THE BIZARRE IMPACT OF COVID-19 PANDEMIC ON HOUSING PRICES ON OAHU ISLAND, HI

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**INTRODUCTION**

This paper aims to investigate the multifaceted impacts of the COVID-19 pandemic on the housing market of Oahu Island, Hawaii. Despite recording comparatively lower death rates than other states in the United States, the tourism-dependent economy of Hawaii has not been immune to the adverse consequences of the ongoing crisis. The first positive case in Hawaii was detected on March 6, 2020, when a Grand Princess passenger returned to the island. As the pandemic unfolded, fears and uncertainties gripped society, compelling businesses to suffer, schools to close, and the healthcare system to strain. This study examines how these circumstances have influenced the housing market dynamics on Oahu Island.  
During the progression of the COVID-19 pandemic, an escalation in positive cases prompted the former Mayor of Honolulu to announce stay-at-home orders, effective from March 23, 2020, until April 30, 2020. In an unprecedented move, the Hawaii Tourism Authority requested media outlets to discourage travel to all the islands in Hawaii. Additionally, former Governor David Ige approved a subsequent stay-at-home order spanning from August 27 to September 24, 2020. Notably, Oahu reopened on March 11, 2021. This study aims to assess how households perceive the prevailing housing market conditions amidst the COVID-19 pandemic, and whether these perceptions have exerted a negative, positive, or neutral influence on housing prices. Hawaii, often referred to as a paradise, exhibits a median housing price exceeding one million dollars. Despite a consistently growing demand for housing in Hawaii, the present inquiry scrutinizes whether the pandemic has altered individuals' aspirations of residing in Hawaii and subsequently diminished their enthusiasm for property acquisition on Oahu Island. Paradoxically, an intriguing phenomenon has emerged during the pandemic, as housing prices on Oahu Island experienced a significant upsurge.

The unusual surge in housing prices on Oahu Island can be attributed to a confluence of factors, namely historically low mortgage rates and the perceived safety and desirability of living in Hawaii. The low mortgage rates have incentivized buyers to acquire multiple properties, capitalizing on the reduced costs associated with homeownership. The appeal of Hawaii's relatively safer environment compared to other states has also prompted individuals to seek housing for the sake of health and safety. The low elasticity of housing due to the combination of increased demand and limited supply has further driven up housing prices in Hawaii. Notably, the escalating prices of lumber have played a significant role, with prices nearly tripling since 2020. The amplified demand stemming from home renovation projects, new home constructions, the Honolulu Rail Transit construction, coupled with reduced global production, has contributed to the upward trajectory of housing prices in Hawaii.

This study significantly contributes to the existing literature by conducting the first island-wide analysis encompassing the spatial patterns and heterogeneity of housing price fluctuations in both the single-family housing and condo markets of Hawaii during the COVID-19 pandemic crisis. To the best of our knowledge, no previous studies have specifically examined the impact of the COVID-19 pandemic on an island's housing market. The primary objective of this research is to comprehensively explore the repercussions of the COVID-19 pandemic on housing prices specifically on Oahu Island, Hawaii. By undertaking this investigation, we aim to enhance the understanding of the unique dynamics shaping the housing market amidst the pandemic and provide valuable insights for policymakers, industry professionals, and prospective homebuyers.

**LITERATURE REVIEW**

The studies on the relationship between the COVID-19 pandemic and housing values can be grouped into three categories: studies that find no measurable effects on property values; studies that find all negative impacts on property values; studies that find all positive impacts on property values, and studies that find mixed results from different study areas or different periods during the pandemic.

**Group A: studies that find no measurable effects on property values.**

Zeng and Yi (2022) used the hedonic price model to compile the second-hand housing price index in Wuhan and its neighboring capital cities and then uses the difference-in-difference (DID) model to conduct a comprehensive study on new commercial housing and second-hand housing market. Their results showed that the negative impact of the pandemic on the housing market was mainly reflected in the volume and area of housing transactions, with little impact on housing prices.

