Rethinking the Role of Racial Segregation in the American Foreclosure Crisis

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Abstract

Racial segregation is an important factor in understanding the foreclosure crisis, but must be understood to operate in particular and specific ways. The primary, positive impact of segregation on foreclosure risk operates prior to loan origination through the differential access to loan quality by race. Afterward, the impact of segregation is negative. Drawing on a rare dataset of loans that combine loan performance and borrower characteristics, I use a competing risks proportional hazard model to examine the impact of race and racial segregation on risk of foreclosure among borrowers. Results indicate that Black segregation has a large, negative impact on foreclosure risk. Instead, the strongest positive contributor to foreclosure is the negative value of the home relative to the balance of the loan (i.e. 'underwater,' as measured by the put option), which is also the mechanism that explains most of the difference in the foreclosure rate by race. The negative impact of racial segregation on foreclosure risk is the result of a mismatch between cities with high levels of segregation and cities with large declines in home prices and related foreclosures.

Keywords: segregation, race, foreclosure, subprime

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1 Tables

Table 1: Descriptive statistics

Variables (expected sign)	mean	sd	min	max
Race & income:				
White (Omitted)	0.576	0.494	0	1
Black (+)	0.138	0.345	0	1
Hispanic (+)	0.208	0.406	0	1
Other (Unknown)	0.077	0.267	0	1
Income ($10,000s) (-)	11.392	8.310	2	61
Index of segregation:				
Black (+)	60.537	11.171	22	81
Hispanic (+)	49.261	9.560	15	70
Asian (+)	44.741	6.189	20	72
Region:				
Northeast	0.138	0.345	0	1
Midwest	0.145	0.352	0	1
South	0.302	0.459	0	1
West	0.415	0.493	0	1
Put (default) option:				
*Put (default) option (+)	-2.109	36.154	-100	296
*Put option^2 (+)	1,311.533	3,246.350	0	87,477
Call (prepay) option:				
*Call (prepay) option (-)	7.688	41.663	-410	72
*Call option^2 (-)	1,794.903	3,554.471	0	168,100
Loan:				
< 620 (Omitted)	0.254	0.435	0	1
620-679 (-)	0.299	0.458	0	1
680-719 (-)	0.182	0.386	0	1
>= 720 (-)	0.265	0.441	0	1
High Cost Loan (>= 300 BPS indicator) (+)	0.418	0.493	0	1
Loan to value (LTV) (+)	80.861	14.751	1	125
Purchase (vs. refinance) indicator (+)	0.468	0.499	0	1
*ARM (vs. FRM) indicator (+)	0.687	0.464	0	1
*Modification indicator (-)	0.145	0.352	0	1
Payment to income (PTI) > 31% indicator (+)	0.139	0.346	0	1
Dependent variables:				
Current	0.311	0.463	0	1
Prepay	0.423	0.494	0	1
Foreclosure	0.266	0.442	0	1

