Housing Price Gradients in Mexico City During the COVID-19 Pandemic

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- The data were accessed through the Econlab at Banco de Mexico. The EconLab collected and processed the data as part of its effort to promote evidence-based research and foster ties between Banco de Mexico's research staff and the academic community. Inquiries regarding the terms under which the data can be accessed should be directed to econlab@banxico.org.mx

Summary

- **What we do**
  - Estimate the slope of the housing price gradient –the relationship between prices and (1) distance to the center, or (2) employment density– in Mexico City from 2019 to 2023.
- **How do we do it?**
  - Use an administrative dataset with the universe of fair market values from home appraisals required to issue mortgages in the Mexico City metropolitan area.
  - Estimate the housing price gradient for pre-pandemic, pandemic and post-pandemic periods.
- **What do we find?**
  - The housing price gradient did not change during the COVID-19 pandemic

Motivation

- Cities around the world exhibit higher housing prices around the centers of economic activity.
- During the COVID-19 pandemic with the rise of remote work, commuting patterns were disrupted and the separation between places of work and places of residence became blurry for people who started working remotely.
- Such disruption changed housing price gradients with respect to distance to centers of economic activity in developed-country cities (Gupta et al., 2022; Brueckner et al., 2023)
- As consequence, the housing price gradient flattened with housing price increases in the suburbs relative to central areas.

Contribution

- **Literature on housing markets during the pandemic**
  - USA: Ramani and Bloom (2021); Althoff et al. (2022).
  - Europe: Gokan et al. (2022); Alves and San Juan del Peso (2021).
  - **Contribution:** Estimates for Mexico City.
- **Literature on changes in city structure because of remote work**
  - Central locations lose relative advantage: Brueckner et al. (2023); Davis et al. (2023); Delventhal et al. (2022); Howard et al. (2023); Mondragon and Wieland (2022)
  - Work-from-home potential: Brueckner et al. (2023)
  - **Contribution:** Showing that this phenomenon is not observed in all cities, especially in developing countries.
- **Mexican housing markets during the pandemic:**
  - Malpezzi (2023); Chiu et al. (2020).

Data

- Universe of fair market values from home appraisals required to issue a mortgage, from *Sociedad Hipotecaria Federal* (SHF).
- All housing properties (used and new) that were bought through a mortgage.
  - However, we do not observe housing that was sold outside of a mortgage contract, nor do we observe self-built housing.
- 5,000 to 7,000 observations per quarter.
- Key variables:
  - Fair market values by property.
  - Property location.
  - **Property characteristics**: Number of bedrooms, bathrooms, house type, parking spaces, number of floors, and building age.
  - **Neighborhood characteristics**: Urban infrastructure and urban amenity indexes.

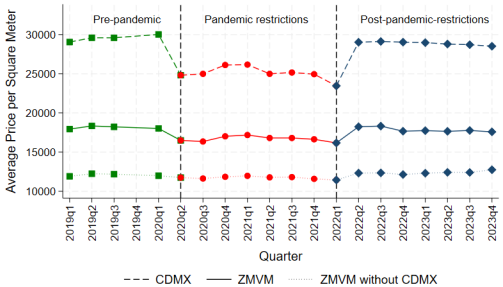
Data

- Covariates from Mexico's Housing and Population Census of 2020 at the postal code level to control for income differences across neighborhoods.
  - **Controls:** Share of population over 18 years of age; share of houses with: dirt floors, washing machines, toilets, cars, computers, and cell phones; robbery rates; and homicide rates.
- Employment density: Log number of workers per square kilometer.
- Three periods:
  - Pre-pandemic from 2019 Q1 to 2020 Q1.
  - Pandemic restrictions from 2020 Q2 to 2022 Q1.
  - Post-pandemic-restrictions from 2022 Q2 to 2022 Q4

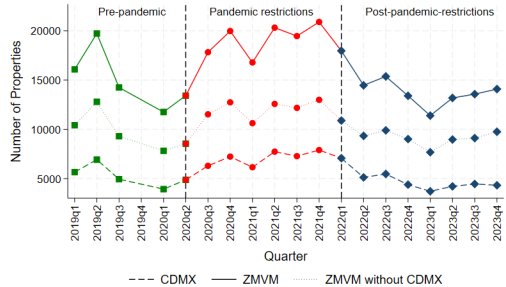
Descriptive Statistics

Figure: Average real prices and number of properties, Mexico City, 2019 Q1 - 2023 Q4

(a) Average price per square meter.



