

# Minority Underrepresentation in U.S. Cities

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- Substantial **underrepresentation** of African American, Asian American, and Latino voters in city councils;
- underrepresentation is **stronger** when minorities account for 55% to 60% of total voting age population;
- underrepresentation is affected by **strategic** selection of **electoral rules**, voters' **registration**, and other **institutional features**;
- removal of **Voting Rights Act** protection by *Shelby County v. Holder* (2013) was **detrimental** for Minority representation and registration.

## Why do we care about **local politics**?

- Profound **racial** and **ethnic divisions** (Hajnal, 2009);
- **entry point** in political careers (Frendreis et al., 1990, Shah, 2014);
- supply of key **public goods**, such as education, policing, infrastructures (Coate and Knight, 2011, Trounstine et al., 2020);
- vast **demographic** and **institutional variation** (Trebbi et al., 2008; Trounstine et al., 2020);
- unknown **effects** of the *Shelby County v. Holder* (2013) ruling at the local level (Komisarchik and White, 2021). [▶ more](#)

This paper relates and adds to the literatures:

- on **VRA** of 1965 and minorities' representation (Shah et al., 2013), civil rights legislation (Schuit and Rogowski, 2017), and voting behavior (Ang, 2019);
- on **endogenous political institutions** (Aghion et al., 2004; Trebbi et al., 2008);
- on minority representation, ethnic diversity, and **public goods provision** (Alesina et al., 1999; Cascio and Washington, 2014; Beach and Jones, 2017; Facchini et al., 2020);
- on voters' **registration** (Hajnal et al., 2017; Feder and Miller, 2020; Cantoni and Pons, 2021).

Institutional data on municipal **forms of government**, **electoral rules**, and **council composition** from **ICMA**:

- quinquennial surveys from **1981** to **2018**;
- representative of US municipalities with pop  $\geq 2,500$ ;
- 29,974 observations, **7,687** unique municipalities, 3.9 waves on average.
- **sociodemographics** from **US Census** (Manson et al., 2021):

	Mean	Std. Dev.	Min.	Max.	Obs.
<i>Council Composition (frac.):</i>					
Latino	0.025	0.111	0.000	1.000	27,686
Asian	0.003	0.030	0.000	1.000	27,686
African American	0.051	0.128	0.000	1.000	27,686
Minority	0.087	0.180	0.000	1.000	27,686
White	0.913	0.180	0.000	1.000	27,686
<i>Main Institutional Features:</i>					
Mayor-Council	0.433	0.495	0.000	1.000	26,802
Council Size	6.230	2.009	2.000	50.000	29,381
At-Large (frac.)	0.716	0.413	0.000	1.000	28,199
Paid Council Members	0.879	0.326	0.000	1.000	29,035
VRA covered	0.171	0.377	0.000	1.000	29,957

▶ Additional Institutional Features

▶ Sociodemographics

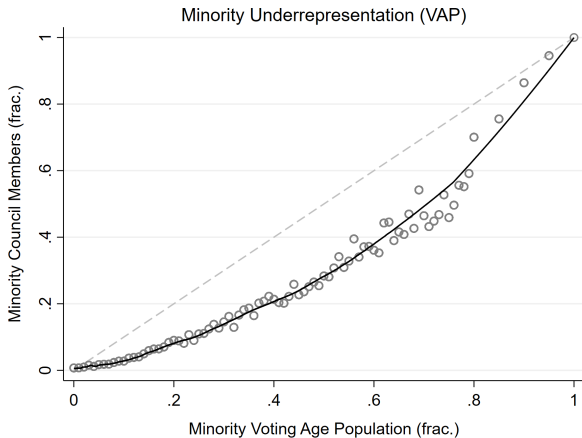
## Registration data from **VLO** of Aristotle:

- **municipal level** counts based on the **live universe** of registered voters in US;
- counts from **2007** to **2020**;
- covering **all** municipalities with  $\text{pop} \geq 2,500$ ;

	Mean	Std. Dev.	Min.	Max.	Obs.
<i>Shares of Registered Voters (frac.):</i>					
Latino	0.087	0.162	0.000	0.979	6,436
Asian	0.021	0.046	0.000	0.672	6,436
African American	0.079	0.173	0.000	0.987	6,436
Minority	0.187	0.231	0.005	0.989	6,436
White	0.813	0.231	0.011	0.995	6,436
<i>Registration Rates:</i>					
Latino	0.390	0.192	0.000	1.000	6,436
Asian	0.485	0.237	0.000	1.000	6,436
African American	0.475	0.330	0.000	1.000	6,436
Minority	0.347	0.197	0.008	1.000	6,436
White	0.873	0.133	0.024	1.000	6,436
Total	0.751	0.130	0.285	1.000	6,436

▶ Additional Registration Data

# Minority Underrepresentation



► Map

► By Race/Ethnicity

► Rep./Dem.

# Minority Underrepresentation (cont.)

Table 1: Minority Underrepresentation

	(1)	(2)	(3)	(4)	(5)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
Minority	0.801*** (0.018)	0.776*** (0.018)	1.238*** (0.029)	1.493*** (0.042)	1.384*** (0.048)
Minority <sup>2</sup>	-0.727*** (0.030)	-0.706*** (0.030)	-1.060*** (0.049)	-1.222*** (0.054)	-1.195*** (0.055)
<i>max</i>	0.216*** (0.004)	0.211*** (0.004)	0.303*** (0.006)	0.364*** (0.009)	0.326*** (0.012)
<i>argmax</i>	0.551*** (0.013)	0.550*** (0.013)	0.584*** (0.016)	0.611*** (0.015)	0.579*** (0.016)
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	27,576	27,576	26,205	26,205	26,065
Municipalities	7,472	7,472	6,101	6,101	6,084
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.260	0.266	0.493	0.500	0.500

► Specification

► By Race/Ethnicity



Electoral rules in US municipalities:

- **At-Large** city-wide multi-member systems (65% in 2018);
- **SMD** first-past-the-post systems (20% in 2018).