As of last period of observation

* Indicates time-varying covariate

Table 2: Competing risks hazard model

	(1) Race & inc. b/se	(2) Segregation b/se	(3) Race, inc., & seg b/se	(4) + Interaction b/se	(5) + Loan controls b/se	(6) + Options (Main) b/se	(7) Northeast b/se	(8) Midwest b/se	(9) South b/se	(10) West b/se
Borrower:										
Black	1.519***		1.599***	1.567***	1.217***	1.038*	1.235***	1.233***	1.030	0.956*
	(0.023)		(0.024)	(0.024)	(0.019)	(0.017)	(0.040)	(0.026)	(0.016)	(0.019)
Hispanic	1.979***		2.063***	2.041***	1.652***	1.258***	1.380***	1.325***	1.319***	1.262***
	(0.021)		(0.022)	(0.023)	(0.019)	(0.015)	(0.041)	(0.033)	(0.019)	(0.013)
Other	1.310***		1.349***	1.334***	1.301***	1.221***	1.217***	1.294***	1.325***	1.147***
	(0.023)		(0.023)	(0.024)	(0.024)	(0.022)	(0.064)	(0.049)	(0.036)	(0.015)
Income ($10,000s)	0.978***		0.981***	0.981***	0.999	1.001	0.989***	0.995**	1.000	1.004***
	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Segregation:										
Black		0.985***	0.985***	0.985***	0.988***	0.988***	0.977***	0.986***	0.998	1.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Hispanic		1.008***	1.003***	1.003***	1.008***	1.003***	1.016***	1.005***	0.988***	1.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Asian		0.997***	0.999	0.999	1.000	1.012***	1.000	0.995*	1.022***	1.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
Race & segregation interaction:										
Black & Black segregation				1.007***	1.007***	1.005***	1.004	1.002	0.997	0.998
				(0.001)	(0.001)	(0.001)	(0.004)	(0.002)	(0.002)	(0.002)
Hispanic & Black segregation				0.996***	0.995***	1.002*	0.998	0.996	1.001	1.001
				(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)
Other & Black segregation				0.997*	0.995**	1.003*	1.012	0.985***	1.008*	1.002
				(0.001)	(0.001)	(0.002)	(0.007)	(0.003)	(0.004)	(0.001)
Put (default) option:										
Put option						1.038***	1.055***	1.046***	1.033***	1.040***
						(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Put option^2						1.000***	1.000***	1.000***	1.000***	1.000***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Call (prepay) option:										
Call option						1.015***	1.026***	1.019***	1.016***	1.012***
						(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Call option^2						1.000***	1.000***	1.000***	1.000***	1.000***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of Observations	7,927,358	7,927,358	7,927,358	7,927,358	7,927,358	7,927,358	2,955,494	2,715,450	6,282,241	7,848,442
Number of Subjects	192,617	192,617	192,617	192,617	192,617	192,617	65,407	70,788	144,915	199,378
Number of Failures (Foreclosure)	50,874	50,874	50,874	50,874	50,874	50,874	8,755	21,065	35,711	62,607
Number of Competing (Prepay)	81,117	81,117	81,117	81,117	81,117	81,117	30,280	29,402	60,041	82,005
Control variables:										
Year of origination	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A
Race & Income interaction	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan performance (LTV, ARM, etc.)	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

National models are run on a 20% sample. Regional models are run on a 50% regional sample.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Competing risks hazard model - control variables from table 2

