*** (3.138)	-0.002*** (-3.712)	0.001*** (2.843)	0.001*** (3.156)	-0.001*** (-3.176)	0.000 (0.125)	0.000 (1.191)	-0.001 (-1.397)
confirmedcases	0.001*** (3.052)	-0.001** (-2.402)	-0.003*** (-9.028)	-0.003*** (-7.456)	-0.002*** (-6.680)	0.000 (0.959)	-0.003*** (-8.410)	-0.003*** (-9.182)	-0.000 (-1.044)	-0.002*** (-6.537)	-0.003*** (-7.429)	-0.002*** (-5.493)
Observations	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237	221,237
Adjusted R-squared	0.079	0.077	0.076	0.062	0.077	0.080	0.076	0.075	0.072	0.064	0.079	0.065
YearQtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This table presents the regression results that examine income return for all properties in the sample period (1Q2017-2Q2023). The measure of *Restriction* is one of the Covid Restriction measures or Mobility measures described in Appendix Table 1. Standard errors are clustered at the property level. T-statistics are in parenthesis. ***, ** and * indicate significance at the 1, 5 and 10 % level respectively.

Figure 1 – this figure plots the growth of \$100, from 1Q22-2Q23, invested in **All** properties in the most and least restrictive counties within the sample. The sample is split into terciles by the level of the Government Response Index in 2Q23. The investment’s return is based on the average quarterly total return data for the highest (Most Restrictive) and lowest (Least Restrictive) terciles.

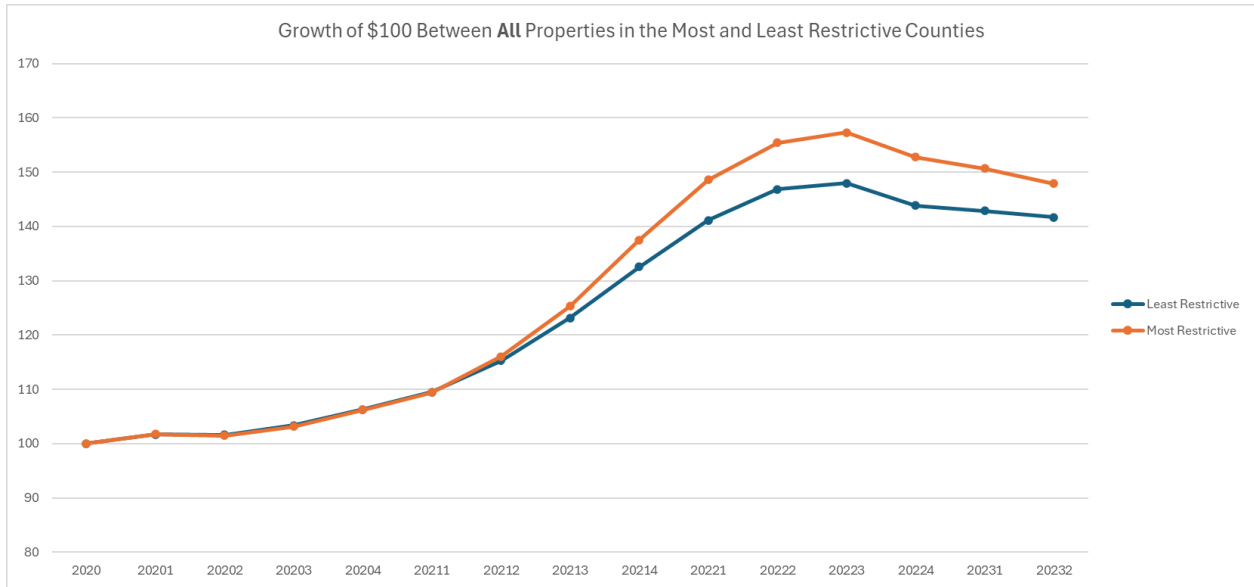


Figure 2 – this figure plots the growth of \$100, from 1Q22-2Q23, invested in **Multifamily** properties in the most and least restrictive counties within the sample. The sample is split into terciles by the level of the Government Response Index in 2Q23. The investment’s return is based on the average quarterly total return data for the highest (Most Restrictive) and lowest (Least Restrictive) terciles.