**Group B: studies that find all negative impacts on property values.**

Del Giudice et al. (2020) conducted a study in the Campania region of Italy, which revealed a short-term decrease of 4.16% and a mid-term decrease of 6.49% in housing prices between late 2020 and early 2021 because of the global pandemic. Hu et al. (2021) examined five Australian cities and found that for every doubling of newly confirmed COVID-19 cases, housing prices dropped by 0.35% to 1.26% annually. Qian et al. (2021) demonstrated that housing prices are negatively affected in regions with higher infection levels or inadequate healthcare, with a 2.47% reduction observed in Ireland as the pandemic persisted. Allen-Coghlan and McQuinn (2021) also observed an 18-month decline in housing prices in the Irish housing sector due to the COVID-19 pandemic. Francke and Korevaar (2021) noted a temporal increase in housing risk premia in Amsterdam and Paris caused by growing uncertainty and economic disruption from the pandemic, resulting in a reduction in housing prices.

**Group C: studies that find all positive impacts on property values.**

Kadi et al. (2020) conducted a study on the rental housing market in four major Austrian cities, analyzing real estate listings, and identified that property owners reconsidered their usage of units for tourism purposes, subsequently converting them back to the regular rental market due to increasing rental prices. Verma and Husain (2020) assessed the resilience and strength of the Canadian housing market during the pandemic and observed that cities near urban centers experienced an upswing in housing prices. In terms of reported COVID-19 cases, Arcaya et al. (2020) found that housing values increased with rising COVID-19 cases, primarily due to housing displacement pressures caused by the pandemic. Delgado and Katafuchi (2020) studied the relationship between the COVID-19 pandemic and the Japanese housing market during the state of emergency declaration. Their findings revealed a favorable demand for housing during this period. Regarding COVID -19 restrictions, Yang and Zhou (2021) examined the effects of the pandemic on the housing market in China and found a considerable and statistically significant increase in housing prices following the emergence of the pandemic, indicating the need for improved home quarantine measures. Wang (2021) argued that stay-at-home orders and business restrictions have contributed to a surge in housing prices, particularly in properties with better amenities. Yang and Zhou (2022) examined COVID-19's impact on the housing market in the Yangtze River delta region in China by using the average selling price of commercial housing to capture the performance of local housing market. They found out that the COVID-19 has significantly increased housing prices, reflecting the need for families to stay together.

**Group D: studies that find mixed impacts on property values.**

Bricongne, Meunier, and Pouget (2022) analyze a large database and find that the listing prices after the lockdown experienced a continued decline in London but increased in other regions. Yang et.al. (2023) analyze the association between to-metro and by-metro accessibility and house prices in Chengdu, China and find different impacts on low-priced houses and high-priced houses. Cheung et.al. (2021) investigate the COVID-19 epicenter in China and find the house prices fall immediately 4.8% by using hedonic pricing model and 5.0-7.0% by using price gradient model after the breakout. They also find that the house prices in the 62 areas in Wuhan City where the COVID-19 pandemic originated rebounded after the lockdown period, and price gradients were flattened from the epicenter to the urban peripherals. Li and Zhang (2021) conclude that the influence of the COVID-19 pandemic crisis on housing price change varied across space in the U.S. They also conclude that COVID-19 may make Americans more cautious about buying property in densely populated urban downtowns that had higher levels of virus infection.

**METHODOLOGY**

Hedonic analysis is the standard methodology for data involving a heterogeneous good to estimate the shadow prices of the various characteristics that make up that good (Ohsfeldt and Smith, 1985) and is most frequently used for making inferences about non-tradable aspects of housing units which are, by definition, a heterogenous good that is always sold as a bundle (Espey and Lopez, 2000). Assuming *P* is a vector of house prices associated with a vector of structure variables (*S*), a set of location variables (*N*), and any policy and amenity variables (*A*), then the shadow prices for the structural, locational, and amenity variables, along with the impact from any policy changes on price, can be estimated via the following model:

(1)

Unfortunately, this model may generate biased results when the relationship between price and housing characteristics is not linear and in the presence of unobserved local factors lead to endogeneity. Additionally, the likelihood of spatial dependence, which is derived from Tobler’s first law of geography (1970), “everything is related to everything else, but near things are more related than distant things,” may lead to further bias in the results. Addressing spatial dependence has received a great deal of attention since Anselin’s (1988) original work and is best summarized in LeSage and Pace (2009). Despite the large literature, both theoretical and empirical, there are still several pitfalls that must be addressed when controlling for the spatial dependence of data including endogeneity, missing variable bias, and the choice of weight matrix. As pointed to in LeSage and Pace (2009), many of these issues can be addressed by estimating a Spatial Durban Model (SDM) via Loglikelihood estimation techniques.

