Commercial Real Estate Market at a Crossroads: The Impact of COVID-19 and the Implications to Future Cities

Yijia Wen 1,*, Li Fang 1 and Qing Li 2

1 Department of Urban and Regional Planning, Florida State University, Tallahassee, FL 32306, USA
2 Department of Finance, Insurance and Real Estate, University of Florida, Gainesville, FL 32611, USA
* Correspondence: yw20bn@fsu.edu; Tel.: +1-352-665-9655

Abstract: This paper aims to examine the responses of commercial real estate markets to COVID-19 and the implications for post-pandemic cities. Using data of Florida’s metropolitan areas in a fixed effect regression model, we find that sales volumes of retail properties decline instantly under the shock of COVID-19 but are followed by a strong recovery after one quarter. Meanwhile, COVID-19 depresses the growth rate of rent for office property, but the impact is short-term, and the office rental market bounces back to about 70 percent one quarter later. In comparison, industrial properties witness a rise in the growth rate of sales and rent price. Results indicate that urban planners may consider adjusting the amount of lands allocated to different usages to meet the evolving demands of urban space in the post-pandemic era.

Keywords: commercial real estate; COVID-19; office; retail; industrial space

1. Introduction

The 2019 Novel Coronavirus (COVID-19) severely shocked public health and disrupted the overall economic sphere around the world. In Denmark, aggregate spending was, on average, 27% below the counterfactual level without the pandemic [1]. In China, consumption dropped by an average of 42% in the two-month post-outbreak period [2]. In the U.S., COVID-19 has caused one million deaths as of August 2022, significantly diminished people’s preference for living in high-density cities, and reshaped our working and living environments [3]. For example, Ramani and Bloom [4] found that the Central Business Districts (CBDs) of the top 12 U.S. cities have experienced a net decline of population and business by 15 percent, while suburbs witnessed a net increase of two percent. Moreover, Barrero, Bloom, and Davis predicted that working from home will continue to make up 20 percent of workdays after the pandemic, which is four times as much as the pre-pandemic level [5]. Gupta, Mittal & Van Nieuwerburgh found that remote work caused a 28% long-term value decline in New York City office buildings [6]. This shift will cut down consumer spending in the CBDs of major cities by about 5 to 10 percent and disturb the economic ecosystem of business districts [3].

Inevitably, the shutdown of corporate offices and businesses and shifted workplace norms and shopping habits caused by COVID-19 reduces the demand for commercial properties [7]. Rosenthal, Strange & Urrego showed a sharp decline in the commercial rent gradient following the COVID shock [8]. At the same time, Ling, Wang, and Zhou found that the total return of retail Real Estate Investment Trusts (REITs) declined by 49 percent, while that of the industrial REITs declined by 10 percent in March 2020—immediately after the COVID-19 crisis [9]. Ling et al.’s noteworthy efforts on REITs [9] deepen our understanding of how the pandemic shocks the commercial-real-estate-related financial asset market, but our understanding of COVID-19’s influence on the physical commercial property market is limited. The financial market is more liquid and volatile, but the physical market is less sensitive because of the long transaction cycle and the dual attribute of both...
an investment good and a consumption good. Moreover, physical commercial real estate plays a critical role in the urban landscape. Corporate towers and skyscrapers define city skylines and function as employment centers [3]. The commercial blocks with office buildings, shopping malls, and plazas contribute to urban vitality by combining various work and life activities [10,11]. As a result, understanding the magnitude of COVID-19’s effects on different types of commercial real estate spaces is indispensable for adjusting the future urban landscape. It is also a prerequisite for designing effective policies to facilitate cities’ post-pandemic recovery and adapt to the shifting demand for commercial spaces.

To fill the gaps, this paper aims to examine the impact of COVID-19 on the price and volume of the three primary types of physical commercial real estate market (i.e., the retail, office and industrial market), using Florida as a contextual example. Florida’s real estate market has received increasing attention from scholars [12,13]. Florida is a particularly good testing ground for this topic as a state with the third-largest accumulated number of COVID-19 cases (4.17 million) in the U.S. in 2021 [14]. Moreover, Florida’s industries have been hit hard by the pandemic [15], making it in immense need of economic recovery and adaptation.

Using the quarterly data from the CoStar Database, we find that COVID-19’s impact on the industrial market is more positive than that on the retail and office market. COVID-19 immediately increases the vacancy rate of retail space. Every one percent increase in COVID-19 cases (deaths) causes the vacancy rate to grow by 0.03 (0.05) percent each quarter—about 352,000 (586) sq. ft. In comparison, the vacancy rate of the office market is not significantly influenced, but rent growth flattens. Every percent increase in COVID-19 causes the office growth rate of rent to decrease by 0.08 percent, but a strong rebound has begun in the following quarter. These findings are consistent with observations of retail store failure during the pandemic (and therefore vacating retail spaces) and corporate employees partly shifting to remote work (and therefore still needing the space but cannot or unwilling to afford increasing rents). The impacts on industrial properties appear to be more positive than negative. Every percentage increase in COVID-19 cases causes the current-quarter growth rate of the sale price and vacancy rate to increase by 0.07 percent and 0.08 percent, respectively. The next quarter sees a total recovery in terms of vacancy rate and a rising trend of rent growth, sale price growth and transaction volumes.

In response, planners may need to adjust urban policies. Urban planners need to adjust the zoning system and re-examine the amount of land allocated to various usages to meet the increasing demand of industrial space in the post-pandemic era. Planners may also need to transform the retail landscape to combine consumption with entertainment and leisure to attract consumers. Furthermore, revitalizing low-quality office buildings to improve sanitization and facilitate face-to-face communication may strengthen the advantage of urban agglomeration (e.g., developing social networks, facilitating innovation bursts) and attract remote workers.

This paper is structured as follows. In Section 2, we introduce the performance of the real estate market during the economic recession and pandemics. The panel dataset of commercial real estate and COVID-19 is presented in Section 3. In Section 4, we introduce the methodology. Section 5 presents the descriptive analysis and regression results. Section 6 concludes.

2. Literature Review

Real estate markets go through boom and bust with business cycles. For example, the early 2000s witnessed a significant appreciation of real estate assets [16], while the 2008 recession trimmed real estate value by 28 percent, followed by lagged real estate valuation deterioration [17,18]. Relatedly, Yunus examined the interrelationship among the major global real estate market and found that it exhibited increasing independent developing trends after the 2008 recession [19]. Previous studies have estimated the impact of economic recessions on real estate, but their focus is mostly on residential real estate markets [20–23]. Only a few examined the commercial real estate markets. For example, Browne and Case...
found that the office market was severely affected by the 1991 recession with dropping rent and depreciating property values [24]. In the meantime, the vacancy rate has reached 20 percent or more. Geltner summarized three major commercial property cycles [17]. He found three asset pricing peaks in 1971, 1987, and 2007, and three troughs in 1975, 1992, and 2009, with prices dropping by 39, 43, and 36 percent, respectively [17]. Relatedly, Sun, Titman, and Twite examined REITs versus the commercial properties’ price during the 2007–2009 recession, and found much more volatility in REITs [25].

