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Núcleo de Economia Regional e Urbana da Universidade de São Paulo

Housing prices and accessibility in Sao Paulo Metropolitan Region

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Motivation and Goals

Real estate prices reflect the value of the characteristics of the building, as well as the local features and facilities

This study intends to measure the impact of accessibility indicators on real estate prices, controlling for all the property physical features

The idea is to isolate the effect of local accessibility conditions and the effect of the characteristics of the property

Hedonic Model

Complex goods can be described by measurable characteristics [Lancaster, 1966].

Each characteristic has derivable implicit prices

Hedonic Price Model: Measures the implicit prices of the complex goods

Basic Assumption:

Price of the characteristics depend on the benefits of the goods

Data set

Empresa Brasileira de Estudos de Patrimônio (Embraesp): Information about property prices (residential releases) and its features - São Paulo Metropolitan Region.

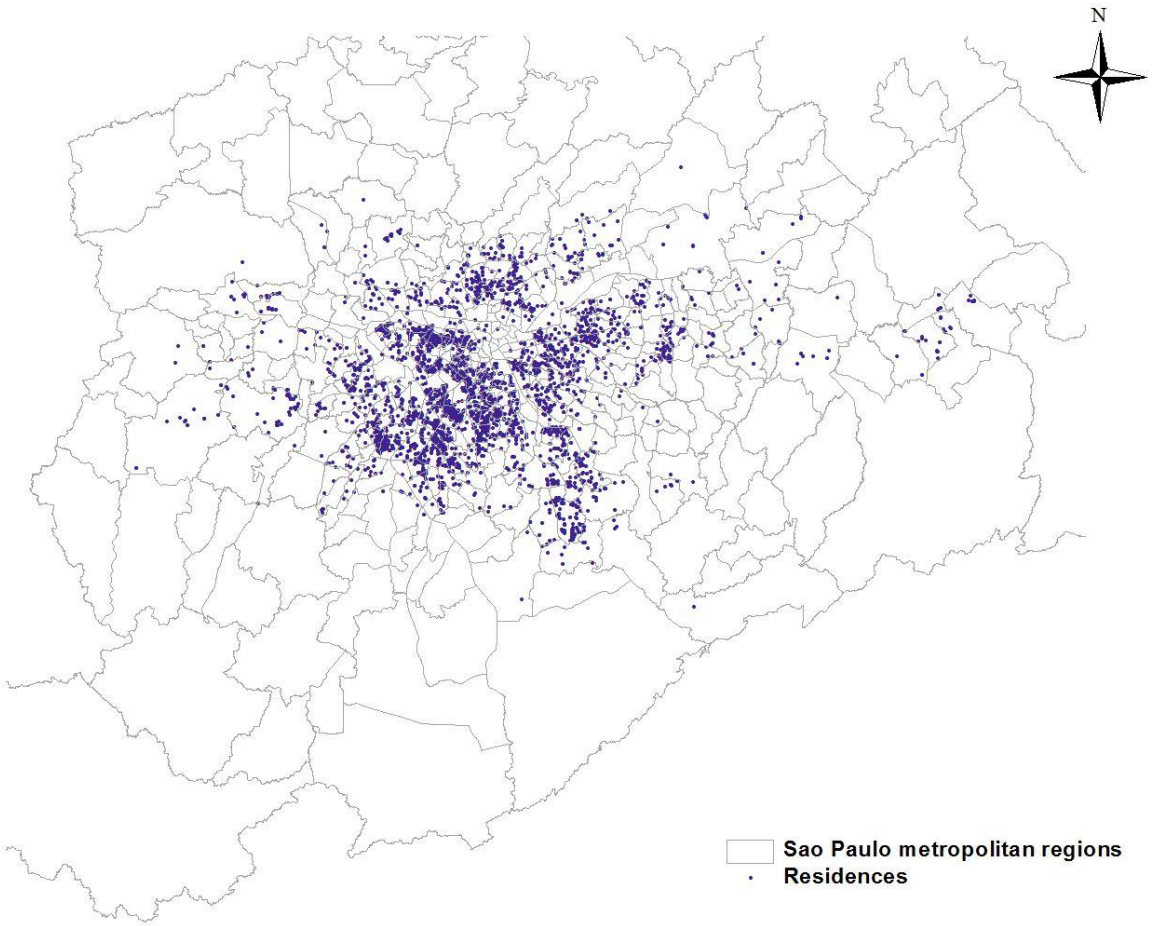
Price information: Supply prices of the real estate releases