From Trebbi et al. (2008), electoral rules are used strategically:

- At-Large systems **dilute** votes of minorities (provided the minorities are relatively not too large);
- SMD systems **pack** and **limit** the political influence of minorities (as their share grows larger).

# Electoral Rules (cont.)

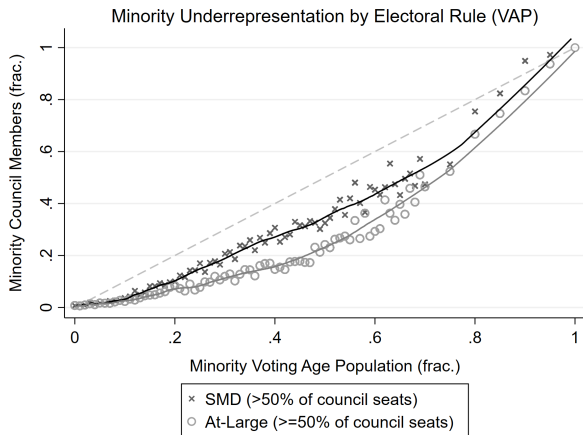


Table 2: Minority Underrepresentation by Electoral Rule

	(1)	(2)	(3)	(4)	(5)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>max (SMD)</i>	0.153*** (0.005)	0.148*** (0.005)	0.265*** (0.011)	0.324*** (0.014)	0.287*** (0.015)
<i>max (At-Large)</i>	0.255*** (0.005)	0.250*** (0.005)	0.340*** (0.008)	0.387*** (0.009)	0.351*** (0.012)
<i>argmax (SMD)</i>	0.548*** (0.027)	0.543*** (0.027)	0.647*** (0.034)	0.667*** (0.029)	0.630*** (0.029)
<i>argmax (At-Large)</i>	0.551*** (0.013)	0.551*** (0.013)	0.591*** (0.018)	0.609*** (0.016)	0.579*** (0.018)
Test <i>max</i> (p-value)	0.000	0.000	0.000	0.000	0.000
Test <i>argmax</i> (p-value)	0.937	0.769	0.074	0.032	0.050
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	26,419	26,419	25,022	25,022	24,885
Municipalities	7,401	7,401	6,004	6,004	5,987
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.293	0.299	0.506	0.511	0.511

► Specification

► Estimates

► By Race/Ethnicity

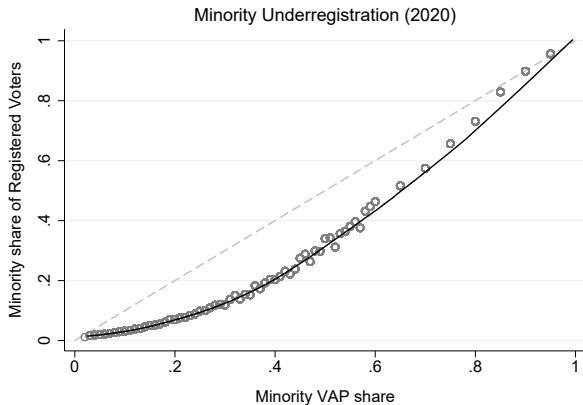
# Electoral Rules (cont.)

Table 3: Endogenous Choice of Electoral Rule

	(1)	(2)	(3)	(4)
	At-Large (frac.)	At-Large (frac.)	At-Large (frac.)	At-Large (frac.)
Minority	0.298*** (0.076)	0.231*** (0.086)	0.811*** (0.119)	0.777*** (0.132)
Minority <sup>2</sup>	-0.510*** (0.083)	-0.484*** (0.084)	-1.693*** (0.201)	-1.686*** (0.201)
<i>argmax</i>	0.293*** (0.042)	0.239*** (0.062)	0.240*** (0.015)	0.230*** (0.022)
Population	VAP	VAP	VAP	VAP
Sample	Full	Full	≤ 50%	≤ 50%
Year FE	X	X	X	X
Municipality FE	X	X	X	X
Controls	-	X	-	X
Obs.	26,714	26,557	24,457	24,314
Municipalities	6,151	6,130	5,756	5,736
Cluster level	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.766	0.766	0.773	0.773

► More Institutional Features

# Underregistration



Registered voters with unknown race/ethnicity are imputed to Minority or White based on the observed distributions. The fitted line is a LOWESS based on the underlying data.

► Definitions

► Estimates

► Map

► Rate

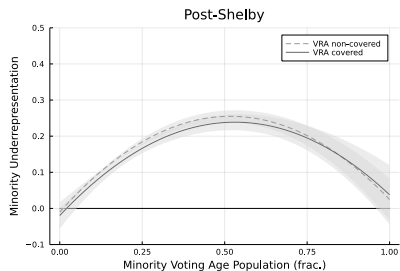
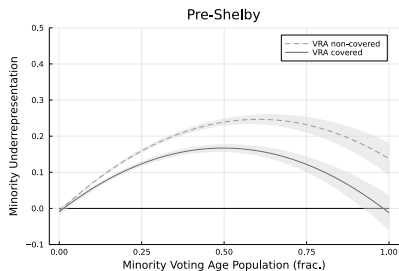
► Gap

► Rep./Dem.

# Shelby County v. Holder (2013)

- **Section 5** of the VRA, requires that all jurisdictions identified by the coverage formula in **Section 4(b)** must receive a federal approval, known as **preclearance**, before implementing any change to their voting procedures (proving no discriminatory purpose nor effects with respect to race or language minorities);
- the **coverage formula** is function of **registration** and **turnout** criteria based on the 1964 Presidential election (updated in 1968 and 1972);
- in *Shelby County v. Holder (2013)*, the US Supreme Court ruled the **coverage formula** unconstitutional, effectively ending the **preclearance** requirement. [▶ Map](#)

# Shelby and Underrepresentation



► Specification

► Parameters

► Estimates

# Shelby and Underrepresentation (cont.)

Table 4: Minority Underrepresentation Pre/Post Shelby (2013)