Pandemics, aside from the normal business cycles, can also induce economic recessions. They disrupt workforces and halt economic activities [26,27]. For example, Ma, Rogers, and Zhou found major pandemics—2003 SARS, 2009 H1N1, 2012 MERS, 2014 Ebola, and 2016 Zika—truncate real GDP by 2.57 percent across 210 countries in the year of the outbreak [28]. Five years later, real GDP is still 2.96 percent below the pre-shock level [29].

However, thus far, only a few studies have examined how commercial real estate markets respond to COVID-19, despite extant literature on residential real estate markets [30–34]. Those that did examine commercial real estate markets primarily focused on the stock market. For example, Ling et al. found that the total return index of retail REITs dropped by 49 percent during March 2020, followed by office REITs (25 percent) [9]. In comparison, the industrial sector was the most resilient, with a decline of 10 percent [9]. Relatedly, Milcheva found that the regional mall sector has the lowest daily average return of −1.88 percent in the stock market, among all commercial properties [35]. The commercial-real-estate stock market and physical market exhibit different features. The stock market is more liquid and volatile based on investors’ expectations. In comparison, the physical market is less sensitive due to the long transaction cycle, high transaction cost, and the dual attribute of both an investment good and a consumption good. Moreover, shifts in the physical commercial real estate market may reshape the urban landscape. A few studies examined the physical commercial real estate markets. For example, Rosenthal et al. found that the commercial rent gradient sharply flattened in transit-oriented cities [8]. However, their study didn’t distinguish whether the decline is caused by COVID-19 or government policies such as stay-at-home and facial covering, or rising remote working popularity. Relatedly, Gupta et al. examined New York City and found that remote work causes a long-term 28% decline in office values [6]. But New York city is an outlier among urban areas in the U.S., and the office market in NYC may be heterogeneous. In addition, Dijk, Thompson, and Geltner used descriptive analysis to measure the magnitude of decline in the physical commercial real estate market and found that the retail sector is hit hard with a 14 to 19 percent predicted price drop by April 2020 [36]. Their study found an immediate shock on the commercial real estate market at the early stage of COVID-19, but failed to examine whether the impact is permanent or temporary due to the short study time period. As a result, our understanding of the shifting demand for the commercial real estate market and their implications for the future urban landscape is limited. This paper fills the gap. We control for government response to COVID-19 and quantify the corresponding relationship between COVID-19 case (deaths) numbers and market fluctuations for different commercial properties for the whole COVID-19-induced public health emergency period.

3. Data

This study focuses on all the metropolitan areas (MSAs) in the state of Florida, capturing the impact of COVID-19 with the data in 2020 and 2021 and using 2018 and 2019 as a pre-shock comparison. Our data come from multiple sources. Commercial real estate market indicators are retrieved from the CoStar database. CoStar is the most extensive commercial real estate database in the U.S., recording around six million commercial properties [37]. It is also one of the most commonly used databases in real estate studies [38,39]. We collected the growth rate of market rent, the vacancy rate, the growth rate of market sales price, and the market sales transaction volume quarterly for MSAs to measure the impact on both the commercial property’s rental and sales market. Data for office, retail, and industrial properties are collected to compare across different commercial spaces. We
also obtained the total employment of each MSA per quarter from the CoStar Database to control for additional economic variations.

Meanwhile, COVID-19 data, including the number of COVID-19 cases and deaths, are collected from the New York Times. We aggregated these daily updated numbers into MSA’s quarterly data to unify the spatiotemporal unit of measurement. In addition, we collected local policy responses to COVID-19—including when each county implemented and abolished Stay-at-Home and/or Facial-Covering policies—from the Institute for County Government. We aggregated these county-level policies to the MSA level via a conservative approach—if at least one county within the MSA was under the Stay-at-Home order, this MSA is considered as having a Stay-at-Home order in place. We understand that this may downwardly bias the coefficients of the policy variables, but given the highly economically integrated nature of MSAs [40], a travel restriction in one county is very likely to exhibit an impact spilling over to other parts of the MSA. The descriptive statistics are as follows (Table 1).

| Table 1. Descriptive statistics. |
|----------------------------------|

| Variable                           | Office          | Retail          | Industrial       |
|-----------------------------------|-----------------|-----------------|-----------------|
|                                   | Mean            | Standard        | Minimum         | Maximum        | Number Of Observations |
| Market Rent Growth                | 0.0081          | 0.0074          | −0.0157         | 0.0290         | 384                   |
| Vacancy Rate                      | 0.0618          | 0.0212          | 0.0123          | 0.1178         | 384                   |
| Sales Volume Transactions         | 44.6204         | 44.8145         | 1.0000          | 255.0000       | 382                   |
| Market Sale Price Growth          | 0.0330          | 0.0156          | −0.0081         | 0.0967         | 384                   |
|                                   |                 |                 |                 |                |                       |
| Market Rent Growth                | 0.0072          | 0.0046          | −0.0079         | 0.0307         | 384                   |
| Vacancy Rate                      | 0.0422          | 0.0115          | 0.0131          | 0.0781         | 384                   |
| Sales Volume Transactions         | 56.2057         | 52.2201         | 1.0000          | 287.0000       | 384                   |
| Market Sale Price Growth          | 0.0306          | 0.0204          | −0.0285         | 0.0940         | 384                   |
|                                   |                 |                 |                 |                |                       |
| In COVID case, current quarter    | 4.29            | 4.56            | 0.00            | 12.16          | 384                   |
| In COVID death, current quarter   | 2.34            | 2.69            | 0.00            | 7.80           | 384                   |
| Million employment                | 0.36            | 0.40            | 0.02            | 1.42           | 384                   |
| Percentage of staying at home     | 4.94            | 21.10           | 0.00            | 100.00         | 384                   |
| Percentage of wearing facial mask | 6.54            | 23.25           | 0.00            | 100.00         | 384                   |

4. Method

We examine the impact of COVID-19 on three types of commercial properties—office, industry, and retail. Four dependent variables measure the price and volume in both the rental and sales markets: In the rental market, we measure the growth rate of market rent and the vacancy rate. The growth rate of market rent is the rent growth per square feet on a quarterly basis. Vacancy rate is the percentage of vacant area among total area. In the sales market, we examine the growth rate of the sales price and the transaction volumes. The growth rate of the sales price is the sale price growth per square feet on an annual basis. Transaction volume is the number of transactions with a sale price. Specifically, the rental market reflects a more immediate response. For example, a sudden significant increase in the vacancy rate during COVID-19 indicates reduced short-term demand given the limited supply change. In comparison, the sales market reflects investors’ sentiment and expectations over a more extended period.