Specifically, we use maximum likelihood to fit the model:

(2)

where indicates the natural log of the sale price for property , is a row-standardized weight matrix modeling the spatial dependance in the data and is an estimated parameter measuring the extent of the dependence. The vector is a combination of the physical attributes and locational variables related to property ; is another row-standardized matrix, typically assumed , with being an estimated parameter measuring the extent to which the neighboring characteristics impact the value of property . The advantage to this model, according to LeSage and Pace (2009) is that if the true data generating process is of any of the variety of spatial models in the literature (SAR, SEM, or SAC), the estimates from the SDM are still unbiased. This leaves only the issue of the choice of weight matrix, and this can be determined using the Log Likelihood statistic produced from the estimation of various spatial models.

A final modeling concern is that impacts may be heterogenous across different types of housing units. Specifically in Hawaii, there is a large portion of the housing that is classified as condominium or townhouse in addition to the standard single family housing unit. To address this concern, we estimate equations (1) and (2) with the full sample of units and then with subsamples of the data split across the two different types of units.

**DATA**

The sales data is obtained from the Hawaii Board of Realtors and contains sales data from 2016 until 2023 and the demographic data is from the ACS 5-year summaries at the block group level from the years 2016 through 2021.[[1]](#footnote-1) The raw data contains 57,217 arms-length transactions for 51,239 unique units from the island of O’ahu, the location of Honolulu and Pearl Harbor. The data is cleaned to remove missing observations, typographical errors in the key variables, and remove any sales that do not match with available demographic data[[2]](#footnote-2) leaving a final total of 50,394 observations for 43,057 unique units. Of these, 36,367 units were sold only once over the nearly 7.25 years of the sample, 6,075 of the remaining observations were sold twice, 586 were sold three times, 28 were sold four times and one unit was sold five times. Additionally, about 70% of the townhouse/condo units sold only once while about 73% of the single-family units sold only once over the sample.

[Insert Table One]

Table One shows the variable definitions and the summary statistics for the three key samples employed in this paper (all units, townhouse/condo units only, and single-family units only) and we instantly see one major difference is the sale prices with the average townhouse/condo units selling for about $660,000 while the average single-family home sells for about $1.25 million. Additionally, single family homes tend to have more bathrooms and bedrooms and the averages square footage is about twice that of townhouse/condo units while nearly half of the townhouse/condo units are in multistory structures. Both types have similar ages, with single-family units being only slightly older when they sale indicating the housing stock between the two types are mostly of the same vintage, however slightly more townhome/condo units are classified as excellent condition while slightly more single-family units are classified as average or fair.

Most of the differences between the two key samples are in the land use classifications as one might expect. There are no units in the townhouse/condo subsample classified as Duplex or Multi-Dwelling Units while there are no units classified as Low-Rise, High-Rise, Townhouse, Walk-Up, or Condo-Hotel in the single-family sample.[[3]](#footnote-3) Most of the single-family housing is located in land zoned as Residential while most of the townhouse/condo units are split between low and medium density, and other zones. As a result of the location, there are also slightly more elevators located in the structures for townhouse/condo units while single family homes are slightly more likely to be remodeled. An interesting result from the summary statistics are that the townhouse/condo units are located about .75 kilometers closer to the ocean than the single-family homes and this is reflected as well in the percentage of units in the various flood zone classifications. Additionally, we see that single family units are located further away from hospitals and airports and slightly further away from the middle and high schools to which they are assigned. Finally, we see that the population racial statistics are similar across both subsamples, however, a slightly higher percentage of the single-family units are occupied and owner-occupied compared to the townhouse/condo subsample.