	(1)	(2)	(3)	(4)	(5)	(6)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>Max (Pre, VRA non-covered)</i>	0.247*** (0.007)	0.247*** (0.030)	0.327*** (0.011)	0.327*** (0.015)	0.286*** (0.081)	0.286*** (0.081)
<i>Max (Pre, VRA covered)</i>	0.167*** (0.006)	0.167*** (0.014)	0.236*** (0.020)	0.236*** (0.021)	0.207** (0.083)	0.207** (0.084)
<i>Max (Post, VRA non-covered)</i>	0.255*** (0.008)	0.255*** (0.012)	0.300*** (0.010)	0.300*** (0.013)	0.261*** (0.081)	0.261*** (0.078)
<i>Max (Post, VRA covered)</i>	0.239*** (0.011)	0.239*** (0.027)	0.272*** (0.020)	0.272*** (0.020)	0.241*** (0.083)	0.241*** (0.086)
<b>Shelby</b>	<b>0.063***</b> (0.015)	<b>0.063**</b> (0.028)	<b>0.063***</b> (0.016)	<b>0.063***</b> (0.019)	<b>0.058***</b> (0.015)	<b>0.058***</b> (0.016)
Population	VAP	VAP	VAP	VAP	VAP	VAP
Sample	Full	Full	Full	Full	Full	Full
Municipality FE	-	-	X	X	X	X
Controls	-	-	-	-	X	X
Obs.	27,562	27,562	26,190	26,190	26,050	26,050
Clusters	7,470	49	6,098	49	6,081	49
Cluster level	Municipality	State	Municipality	State	Municipality	State

▸ Specification

▸ Parameters

▸ Estimates

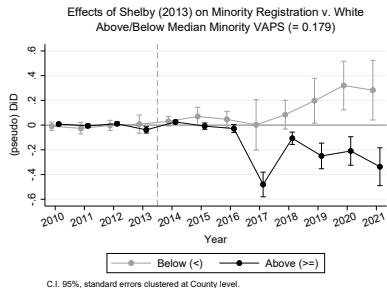
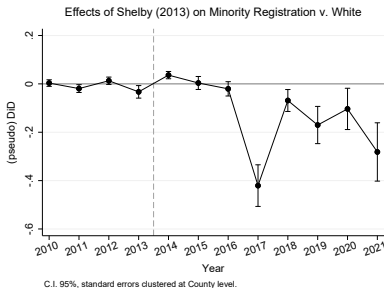
▸ Pre-trend

▸ Robustness



# Shelby and Registration

Figure 2: Registration and Shelby (2013)



► Estimation

► 200 miles

► 100 miles

► Rep./Dem.

# Conclusions

- **Minorities** are **underrepresented** in city councils, and more so when they account for **55%** to **60%** of the voting age population (i.e. when they are likely electorally **pivotal**);
- the underrepresentation pattern is consistent with the **strategic** selection of **electoral rules**, **underregistration**, and other **institutional features**;
- removal of **VRA** protection following *Shelby County v. Holder* (2013) **increased** underrepresentation (by up to **6 pp** or **37%**) and **negatively** affected **Minority registration** relative to White in previously covered municipalities.

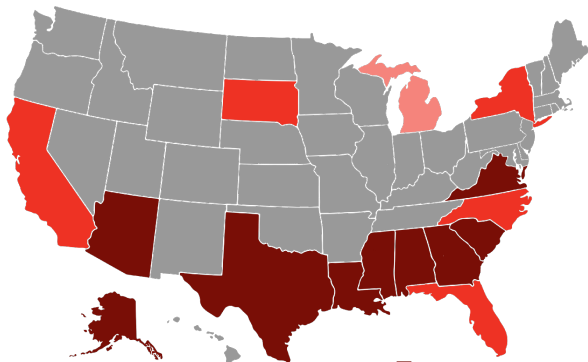
Thank you

Why do we care about **voting rights** and *Shelby County v. Holder* (2013)?

- **86** discriminatory laws blocked in the 15 years before ruling (13 in the last 18 months), **262** laws altered in the last 6 years;
- **immediate** attempts to introduce **discriminatory** voting laws following the ruling (Texas tried to implement a strict-ID law rejected just 2 years before, similarly in North Carolina, Alabama, Mississippi);
- **ongoing** efforts: **14** states with new restrictive laws in 2016 (**6** from previously covered state); **250** proposed bills with restrictive provisions since start of 2022 regular legislative sessions (**75** in 2021);



## States Covered by Section 5 at the time of the Shelby County Decision



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- States Covered as Whole by Section 5
- Some Counties Covered by Section 5
- Some Townships Covered by Section 5



Table A1: Additional Institutional Features

	Mean	Std. Dev.	Min.	Max.	Obs.
<i>Additional Institutional Features:</i>					
Partisanship	0.262	0.440	0.000	1.000	28,954
Running Fees	22.923	105.453	0.000	5,000.000	15,904
Voters per Councilor (thousands)	2.662	5.566	0.181	180.901	29,347
Staggered Terms	0.807	0.395	0.000	1.000	29,046
Term Length	3.390	0.904	1.167	8.000	28,584
Term Limits	0.092	0.289	0.000	1.000	16,692



## Sociodemographic data at municipal level from US Census (IPUMS NHGIS from Manson et al., 2021):

	Mean	Std. Dev.	Min.	Max.	Obs.
<i>Voting Age Population (frac.):</i>					
Latino	0.069	0.130	0.000	0.985	29,940
Asian	0.019	0.040	0.000	0.693	27,884
African American	0.070	0.127	0.000	0.982	29,847
Minority	0.171	0.191	0.000	1.000	29,855
White	0.829	0.191	0.000	1.000	29,931
<i>Sociodemographics:</i>					
Population	24,117.542	85,414.602	2,313	7,071,639	29,940
Voting Age Population	18,043.860	63,780.398	1,472	5,306,172	29,940
Over 65 (frac.)	0.144	0.058	0.001	0.708	29,922
Rural (frac.)	0.075	0.206	0.000	1.000	29,621
Foreign (frac.)	0.064	0.078	0.000	0.706	29,902
Median Household Income	42,358.913	19,242.365	4,563.352	200,001.000	29,922