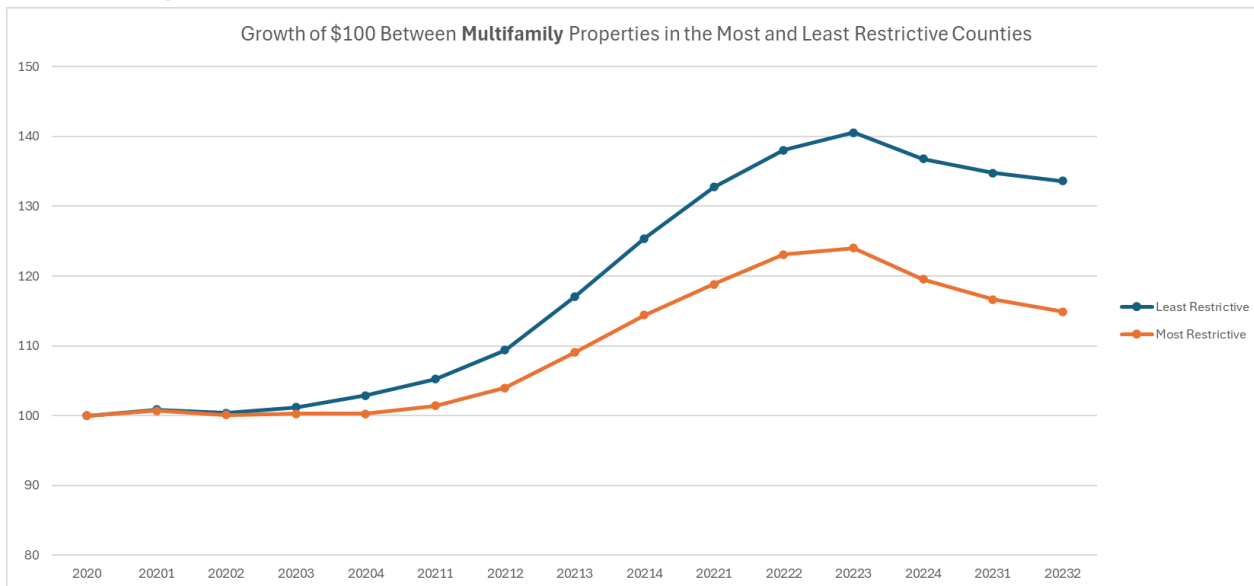


Figure 3 – this figure plots the growth of \$100, from 1Q22-2Q23, invested in **Retail** properties in the most and least restrictive counties within the sample. The sample is split into terciles by the level of the Government Response Index in 2Q23. The investment’s return is based on the average quarterly total return data for the highest (Most Restrictive) and lowest (Least Restrictive) terciles.

