

Analyzing the Effects of Down Payment Assistance Programs on Foreclosure Rates in Covington, Kentucky

Research Practicum
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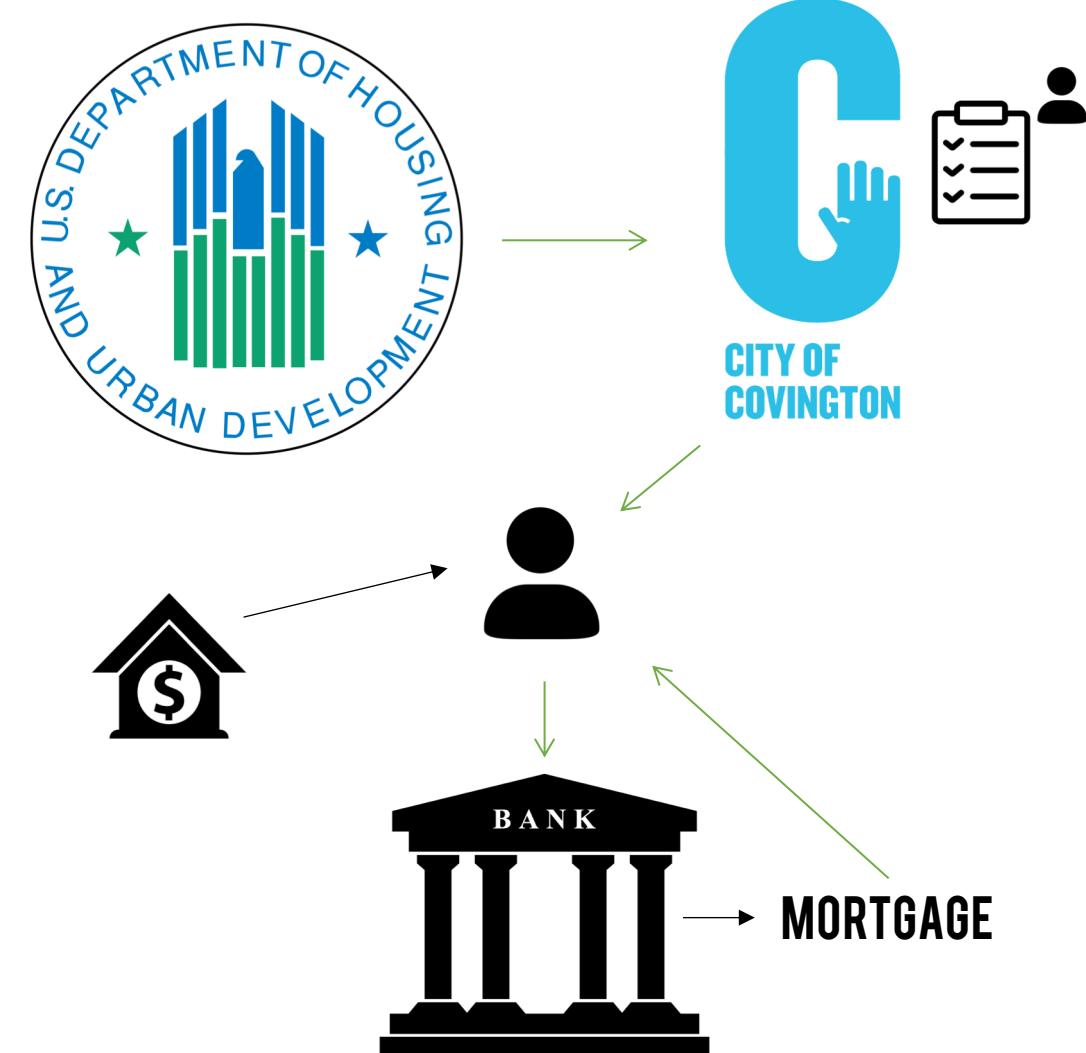
CAUSE OF A PROBLEM

- HUD prioritizes homeownership in the United States
- Housing and Community Development Act of 1974 secured funding and added protections for renters and mortgage lessees
- More recently, banks abused credit accessed and a housing bubble began to come to fruition in 2006, which was a major cause of the Great Recession
- This led to "Fanny and Freddie" entering in government conservatorship in 2008.



