Redlining, Housing Wealth, and the Consumption Collapse in Southern U.S. Cities

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1 Data and Summary Statistics

1.1 HOLC Redlining Grades

Redlining zone boundaries and grades come from the Mapping Inequality Project at the University of Richmond (?). Table 1 reports the distribution of HOLC residential security grades across the three cities studied. Birmingham has the highest concentration of Grade D (*Hazardous*) zones at 35.0 percent, followed by Atlanta at 28.8 percent and Memphis at 11.5 percent.

Table 1: HOLC Grade Distribution by City

City	Total Zones	Grade A (%)	Grade B (%)	Grade C (%)	Grade D (%)
Atlanta, GA	111	8.1	25.2	37.8	28.8
Birmingham, AL	60	5.0	26.7	33.3	35.0
Memphis, TN	26	26.9	30.8	30.8	11.5

Source: Mapping Inequality Project (?). Residential zones only. Atlanta zones are allocated equally to Fulton and DeKalb Counties.

1.2 American Community Survey

County-level demographic and housing data come from the American Community Survey (ACS) 5-year estimates. Table 2 reports baseline statistics for 2010. The mortgage rate variable – the share of owner-occupied units carrying an outstanding mortgage – is the leverage proxy used in the housing net worth shock calculation. Leverage ranges from 68.5 percent in Jefferson County to 80.7 percent in DeKalb County.

Table 2: County-Level Summary Statistics, 2010 Baseline

County	% Black	Med. Income	Homeown. Rate	Med. HV	Mortgage Rate
DeKalb Co., GA	55.0%	\$51,349	58.6%	\$190,000	80.7%
Fulton Co., GA	43.9%	\$56,709	56.0%	\$253,100	80.3%
Jefferson Co., AL	41.8%	\$45,244	66.8%	\$138,300	68.5%
Shelby Co., TN	51.5%	\$44,705	61.7%	\$135,300	74.4%

Source: ACS 5-Year Estimates, 2010 (Tables B02001, B19013, B25003, B25077, B25081). Dollar values in nominal 2010 dollars. Mortgage Rate is the share of owner-occupied units with an outstanding mortgage.

1.3 Zillow Home Value Index

House price changes are measured using the Zillow Home Value Index (ZHVI) for single-family residences and condominiums at the ZIP code level. January 2007 is the pre-crisis baseline and December 2010 is the crisis trough. Table 3 reports county-level price shocks alongside HOLC Grade D shares and housing net worth shocks (defined in Section 2). The housing net worth (HNW) shock follows **?**:

$$\widehat{\Delta \mathrm{HNW}}_i \;=\; \Delta \log p_i^H \;\times\; \mathrm{HomeownRate}_i \;\times\; \mathrm{LevRate}_i.$$

Fulton County experienced the largest log price decline at -0.418, followed by DeKalb at -0.336. Jefferson County declined -0.196 and Shelby County -0.296.

Table 3: Zillow ZHVI Price Shocks and Housing Net Worth Shock, 2007–2010

County	ZHVI Jan 2007	ZHVI Dec 2010	$\Delta \log p$	Grade D (%)	HNW Shock	N (ZIPs)
DeKalb Co., GA	\$193,253	\$138,050	−0.336	28.8%	−0.159	26
Fulton Co., GA	\$258,216	\$170,010	−0.418	28.8%	−0.188	32
Jefferson Co., AL	\$114,754	\$94,309	−0.196	35.0%	−0.090	41
Shelby Co., TN	\$112,848	\$83,959	−0.296	11.5%	−0.136	32

Source: Zillow Home Value Index, ZIP-code level (**?**). $\Delta \log p$ is the log change in the county median ZHVI from January 2007 to December 2010. HNW Shock = $\Delta \log p \times$ HomeownRate $\times$ LevRate, following **?**. N (ZIPs) is the number of ZIP codes in each county with valid ZHVI observations in both periods.