	(1) Race & inc. b/se	(2) Segregation b/se	(3) Race, inc., & seg b/se	(4) + Interaction b/se	(5) + Loan controls b/se	(6) + Options (Main) b/se	(7) Northeast b/se	(8) Midwest b/se	(9) South b/se	(10) West b/se
Year of origination:										
2005	1.761***	1.827***	1.755***	1.755***	1.505***	0.896***	0.730***	0.803***	0.952*	0.951**
	(0.029)	(0.030)	(0.028)	(0.028)	(0.025)	(0.016)	(0.029)	(0.017)	(0.020)	(0.017)
2006	2.541***	2.696***	2.523***	2.521***	2.084***	0.762***	0.552***	0.678***	0.811***	0.782***
	(0.040)	(0.042)	(0.040)	(0.040)	(0.034)	(0.014)	(0.023)	(0.015)	(0.018)	(0.014)
2007	2.268***	2.324***	2.263***	2.262***	2.060***	0.621***	0.391***	0.573***	0.671***	0.640***
	(0.043)	(0.044)	(0.043)	(0.043)	(0.041)	(0.013)	(0.021)	(0.018)	(0.018)	(0.013)
Race & income interaction:										
Black & income	1.023***		1.023***	1.023***	1.008***	1.005*	1.029***	0.999	1.010***	1.012***
	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)	(0.002)	(0.003)
Hispanic & income	1.037***		1.037***	1.037***	1.022***	1.016***	1.025***	1.026***	1.018***	1.012***
	(0.001)		(0.001)	(0.001)	(0.001)	(0.002)	(0.005)	(0.005)	(0.002)	(0.001)
Other & income	1.011***		1.010***	1.011***	1.005*	1.007***	1.015*	1.007	1.017***	1.006***
	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)	(0.007)	(0.006)	(0.003)	(0.002)
Region:										
Northeast (ommitted)										
Midwest	2.548***	2.682***	2.621***	2.611***	2.348***	1.648***				
	(0.052)	(0.056)	(0.055)	(0.055)	(0.050)	(0.036)				
South	1.845***	1.720***	1.538***	1.569***	1.690***	1.118***				
	(0.035)	(0.034)	(0.031)	(0.032)	(0.035)	(0.024)				
West	2.583***	2.263***	2.057***	2.073***	2.659***	1.668***				
	(0.047)	(0.044)	(0.041)	(0.042)	(0.055)	(0.035)				
Loan characteristics:										
FICO < 620 (ommitted)										
FICO (620-679)					0.951***	0.966**	1.154***	0.953**	1.010	0.974*
					(0.011)	(0.012)	(0.032)	(0.016)	(0.014)	(0.013)
FICO (680-719)					0.794***	0.814***	0.964	0.791***	0.868***	0.786***
					(0.012)	(0.013)	(0.036)	(0.020)	(0.016)	(0.012)
FICO (>= 720)					0.510***	0.563***	0.669***	0.509***	0.599***	0.575***
					(0.008)	(0.010)	(0.030)	(0.016)	(0.013)	(0.009)
High cost loan (>= 300 BPS indicator)					1.351***	1.296***	1.414***	1.239***	1.264***	1.357***
					(0.015)	(0.014)	(0.042)	(0.023)	(0.017)	(0.013)
Loan to value (LTV)					1.033***	1.005***	0.994***	0.984***	1.002**	1.009***
					(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Purchase (vs. refinance) indicator					1.187***	1.265***	1.105***	1.288***	1.309***	1.254***
					(0.012)	(0.013)	(0.028)	(0.020)	(0.017)	(0.012)
ARM indicator					1.492***	1.490***	1.330***	1.225***	1.466***	1.605***
					(0.017)	(0.018)	(0.036)	(0.021)	(0.019)	(0.019)
Modification indicator					1.164***	0.901***	0.800***	1.135***	1.025	0.781***
					(0.017)	(0.015)	(0.033)	(0.028)	(0.020)	(0.012)
PTI > 31% indicator					1.053***	1.024	1.058*	1.070**	1.019	0.996
					(0.014)	(0.014)	(0.029)	(0.022)	(0.017)	(0.013)

National models are run on a 20% sample. Regional models are run on a 50% regional sample.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