[Insert Figure One]

While it may not seem obvious as to why we split the sample into these two groups given the fact that many differences should be controlled with the variables in the model, we are concerned about unobservable preferences related to the fact that the Covid-19 virus is an airborne virus spreadable in medium to high density environments which, as sown in the summary statistics, are more typical among townhouse/condo units rather than single family units. On the other hand, given that more townhouse/condo units are closer to the beaches, it may be that in response to the stay-at-home orders and the increase of work-from-home may lead to individuals placing a premium of views and proximity to outdoor amenities. We can see this visually looking at Figure One. The upper line is the monthly average sale price for single-family properties while the lower line is the monthly average sale price for townhome/condo unit. The horizontal lines located across the graph represent the annual average for each unit type and the vertical line indicates the start of the Covid-19 pandemic. From this graph there does not appear to be much of a change in the value for the townhouse/condo units; however, this is not the case for the single-family units. While in the month initially after the declaration of the pandemic shows a small dip in the value, the market quickly rebounds leading to the overall annual average to be higher in 2020 compared to 2019 and higher still in 2021.

[Insert Table Two]

Table Two breaks each of these samples into into the pre- and post-Covid periods. All units sold before March 2020 are classified as pre-Covid while all units sold during or after March 2020 are classified as post-Covid.[[4]](#footnote-4) Comparing columns three and five show the averages for most of the characteristics and location control variables are very similar across the pre and post Covid periods for the full sample. Some key elements that are different are the average sale price is higher, days on the market (DOM) are lower. Columns seven and nine show the split for the townhouse/condo subsample and, like the full sample, the characteristics and location variables are very similar across the two periods except for sale price and days-on-market. For townhouse/condo units both the average sale price and days-on-market fall. The difference in sale price is not statistically significant, indicating that, at best, the sale price did not change due to the Covid pandemic although units on the market did sell faster than before indicating a speed up in the market.

Columns eleven and thirteen show the means for the single-family subsample and, as with the other samples, the means for most characteristics are similar except for the sale price and days-on-market. The latter variable is cut nearly in half indicating units selling faster after the start of the pandemic than before, while the former variable indicates that sale prices were rising after the start of the pandemic. This increase could be related to other market conditions or related to a change in preferences because of the pandemic environment. While this and the image in Figure One seem to support the idea that people shifted preferences toward isolated single-family units compared to the more densely populated townhouse/condo units, we need to ensure that the differences in the characteristics between the property types and other factors are not driving the results.

**RESULTS**

*Linear OLS Regressions*

We start with a standard OLS hedonic regression of the indicator variable for sales occurring after the start of the Covid-19 pandemic and build on that by adding variables from each of the general categories discussed above. The results from the OLS estimations are shown in Table Three and we see that when only the COVID variable is regressed on the natural log of the real closing price, there is an 8.1 percent increase in the value of the homes sold after the start of the Covid pandemic equating to a premium of about $75,000. On its face, this runs contrary to many previous studies showing decreases in home values including \*(\*(\* that looks at home in Honolulu. In their analysis of home values shortly after the start of the pandemic, they show that home values fall by &\*&\*&. Once we add more data to the analysis, however, we see this was a temporary negative shock (see Figure One) that quickly rebounded once the initial confusion surrounding the disease was resolved.

[Insert Table Three]

The significance and the magnitude of this result, as expected, falls after the inclusion of year fixed effects to control for other, unobserved market conditions. Specifically, once the days on the market (DOM) and the year fixed effects are added to the model, the coefficient on the Covid indicator is cut nearly in half and the significance drops. Model three of Table Three shows the impact of adding the characteristic and condition variables to the model. The coefficient on the Covid indicator drops further and its statistical significance drops below the 10% threshold. The remaining coefficients fall inline with expectations as more bedrooms, full and half bathrooms, and square footage all increase the value of the home while having multiple stories and being older at the time of the sale all lower the value of the home. Furthermore, homes rated in Excellent or Above Average condition see a slightly higher premium compared to homes with an Average rating, while homes with a Fair rating see a lower value. Only the variable for the existence of a basement is not significant which is likely due to the very few homes with basements and the fact that basements are likely higher flooding risks given it is an island.