BRIEF OVERVIEW OF HAP

- Through the Housing and Community Development Act of 1974, Community Development Block Grant Program was established
- One type of block grant is used to help homebuyers under certain socioeconomic conditions to be able to receive aid from the government.
- Covington is part of the Northern Kentucky Housing Consortium, a collection of municipal governments, which works to help residents pay certain housing costs such as closing costs and downpayments through a forgivable loan





LITERATURE REVIEW

- Little research directly investigates the relationship between down payment assistance and default (Freedman, Harden, 2015)
 - They found that low and moderate-income homeowners who have used down payment assistance programs show no difference mortgage performance between those who used down payment assistance versus those who did not.
- Another study from Case Western investigated mortgages in Cuyahoga County, Ohio (Coulton, et. all, 2008)
 - This study concluded the leading indicator that resulted in a *lis pendens* filing in civil court was due to subprime lending, and that certain lenders were more likely to file suit than others.



DATA

TYPES:

- Land Parcel Information
- Monthly Sales data (2014-2018) for all parcels in Covington
- Foreclosure data by parcel
- Descriptive structure information including:
 - Squarefootage (sqft); and
 - Year of construction (age)
- HAP participants by year (organized by parcel)
- Three cohorts were created from this data: 2014, 2015, and 2016

SOURCES:



2014 Property Sales Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
hap	473	0.04	0.2	0	0	0	1
fdummy	473	0.1	0.3	0	0	0	1
sdummy	473	0.4	0.5	0	0	1	1
spell	473	44.6	20.5	1	30	60	60
saleval	464	10.9	0.8	7.7	10.3	11.4	13.3
sqft	473	7.4	0.4	6.4	7.1	7.6	8.4
age	473	4.4	0.6	1.1	4.3	4.7	5.4

2015 Property Sales Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
hap	525	0.05	0.2	0	0	0	1
fdummy	525	0.1	0.3	0	0	0	1
sdummy	525	0.3	0.5	0	0	1	1
spell	525	38.0	15.1	1	27	48	48
age	525	4.3	0.9	0.0	4.1	4.7	5.2
sqft	525	7.4	0.4	6.5	7.1	7.6	8.7
saleval	525	10.9	1.1	0.0	10.4	11.5	13.7