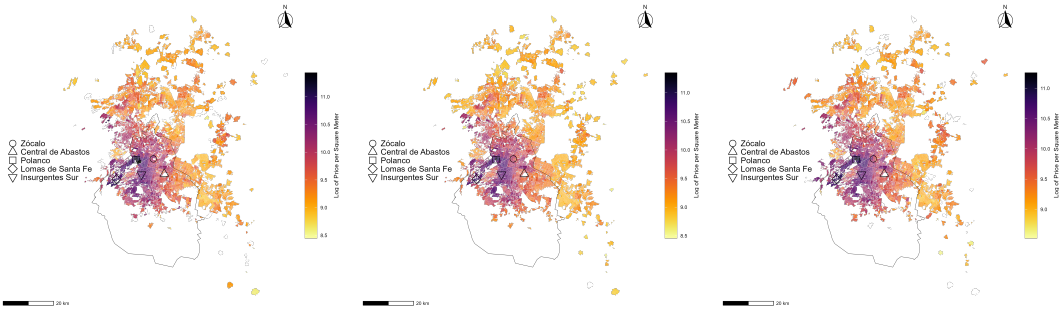
(b) Number of properties.



Source: SHF, authors' calculations. Pesos of July 2018. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.
1 USD = 18.54 MXN in Jul 2018.

Descriptive Statistics

Figure: Log price per square meter, Mexico City metropolitan area



Pre-pandemic: 2019 Q1-2020 Q1 | Pandemic: 2020 Q2-2022 Q1 | Post-pandemic: 2022 Q2-2023 Q4

Source: SHF, authors' calculations. Observations are quarterly average log prices by postal code. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.

Methodology

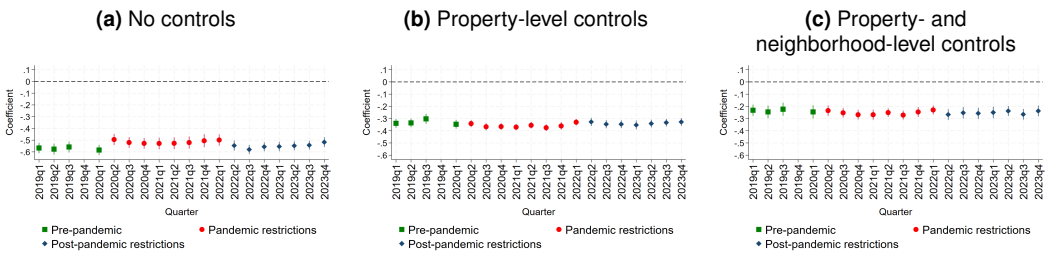
$$\ln\left(P_{i,t}\right) = \alpha_t + \delta \ln\left(D_{c(i)}\right) + X'_{it}\beta + Z'_{c(i)}\gamma + \varepsilon_{i,t}. \tag{1}$$

Where

- $P_{i,t}$ is the price per square meter of built area i at quarter t.
- α_t intercept per quarter.
- $D_{c(i)}$ is (1) the distance from the centroid of property i's postal code $c(i)$ to the city center plus 1, or (2) the employment density quantile at property i's postal code.
- X_{it} are controls at the property level.
- $Z_{c(i)}$ are controls that vary at the postal code level.
- δ measures the percentage change in price per square meter for a 1% increase in distance to the city center.