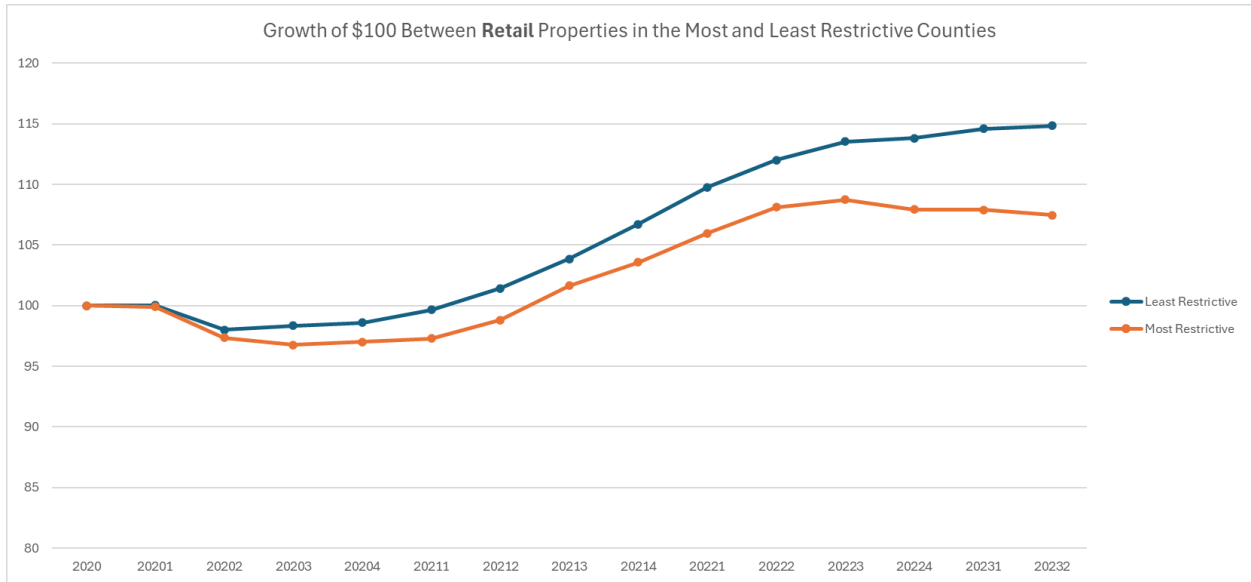


Figure 4 – this figure plots the growth of \$100, from 1Q22-2Q23, invested in **Office** properties in the most and least restrictive counties within the sample. The sample is split into terciles by the level of the Government Response Index in 2Q23. The investment’s return is based on the average quarterly total return data for the highest (Most Restrictive) and lowest (Least Restrictive) terciles.

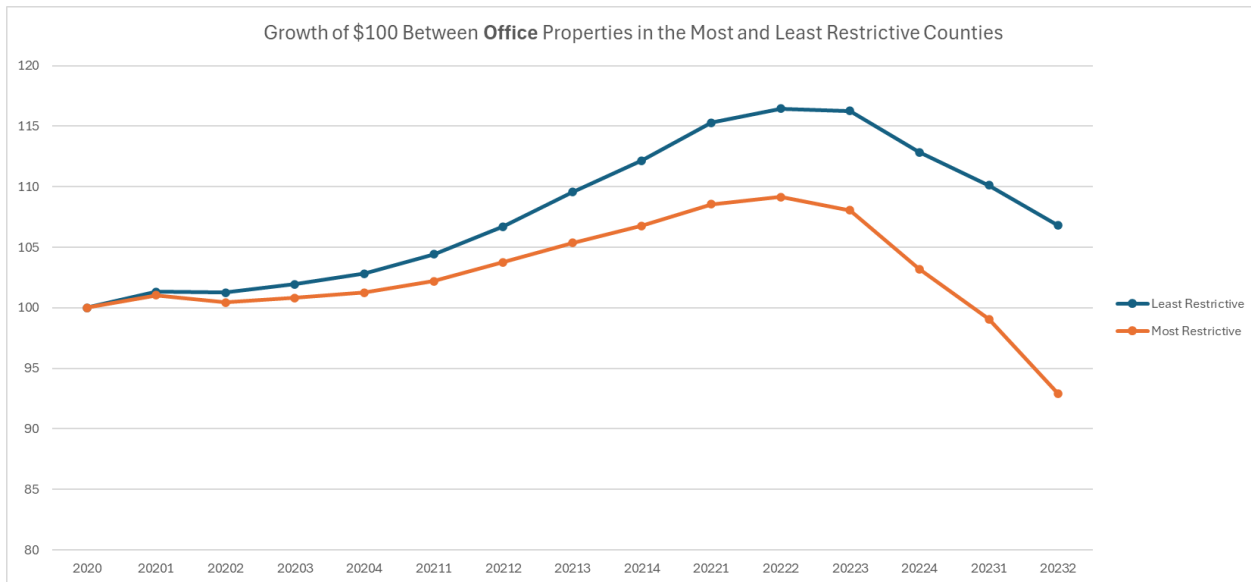


Figure 5 – this figure plots the growth of \$100, from 1Q22-2Q23, invested in **Industrial** properties in the most and least restrictive counties within the sample. The sample is split into terciles by the level of the Government Response Index in 2Q23. The investment’s return is based on the average quarterly total return data for the highest (Most Restrictive) and lowest (Least Restrictive) terciles.