We adopt the following metropolitan-area-level fixed effect regression model:

\[
y_{ij} = \beta_1 + \beta_2 \ln \text{COVID}_{\text{itj}} + \beta_3 \ln \text{COVID}_{\text{itj-1}} + \beta_4 a_{itj} + \beta_5 Q_j + c_i + u_{itj}
\]
where \( y_{itj} \) denotes the growth rate of rent, the vacancy rate, the growth rate of sale price, and sales volume of the commercial property (i.e., office, retail, or industry) in metropolitan area \( i \), year \( t \), and quarter \( j \). \( COVID_{itj} \) denotes the number of COVID-19 cases or deaths in metropolitan area \( i \), year \( t \), and quarter \( j \). \( COVID_{it,j-1} \) denotes a one-quarter lag, which tests potential lagging responses of the commercial real estate markets to COVID-19. COVID-19-related variables are in natural logarithm form to reduce skewness in the distribution of the data.

\( a_{itj} \) is a vector of economic and political factors. These include total employment in metropolitan area \( i \), year \( t \), and quarter \( j \), and how many days in quarter \( j \) of year \( t \) that metropolitan \( i \) is under a Stay-at-Home Order, or Facial-Covering Order. Additionally, a group of dummy variables \( (Q_j) \) are included to capture the seasonality of the real estate markets \([41,42]\). \( c_i \) denotes metropolitan area fixed effects. \( u_{itj} \) denotes the error term. We clustered standard errors at the metropolitan-area level to account for spatial correlations.

We ran eight fixed effect regressions in each of the three commercial real estate markets, so 24 regressions are performed. 382 and 378 sample sizes exist for how COVID-19 affects sale volume transactions in the office and industrial market, respectively, and the remaining twenty regressions all include 384 sample size.

This model has a multicollinearity issue, but it is not worthy of concern. The current and last quarter COVID-19 indicators are often positively correlated, which weakens the statistical significance of \( \beta_1 \) and \( \beta_2 \). However, it only strengthens our confidence if the conservative estimates are still statistically significant. We’ve also tested correlations between COVID-19 variables and the control variables. Most correlation coefficients are small (Appendix A Table A1)—between 0 and 0.35. Again, these positive correlations only weaken the statistical significance of COVID-19 variables, and thus provide conservative estimates. Correlations between facial mask and stay-at-home policies are high (0.65) but the statistical significance of control variables is not the focus of this paper. Additionally, we classify the commercial real estate market into rent market and sale market and hypothesize the dependent variables (i.e., rent growth rate, vacancy rate) in the rent market are independent from those (i.e., sale price growth rate, sales volume transactions) in the sale market. Rent may be positively associated with sale price, but the growth rate of rent may not be correlated with the growth rate of the sale price. Nevertheless, we acknowledge that the dependent variables within the sale market or rent market are correlated but we treat them independently. A high vacancy rate may depress the rent growth rate, resulting in a downward bias to the estimates of COVID’s influence on market rent growth. It is not a concern on the estimates of how one-quarter-lag COVID influences rent growth because the weakened coefficients are still positively significant. Nevertheless, it may enlarge the magnitude of immediate shock of COVID on the office rental market. Meanwhile, an active market with a large transaction volume may stimulate investors to increase the sale price, but how the growth rate of the sale price varies accordingly is hard to determine.

5. Results

5.1. Descriptive Analysis

COVID-19 exhibits an instant shock on commercial property markets, but the recovery is significant. Specifically, the sales volume transactions experience an immediate decline and reach a record low in the second quarter of 2020, followed by a quick rebound in the third and fourth quarters (Figure 1). The following year, 2021, witnesses a fluctuation of sales volume transactions. The first quarter sees a dramatic drop followed by a strong recovery. The growth rate of the sales price seems stable for both industrial and retail space, but office space witnesses a declining trend in 2020 yet recovers strongly in 2021 (Figure 2).
Figure 1. Average transaction volume for different commercial properties.

Figure 2. Average growth rate of sales price for different commercial properties.

While the effects on the sales markets are somewhat similar for all three types of properties, those on the rental markets are heterogeneous. The growth rate of rent for industrial and retail spaces is not disrupted by COVID-19 but experiences a flourishing trend. In comparison, that of office space goes through booms and busts in the pandemic period (Figure 3). The vacancy rate of retail and office spaces have reached the highest point of the four years by the first quarter of 2021, followed by a return to the pre-COVID level (using the first quarter of 2018 as a baseline) at the end of 2021 (Figure 4). However, the vacancy rate of industrial space peaks in the third quarter of 2020 and declines dramatically over 2021 (Figure 4).
5.2. The Impact on Retail Properties

Table 2 shows that COVID-19 disturbs the retail rental and sale markets instantly by increasing the vacancy rate and reducing the sale volume transactions. Every one percent increase in COVID-19 cases causes the vacancy rate to grow by 0.03 percent each quarter—about 352 thousand square feet. COVID-19 immediately shifted consumer behaviors from offline to delivery-based shopping [43]. This shift causes some small businesses without the capacity to provide effective delivery services to close and some to re-organize their
business models to reduce the need for a physical store. These transitions decrease the short-term demand for retail properties and may therefore raise the vacancy rate [44].

Table 2. Impact of COVID-19 on the retail property market.

| Market Rent Growth | Vacancy Rate | Market Sale Price Growth | Sales Volume Transactions |
|--------------------|--------------|--------------------------|---------------------------|
| In COVID case in metro area, current quarter | −0.000110 (0.000102) | 0.000319 * (0.00138) | 0.000307 (0.000464) | −0.903 * (0.576) |
| In COVID death in metro area, last quarter | 0.000600 *** (0.000111) | 0.000342 (0.00138) | 0.00136 * (0.000618) | 2.397 *** (0.477) |
| In COVID death in metro area, current quarter | 0.000125 (0.000144) | 0.000507 * (0.000244) | 0.00153 (0.000796) | −2.694 *** (0.577) |
| In COVID death in metro area, last quarter | 0.000729 *** (0.000115) | 0.000551 (0.000208) | 0.00127 (0.00103) | 5.372 *** (0.901) |
| Million Employment | 0.0530 *** (0.0819) | 0.0500 *** (0.0810) | 0.000676 (0.0157) | 0.00103 (0.0154) |
| Percentage of dates requiring face mask | −0.0000497 *** (0.0000904) | −0.0000510 *** (0.0000917) | −0.0000212 (0.000135) | −0.0000225 (0.000132) |
| Percentage of dates requiring stay at home | −0.0000229 (0.000125) | −0.0000207 (0.000137) | −0.0000109 (0.0000234) | −0.0000138 (0.0000247) |
| Q2 | 0.00187 *** (0.00241) | 0.00221 *** (0.00212) | 0.000101 (0.000649) | 0.0000124 (0.000636) |
| Q3 | 0.00157 *** (0.000295) | 0.00166 *** (0.000339) | −0.00121 * (0.000431) | −0.00143 ** (0.000394) |
| Q4 | 0.000659 (0.000387) | 0.000763 (0.000391) | −0.00142 ** (0.000502) | −0.00162 ** (0.000498) |
| constant | −0.0140 *** (0.02036) | −0.0131 ** (0.00297) | 0.0414 *** (0.00599) | 0.0411 *** (0.00886) |
| Fixed Effect | Yes | Yes | Yes | Yes |
| R-squared | 0.427 | 0.426 | 0.106 | 0.0971 |
| F Statistics | 54.51 | 106.3 | 5.411 | 6.224 |
| Number of Observations | 384 | 384 | 384 | 384 |