Other information:

- *Number of rooms*
- *Number of restrooms*
- *Number of car park places*
- *Number of lifts*
- *Address*
- *Units per floor*
- *Number of blocks*
- *Number of floors*
- *Dummy for house/apartment*

Accessibility index: Vieira (2011)

Residences Location in Sao Paulo Metropolitan Region (sample)



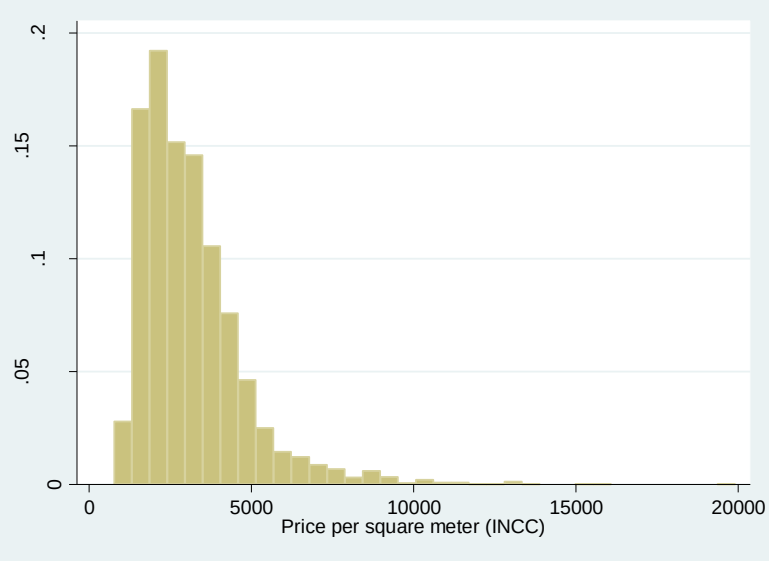
Hedonic equation: Functional Form

Box-Cox Test

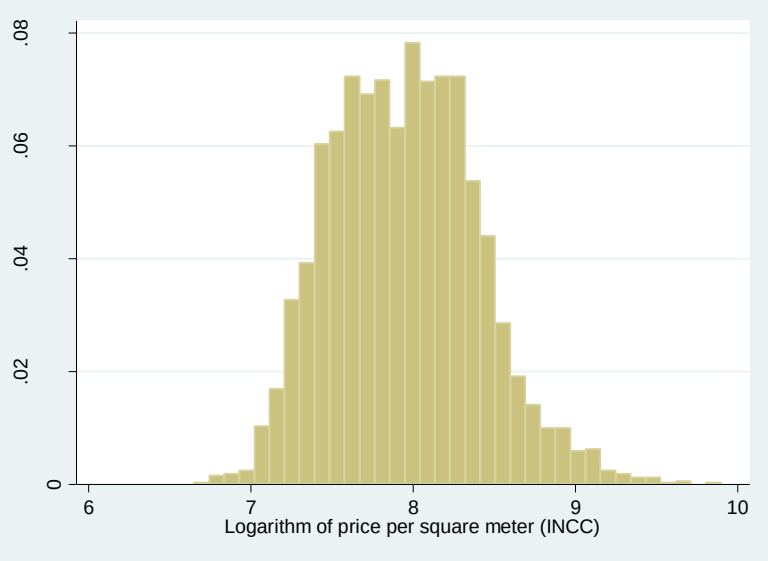
$$\frac{P^{\psi}-1}{\psi}$$

- Tests the value of the parameter
- Results indicate that the dependent variable is closer to the logarithm form

Price: Level



Price: Logarithm



Hedonic Model

The following models were estimated:

Model 0: $$\ln(price_i) = \beta_0 + \sum_{k=1}^{K} \beta_k x_{k,i} + \sum_{j=1}^{T} \theta_j dummy_{j,i} + \varepsilon_i$$