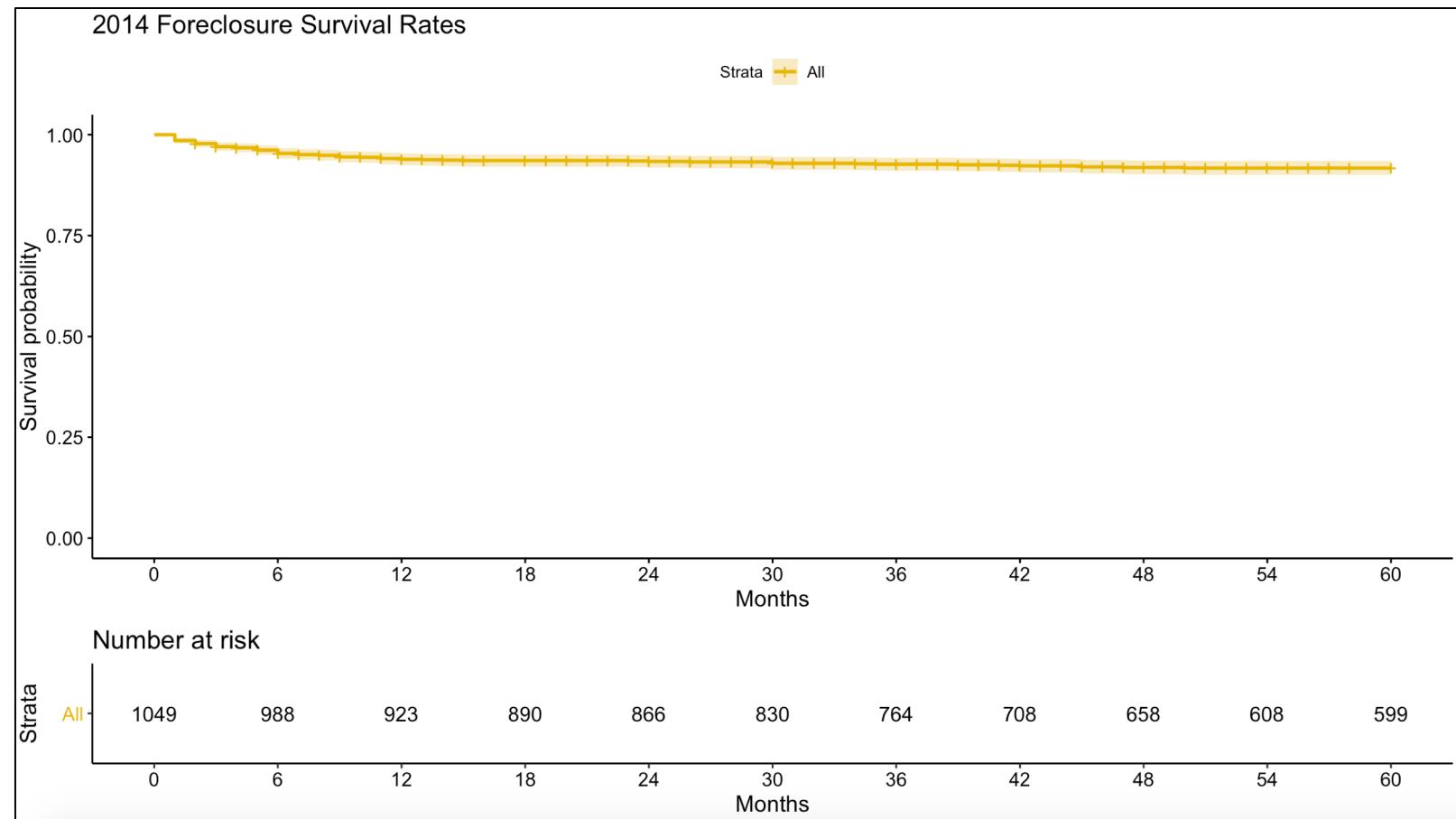
SUMMARY STATISTICS

2016 Property Sales Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
hap	465	0.1	0.3	0	0	0	1
age	465	4.4	0.7	0.0	4.5	4.7	5.4
sqft	465	7.4	0.4	6.1	7.1	7.6	9.3
saleval	465	10.9	1.3	0.0	10.5	11.5	14.3
spell	465	27.9	11.4	2	16	36	36
fdummy	465	0.1	0.3	0	0	0	1
sdummy	465	0.3	0.5	0	1	1	1

SURVIVAL REGRESSION

- What is it?
- What does it measure?
- Can you use this for economics?
- Has anyone done this for real estate before?



IMPORTANT EQUATIONS

EQ 1.

$$\text{hazard, } h(t) = h_0(t) * \exp(\beta_{HAP_i}x_1 + \beta_{saleval_i}x_2 + \beta_{age_i}x_3 + \beta_{sqft_i}x_4);$$