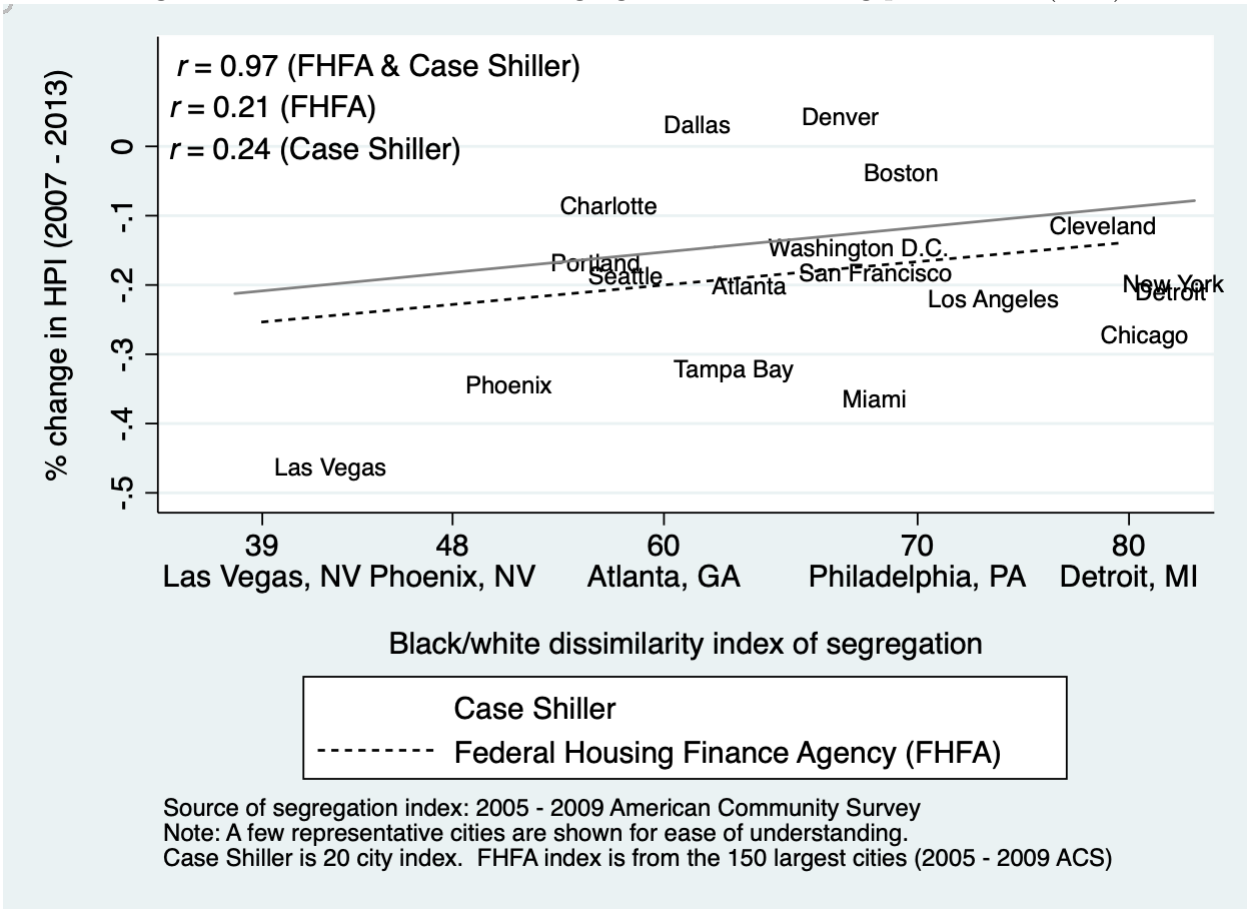
Table 4: Marginal effect on the risk of foreclosure from the main model

	United States				Northeast	Midwest	South	West
	mean	mean + 1 sd	*exp(β)*	*β*	*β*	*β*	*β*	*β*
Continuous variables (Marginal effect of 1 SD increase from the mean):								
Put option	2.504	38.15	3.041	1.112***	1.478***	1.276***	0.978***	1.163***
Call option	8.418	45.059	1.83	0.604***	1.033***	0.736***	0.658***	0.5***
LTV	80.783	95.484	1.073	0.071***	-0.082***	-0.24***	0.024**	0.139***
Income ($10,000s)	11.656	20.148	1.05	0.049***	-0.01	0.002	0.053***	0.07***
Asian segregation	44.847	51.059	1.075	0.072***	0.002	-0.03*	0.137***	0.014*
Hispanic segregation	49.569	59.137	1.025	0.024**	0.154***	0.05***	-0.112***	-0.004
Black segregation	60.85	71.954	0.886	-0.121***	-0.241***	-0.174***	-0.015	0.001
Categorical variables:								
ARM indicator			1.49	0.399***	0.285***	0.203***	0.383***	0.473***
Hispanic to white			1.257	0.229***	0.323***	0.281***	0.277***	0.233***
High cost loan indicator			1.296	0.259***	0.347***	0.215***	0.234***	0.306***
Purchase to refinance			1.265	0.235***	0.1***	0.253***	0.269***	0.226***
Black to white			1.038	0.037*	0.211***	0.21***	0.029	-0.045*
PTI > 31% indicator			1.024	0.023	0.057*	0.068**	0.019	-0.004
Modification indicator			0.901	-0.104***	-0.223***	0.126***	0.025	-0.248***
FICO >= 720 to FICO < 620			0.563	-0.575***	-0.401***	-0.675***	-0.513***	-0.553***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