1.4 HMDA 2007 Mortgage Data

Loan-level mortgage data come from the Home Mortgage Disclosure Act (HMDA) 2007 dataset (**?**), restricted to originated first-lien owner-occupied one-to-four family loans. The full nationwide file contains 7.2 million originated loans; after filtering to Fulton, DeKalb, Jefferson, and Shelby Counties, 79,996 loans remain across 636 census tracts.

The key variable constructed from HMDA is the **high-cost loan share** (HCS): the fraction of originated loans in a census tract with a reported rate spread, defined as a mortgage interest rate at least 3 percentage points above the yield on a comparable-maturity Treasury security. HMDA requires lenders to report rate spreads only on loans meeting this threshold, which serves as the regulatory proxy for subprime or predatory lending. Table 4 reports county-level summaries alongside minority population breakdowns from the HMDA tract-level demographic fields.

2 Empirical Strategy

2.1 Three-Equation Causal Chain

The empirical strategy tests three linked equations that trace the causal chain from historical redlining to the 2008 housing wealth collapse. Equation (1) tests whether minority neigh-

Table 4: HMDA 2007 High-Cost Loan Share by County

County	N Loans	N Tracts	Mean HCS	HCS: Min $> 50\%$	HCS: Min $\leq 50\%$
DeKalb Co., GA	17,468	115	17.5%	24.2%	5.8%
Fulton Co., GA	26,028	165	21.9%	30.8%	7.2%
Jefferson Co., AL	16,970	147	32.8%	50.4%	19.6%
Shelby Co., TN	19,530	209	38.5%	52.7%	18.8%

Source: HMDA 2007 (**?**), first-lien owner-occupied 1–4 family originated loans. HCS = high-cost loan share (rate spread $\geq$ 3 pp above comparable Treasury). Minority columns split tracts by minority population share above and below 50 percent using HMDA tract-level demographic fields.

borhood concentration predicts high-cost lending at the census tract level, documenting the predatory lending substitution channel. Equation (2) tests whether lower initial home values within a county predict larger crisis-era price declines at the ZIP code level. Equation (3) combines both channels, regressing ZIP-level price declines on county-level high-cost lending and leverage. Together, the three equations provide an empirical narrative consistent with the balance sheet mechanism of **?** and the causal redlining evidence of **?**.

2.2 Equation 1: Predatory Lending Channel

The first equation tests whether the share of high-cost originated mortgages in a census tract is explained by minority population concentration, conditional on relative neighborhood income and county fixed effects:

$$\text{HCS}_t \;=\; \alpha \;+\; \beta_1 \cdot \text{MinorityShare}_t \;+\; \beta_2 \cdot \text{TractIncome}_t \;+\; \sum_c \gamma_c \cdot \mathbf{1}[\text{County}_c] \;+\; \varepsilon_t, \quad (1)$$

where HCS_t is the share of originated loans in tract t with a rate spread at or above the HMDA high-cost threshold, MinorityShare_t is the minority population share from the HMDA tract-level fields, and TractIncome_t is the ratio of tract-level median family income to the MSA median. County fixed effects absorb unobserved county-level differences in lender presence and market structure. Standard errors are heteroskedasticity-robust (HC1). Under the AHM redlining channel, $\beta_1 > 0$ because the denial of conventional credit in historically redlined neighborhoods was replaced by higher-cost subprime products.

2.3 Equation 2: ZIP-Level Price Shock

The second equation tests whether lower initial home values – a proxy for historically disinvested, lower-equity neighborhoods – predict larger price declines during the crisis, using variation across ZIP codes within each county:

$$\Delta \log p_z \;=\; \alpha \;+\; \beta_1 \cdot \log(p_{z,2007}) \;+\; \sum_c \gamma_c \cdot \mathbf{1}[\text{County}_c] \;+\; \varepsilon_z, \tag{2}$$

where $\Delta \log p_z = \log(\text{ZHVI}_{z,\,\text{Dec}\,2010}) - \log(\text{ZHVI}_{z,\,\text{Jan}\,2007})$ is the log price change for ZIP code z and $\log(p_{z,2007})$ is the log January 2007 ZHVI. County fixed effects absorb cross-county heterogeneity in boom-bust dynamics. The coefficient β_1 is predicted to be positive: conditional on county, higher-valued ZIPs experienced smaller declines, while lower-valued ZIPs – which correspond to historically disinvested areas – experienced larger declines. The interaction specification adds $\log(p_{z,2007}) \times \mathbf{1}[\text{HOLC-D}_c]$ to test whether this gradient is steeper in counties with above-median Grade D exposure.