Results

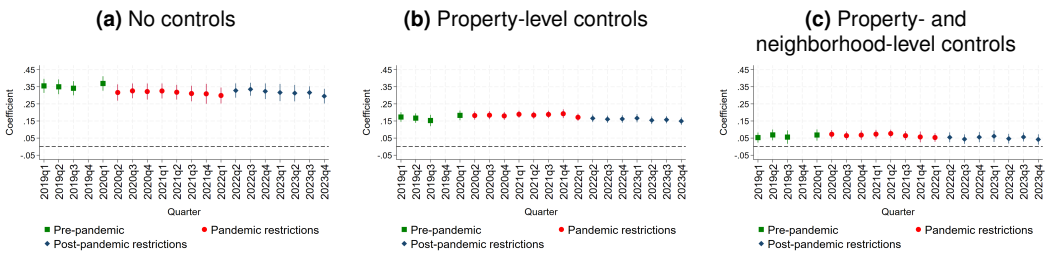
Figure: Quarterly estimates of the slope of the log price-distance to the center relationship. Mexico City, 2019 Q1–2023 Q4



Source: SHF, authors' calculations. Each coefficient is the estimate of δ, the relationship between log housing prices and employment density quantiles from equation (1) in each quarter. The bars are confidence intervals at the 95% confidence level. Standard errors clustered by postal code. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.

Results

Figure: Quarterly estimates of the slope of the log price-employment density relationship. Mexico City, 2019 Q1-2023 Q4



Source: SHF, authors' calculations. Each coefficient is the estimate of δ, the relationship between log housing prices and distance to the city center from equation (1) in each quarter. The bars are confidence intervals at the 95% confidence level. Standard errors clustered by postal code. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.

Results

Table: Distance and density gradient estimates, Mexico City metropolitan area, 2019–2023

	Pre-pandemic			Pandemic			Post-pandemic		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A									
log(distance + 1)	-0.571***	-0.331***	-0.237***	-0.516***	-0.358***	-0.254***	-0.549***	-0.339***	-0.255***
	(0.022)	(0.017)	(0.024)	(0.023)	(0.012)	(0.016)	(0.019)	(0.015)	(0.020)
N	61308	61308	60377	145194	145194	142991	94374	94374	94007
R-squared	0.521	0.791	0.849	0.388	0.703	0.760	0.550	0.791	0.844
Panel B									
log(employment density)	0.353***	0.168***	0.062***	0.316***	0.184***	0.066***	0.319***	0.159***	0.051***
	(0.020)	(0.014)	(0.016)	(0.022)	(0.010)	(0.012)	(0.021)	(0.010)	(0.014)
N	57807	57807	57722	138545	138545	138383	88739	88739	88654
R-squared	0.403	0.768	0.836	0.310	0.677	0.745	0.417	0.767	0.830
Number of quarters	4	4	4	8	8	8	7	7	7
Controls		Yes	Yes		Yes	Yes		Yes	Yes
Neighborhood			Yes			Yes			Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: SHF, authors' calculations. Estimates from equation (1). Panel A: distance to center. Panel B: employment density. We exclude 2019 Q4 due to unusual listing volume.

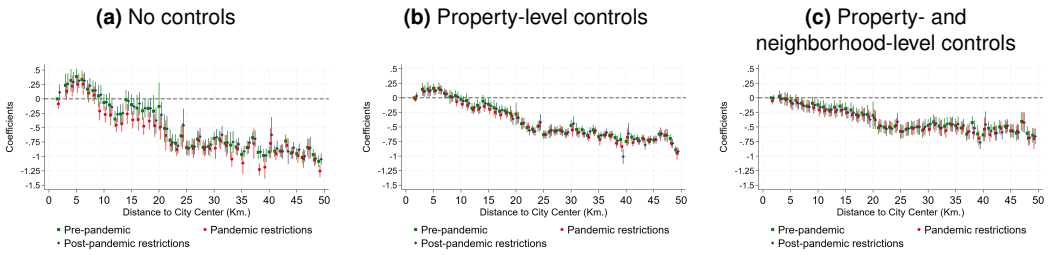
Methodology

$$\ln\left(P_{i,t}\right) = \tilde{\alpha} + \sum_{k} \tilde{\delta}_{k}^{j} \mathbb{1}\left(D\text{Km}_{c(i)} = k\right) \mathbb{1}\left(t \in j\right) + X_{it}^{\prime}\tilde{\beta} + Z_{c(i)}^{\prime}\tilde{\gamma} + \tilde{\varepsilon}_{i,t}. \tag{2}$$

- $D\text{Km}_{c(i)}$ is the distance from the centroid of postal code $c(i)$ to the city center, rounded to the nearest kilometer or employment density quantiles.
- $\mathbb{1}\left(t \in j\right), j \in \{\text{pre, pandemic, post}\}$ are dummies for periods.
- $\tilde{\delta}_{k}^{j}$ measure the average log price per square meter of built area in each bin after controlling for property and neighborhood characteristics in each of the three analysis periods.