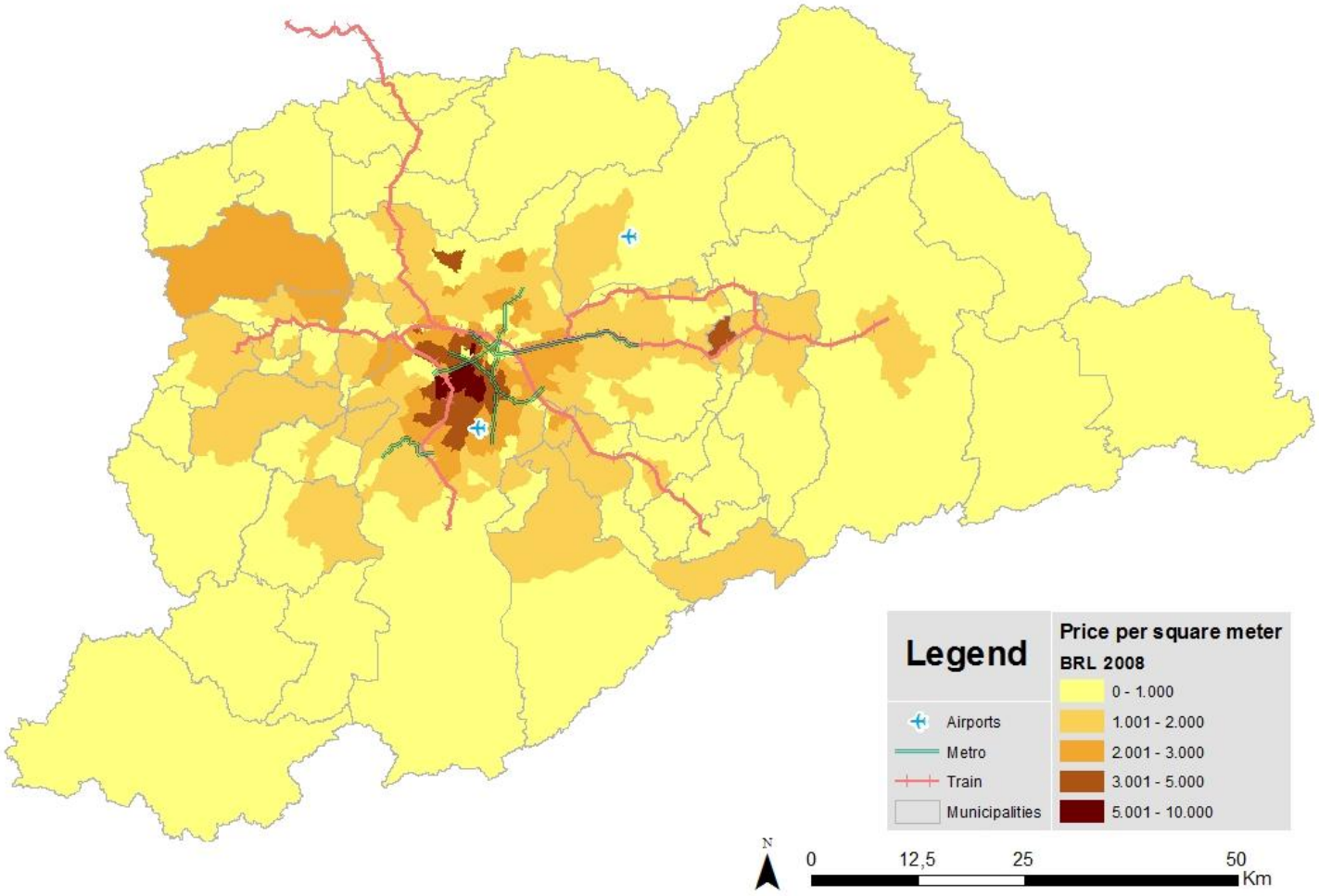
Model 1: $$\ln(price_i) = \beta_0 + \sum_{k=1}^{K} \beta_k x_{k,i} + \sum_{j=1}^{T} \theta_j dummy_{j,i} + \gamma_1 access_i^1 + \varepsilon_i$$

Model 2: $$\ln(price_i) = \beta_0 + \sum_{k=1}^{K} \beta_k x_{k,i} + \sum_{j=1}^{T} \theta_j dummy_{j,i} + \gamma_2 access_i^2 + \varepsilon_i$$

Model 3: $$\ln(price_i) = \beta_0 + \sum_{k=1}^{K} \beta_k x_{k,i} + \sum_{j=1}^{T} \theta_j dummy_{j,i} + \sum_{g=1}^{G} \delta_g access_{g,i}^1 + \varepsilon_i$$

Model 4: $$\ln(price_i) = \beta_0 + \sum_{k=1}^{K} \beta_k x_{k,i} + \sum_{j=1}^{T} \theta_j dummy_{j,i} + \sum_{r=1}^{R} \delta_r access_{r,i}^2 + \varepsilon_i$$