Notes: standard errors in parentheses. ***, **, * denotes statistical significance at the 0.1%, 1% and 5% levels, respectively.

Every one percent increase in COVID-19 cases and deaths decreases the transaction volume by 0.9 and 2.7, respectively, but the rebounds in the next quarter are about twice as large. The risk of contagion and stay-at-home orders increase the search cost for buyers and sellers, causing a temporary reduction in transaction volumes. Such a phenomenon is also found in Hong Kong during SARS [45]. However, the demands for transactions do not disappear but delay to the next quarter.

The short-term contraction of the retail market ends when people become more comfortable coexisting with COVID-19. Besides the rebounding transaction volume, we could see that a strong recovery occurs one quarter later through the increasing growth rate of the rent and sale price. Every one percent increase in COVID-19 cases causes the growth rate of rents to increase by 0.06 percent in the next quarter, and the one-quarter-lag impact on the growth rate of the sale price is more than twice as large—about 0.14 percent. This indicates that rental and sale markets are both on the recovering trajectory.

5.3. The Impact on Office Properties

Table 3 shows that the number of COVID-19 cases immediately suppresses the growth rate of rent for offices. However, this impact is short-lived, with the growth rate beginning to recover in the following quarter. Every one percent increase in COVID-19 cases causes the growth rate of rent to drop by 0.08 percent; nonetheless, the growth rate increases by 0.05 percent in the next quarter—about 60% recovery. The magnitude of influence from COVID-19 death is larger: every one percent increase in COVID-19 death drops the growth rate of rent by 0.13 percent, followed by a 0.1 percent recovery in the following quarter. At the same time, the vacancy rate is not significantly influenced. These findings show that...
most offices have kept their physical spaces, at least in the short term, despite the increased work-from-home practice. Some may have negotiated for temporary rent relief.

Table 3. Impacts of COVID-19 on the office property market.

| Market Rent Growth | Vacancy Rate | Market Sale Price Growth | Sales Volume Transactions |
|-------------------|-------------|--------------------------|--------------------------|
| In COVID case in metro area, current quarter | $-0.00765^{**}$ | 0.00215 | 0.00662 | 0.334 |
| | (0.00226) | (0.00208) | (0.00574) | (0.829) |
| In COVID case in metro area, last quarter | $0.00527^{*}$ | 0.00215 | 0.00112 | 0.805 |
| | (0.00232) | (0.00219) | (0.00485) | (0.804) |
| In COVID death in metro area, current quarter | $-0.0133^{***}$ | 0.000574 | 0.00125 | $-1.190$ |
| | (0.000251) | (0.000350) | (0.000816) | (0.859) |
| In COVID death in metro area, last quarter | $0.00998^{***}$ | 0.000705 | 0.000102 | $3.213^{**}$ |
| | (0.000226) | (0.000382) | (0.000663) | (0.962) |
| Million Employment | 0.00928 | $-0.0159$ | $-0.0653^{*}$ | $-0.0676^{*}$ |
| | (0.00912) | (0.0108) | (0.0264) | (0.0262) |
| Percentage of dates requiring facial mask | $-0.000119$ | $-0.000165$ | $-0.0000750$ | $-0.0000752$ |
| | (0.000210) | (0.000215) | (0.000244) | (0.000256) |
| Percentage of dates requiring stay at home | $-0.000427$ | $-0.000415$ | $-0.0000259$ | $-0.0000169$ |
| | (0.000227) | (0.000226) | (0.000225) | (0.000233) |
| Q2 | 0.000451 | 0.000968 | 0.0000228 | 0.0000252 |
| | (0.00112) | (0.00104) | (0.000596) | (0.000565) |
| Q3 | 0.00121 | 0.00195 | 0.0000304 | 0.0000283 |
| | (0.000889) | (0.000878) | (0.000666) | (0.000734) |
| Q4 | $-0.00143$ | $-0.00108$ | $-0.000567$ | $-0.000775$ |
| | (0.000877) | (0.000749) | (0.000971) | (0.000910) |
| constant | 0.00630 | 0.00958 | 0.0835*** | 0.0846*** |
| | (0.00329) | (0.00972) | (0.00966) | (0.00915) |
| Fixed Effect | Yes | Yes | Yes | Yes |
| R-squared | 0.101 | 0.0987 | 0.0952 | 0.0996 |
| F Statistics | 7.209 | 6.507 | 4.523 | 5.100 |

Notes: standard errors in parentheses. ***, **, * denotes statistical significance at the 0.1%, 1% and 5% levels, respectively.

In comparison, the sales market experiences a one-quarter-lag rise in transaction volumes in response to COVID-19 deaths, but the growth rate of the sales price is insignificantly affected. It indicates that the Florida office market captivates investors’ attention and exhibits a positive momentum despite the nationwide market downturn precipitated by COVID-19. COVID-19 accelerates corporate relocation to the low-cost business environment and makes sunbelt markets such as Miami outperform their northern competitor [46]. Hence, the Florida office market seems resilient and on the path to robust recovery despite the instant shock from COVID-19.

It is sensible that the shock of COVID-19 on the office market is temporary. Urban concentrations provide more opportunities to initiate face-to-face communication, build social networks, and facilitate innovation bursts [47]. Such benefits cannot be completely replicable through remote working. Thus, the high market demand for office hubs may coexist with the rising trend of remote working.