2.4 Equation 3: High-Cost Lending and Price Shocks

The third equation directly links county-level subprime lending concentration to ZIP-level price declines, controlling for initial price level and leverage:

$$\Delta \log p_z \;=\; \alpha \;+\; \beta_1 \cdot \text{HCS}_c \;+\; \beta_2 \cdot \log(p_{z,2007}) \;+\; \beta_3 \cdot \text{LevRate}_c \;+\; \varepsilon_z, \tag{3}$$

where HCS_c is the mean tract-level high-cost loan share in ZIP z's county from HMDA 2007 and LevRate_c is the county mortgage leverage rate from ACS 2010. The coefficient β_1 captures the cross-county gradient: counties with higher subprime concentration should have experienced larger price declines. The coefficient β_3 on leverage is predicted to be negative: counties where more homeowners carried mortgages had less equity cushion and were more exposed to forced selling when prices began to fall, consistent with the amplification mechanism in **?**.

3 Results

3.1 Equation 1: Minority Concentration and High-Cost Lending

Table 5 reports estimates of Equation (1) for 635 census tracts across all four counties. The bivariate specification in column (1) yields a coefficient of 0.393 on minority population share (SE = 0.017, $p < 0.001$), indicating that a 10 percentage point increase in minority share is associated with a 3.9 percentage point higher high-cost loan share. The R^2 of 0.417 indicates that minority composition alone explains 42 percent of cross-tract variation in subprime lending concentration.

Column (2) adds the tract-to-MSA income ratio and county fixed effects. The minority share coefficient rises to 0.428 (SE = 0.021), while the income ratio coefficient is statistically indistinguishable from zero (coefficient = -0.003, SE = 0.014). This is the central finding of Equation (1): **conditional on county and relative income, minority population share drives high-cost lending concentration, not poverty per se.** The county fixed effects are large and significant: Jefferson and Shelby Counties have high-cost shares 22 and 24 percentage points higher than DeKalb County after controlling for minority composition, reflecting persistent differences in lender practices across metropolitan areas.

The descriptive gap in high-cost lending is striking. Among tracts with minority population share above 50 percent, the average high-cost loan share is 40.3 percent. Among tracts with minority population share at or below 50 percent, it is 14.4 percent – a gap of 25.9 percentage points. Within individual counties the gap is larger still: in Jefferson County, majority-minority tracts carry a high-cost share of 50.4 percent versus 19.6 percent in majority-white

Table 5: Predatory Lending Channel – Equation (1)

	(1)	(2)
Dependent variable:	*High-cost loan share, census tract*	
Minority Pop Share	0.393***	0.428***
	(0.017)	(0.021)
Tract/MSA Income Ratio		−0.003
		(0.014)
FE: Fulton County		0.044***
		(0.012)
FE: Jefferson County		0.223***
		(0.014)
FE: Shelby County		0.238***
		(0.014)
R^2	0.417	0.639
Adjusted R^2	0.416	0.636
N (tracts)	635	635

Heteroskedasticity-robust (HC1) standard errors in parentheses. Reference county is DeKalb County, GA. High-cost loan defined as rate spread $\geq$ 3 pp above comparable Treasury yield (HMDA reportable threshold). Minority Pop Share expressed as a proportion (0–1). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

tracts; in Shelby County, 52.7 percent versus 18.8 percent. These differentials are consistent with the AHM mechanism: the historical exclusion of Black neighborhoods from conventional mortgage credit was replaced by the concentration of subprime lending in those same areas by 2007.