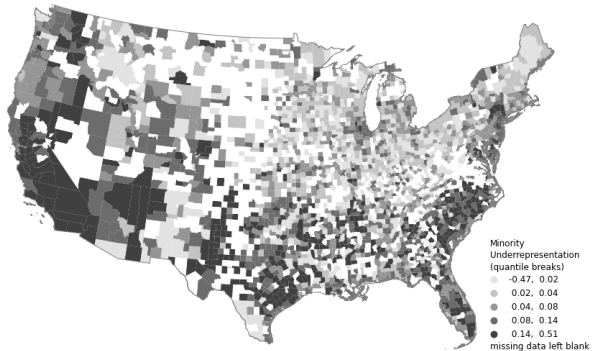


Table A2: Additional Registration Data

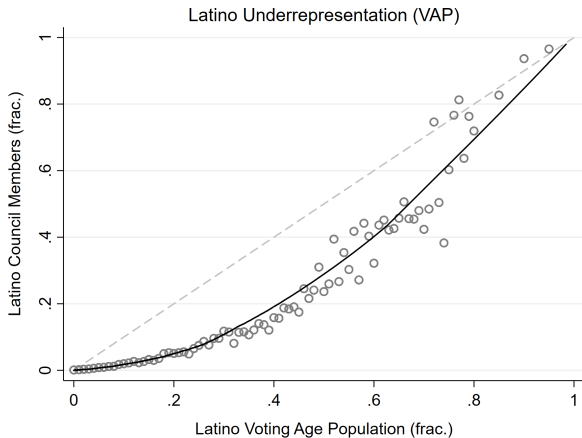
	Mean	Std. Dev.	Min.	Max.	Obs.
<i>Voting Age Population (frac.):</i>					
Latino	0.130	0.171	0.001	0.985	6,436
Asian	0.036	0.064	0.000	0.719	6,436
African American	0.104	0.162	0.000	0.971	6,436
Minority	0.313	0.232	0.024	0.995	6,436
White	0.687	0.232	0.005	0.976	6,436
<i>Sociodemographics:</i>					
Population	30,086.356	147,209.615	2,502	8,804,190	6,436
Voting Age Population	23,413.266	117,290.619	1,733	7,064,048	6,436
Over 65* (frac.)	0.145	0.055	0.010	0.795	6,436
Rural* (frac.)	0.055	0.155	0.000	1.000	6,436
Foreign* (frac.)	0.087	0.099	0.000	0.970	6,436
Median Household Income*	42,416.786	20,508.293	11,578.660	197,427.141	6,436



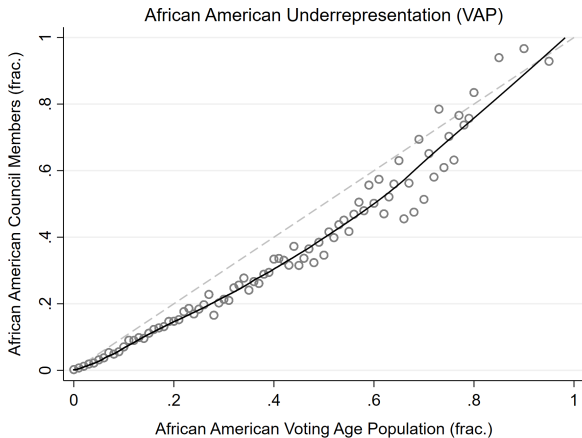
# Minority Underrepresentation - Extra



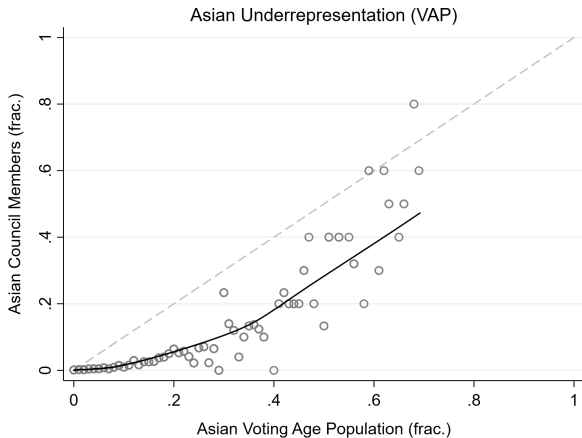
# Minority Underrepresentation - Extra (cont.)



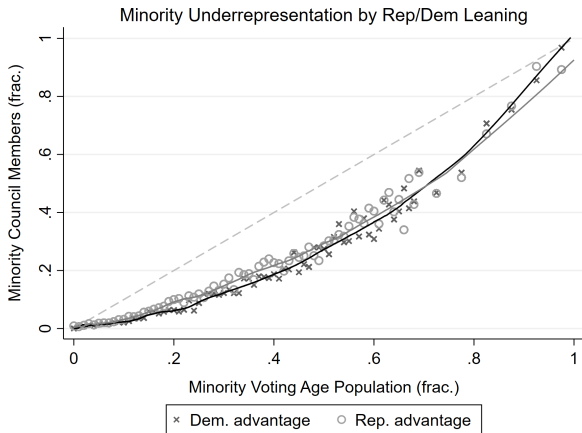
# Minority Underrepresentation - Extra (cont.)



# Minority Underrepresentation - Extra (cont.)



# Minority Underrepresentation - Extra (cont.)



# Minority Underrepresentation - Extra (cont.)

For a given municipality  $m$  at time  $t$ , **underrepresentation** is defined as:

$$u_{mt} = p_{mt} - c_{mt} \quad (\text{A1})$$

where  $p$  is the Minority share of the voting age population and  $c$  is the Minority share of the council members. We estimate the following **quadratic** specification:

$$u_{mt} = \beta_0 + \beta_1 p_{mt} + \beta_2 p_{mt}^2 + \delta_m + \delta_t + \mathbf{x}'_{mt} \boldsymbol{\alpha} + \varepsilon_{mt}, \quad (\text{A2})$$

where  $\delta_m$  and  $\delta_t$  are the municipality and year fixed effects, and  $\mathbf{x}_{mt}$  is a vector of time varying controls.