5.4. The Impact on Industrial Properties

Table 4 shows that COVID-19 immediately negatively affects the rental market for industrial properties by increasing the vacancy rate, but the market fully bounces back in the next quarter. Every one percent increase in COVID-19 cases (deaths) raises the vacancy rate by 0.08 (0.11) percent, followed by a complete recovery of 0.08 (0.11) percent in the following quarter. The one-quarter-lag strong recovery also occurs via the rising growth rate of rent. Specifically, one more percent of COVID-19 cases and deaths increases the growth rate of rent by 0.12 and 0.18 percent, respectively.
The instant influence on the sales market is mixed. COVID-19 deaths depress the sale volume transactions but meanwhile increase the growth rate of sale price. This indicates that investors look optimistically toward the prospects of the market, but the inconvenience of transactions depresses the transaction volume. Moreover, the one-quarter-lag recovery is strong in both the rental and sale markets. Rising transaction volume and growth rate of the sale price and rent indicate that industrial properties exhibit positive momentum. Increasing COVID-19 cases (deaths) by one percent increases the growth rate of sale price by 0.12 (0.17) percent in the next quarter. The pandemic might disrupt the global supply chain and curf manufacturing activities, causing firms to consider relocating, restructuring their spaces, and rearranging logistics to minimize the exposure to global disruptions. Moreover, demand for warehouses, storage, and distribution centers may surge to accommodate the increasing online shopping demand caused by COVID-19.

Among control variables, we find that facial mask orders significantly influence the retail market by decreasing the rent growth rate and shock the industrial market by decreasing the growth rate of rent and sale prices, increasing the vacancy rate. However, the impact on the office market is negligible. It may indicate that facial masks make people reluctant to shop at stores and accelerate the switch to online shopping. Compared with employees working in the industrial spaces and office buildings, we could see facial masks order influence more on industrial space than office. This may be because a higher percentage of white-collar employees work than places where blue-collar employees work. Hence, face masks have a less significant influence on the workforce where white-collar employees work than places where blue-collar employees work.

5.5. Robustness Check With COVID Shocks at Different Geographical Scale

Researchers have found that COVID-19 shocks at different geographical scales exhibit various effects on the hotel industry [48]. We suspect the same for our case and therefore further conduct a robustness analysis by adding COVID-19 cases or deaths at the state or
national level to examine COVID-19’s heterogeneous influence. Table 5 presents the results by adding the natural logarithm of Florida’s COVID cases as an explanatory variable.

Table 5. Impacts of COVID-19 on three types of commercial property markets with controlling the number of state-level COVID-19 cases.

| Market Rent Growth | Vacancy Rate | Market Sale Price Growth | Sales Volume Transactions |
|--------------------|--------------|--------------------------|--------------------------|
| Retail property market | | | |
| In COVID case in metro area, current quarter | −0.0000178 (0.00020) | −0.000324 (0.00079) | 0.000112 (0.00133) | 1.097 (0.925) |
| In COVID case in metro area, last quarter | 0.000597 *** (0.00010) | 0.0000559 (0.00015) | 0.00137 * (0.00062) | 2.319 *** (0.367) |
| In COVID death in metro area, current quarter | 0.000163 (0.00024) | −0.000526 (0.00070) | 0.000456 (0.00126) | −2.740 ** (0.923) |
| In COVID death in metro area, last quarter | 0.000725 *** (0.00012) | 0.000156 (0.00024) | 0.00138 (0.00100) | 5.376 *** (0.897) |
| In COVID case in Florida, current quarter | −0.0000635 (0.00011) | −0.000015 (0.00006) | 0.0000341 (0.00016) | −0.00416 (0.00062) | −1.373 * (0.631) | 0.018 (0.275) |
| Office property market | | | |
| In COVID case in metro area, current quarter | 0.000507 (0.00035) | 0.00186 * (0.00083) | −0.000738 (0.00095) | 2.39 (1.785) |
| In COVID case in metro area, last quarter | 0.000484 ** (0.00017) | 0.000016 (0.00028) | 0.000359 (0.00044) | 0.741 (0.835) |
| In COVID death in metro area, current quarter | 0.000215 (0.00051) | 0.000659 (0.00053) | −0.000263 (0.00098) | −1.858 * (0.742) |
| In COVID death in metro area, last quarter | 0.000848 ** (0.00023) | 0.000646 (0.00056) | 0.000249 (0.00064) | 3.277 ** (0.927) |
| In COVID case in Florida, current quarter | −0.000873 *** (0.00021) | −0.000599 *** (0.00015) | −0.00113 * (0.00054) | 0.000975 (0.00054) | 0.000586 (0.00030) | −1.416 (0.820) | 0.26 (0.328) |
| Industrial property market | | | |
| In COVID case in metro area, current quarter | −0.000301 (0.00045) | 0.000692 (0.00065) | 0.000318 (0.00121) | 0.808 (0.50000) |
| In COVID case in metro area, last quarter | 0.00123 *** (0.00019) | −0.000824 * (0.00031) | 0.00119 ** (0.00035) | 0.468 (0.30900) |
| In COVID death in metro area, current quarter | −0.000342 (0.00033) | 0.000522 (0.00084) | 0.000514 (0.00105) | −3.494 * (1.32200) |
| In COVID death in metro area, last quarter | 0.00183 *** (0.00017) | −0.00107 * (0.00045) | 0.000183 ** (0.00050) | 2.892 ** (0.88900) |
| In COVID case in Florida, current quarter | −0.0000302 (0.00023) | 0.0000281 (0.00009) | 0.0000101 (0.00041) | 0.000228 (0.00031) | −0.00044 (0.00079) | 0.000414 (0.00053) | −0.5 (0.27600) | 0.685 * (0.31100) |

Notes: standard errors in parentheses. ***, **, * denotes statistical significance at the 0.1%, 1% and 5% levels, respectively.

We can see that, in the retail property market, the growth rates of rents and sale prices have negligible fluctuation after controlling for the state-level COVID cases. Meanwhile, the current-quarter COVID shock at the metro level on the growth rate of vacancy becomes insignificant when we introduce the state-level COVID shock. This might be because the state-level and metro-level COVID shock are highly correlated with a correlation coefficient of more than 0.9 (Table A1), which attenuates the statistical significance. Similarly, the metro-level’s COVID shock on transaction volume in the current quarter becomes insignificant, while the state-level’s COVID shock is negatively significant. Such change indicates that the instant COVID shock on retail transaction volume is primarily at the state level.

In the office property market, the state-level COVID shock significantly depresses the market rent growth, while the metro-level COVID shock becomes insignificant. Meanwhile, the metro-level COVID shock on driving up vacancy rates and depressing transaction volumes become marginally significant. It indicates that the office market may experience temporary rent relief at the state level, but the immediate reduction in transaction volumes and occupancy rates occurs at the metro level. Agents’ and employees’ perception of contagion and local jurisdictions’ stay-at-home orders varies dramatically across metro areas [49,50], so it is sensible that the variance of face-to-face transactions and work exist at the metro level accordingly.
In the industrial property market, the growth rate of rents has negligible fluctuation after controlling for the state-level COVID cases. Meanwhile, the current-quarter COVID’s influence on vacancy rate and growth rate of sale price becomes statistically insignificant but remains qualitatively consistent. Such performance is similar to that in the retail market. State-level COVID shock inflates the estimate of metro-level COVID shock in the original analysis.