Results

Figure: Semiparametric estimates of the slope of the log price - distance to center relationship. Mexico City, 2019-2023



Source: SHF, authors' calculations. Each coefficient is the estimate of $\tilde{\delta}^{j}_{k}$, from equation (2). Pre-pandemic is the period from 2019 Q1 to 2020 Q1. Pandemic restrictions is the period from 2020 Q2 to 2022 Q1. Post-pandemic-restrictions is the period from 2022 Q2 to 2022 Q4. The bars are confidence intervals at the 95% confidence level. Standard errors clustered by postal code. We group the first two bins of distance to the center (1km and 2km) into a single bin and a single coefficient because of small sample sizes, and we omit the coefficients for distances larger than 50km. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.

Results

Table: Distance and density gradient estimates, Mexico City metropolitan area, 2019–2023

	No controls	Property	Property and neighborhood
Distance (difference $> 0 \implies$ gradient flattening)			
Pandemic restrictions - Pre-pandemic	0.055***	-0.027**	-0.017
	(0.028, 0.083)	(-0.049, -0.005)	(-0.050, 0.016)
Post-pandemic-restrictions - Pre-pandemic	0.022	-0.008	-0.018
	(-0.011, 0.054)	(-0.030, 0.014)	(-0.055, 0.019)
Post-pandemic-restrictions - Pandemic restrictions	-0.034**	0.019**	-0.001
	(-0.060, -0.007)	(0.001, 0.037)	(-0.025, 0.023)
Employment Density (difference $< 0 \implies$ gradient flattening)			
Pandemic restrictions - Pre-pandemic	-0.037**	0.016*	0.004
	(-0.067, -0.008)	(-0.002, 0.034)	(-0.018, 0.027)
Post-pandemic-restrictions - Pre-pandemic	-0.034*	-0.009	-0.011
	(-0.071, 0.003)	(-0.029, 0.011)	(-0.036, 0.015)
Post-pandemic-restrictions - Pandemic restrictions	0.003	-0.025***	-0.015**
	(-0.014, 0.020)	(-0.035, -0.016)	(-0.027, -0.003)

Source: We obtain the covariance between the estimates using seemingly unrelated estimations. Standard errors clustered by postal code. Before COVID is 2019 Q1–2020 Q1, During COVID is 2020 Q2–2022 Q1, After COVID is 2022 Q2–2022 Q4. 2019 Q4 is excluded due to an unusual change in property count.

Discussion

Three differences between Mexico's housing market dynamics during the pandemic and those in the US and other developed countries:

- There were fewer mobility restrictions in Mexico than in other countries (Hale et al., 2023).
  - The less-stringent restrictions may have contributed to smaller changes in worker mobility, commuting behavior and equilibria in the housing market.
- Remote work may have been harder to implement in Mexico City.
  - In 2022, only 5.7% of job postings in Mexico offered remote work (Adrjan et al., 2023) and just 10% can be done from home, about half the share in the US (Leyva and Mora, 2021).

Discussion

- Households in Mexico City may be less mobile because of lack of access to funding to acquire new housing.
  - Large share of self-built houses financed by household savings or limited additional sources of financing (INFONAVIT, 2020).

Other possible explanations:

- A positive demand shock for properties away from the city center that would induce gradient flattening.
- An increase in the number of international residents in Mexico City during the pandemic.

Concluding Remarks

- We estimate the housing price gradient in Mexico City during the COVID-19 pandemic using administrative data for appraised properties.
- Housing prices are higher

closer to the city center and to centers of economic activity, as observed in other cities around the world.

- However, we do not find evidence

of a flattening of this relationship during the COVID-19 pandemic, in contrast to what has been documented for other cities (Gupta et al., 2022; Ziemann et al., 2023)

- We list some possible mechanisms behind the lack of change in housing price gradients in Mexico City.