Housing prices per square meter



Preliminary Results

Variables	(0) OLS	(1) OLS (car)	(2) OLS (pub)	(3) OLS (district)	(4) OLS (zones)
Dependent variable:	**ln(price)**	**ln(price)**	**ln(price)**	**ln(price)**	**ln(price)**
1 room	1.64***	0.886***	0.964***	0.673***	1.211***
2 rooms	1.257***	0.741***	0.800***	0.534***	0.878***
3 rooms	1.225***	0.732***	0.787***	0.537***	0.863***
4 rooms	1.198***	0.733***	0.784***	0.531***	0.820***
5 rooms	0.967***	0.635***	0.627***	0.531***	0.659***
Number of restrooms	0.185***	0.130***	0.147***	0.0870***	0.151***
Number of car park places	0.142***	0.115***	0.125***	0.0960***	0.130***
Number of lifts	0.004	0.00794***	0.00735***	0.00464*	0.00412
Units per floor	0.016***	0.0108***	0.0133***	0.0142***	0.00587
Number of blocks	-0.043***	-0.0265***	-0.0294***	-0.0173***	-0.0371***
Number of floors	0.009***	0.00309***	0.00289***	0.00267***	0.00827***
Dummy for house	-0.149***	-0.106***	-0.135***	-0.0874***	-0.202***
year = 2001	0.036	0.0372	0.0490*	0.0242	-0.0305
year = 2002	0.032	0.0173	0.0331	0.0122	-0.0397
year = 2003	-0.016	-0.0168	-0.00692	-0.0307	-0.0761***
year = 2004	-0.041	-0.0454**	-0.0333	-0.0546***	-0.110***
year = 2005	-0.079***	-0.0824***	-0.0726***	-0.0782***	-0.137***
year = 2006	-0.08***	-0.0590***	-0.0545**	-0.0568***	-0.113***
year = 2007	-0.024	-0.0244	-0.0196	-0.0268	-0.0218
Accessibility Index (private cars)		**0.193*** **			
Accessibility Index (public transportation)			**0.164*** **		
d1 to d137				#	
zone 1 to zone 16					##
Constant	5.969***	6.703***	6.583***	7.153***	6.369***
Observations	**3,134**	**3,134**	**3,134**	**3,179**	**3,179**
R-squared	**66.83%**	**78.60%**	**75.70%**	**85.50%**	**72.50%**

Robust standard errors in parentheses

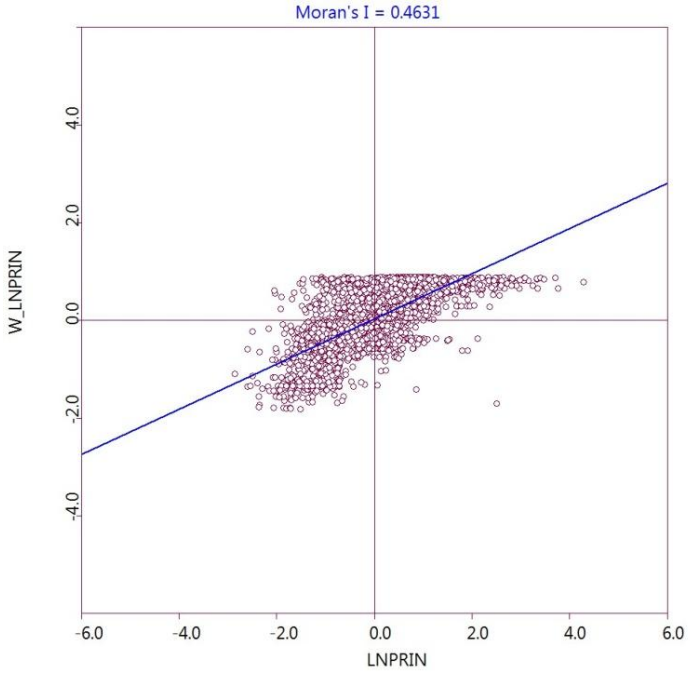
*** p<0.01, ** p<0.05, * p<0.1

District dummies for the metropolitan r

Dummies for zones collected by EMI

Diagnostics for Spatial Dependence

Spatial autocorrelation test for housing prices



The test indicates a positive spatial autocorrelation

Diagnostics for Spatial Dependence

Spatial dependence tests for the models (0), (1) and (2)