Furthermore, we add the natural logarithm of Florida’s COVID deaths or American COVID cases or deaths to investigate various COVID impacts. We find that the results are similar with that of the state-level COVID cases (results not shown but available upon request). This might be because the COVID trends in Florida and the U.S. are highly correlated. To summarize, the COVID shock at different geographic scales exhibit slightly heterogeneous influences on the metro-level commercial real estate market in Florida, but most conclusions remain consistent.

6. Discussion

This paper is among the first to examine how COVID affects different types of physical commercial real estate markets in the U.S. Compared with commercial-real-estate performance in previous economic recessions, we find that COVID-induced commercial real estate market disruption is less severe than that of the prior recessions. The 2008 recession depressed real estate values by 28 percent [1], while the asset price under COVID shock is marginally affected. It is sensible that real estate prices collapsed more during the 2008 recession because the subprime mortgages accelerated price irrationally rising before the crisis and the recession punctured the price bubble. Nevertheless, the COVID crisis is a different case because the financial system functions well, assets are not overleveraged, and the government offered stimulus packages to relieve financial pressure on business owners and households [51]. The demands of investors and tenants were temporarily delayed by COVID but did not collapsed, so the value of asset is not depreciated but marginally affected.

The 1991 recession witnessed office vacancy rates rising to about 20 percent [24], while COVID saw negligible rising vacancy rates. There are two main reasons for these differences. Firstly, investors’ over-optimism and government’s financial deregulation in the mid 1980s led to the over construction of office buildings [24]. The oversupply caused the office building vacancy rate to skyrocket in the 1991 recession. Second, no evidence was found to indicate that a construction boom occurred before COVID. And the COVID shock on the demand side of the office building seems temporary because face-to-face interaction can offer huge advantages over remote working in terms of idea generation, collaboration and social capital formation [47]. Thus, the high market demand for office hubs may coexist with the rising trend of working remotely. It is reasonable that the disruption in the office market during COVID-19 is less severe than in that of the 1991 recession.

Comparing the performance of the physical commercial real estate market with that of the stock commercial real estate market, we can see that the former is less volatile. Ling et al. found that retail REITs declined by 49 percent in the first month of the COVID-induced shutdown, followed by office and industrial property with a decline of 25 percent and 10 percent, respectively [9]. We don’t see such a huge value decline in the physical commercial real estate market. It is sensible that the physical market is less sensitive to COVID shock because of the extended transaction cycle and high transaction cost. However, our finding that industrial property is the most resilient category under COVID shock is consistent with the findings of Ling et al. and Milcheva [9,35].

7. Conclusions

This paper examines the impact of pandemics on commercial real estate markets in the context of Florida MSAs, using COVID-19 as a case. We find that the impact of COVID-19 varies for different types of commercial properties. Specifically, industrial properties have suffered from an instant shock from rising vacancy rates and decreasing sales volume.
transactions, but this was followed by a strong rebound via enlarging sales volumes, reduced vacancy rates, and increasing growth rates of rent and sale prices one quarter later. Retail properties have also experienced an immediate increase in the vacancy rate and the contraction of sales volume transactions, but a one-quarter-lagging recovery is significant in the growth rate of rent and sale price and expanding transaction volume, indicating that the shock is short-term and the retail market is bouncing back. Finally, the growth rate of rent for office spaces has declined immediately after COVID-19, but 60 percent of the growth rate has bounced back in the next quarter. Meanwhile, the sales volume for office spaces has expanded with a one-quarter-lag, indicating a positive recovery.

This study indicates that the negative shock of COVID-19 on commercial real estate is more short-term than long-term, and the recovery is strong and significant. In particular, the industrial space experienced a positive momentum. It may benefit from the supply chain adjustment and increasing online shopping patterns. Fulfillment centers and logistic spaces close to the nodes and arteries of the regional transportation network may flourish with the regionalized supply chain. New and small last-mile warehouses may increase and scatter around cities to reduce the delivery time to reach end-users and improve customers’ shopping experience. The physical commercial real estate market is spatially heterogeneous and segregated [52], so the result cannot be generalized to all the states in the United States. Moreover, the State of Florida repealed COVID-19 emergency orders and reopened businesses on 1 July 2021 [53], which may make Florida’s commercial real estate markets very different from those in stringently regulated states (e.g., California). Regardless, our findings in Florida may provide a reference to other sun-belt states that have commonalities with Florida.

Policymakers may design adaptive policies to help cities adjust. First, zoning regulations should allow for a more flexible and adaptive use of commercial spaces in response to the shifting demand in the rental and sales markets. For example, we may see increasing demand for industrial space in the post-pandemic area. Making sure that the zoning system and land supply can accommodate the increasing need is critical. Second, policymakers may consider reinventing underperforming commercial spaces. Office and retail spaces are not fully recovered to the pre-pandemic equilibrium despite being on a positive recovery trajectory. And they may never be due to the shift to remote working and online shopping [54], part of which may be permanent. Hence, revitalizing outdated physical spaces to meet the evolving consumer needs is beneficial [55]. For example, reforming office buildings to improve sanitization and facilitate face-to-face communication may provide unique values to maintain the vibrance of in-person work. Furthermore, the clone malls and uniform high streets may fail to attract customers from online shopping, but a commercial landscape with diverse spaces designed to accommodate social interactions and experiential activities may provide unique values and remain vibrant [47].

8. Limitations and Future Studies

The most substantial limitation of the study is that the data are collected at the metropolitan-area level and only focus on Florida. We cannot conduct a fine-grained investigation on how COVID-19 heterogeneously affects the commercial real estate market at the city or county level. Moreover, we haven’t compared Florida’s market with that of other states in the U.S.

Thus, future studies may adopt a larger dataset to compare the metro areas in Florida with other representative metro areas, such as Greater Los Angeles, to explore the more general dynamics of COVID-19’s shock. In addition, researchers can conduct a more fine-geographical analysis at the community or city level to uncover the various influences within metro areas.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

Appendix A

Table A1. Correlation analysis.