Model four in Table Three adds variables measuring the structural characteristics of the building within which the unit is located and the land use of the parcel. The covid indicator variable sees an increase in value, now yielding an increase in value of about $20,000, and moves back within the 10% statistical significance threshold. Additionally, we see that the estimated coefficient on the number of bedrooms becomes negative and statistically significant, which is unexpected. This may, however, be related to the inclusion of the structure type descriptors added to the model which can be viewed as a description of the structure within which the unit is located, and a structure can have one or more descriptions. Therefore, the coefficient estimates indicate the premium or discount associated with each description tag. For example, a unit with a PUD designation will see a slight decrease in value but gain an increase in value if also tagged as single family and the net effect would be a sum of the various tag impacts.[[5]](#footnote-5)

Additionally, model four adds zoning information and the coefficients all are as expected. Here the reference category is residential, and we see that high- and low-density properties see lower values while business, other, and resort classifications all see increases in value compared to residential and use. By the time we add additional controls and estimate the model with robust standard errors, none of the estimates of land use code are statistically significant. More parking demands a higher premium, however, once a property has two parking spaces, the gain does not increase with more spaces. Having elevators in the structure is also viewed as a positive factor as well while the presence of an HOA fee has a very minimum impact on value, and finally, being remodeled shows a slight decrease in value, however, this result, which is unexpected, eventually turns slightly positive as more controls are added to the model.

Model five adds distance controls along with a variable denoting the latitude and longitude for the centroid of the parcel upon which the unit is located. Being located further from positive amenities such as parks and the ocean, and services such as hospitals and airports all decrease the value of a home. Each kilometer away from the ocean sees a drop of about $8,000 while being the same distance from a park of any type costs a great deal more indicating the importance of green space in this market. Being located further from the elementary school assigned to the property does not impact the property significantly, however, residents prefer to be further from the middle or high schools assigned to the parcel. Column seven, showing model six, adds census controls to the model and there are few unexpected results here. More non-whites in the census track lowers the value while having more owner-occupied units increases values compared to more rental units. What is unusual is that more occupied units, compared to vacant ones, decreases the value of a unit.[[6]](#footnote-6)

The full model, which shows an R2 of 0.814, shows that we can expect the value of a unit to increase by about $18,000 if it is sold after the start of the Covid pandemic, however, it is important to measure the sensitivity of these results. The first test is shown in the last column of Table Three where the estimates are reported for the model estimated with robust standard errors clustered by zip code. While some measures such as bedrooms and several of the distance measures lose significance with this error structure, the variable of interest remains significant at the 5% level.

*Heterogenous Housing Types*

As observed in the summary statistics and Figure One, the impact of the pandemic on the sale price may be different for different types of units. The first three data columns of Table Four show the results of the full OLS model with robust standard errors of the townhouse/condo subsample only. The first column uses the full sample of units sold and we see that the indicator for units sold after the start of the Covid pandemic has dropped in magnitude equating to a premium of only about $9,000 given the average townhouse/condo units selling at about $660,000, but the coefficient is also no longer statistically significant (the estimated p-value is 0.1641). This seems to indicate the units classified as townhouse or condominium did not enjoy the post-Covid premium that is indicated in Table Three supporting the idea that consumer preferences may not have changed for these types of units after the start of the pandemic.[[7]](#footnote-7)

Among the other control variables, we do not see any unexpected results. The coefficient on the number of bedrooms is positive for these units compared to the negative found in the full sample and consumers seem to prefer the high-rise building over low-rise buildings. Additionally, being remodeled sees a slight increase in value while distance to the beach or parks are not considered, however, being further from a hospital seems to decrease value while further from the middle school assigned to the unit increases value. Finally, the demographic impacts are like those found prior.

The second and third columns of townhouse/condo results are estimates of the same model with slightly different subsamples. For the spatial analysis discussed shortly, repeated sales of the same units had to be removed to ensure the weight matrix would be generated correctly. To accomplish this, two strategies are used. First, we retained only the most recent sale of a unit, a method we feel is the most logical approach given that the units that only appear once in our data are the most recent sales for those units (presumably they have sold before, just prior to the start of our data sample). Secondly, we retained the first sale of the unit in the data to ensure that using the most recent sale does not skew our results by including more post-Covid sales relative to pre-Covid.

We include columns two and three to show that with the OLS modeling, there are no real differences between the parameter estimates without the filtering scheme or between the two methods. Of interest, however, is that when the data is filtered to keep only the most recent sale, we see a smaller, albeit insignificant, coefficient on the Covid indicator; however, when filtered to keep the first sale, thus increasing the number of pre-Covid sales, the estimate on the Covid coefficient is larger. In both cases, however, the estimate is not statistically significant with p-values equal to 0.603 and 0.555 respectively.