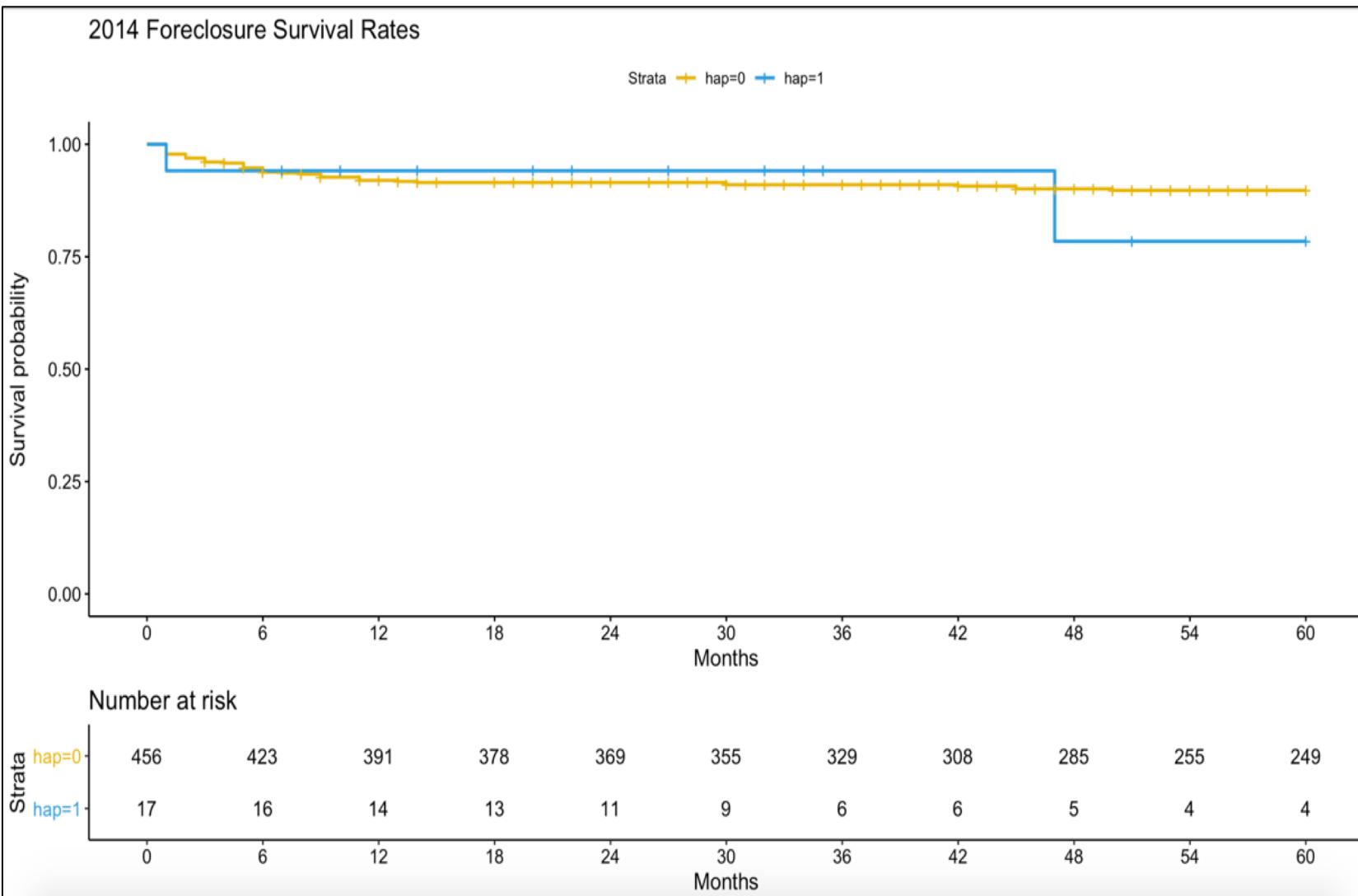
Wherein each explanatory variable represents a static measure from time $t=0$, until a censor event is triggered at $t=t_i$

EQ 2.