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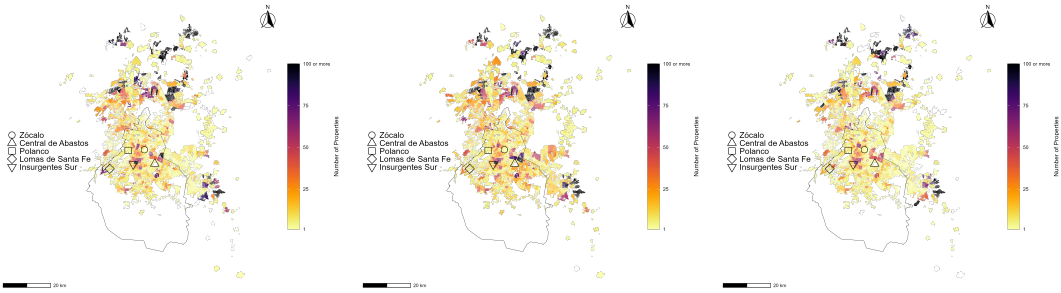
Appendix

Figure: Number of properties appraised in SHF data, Mexico City

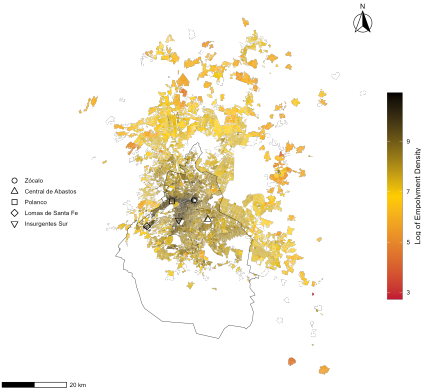


Pre-pandemic: 2019 Q1-2020 Q1 | Pandemic: 2020 Q2-2022 Q1 | Post-pandemic: 2022 Q2-2023 Q4

Source: SHF, authors' calculations. Quarterly average number of observations by postal code. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.

Appendix

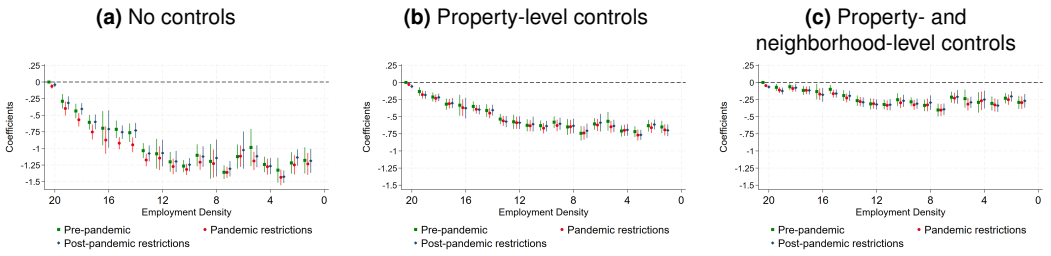
Figure: Employment density in the Mexico City metropolitan area. Pre-pandemic period



Source: DENUE, authors' calculations. Log of number of workers over are in squared kilometers per geo-statistical area (AGEB). DENUE employment data only includes establishments with a fixed physical location, and excludes establishments with mobile locations. It also excludes workers in the agricultural sector, bus and cab drivers, domestic workers, political associations, and diplomats. The number of workers is recorded in intervals: 0-5, 6-10, 11-30, 31-50, 51-100, 101-250, and over 251. We assign a value of 3 for the first bin, and we take the lower bound of the interval for all other bins.

Appendix

Figure: Semiparametric estimates of the slope of the log price - employment density relationship. Mexico City, 2019-2023



Source: SHF, authors' calculations. Each coefficient is the estimate of $\tilde{\delta}_k^j$, from equation (2). Pre-pandemic is the period from 2019 Q1 to 2020 Q1. Pandemic restrictions is the period from 2020 Q2 to 2022 Q1. Post-pandemic-restrictions is the period from 2022 Q2 to 2022 Q4. The bars are confidence intervals at the 95% confidence level. Standard errors clustered by postal code. We group the first two bins of distance to the center (1km and 2km) into a single bin and a single coefficient because of small sample sizes, and we omit the coefficients for distances larger than 50km. We exclude 2019 Q4 because of an unusual change in the number of properties in this period.