# Minority Underrepresentation - Extra (cont.)

Given estimates of (A2), the **max** and **argmax** of underrepresentation with respect to  $p$  are given by:

$$\max = \hat{\beta}_0 - \frac{\hat{\beta}_1^2}{4\hat{\beta}_2}; \quad \text{argmax} = -\frac{\hat{\beta}_1}{2\hat{\beta}_2}, \quad (\text{A3})$$



# Minority Underrepresentation - Extra (cont.)

Table A3: Latino Underrepresentation

	(1)	(2)	(3)	(4)	(5)
	Latino Underrep.	Latino Underrep.	Latino Underrep.	Latino Underrep.	Latino Underrep.
Latino	1.001*** (0.020)	0.997*** (0.020)	1.127*** (0.035)	1.236*** (0.047)	1.262*** (0.056)
Latino <sup>2</sup>	-1.057*** (0.036)	-1.053*** (0.036)	-1.049*** (0.085)	-1.137*** (0.093)	-1.141*** (0.093)
<i>max</i>	0.235*** (0.006)	0.234*** (0.006)	0.291*** (0.011)	0.319*** (0.011)	0.330*** (0.017)
<i>argmax</i>	0.473*** (0.011)	0.474*** (0.011)	0.537*** (0.030)	0.544*** (0.028)	0.553*** (0.029)
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	27,656	27,656	26,282	26,282	26,142
Municipalities	7,479	7,479	6,105	6,105	6,088
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.476	0.477	0.639	0.641	0.641





# Minority Underrepresentation - Extra (cont.)

Table A4: African American Underrepresentation

	(1)	(2)	(3)	(4)	(5)
	African American Underrep.	African American Underrep.	African American Underrep.	African American Underrep.	African American Underrep.
African American	0.395*** (0.021)	0.397*** (0.021)	1.071*** (0.052)	1.239*** (0.056)	1.283*** (0.057)
African American <sup>2</sup>	-0.393*** (0.041)	-0.393*** (0.041)	-1.407*** (0.095)	-1.535*** (0.094)	-1.567*** (0.095)
<i>max</i>	0.100*** (0.005)	0.100*** (0.005)	0.178*** (0.010)	0.214*** (0.011)	0.225*** (0.012)
<i>argmax</i>	0.503*** (0.031)	0.505*** (0.031)	0.381*** (0.015)	0.404*** (0.015)	0.409*** (0.015)
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	27,569	27,569	26,182	26,182	26,042
Municipalities	7,479	7,479	6,092	6,092	6,075
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.120	0.124	0.418	0.429	0.432



# Minority Underrepresentation - Extra (cont.)

Table A5: Asian Underrepresentation

	(1) Asian Underrep.	(2) Asian Underrep.	(3) Asian Underrep.	(4) Asian Underrep.	(5) Asian Underrep.
Asian	1.014*** (0.028)	1.010*** (0.030)	1.079*** (0.033)	1.108*** (0.041)	1.096*** (0.045)
Asian <sup>2</sup>	-1.140*** (0.092)	-1.133*** (0.094)	-1.205*** (0.099)	-1.249*** (0.106)	-1.243*** (0.110)
<i>max</i>	0.224*** (0.013)	0.224*** (0.013)	0.239*** (0.014)	0.243*** (0.014)	0.239*** (0.014)
<i>argmax</i>	0.445*** (0.029)	0.446*** (0.029)	0.448*** (0.029)	0.443*** (0.028)	0.441*** (0.028)
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	25,688	25,688	24,160	24,160	24,013
Municipalities	7,396	7,396	5,868	5,868	5,843
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.540	0.540	0.620	0.620	0.619



We add electoral rules **interactions** to the quadratic specification in (A2):

$$u_{mt} = \beta_0 + \beta_1 p_{mt} + \beta_2 p_{mt}^2 + \gamma_0 AL_{mt} + \gamma_1 (AL_{mt} \times p_{mt}) + \gamma_2 (AL_{mt} \times p_{mt}^2) + \delta_m + \delta_t + \mathbf{x}'_{mt} \boldsymbol{\alpha} + \varepsilon_{mt}, \quad (\text{A4})$$

Where  $AL_{mt}$  is an indicator for At-Large municipalities at time  $t$ . The **max** and **argmax** estimates are given by:

$$\begin{aligned} \max_{SMD} &= \hat{\beta}_0 - \frac{\hat{\beta}_1^2}{4\hat{\beta}_2} & \max_{AL} &= \hat{\beta}_0 + \hat{\gamma}_0 - \frac{(\hat{\beta}_1 + \hat{\gamma}_1)^2}{4(\hat{\beta}_2 + \hat{\gamma}_2)} \\ \text{argmax}_{SMD} &= -\frac{\hat{\beta}_1}{2\hat{\beta}_2} & \text{argmax}_{AL} &= -\frac{(\hat{\beta}_1 + \hat{\gamma}_1)}{2(\hat{\beta}_2 + \hat{\gamma}_2)} \end{aligned}$$

# Electoral Rules - Extra (cont.)

Table A6: Minority Underrepresentation by Electoral Rule - Estimates

	(1) Minority Underrep.	(2) Minority Underrep.	(3) Minority Underrep.	(4) Minority Underrep.	(5) Minority Underrep.
Minority	0.543*** (0.028)	0.519*** (0.028)	0.990*** (0.041)	1.219*** (0.051)	1.124*** (0.056)
Minority <sup>2</sup>	-0.495*** (0.046)	-0.478*** (0.045)	-0.765*** (0.066)	-0.914*** (0.068)	-0.892*** (0.068)
At-Large	-0.017*** (0.002)	-0.016*** (0.002)	-0.008 (0.005)	-0.009* (0.005)	-0.008 (0.005)
At-Large × Minority	0.427*** (0.035)	0.424*** (0.035)	0.373*** (0.046)	0.353*** (0.045)	0.345*** (0.045)
At-Large × Minority <sup>2</sup>	-0.386*** (0.057)	-0.377*** (0.056)	-0.388*** (0.072)	-0.378*** (0.071)	-0.376*** (0.072)
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	26,419	26,419	25,022	25,022	24,885
Municipalities	7,401	7,401	6,004	6,004	5,987
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.293	0.299	0.506	0.511	0.511