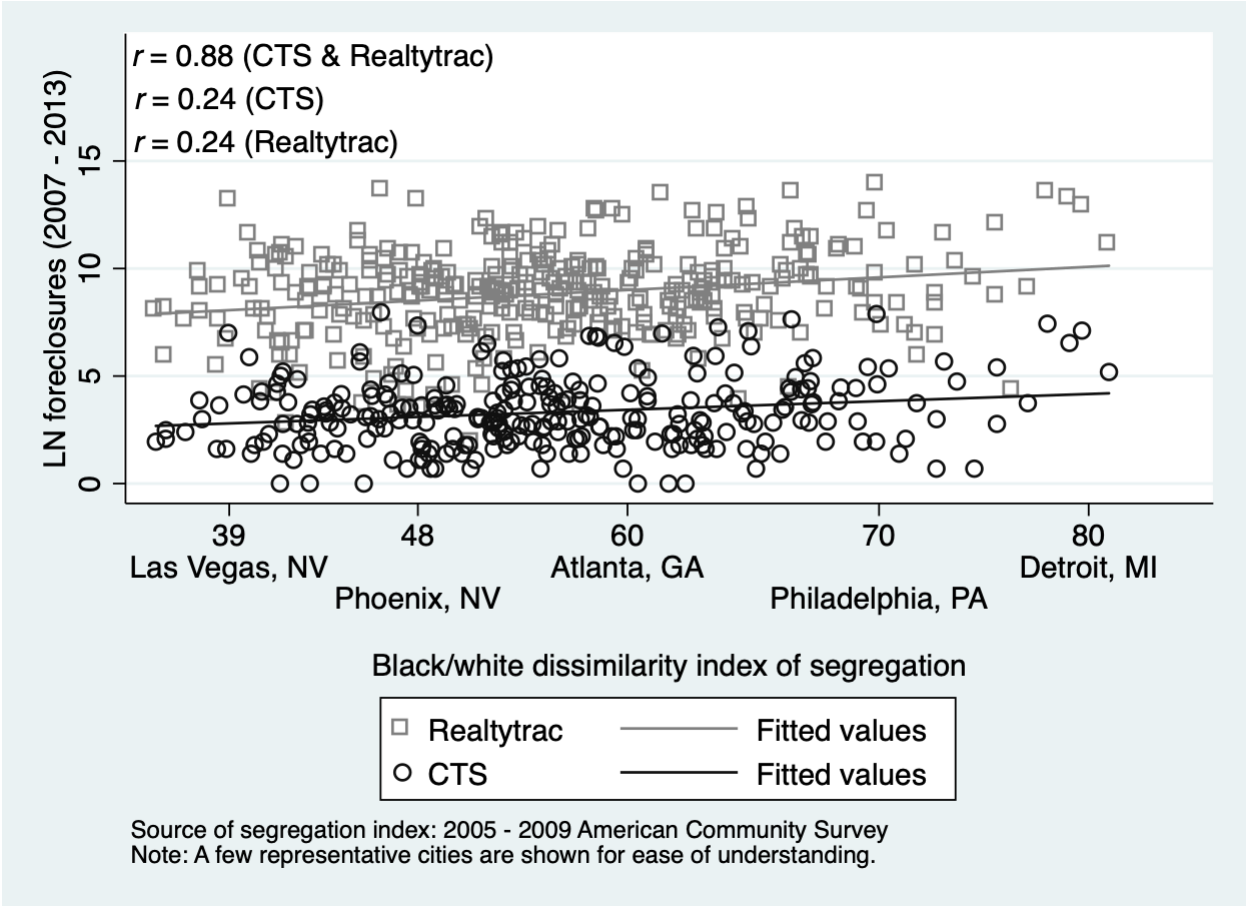
2 Figures

Figure 1: Correlation between segregation and housing price index (HPI)