3.2 Equation 2: Initial Price Level and Crisis Decline

Table 6 reports estimates of Equation (2) for 131 ZIP codes. Column (1) establishes the basic cross-ZIP relationship: a one-log-unit increase in the January 2007 ZHVI is associated with a 0.252 increase in the log price change from 2007 to 2010 (SE = 0.029), meaning lower-priced ZIPs experienced sharper declines. The R^2 of 0.302 indicates that initial price level alone explains 30 percent of ZIP-level variation in price shocks.

Column (2) adds county fixed effects. The coefficient on $\log(p_{z,2007})$ rises to 0.383 (SE =

0.035), indicating that within a given county, a one-log-unit difference in initial home value predicts a 0.38 difference in log price change. The county fixed effects are all statistically significant, with Jefferson County experiencing smaller declines relative to DeKalb (the reference county) and Shelby County also performing relatively better, consistent with the less pronounced boom-bust cycle in Alabama and Tennessee documented in Table 3.

Column (3) adds the interaction of $\log(p_{z,2007})$ with an indicator for above-median HOLC-D county exposure. The interaction coefficient is -0.114 (SE $= 0.068$, $p < 0.10$), indicating that the negative relationship between initial price level and crisis decline is steeper in counties with higher historical Grade D exposure. Low-value ZIPs in the more heavily redlined counties suffered disproportionately larger declines than low-value ZIPs in the less redlined Shelby County, consistent with the balance sheet hypothesis.

Table 6: ZIP-Level Price Shock – Equation (2)

	(1)	(2)	(3)
Dependent variable:		$\Delta \log p_z$, *ZIP code level*	
$\log(p_{z,2007})$	0.252***	0.383***	0.466***
	(0.029)	(0.035)	(0.054)
$\log(p_{z,2007}) \times \mathbf{1}$[HOLC-D]			−0.114*
			(0.068)
FE: Fulton County		−0.151***	−0.144***
		(0.050)	(0.051)
FE: Jefferson County		0.250***	0.236***
		(0.050)	(0.050)
FE: Shelby County		0.143***	
		(0.047)	
County FEs	No	Yes	Yes
R^2	0.302	0.558	0.567
Adjusted R^2	0.297	0.544	0.549
N (ZIP codes)	131	131	131

Heteroskedasticity-robust (HC1) standard errors in parentheses. Reference county is DeKalb County, GA. $\log(p_{z,2007})$ is the natural log of the ZIP-level Zillow ZHVI in January 2007. $\mathbf{1}$[HOLC-D] equals one if the county's Grade D zone share exceeds 25 percent (above sample median). Column (3) omits the Shelby County FE because it is collinear with the HOLC-D indicator at the county level (Shelby is the only county below the 25 percent threshold). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 7 quantifies the within-county price gradient in a descriptive format. In every county, bottom-quartile ZIPs declined between 2.5 and 4.7 times more than top-quartile ZIPs. The largest differentials appear in Shelby County (ratio of 4.7×) and Jefferson County (4.5×), the two counties with the highest overall high-cost lending rates. In Fulton County, where the crisis was most severe in absolute terms, bottom-quartile ZIPs lost 76.4 log-percent of value while top-quartile ZIPs lost 20.6 log-percent.

Table 7: Within-County Price Declines by Initial Value Quartile, 2007–2010

County	Q1 (Cheapest ZIPs)	Q4 (Most Expensive ZIPs)	Gap (Q1 − Q4)	Ratio |Q1|/|Q4|
DeKalb Co., GA	−0.589	−0.233	−0.356	2.5×
Fulton Co., GA	−0.764	−0.206	−0.558	3.7×
Jefferson Co., AL	−0.543	−0.121	−0.423	4.5×
Shelby Co., TN	−0.757	−0.160	−0.597	4.7×

Source: Zillow ZHVI, authors' calculations. Q1 (Q4) is the mean $\Delta \log p$ for ZIP codes in the bottom (top) quartile of the January 2007 ZHVI within each county. Ratio = |Q1 mean|/|Q4 mean|.