# Electoral Rules - Extra (cont.)

Table A7: Latino Underrepresentation by Electoral Rule

	(1)	(2)	(3)	(4)	(5)
	Latino Underrep.	Latino Underrep.	Latino Underrep.	Latino Underrep.	Latino Underrep.
<i>max (SMD)</i>	0.212*** (0.009)	0.211*** (0.009)	0.275*** (0.016)	0.304*** (0.016)	0.318*** (0.021)
<i>max (At-Large)</i>	0.245*** (0.007)	0.244*** (0.007)	0.312*** (0.014)	0.339*** (0.014)	0.353*** (0.019)
<i>argmax (SMD)</i>	0.466*** (0.022)	0.466*** (0.022)	0.572*** (0.045)	0.576*** (0.040)	0.586*** (0.042)
<i>argmax (At-Large)</i>	0.475*** (0.012)	0.475*** (0.012)	0.546*** (0.034)	0.551*** (0.032)	0.563*** (0.034)
Test <i>max</i> (p-value)	0.002	0.002	0.024	0.033	0.040
Test <i>argmax</i> (p-value)	0.716	0.711	0.501	0.486	0.523
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	26,498	26,498	25,100	25,100	24,963
Municipalities	7,407	7,407	6,009	6,009	5,992
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.483	0.484	0.643	0.645	0.645

# Electoral Rules - Extra (cont.)

Table A8: African American Underrepresentation by Electoral Rule

	(1)	(2)	(3)	(4)	(5)
	African American Underrep.	African American Underrep.	African American Underrep.	African American Underrep.	African American Underrep.
<i>max (SMD)</i>	0.058*** (0.007)	0.059*** (0.007)	0.110*** (0.010)	0.141*** (0.012)	0.150*** (0.012)
<i>max (At-Large)</i>	0.142*** (0.008)	0.141*** (0.008)	0.239*** (0.011)	0.264*** (0.012)	0.274*** (0.012)
<i>argmax (SMD)</i>	0.541*** (0.087)	0.541*** (0.085)	0.377*** (0.023)	0.403*** (0.023)	0.408*** (0.023)
<i>argmax (At-Large)</i>	0.515*** (0.035)	0.516*** (0.036)	0.421*** (0.019)	0.431*** (0.018)	0.435*** (0.018)
Test <i>max</i> (p-value)	0.000	0.000	0.000	0.000	0.000
Test <i>argmax</i> (p-value)	0.773	0.779	0.030	0.149	0.165
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	26,413	26,413	25,001	25,001	24,864
Municipalities	7,406	7,406	5,994	5,994	5,977
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.150	0.152	0.454	0.460	0.463



# Electoral Rules - Extra (cont.)

Table A9: Asian Underrepresentation by Electoral Rule

	(1) Asian Underrep.	(2) Asian Underrep.	(3) Asian Underrep.	(4) Asian Underrep.	(5) Asian Underrep.
<i>max (SMD)</i>	0.310*** (0.094)	0.316*** (0.101)	0.275*** (0.081)	0.262*** (0.065)	0.289** (0.118)
<i>max (At-Large)</i>	0.222*** (0.014)	0.222*** (0.014)	0.238*** (0.014)	0.241*** (0.014)	0.237*** (0.015)
<i>argmax (SMD)</i>	0.653*** (0.215)	0.673*** (0.235)	0.550*** (0.183)	0.501*** (0.144)	0.569** (0.264)
<i>argmax (At-Large)</i>	0.439*** (0.031)	0.440*** (0.031)	0.440*** (0.030)	0.437*** (0.029)	0.434*** (0.029)
Test <i>max</i> (p-value)	0.357	0.359	0.645	0.751	0.656
Test <i>argmax</i> (p-value)	0.325	0.324	0.554	0.659	0.608
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	24,587	24,587	23,011	23,011	22,873
Municipalities	7,313	7,313	5,737	5,737	5,716
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.539	0.540	0.617	0.618	0.616

# Institutional Features

- **Council-Manager** municipalities display **higher** underrepresentation levels compared to ones with **Mayor-Council** systems (▶), consistent with more value per council seat and more incentives to disenfranchise;
- municipalities with **smaller councils** have more underrepresentation (▶), consistent with higher representation threshold;
- municipalities with **unpaid** council members show more underrepresentation (▶), consistent with higher barriers to entry and opportunity cost.





Table A10: Mayor-Council v. Council-Manager

	(1)	(2)	(3)	(4)	(5)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>max (Council-Manager)</i>	0.235*** (0.006)	0.230*** (0.006)	0.306*** (0.007)	0.368*** (0.010)	0.328*** (0.012)
<i>max (Mayor-Council)</i>	0.182*** (0.006)	0.178*** (0.006)	0.289*** (0.008)	0.351*** (0.010)	0.315*** (0.013)
<i>argmax (Council-Manager)</i>	0.580*** (0.019)	0.579*** (0.019)	0.593*** (0.019)	0.622*** (0.018)	0.587*** (0.018)
<i>argmax (Mayor-Council)</i>	0.511*** (0.015)	0.510*** (0.015)	0.565*** (0.018)	0.595*** (0.016)	0.565*** (0.018)
Test <i>max</i> (p-value)	0.000	0.000	0.039	0.044	0.110
Test <i>argmax</i> (p-value)	0.002	0.003	0.096	0.080	0.120
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	24,855	24,855	23,658	23,658	23,553
Municipalities	6,783	6,783	5,586	5,586	5,574
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.261	0.267	0.493	0.499	0.500