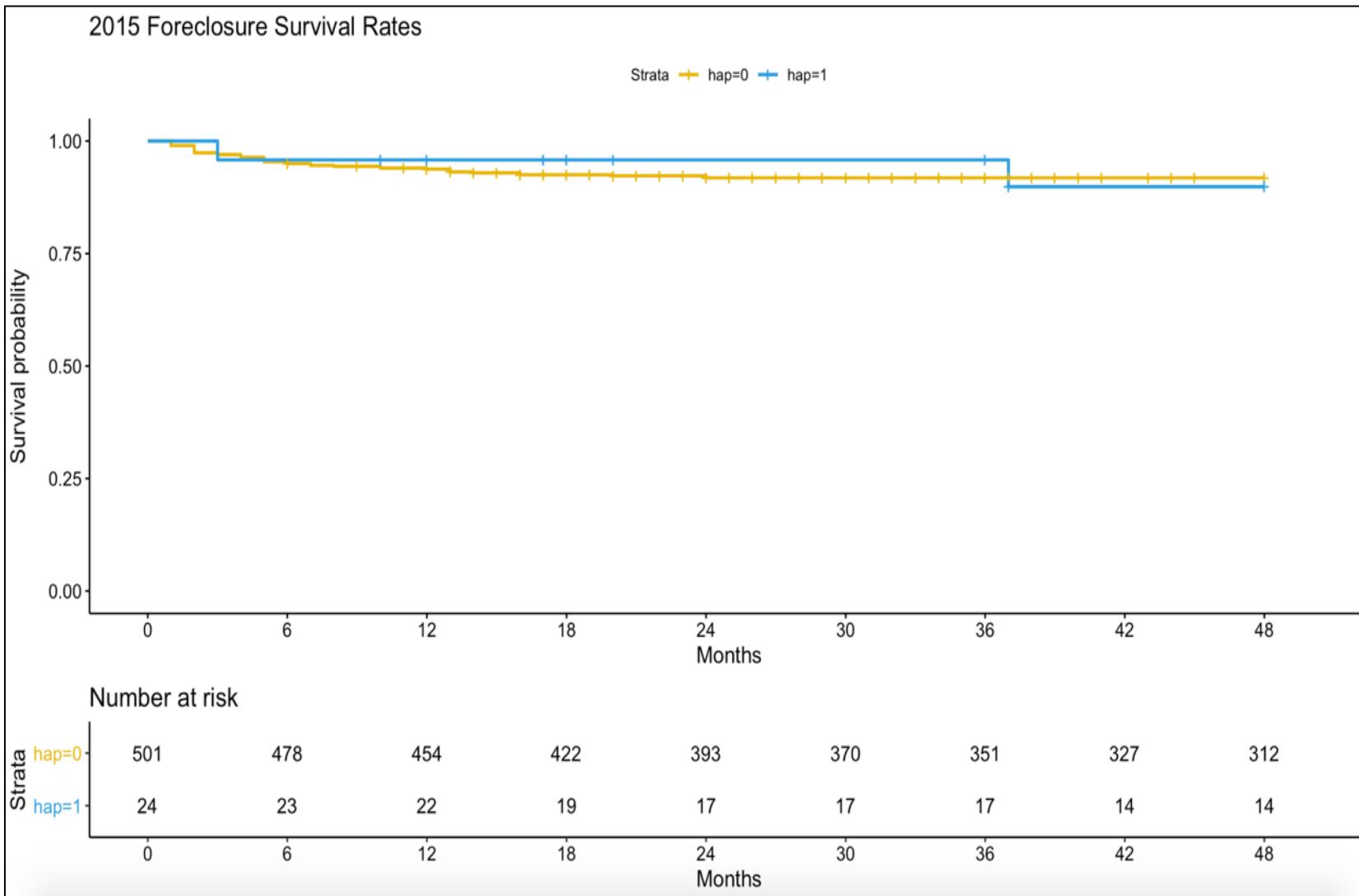
$$\text{survival probability, } \hat{S}(t) = \prod_{i:t_i \leq t} \left(1 - \frac{d_i}{n_i}\right);$$

Where time t_i represents a time in which at least one censor event has occurred, d_i the number of events (i.e., foreclosures or sales) that happened at t_i and n_i the *individuals known to have survived* (indicating they have not yet been censored), up to time t_i (Kaplan, Meier, 1958)