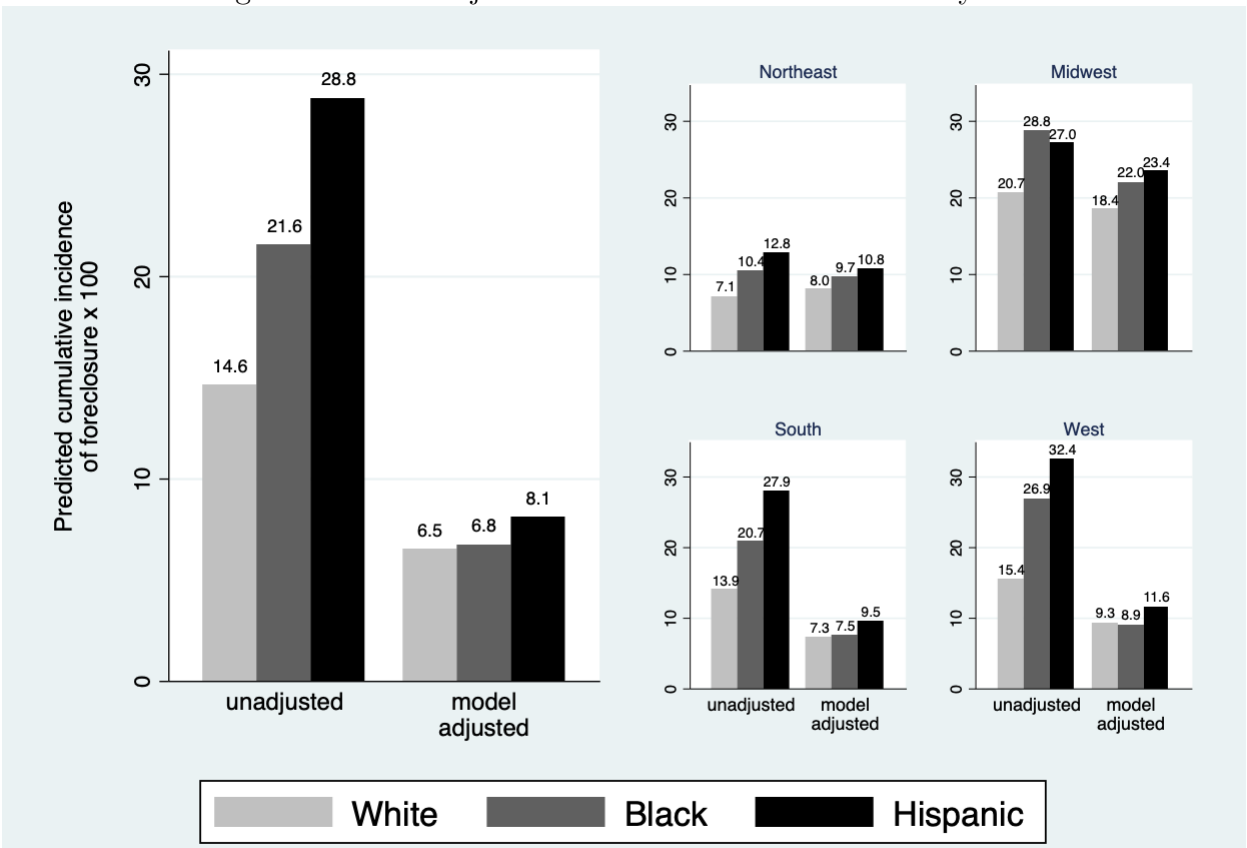
Source of segregation index: 2005 - 2009 American Community Survey
Note: A few representative cities are shown for ease of understanding.
Case Shiller is 20 city index. FHFA index is from the 150 largest cities (2005 - 2009 ACS)