|                                | ln COVID Case in Metro Area, Current Quarter | ln COVID Case in Metro Area, Last Quarter | ln COVID Death in Metro Area, Current Quarter | ln COVID Death in Metro Area, Last Quarter | ln COVID case in Florida, Current Quarter | ln COVID cases in the U.S. | ln COVID Deaths in Florida, Current Quarter | ln COVID Deaths in the U.S. | Million Employment | Percentage of Dates Requiring Facial Mask | Percentage of Dates Requiring Stay at Home |
|--------------------------------|---------------------------------------------|------------------------------------------|-----------------------------------------------|---------------------------------------------|------------------------------------------|----------------------------|---------------------------------------------|---------------------------------------------|-------------------------|-------------------------------------------|--------------------------------------------|
| ln COVID case in metro area, current quarter | 1.00                                         | 0.93                                     | 0.97                                          | 0.88                                        | 0.97                                     | 0.96                                      | 0.98                                        | 0.96                                        | 0.11                                   | 0.28                                      | 0.34                                       |
| ln COVID case in metro area, last quarter     | 0.93                                         | 1.00                                     | 0.96                                          | 0.97                                        | 0.90                                     | 0.88                                      | 0.92                                        | 0.88                                        | 0.09                                   | 0.22                                      | 0.32                                       |
| ln COVID death in metro area, current quarter  | 0.97                                         | 0.96                                     | 1.00                                          | 0.91                                        | 0.93                                     | 0.91                                      | 0.95                                        | 0.91                                        | 0.14                                   | 0.27                                      | 0.35                                       |
| ln COVID death in metro area, last quarter     | 0.88                                         | 0.97                                     | 0.91                                          | 1.00                                        | 0.83                                     | 0.82                                      | 0.85                                        | 0.81                                        | 0.13                                   | 0.16                                      | 0.28                                       |
| ln COVID case in Florida, current quarter      | 0.97                                         | 0.90                                     | 0.93                                          | 0.83                                        | 1.00                                     | 1.00                                      | 1.00                                        | 1.00                                        | −0.01                                  | 0.23                                      | 0.30                                       |
| ln COVID cases in the U.S.                     | 0.96                                         | 0.88                                     | 0.91                                          | 0.82                                        | 1.00                                     | 1.00                                      | 0.99                                        | 1.00                                        | −0.01                                  | 0.23                                      | 0.29                                       |
| ln COVID deaths in Florida, current quarter    | 0.98                                         | 0.92                                     | 0.95                                          | 0.85                                        | 1.00                                     | 0.99                                      | 1.00                                        | 0.99                                        | −0.01                                  | 0.24                                      | 0.31                                       |
| ln COVID deaths in the U.S.                    | 0.96                                         | 0.88                                     | 0.91                                          | 0.81                                        | 1.00                                     | 1.00                                      | 0.99                                        | 1.00                                        | −0.01                                  | 0.25                                      | 0.30                                       |
| Million employment                            | 0.11                                         | 0.09                                     | 0.14                                          | 0.13                                        | −0.01                                   | −0.01                                     | −0.01                                        | −0.01                                        | −0.01                                 | 0.18                                      | 0.16                                       |
| Percentage of dates requiring facial mask     | 0.28                                         | 0.22                                     | 0.27                                          | 0.16                                        | 0.23                                     | 0.23                                      | 0.24                                        | 0.25                                        | 0.18                                   | 1.00                                      | 0.65                                       |
| Percentage of dates requiring facial mask     | 0.34                                         | 0.32                                     | 0.35                                          | 0.28                                        | 0.30                                     | 0.29                                      | 0.31                                        | 0.30                                        | 0.16                                   | 0.65                                      | 1.00                                       |

References
1. Andersen, A.L.; Hansen, E.T.; Johannesen, N.; Sheridan, A. Consumer Responses to the COVID-19 Crisis: Evidence from Bank Account Transaction Data. 2020. Available online: https://ssrn.com/abstract=3609814 (accessed on 1 July 2021).
2. Chen, H.; Qian, W.; Wen, Q. The impact of the COVID-19 pandemic on consumption: Learning from high-frequency transaction data. *AEA Pap. Proc.* 2021, 111, 307–311. [CrossRef]
3. Florida, R. *The Death and Life of the Central Business District*; CityLab: Washington, DC, USA, 2022.
4. Ramani, A.; Bloom, N. *The Donut Effect of COVID-19 on Cities*; National Bureau of Economic Research: Cambridge, MA, USA, 2021. [CrossRef]
5. Barrero, J.M.; Bloom, N.; Davis, S.J. *Why Working from Home Will Stick*; National Bureau of Economic Research: Cambridge, MA, USA, 2021.
6. Gupta, A.; Mittal, V.; Van Nieuwerburgh, S. *Work From Home and the Office Real Estate Apocalypse*. 2022. Available online: https://ssrn.com/abstract=4124698 (accessed on 4 August 2022).
7. Gujral, V.; Palter, R.; Sanghvi, A.; Vickery, B. *Commercial Real Estate Must Do More Than Merely Adapt to Coronavirus*; McKinsey: New York, NY, USA, 2020.
8. Rosenthal, S.S.; Strange, W.C.; Urengo, J.A. JUE insight: Are city centers losing their appeal? Commercial real estate, urban spatial structure, and COVID-19. *J. Urban Econ.* 2022, 127, 103381. [CrossRef]
9. Ling, D.C.; Wang, C.; Zhou, T. A first look at the impact of COVID-19 on commercial real estate prices: Asset-level evidence. *Rev. Asset Pricing Stud.* 2020, 10, 669–704. [CrossRef]

10. Hu, Q.; Bai, G.; Wang, S.; Ai, M. Extraction and monitoring approach of dynamic urban commercial area using check-in data from Weibo. *Sustain. Cities Soc.* 2019, 45, 508–521. [CrossRef]

11. Zhang, A.; Li, W.; Wu, J.; Lin, J.; Chu, J.; Xia, C. How can the urban landscape affect urban vitality at the street block level? A case study of 15 metropolises in China. *Environ. Plan. B: Urban Anal. City Sci.* 2021, 48, 1245–1262. [CrossRef]

12. Taylor, Z.J. The real estate risk fix: Residential insurance-linked securitization in the Florida metropolis. *Environ. Plan. Econ. Space 2020, 52, 1131–1149. [CrossRef]*

13. Lifam Marthya, K.; Major, M.D. Real estate market trends in the first new urbanist town: Seaside, Florida. *J. Urban. Int. Res Placemaking Urban Sustain.* 2022, 1–22. [CrossRef]

14. The New York Times. Coronavirus in the U.S.: Latest Map and Case Count. *The New York Times.* 2022. Available online: https://www.nytimes.com/interactive/2021/us/covid-cases.html (accessed on 22 May 2022).

15. McCann, A. *State Economies Hit the Most by Coronavirus*; WalletHub: Washington, DC, USA, 2021.

16. Donihue, M.; Avrarenko, A. Decomposing consumer wealth effects: Evidence on the role of real estate assets following the wealth cycle of 1990–2002. *BE J. Macroecon.* 2007, 7. [CrossRef]

17. Geltner, D. *Commercial Real Estate and the 1990–1991 Recession in the United States*. Working Paper for the Korea Development Institute. 2013, pp. 1–35. Available online: https://mitcre.mit.edu/wp-content/uploads/2013/10/Commercial_Real_Estate_and_the_1990-91_Recession_in_the_US.pdf (accessed on 2 May 2020).