3.3 Equation 3: High-Cost Lending, Leverage, and Price Shocks

Table 8 reports estimates of Equation (3). Column (1) regresses ZIP-level log price changes on county high-cost share and log initial price level. The county high-cost share coefficient is 1.258 (SE = 0.224, $p < 0.001$), indicating that a 10 percentage point higher county-level subprime lending share is associated with a 0.126 larger log price decline. The log price coefficient remains significant at 0.329, confirming the within-county gradient from Equation (2).

Column (2) adds the county mortgage leverage rate. The leverage coefficient is −2.494 (SE = 0.489, $p < 0.001$): counties where a higher fraction of owners carried mortgages experienced sharper ZIP-level declines, consistent with the **?** amplification mechanism. Once leverage is controlled, the high-cost share coefficient falls to 0.157 and becomes statistically insignificant. This attenuation is not surprising: at the county level, high-cost lending share and leverage are positively correlated (Pearson $r = 0.48$), since the same historical credit exclusion that generated subprime substitution also elevated leverage ratios in these counties. Separating the two channels requires within-county variation in leverage, which tract-level HMDA integration will provide.

Table 8: Price Shock, High-Cost Lending, and Leverage – Equation (3)

	(1)	(2)
Dependent variable:	$\Delta \log p_z$, *ZIP code level*	
County High-Cost Share	1.258***	0.157
	(0.224)	(0.290)
$\log(p_{z,2007})$	0.329***	0.359***
	(0.033)	(0.034)
County Mortgage Rate		−2.494***
		(0.489)
R^2	0.417	0.513
Adjusted R^2	0.408	0.501
N (ZIP codes)	131	131

Heteroskedasticity-robust (HC1) standard errors in parentheses. County High-Cost Share is the mean tract-level HMDA high-cost loan share in the ZIP's county. County Mortgage Rate is the ACS 2010 share of owner-occupied units with an outstanding mortgage, used as the leverage proxy following **?**. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

3.4 Summary of Findings

Taken together, the three equations document a coherent empirical pattern consistent with the theoretical chain linking historical redlining to the 2008 housing wealth collapse. Equation (1) establishes that minority neighborhoods faced systematically higher subprime lending concentration in 2007, conditional on income and county. Equation (2) establishes that lower-valued ZIP codes experienced 2.5 to 4.7 times larger price declines within each county during the crisis. Equation (3) shows that county-level subprime lending concentration predicts crisis severity across counties, with leverage as the primary amplification mechanism consistent with **?**. The interaction in Equation (2) provides suggestive evidence that the price-level gradient is steeper in counties with higher historical Grade D exposure, connecting the AHM causal chain to the specific moment of the 2008 collapse.

4 Robustness and Limitations

Several limitations constrain the current analysis and motivate the next stage of work. First, the HMDA high-cost share varies only at the county level in Equations (2) and (3) because census tracts cannot yet be matched to ZIP codes without a crosswalk file. The within-county variation in high-cost lending documented in Equation (1) is therefore not exploited in the price shock regressions. Once the tract-to-ZIP crosswalk is integrated, the county-level high-cost share variable can be replaced with a ZIP-level estimate, substantially sharpening identification in Equations (2) and (3).

Second, the interaction coefficient in Equation (2), column (3) is identified partly by the difference between the Shelby County fixed effect and the HOLC-D indicator. Jefferson County's high Grade D share (35 percent) but moderate price decline (-0.196 log units) illustrates the attenuation problem: the Alabama market did not experience the same 2003–2007 boom as Georgia, so the pre-crisis price run-up that amplified the Georgia declines is absent. Future specifications will add a pre-crisis appreciation control – the log price change from 2000 to 2007 – to absorb this variation.

Third, with only four counties, the county-level correlations and the cross-county variation in Equation (3) must be interpreted as descriptive rather than causal. The sample does not provide sufficient degrees of freedom to fully separate the effects of high-cost lending, leverage, and historical redlining at the county level. Expanding the sample to additional Southern MSAs – Nashville, Charlotte, New Orleans – is a priority for future work.

References