Figure 2: Correlation between RealtyTrac and CTS foreclosures across metropolitan areas



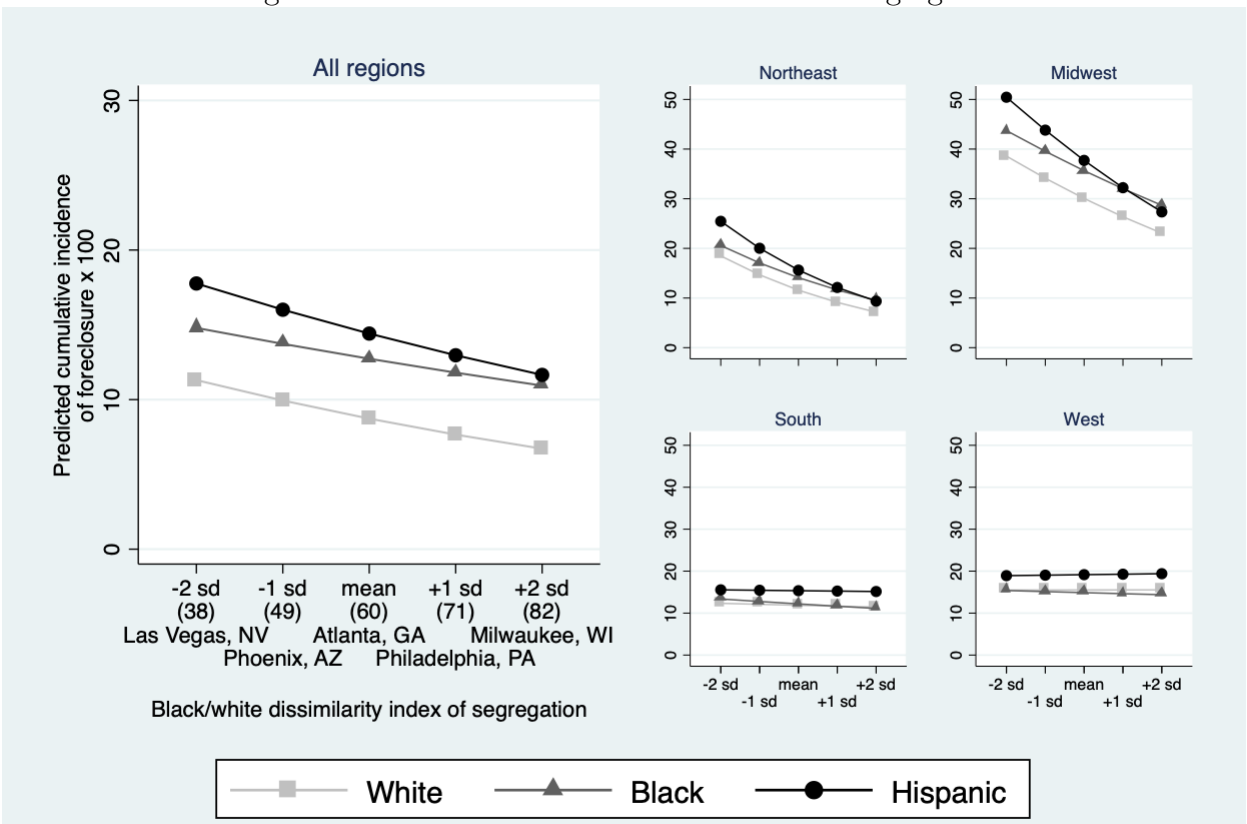
Source of segregation index: 2005 - 2009 American Community Survey
Note: A few representative cities are shown for ease of understanding.

Figure 3: Model adjusted cumulative foreclosure rate by race



Note: model controls for borrower race, income, credit, loan, and geographic characteristics

Figure 4: Interaction between race and black segregation



Note: Representative MSA's with a similar index of dissimilarity are listed below the appropriate tick mark.