18. Aiizenman, J.; Jinjarak, Y. Real estate valuation, current account and credit growth patterns, before and after the 2008–9 crisis. *J. Money Finance 2014, 48, 249–270. [CrossRef]*

19. Yunus, N. Transmission of shocks across global real estate and equity markets: An examination of the 2007–2008 housing crisis. *Appl. Econ. 2018, 50, 3899–3922. [CrossRef]*

20. Hackworth, J. Inner-city real estate investment, gentrification, and economic recession in New York City. *Environ. Plan. A 2001, 33, 863–880. [CrossRef]*

21. Martin, R. The local geographies of the financial crisis: From the housing bubble to economic recession and beyond. *J. Econ. Geogr.* 2011, 11, 587–618. [CrossRef]

22. Yilmazer, T.; Babiarz, P.; Liu, F. The impact of diminished housing wealth on health in the United States: Evidence from the Great Recession. *Soc. Sci. Med.* 2015, 130, 234–241. [CrossRef] [PubMed]

23. Jang, H.; Song, Y.; Sohn, S.; Ahn, K. Real estate booms and financial crises: Recent stories. *Sustainability 2018, 10, 4559. [CrossRef]*

24. Browne, L.E.; Case, K.E. *How the Commercial Real Estate Boom Undid the Banks*; Conference Series; Federal Reserve Bank of Boston: Boston, MA, USA, 1992; Volume 36, pp. 57–113.

25. Sun, L.; Titman, S.D.; Twite, G.J. REIT and Commercial Real Estate Returns: A Postmortem of the Financial Crisis. *Real Estate Econ.* 2015, 43, 8–36. [CrossRef]

26. Barua, S. Understanding coronanomics: The economic implications of the COVID-19 pandemic. *J. Dev. Areas 2021, 55, 435–450. [CrossRef]*

27. Santos, J.R.; Orsi, M.J.; Bond, E.J. Pandemic recovery analysis using the dynamic inoperability input-output model. *Risk Anal. Int. J.* 2009, 29, 1743–1758. [CrossRef]

28. Ma, C.; Rogers, J.H.; Pradhan, A. COVID-19 and Housing market effects: Evidence from US shutdown orders. *Real Estate Econ.* 2021, 50, 303–339. [CrossRef]

29. Francke, M.; Korevaar, M. Housing markets in a pandemic: Evidence from historical outbreaks. *J. Urban Econ.* 2021, 123, 103333. [CrossRef]

30. Jiren, Z.; Jieming, Z.; Yan, G. Implications of the COVID-19 pandemic for urban informal housing and planning interventions: Evidence from Singapore. *Habitat Int.* 2022, 127, 102627. [CrossRef]

31. Milcheva, S. Volatility and the cross-section of real estate equity returns during COVID-19. *J. Real Estate Finance Econ.* 2021, 65, 293–320. [CrossRef]

32. van Dijk, D.; Thompson, A.K.; Geltner, D. Recent Drops in Market Liquidity May Foreshadow Major Drops in US Commercial Real Estate Markets; MIT Center for Real Estate Research: Cambridge, MA, USA, 2020. [CrossRef]

33. CoStar. *CoStar Commercial Real Estate Solutions*; CoStar: Washington, DC, USA, 2021.

34. Fuerst, F.; McAllister, P. Green noise or green value? Measuring the effects of environmental certification on office values. *Real Estate Econ.* 2011, 39, 45–69. [CrossRef]
39. Geltner, D. Real estate price indices and price dynamics: An overview from an investments perspective. *Annu. Rev. Financ. Econ.* 2015, 7, 615–633. [CrossRef]
40. U.S. Census Bureau. *The U.S. Census Bureau Classification of Metropolitan Areas*; U.S. Census Bureau: Suitland, MD, USA, 2013. [CrossRef]
41. Clayton, J.; Hamilton, S.W. Risk and return in the Canadian real estate market. *Can. J. Adm. Sci. Can. Sci. Adm.* 1999, 16, 132–148. [CrossRef]
42. McGreal, S.; Adair, A.; Brown, L.; Webb, J. Pricing and time on the market for residential properties in a major UK city. *J. Real Estate Res.* 2009, 31, 209–234. [CrossRef]
43. Grashuis, J.; Skevas, T.; Segovia, M.S. Grocery shopping preferences during the COVID-19 pandemic. *Sustainability* 2020, 12, 5369. [CrossRef]
44. Florida, R.; Rodríguez-Pose, A.; Storper, M. Cities in a post-COVID world. *Urban Stud.* 2021, 1–23. [CrossRef]
45. Wong, G. Has SARS infected the property market? Evidence from Hong Kong. *J. Urban Econ.* 2008, 63, 74–95. [CrossRef][PubMed]
46. Alexander, P. The Sun Belt’s Surging Office Market. Available online: https://www.commercialsearch.com/news/the-pandemic-related-acceleration-of-sun-belt-office-markets/ (accessed on 15 May 2022).
47. Storper, M.; Venables, A.J. Buzz: Face-to-face contact and the urban economy. *J. Econ. Geogr.* 2004, 4, 351–370. [CrossRef]
48. Napierła, T.; Leśniewska-Napierła, K.; Burski, R. Impact of geographic distribution of COVID-19 cases on hotels’ performances: Case of Polish cities. *Sustainability* 2020, 12, 4697. [CrossRef]
49. Barrios, J.M.; Hochberg, Y.V. Risk perceptions and politics: Evidence from the COVID-19 pandemic. *J. Financ. Econ.* 2021, 142, 862–879. [CrossRef]
50. Yang, Y.; Liu, H.; Chen, X. COVID-19 and restaurant demand: Early effects of the pandemic and stay-at-home orders. *Int. J. Contemp. Hosp. Manag.* 2020, 32, 3809–3834. [CrossRef]
51. Narayan, P.K.; Phan, D.H.B.; Liu, G. COVID-19 lockdowns, stimulus packages, travel bans, and stock returns. *Finance Res. Lett.* 2021, 38, 101732. [CrossRef]
52. Yang, L.; Chau, K.W.; Chen, Y. Impacts of information asymmetry and policy shock on rental and vacancy dynamics in retail property markets. *Habitat Int.* 2021, 111, 102359. [CrossRef]
53. The New York Times. See Reopening Plans and Mask Mandates for All 50 States. *The New York Times*. 2021. Available online: https://www.nytimes.com/interactive/2020/us/states-reopen-map-coronavirus.html (accessed on 9 August 2022).
54. Zhang, D.; Zhu, P.; Ye, Y. The effects of E-commerce on the demand for commercial real estate. *Cities* 2016, 51, 106–120. [CrossRef]
55. Armstrong, G.; Soebarto, V.; Zuo, J. Vacancy Visual Analytics Method: Evaluating adaptive reuse as an urban regeneration strategy through understanding vacancy. *Cities* 2021, 115, 103220. [CrossRef]