Tests	**Model 0**		**Public transportation**		**Private cars**	
	Value	Probability	Value	Probability	Value	Probability
Lagrange Multiplier (lag)	2496.89	0.000	746.946	0.000	291.151	0.000
Robust LM (lag)	849.45	0.000	410.258	0.000	203.269	0.000
Lagrange Multiplier (error)	17274.57	0.000	3479.370	0.000	614.640	0.000
Robust LM (error)	15627.12	0.000	3142.682	0.000	526.758	0.000
Lagrange Multiplier (SARMA)	18124.01	0.000	3889.628	0.000	817.909	0.000

The tests indicates presence of spatial autocorrelation on regressions

Preliminary Results

Accessibility indices seem to be good indicators to measure the transportation conditions in the regions

The index for private car indicates a better adjustment than the public transportation index

The estimated coefficients were robust for all regional and accessibility measures

The accessibility indices summarize many localities features, saving degrees of freedom

The tests indicate absence of spatial dependence in the regressions

Final Considerations

Include the updated accessibility index

This Paper:

“Is it all about accessibility? Testing the policentric city model for the São Paulo Metropolitan Region” (with Haddad and Vieira)

Next Paper:

“Hanging around by Metro?: Housing Price Effects of the Subway Infrastructure in Sao Paulo Metropolitan Region ” (with Haddad and Vieira)

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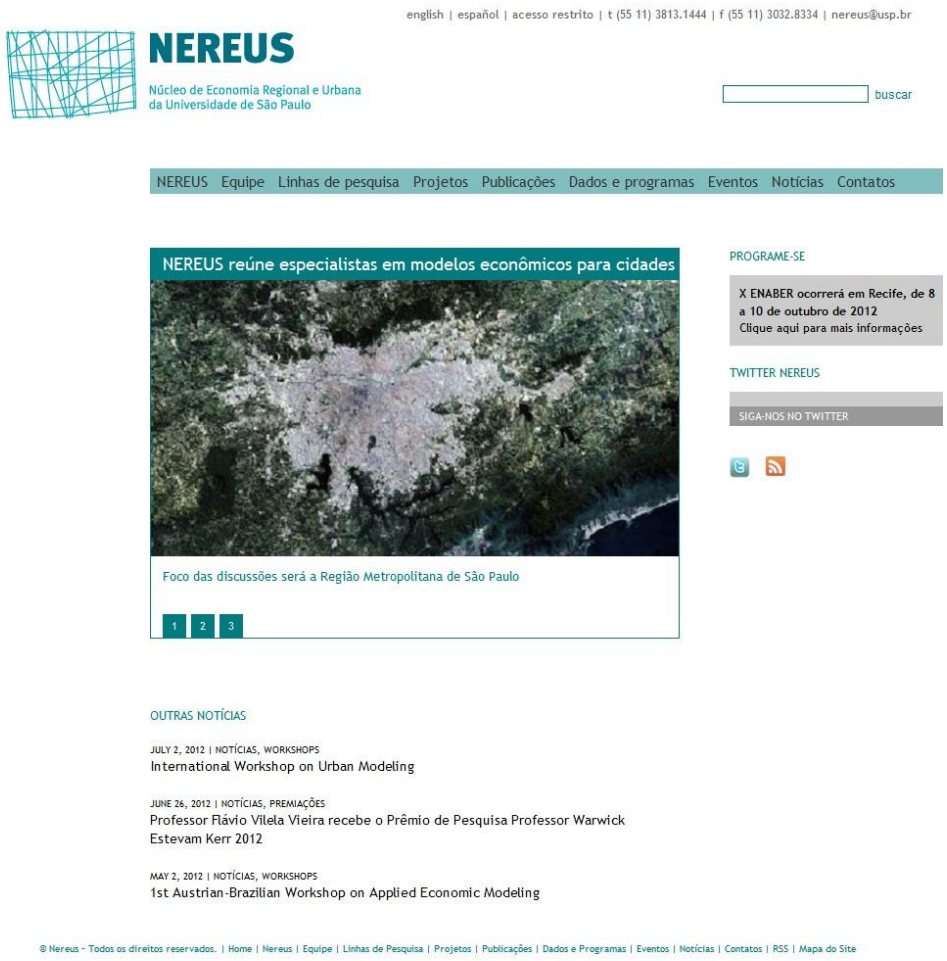

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Danke!

Gracias!

Thank you!

Merci!

Tak!