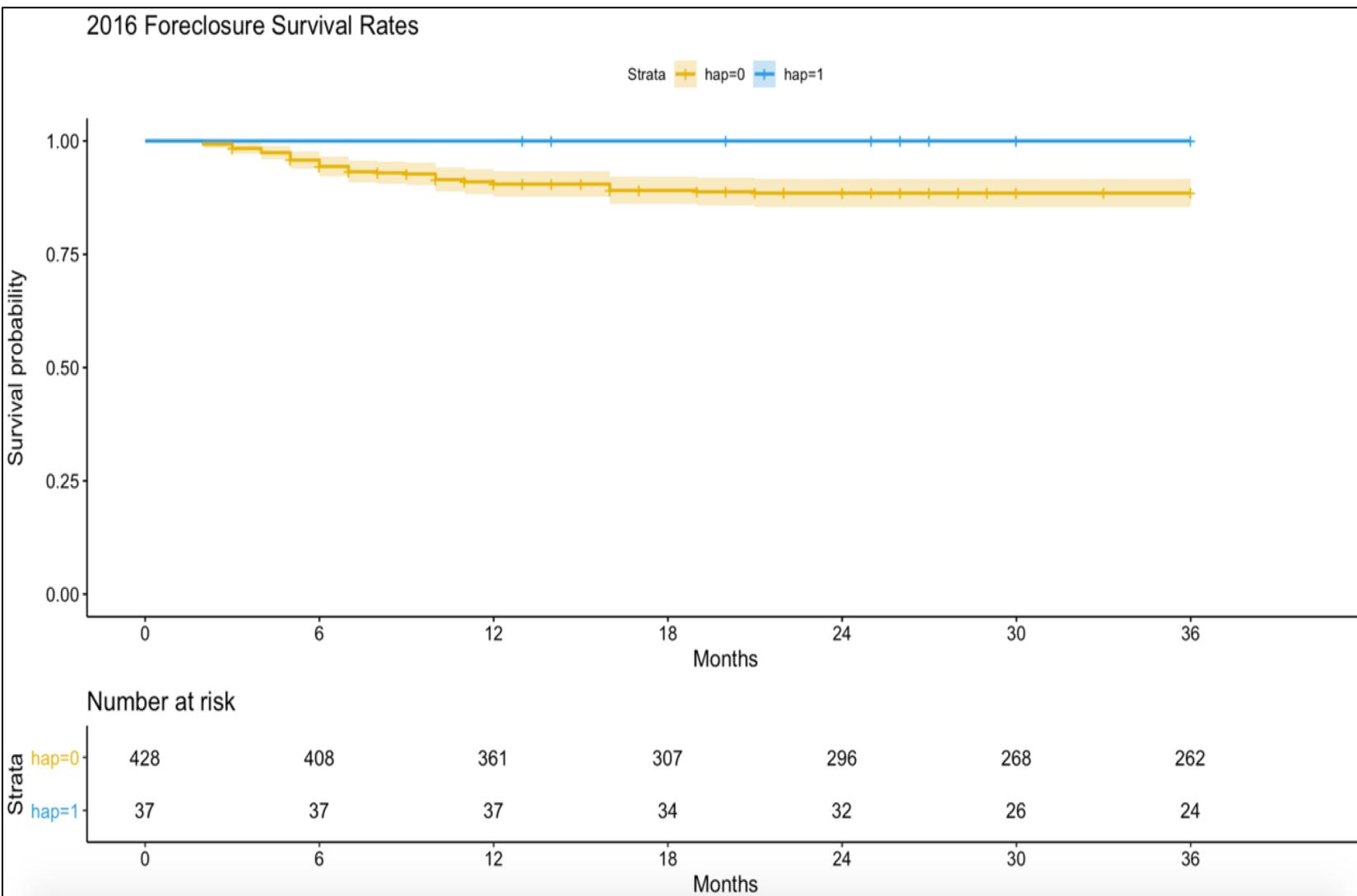
EMPIRICAL RESULTS



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Cox Proportional Analysis of Foreclosure Rates				
	Dependent variable:			
Cohort	spell			
	(2014)	(2015)	(2016)	
hap	0.278 (0.723)	0.052 (0.725)	-17.144 (2,511.273)	
Observations	473	525	465	
R ²	0.0003	0.00001	0.018	
Max. Possible R ²	0.692	0.629	0.706	
Log Likelihood	-278.299	-260.263	-280.254	
Wald Test (df = 1)	0.150	0.010	0.000	
LR Test (df = 1)	0.136	0.005	8.452***	
Score (Logrank) Test (df = 1)	0.149	0.005	4.423**	
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01			

Cox Proportional Analysis of Foreclosure Rates				
	Dependent variable:			
	spell			
	(2014)	(2015)	(2016)	
saleval	0.107 (0.206)	-0.155 (0.115)	-0.070 (0.098)	
hap	0.458 (0.726)	-0.021 (0.727)	-17.262 (2,543.237)	
age	1.091** (0.485)	0.365 (0.334)	-0.062 (0.207)	
sqft	-0.598 (0.433)	-0.688* (0.415)	-0.726* (0.371)	
Observations	464	525	465	
R ²	0.021	0.018	0.029	
Max. Possible R ²	0.690	0.629	0.706	
Log Likelihood	-266.664	-255.530	-277.589	
Wald Test (df = 4)	6.710	8.190*	5.180	
LR Test (df = 4)	9.618**	9.471*	13.784***	
Score (Logrank) Test (df = 4)	7.081	8.566*	9.769**	
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01			

Hazard Table

Covariate (p-value)	Cohort:		
	(2014)	(2015)	(2016)
saleval	1.11 (0.603)	0.86 (0.177)	0.93 (0.473)
hap	1.58 (0.528)	0.98 (0.977)	3.19e-8 (0.995)
age	2.98** (0.025)	1.44 (0.275)	0.94 (0.765)
sqft	0.55 (0.168)	0.50* (0.097)	0.484* (0.051)

Note

: *p<0.1; **p<0.05; ***p<0.01

CONCLUSIONS