Columns five through seven show the results of the full and two filtered samples using only units classified as a single-family property type. In all three cases, the coefficient on the indicator for units sold during the Covid-19 pandemic sees a statistically significant increase in value of between 3.7% and 3.9%, or between $46,000 and $49,000. This is in stark contrast to the estimates from the townhouse/condo subsample where the magnitudes were quite small and statistically insignificant.

Beyond this, the remaining coefficient estimates, when statistically significant, fall in line with expectations with the exception of the number of bedrooms that are negative and statistically significant, while more bathrooms increase the values. Higher building heights and the existence of a basement lower the value; however, zoning of the land has no statistical impact. Distance to the beach, airport, or hospital does not seem to matter, however, being further from a park lowers the value while being further from a school increases the value. Finally, among the demographic variables, we see that being surrounded by more people identified as Black, while like the impact for townhomes and condo units, is not statistically significant, while areas with increased Asian and, especially, native Hawaiian residents see major discounts in value. Being surrounded by more owner-occupied units increases values, while again, being surrounded by more occupied units lowers the value.

*Spatially Controlled Regressions*

While the linear regressions show a clear, heterogeneous impact from the Covid-19 pandemic on the sale of units in Hawaii, we need to be certain that there is no spatial relationships or unobserved spatial factors that are skewing or creating biased estimate. Therefore, we estimate a Spatial Durbin model (equation (2)) above using maximum likelihood processes. Estimating spatial models requires the choice of weight matrix. Given the size of the data sample and for computational efficiency, we choose to use a row-standardized, k-nearest neighbor approach and set k = 20.[[8]](#footnote-8)

Secondly, when estimating the spatial Durbin model, the results are best interpreted by finding the direct, indicator, and total effects from each of the estimated coefficients (Pace and LeSage, 2009). The statistical significance of each effect is then determined via bootstrapping processes which we complete using the *impacts* function built into the *spatialreg* package for R. The direct effect is the impact on the variable of interest directly on the value of the units, while the indirect can be thought of as the external impact from that variable on the unit of interest via the 20 nearest neighbors. The total effect is then the combination of these two impacts.

Table Five shows the direct, indirect and total effects, along with the values of the spatial parameter () from estimate of the spatial Durbin model using the functional form as in the full models presented in Table Four with the full, townhouse/condo, and single-family subsamples. To avoid a unit being a neighbor unto itself, we use the two restricted data sets as shown in Table Four above.

**CONCLUSIONS**

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1. Sale completed in 2022 and 2023 are matched with 2021 census data due to those 5-year estimate files not available at the time of this writing. [↑](#footnote-ref-1)
2. The demographic data is matched between the year of the sale and the year of the 5-year estimate files from the ACS. As a result, about 100 transactions did not have census block group data reported in 2016. [↑](#footnote-ref-2)
3. It is important to note that the classifications of Split-level, PUD, Low-Rise, High-Rise, Townhouse, Condo-Hotel, Single Family, Duplex, Multi-Unit and Walk-Up are not mutually exclusive categories in the realtor database resulting in means summing to more than unity. Additionally, the determination for the Townhouse/Condo and Single-Family subsample is taken from a different classification variable in the data which is mutually exclusive and unique for each property. [↑](#footnote-ref-3)
4. As a robustness check discussed in the results section, we also estimate models with a further restrictive definition of post-covid removing all units sold after the end of 2022 and the results are similar. [↑](#footnote-ref-4)
5. While there are likely econometric concerns with these variables, we include them for completeness in addition to the fact that they are likely doing some of the work with regards to the heterogenous impact from the two property types of classifications used later. [↑](#footnote-ref-5)
6. Estimates on the variables of interest are stable if we use percentage of vacant or remove this variable from the model. [↑](#footnote-ref-6)
7. Of interest, but beyond the scope of this paper, for units listed as townhouse/condo units, the difference between the list price and the close price is actually negative indicating that sellers were lowering their reservations prices which provides additional, albeit circumstantial, evidence that the higher density environment in which then units exist may have actually had a disutility associated with it. [↑](#footnote-ref-7)
8. The value of k is determined by maximizing the log likelihood value of the simple regression of prices on the covid indicator as outlined in Pace and LaSage (2009). [↑](#footnote-ref-8)