Table A11: Council Size

	(1) Minority Underrep.	(2) Minority Underrep.	(3) Minority Underrep.	(4) Minority Underrep.	(5) Minority Underrep.
<i>max (CS below median)</i>	0.244*** (0.006)	0.240*** (0.006)	0.320*** (0.009)	0.378*** (0.011)	0.338*** (0.014)
<i>max (CS above median)</i>	0.190*** (0.005)	0.185*** (0.005)	0.294*** (0.009)	0.355*** (0.011)	0.316*** (0.013)
<i>argmax (CS below median)</i>	0.567*** (0.017)	0.567*** (0.017)	0.578*** (0.020)	0.607*** (0.019)	0.571*** (0.020)
<i>argmax (CS above median)</i>	0.511*** (0.015)	0.509*** (0.015)	0.597*** (0.022)	0.618*** (0.020)	0.589*** (0.020)
Test <i>max</i> (p-value)	0.000	0.000	0.043	0.092	0.069
Test <i>argmax</i> (p-value)	0.011	0.010	0.462	0.650	0.428
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	27,576	27,576	26,205	26,205	26,065
Municipalities	7,472	7,472	6,101	6,101	6,084
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.268	0.275	0.494	0.500	0.501



# Institutional Features - Extra (cont.)

Table A12: Paid Council Members

	(1)	(2)	(3)	(4)	(5)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>max (not Paid)</i>	0.234*** (0.011)	0.228*** (0.011)	0.327*** (0.015)	0.394*** (0.017)	0.352*** (0.018)
<i>max (Paid)</i>	0.213*** (0.004)	0.209*** (0.004)	0.300*** (0.006)	0.359*** (0.009)	0.320*** (0.012)
<i>argmax (not Paid)</i>	0.542*** (0.028)	0.541*** (0.029)	0.645*** (0.033)	0.663*** (0.029)	0.629*** (0.029)
<i>argmax (Paid)</i>	0.552*** (0.014)	0.551*** (0.014)	0.574*** (0.016)	0.602*** (0.015)	0.568*** (0.016)
Test <i>max</i> (p-value)	0.059	0.091	0.047	0.021	0.018
Test <i>argmax</i> (p-value)	0.743	0.729	0.017	0.022	0.014
Population	VAP	VAP	VAP	VAP	VAP
Year FE	-	X	-	X	X
Municipality FE	-	-	X	X	X
Controls	-	-	-	-	X
Obs.	27,077	27,077	25,704	25,704	25,564
Municipalities	7,436	7,436	6,063	6,063	6,046
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality
Adjusted R <sup>2</sup>	0.261	0.267	0.494	0.500	0.501

# Underregistration - Extra

Define  $R_{mt}$  as the number of voters in municipality  $m$  whose **registration** date is before or equal to time  $t$ . We focus on 2020 cross-section and three dependent variables of interest:

- **underregistration:**

$$ur_m = p_m^M - r_m^M, \quad (\text{A5})$$

where  $r_m^M$  is the Minority share of registered voters;

- **registration rate:**

$$rr_m^M = \frac{R_m^M}{P_m^M}, \quad (\text{A6})$$

where  $R_m^M$  be the absolute number of Minority voters who are registered;

- **registration gap:**

$$rg_m = \frac{R_m^W}{P_m^W} - \frac{R_m^M}{P_m^M}, \quad (\text{A7})$$



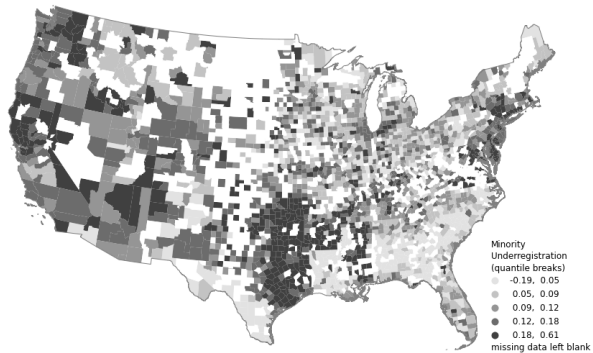
# Underregistration - Extra (cont.)

Table A13: Minority Underregistration

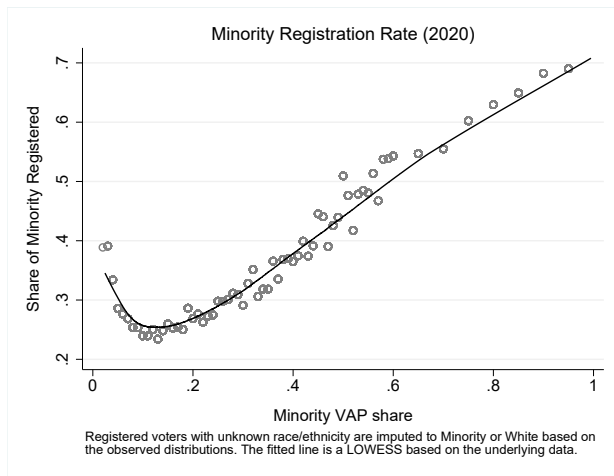
	(1) Minority Underreg.	(2) Minority Underreg.	(3) Minority Underreg.
Minority	0.831*** (0.014)	0.957*** (0.015)	0.901*** (0.019)
Minority <sup>2</sup>	-0.870*** (0.015)	-0.971*** (0.015)	-0.963*** (0.017)
<i>max</i>	0.196*** (0.002)	0.209*** (0.002)	0.201*** (0.002)
<i>argmax</i>	0.477*** (0.003)	0.493*** (0.003)	0.468*** (0.005)
Population	VAP	VAP	VAP
Year	2020	2020	2020
State FE	-	X	X
Controls	-	-	X
Obs.	6,436	6,435	6,435
Adjusted R <sup>2</sup>	0.359	0.586	0.597



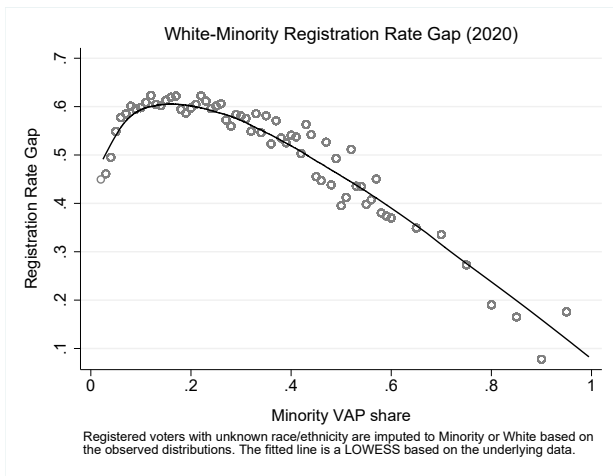
# Underregistration - Extra (cont.)



# Underregistration (cont.)

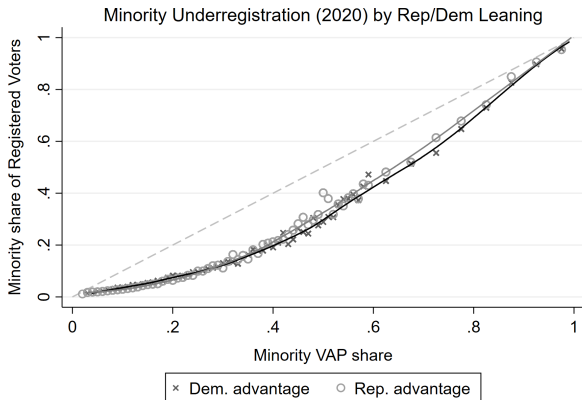


# Underregistration (cont.)





# Underregistration - Extra (cont.)



Registered voters with unknown race/ethnicity are imputed to Minority or White based on the observed distributions. The fitted line is a LOWESS based on the underlying data.



Let  $VRA_m = I(m \text{ covered})$  be an indicator variable if municipality  $m$  was **covered** by the VRA before *Shelby County v. Holder* (2013). Let  $POST_t = I(t > 2013)$  be an indicator variable for **post** *Shelby County v. Holder* (2013) observations. We estimate:

$$\begin{aligned} u_{mt} = & \beta_0 + \beta_1 p_{mt} + \beta_2 p_{mt}^2 + \\ & + \gamma_0 VRA_m + \gamma_1 (VRA_m \times p_{mt}) + \gamma_2 (VRA_m \times p_{mt}^2) + \\ & + \delta_0 POST_t + \delta_1 (POST_t \times p_{mt}) + \delta_2 (POST_t \times p_{mt}^2) + \\ & + \eta_0 (VRA_m \times POST_t) + \eta_1 (VRA_m \times POST_t \times p_{mt}) + \\ & + \eta_2 (VRA_m \times POST_t \times p_{mt}^2) + \varepsilon_{mt}. \end{aligned} \tag{A8}$$



# Shelby and Underrepresentation - Extra (cont.)

Given estimates of (A8), let  $g(m, t)$  summarize the four groups of **pre** and **post**, **covered** and **non-covered** municipalities, the quadratic formula parameters are:

$$\begin{aligned}\hat{c}_{g(m,t)} &= \hat{\beta}_0 + \hat{\gamma}_0 \text{VRA}_{g(m,t)} + \hat{\delta}_0 \text{POST}_{g(m,t)} + \hat{\eta}_0 (\text{VRA}_{g(m,t)} \times \text{POST}_{g(m,t)}), \\ \hat{b}_{g(m,t)} &= \hat{\beta}_1 + \hat{\gamma}_1 \text{VRA}_{g(m,t)} + \hat{\delta}_1 \text{POST}_{g(m,t)} + \hat{\eta}_1 (\text{VRA}_{g(m,t)} \times \text{POST}_{g(m,t)}), \\ \hat{a}_{g(m,t)} &= \hat{\beta}_2 + \hat{\gamma}_2 \text{VRA}_{g(m,t)} + \hat{\delta}_2 \text{POST}_{g(m,t)} + \hat{\eta}_2 (\text{VRA}_{g(m,t)} \times \text{POST}_{g(m,t)}).\end{aligned}$$

The corresponding **max** and **argmax** are given by:

$$\max_{g(m,t)} = \hat{c}_{g(m,t)} - \frac{\hat{b}_{g(m,t)}^2}{4\hat{a}_{g(m,t)}}, \quad \text{argmax}_{g(m,t)} = -\frac{\hat{b}_{g(m,t)}}{2\hat{a}_{g(m,t)}}.$$

Finally:

$$\text{Shelby} = (\max_{\text{VRA,POST}} - \max_{\text{VRA,PRE}}) - (\max_{\text{nonVRA,POST}} - \max_{\text{nonVRA,PRE}}).$$



# Shelby and Underrepresentation - Extra (cont.)

Table A14: Minority Underrepresentation Pre/Post Shelby (2013) - Parameters

	(1)	(2)	(3)	(4)	(5)	(6)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>Pre, VRA non-covered</i>						
constant	-0.007*** (0.001)	-0.007** (0.004)	-0.044 (.)	-0.044 (.)	-0.030 (0.082)	-0.030 (0.078)
Minority	0.841*** (0.023)	0.841*** (0.070)	1.236*** (0.036)	1.236*** (0.037)	1.152*** (0.043)	1.152*** (0.031)
Minority <sup>2</sup>	-0.696*** (0.039)	-0.696*** (0.061)	-1.029*** (0.064)	-1.029*** (0.061)	-1.052*** (0.066)	-1.052*** (0.053)
<i>Pre, VRA covered</i>						
constant	-0.009 (0.006)	-0.009 (0.007)	-0.141 (.)	-0.141 (.)	-0.114 (0.082)	-0.114 (0.078)
Minority	0.708*** (0.042)	0.708*** (0.116)	1.324*** (0.077)	1.324*** (0.074)	1.209*** (0.081)	1.209*** (0.060)
Minority <sup>2</sup>	-0.711*** (0.056)	-0.711*** (0.162)	-1.164*** (0.112)	-1.164*** (0.091)	-1.137*** (0.113)	-1.137*** (0.078)
<i>Post, VRA non-covered</i>						
constant	-0.010** (0.004)	-0.010** (0.004)	-0.064*** (0.006)	-0.064*** (0.006)	-0.046 (0.082)	-0.046 (0.080)
Minority	1.024*** (0.048)	1.024*** (0.048)	1.341*** (0.064)	1.341*** (0.067)	1.237*** (0.070)	1.237*** (0.067)
Minority <sup>2</sup>	-0.990*** (0.063)	-0.990*** (0.049)	-1.235*** (0.090)	-1.235*** (0.064)	-1.245*** (0.092)	-1.245*** (0.060)
<i>Post, VRA covered</i>						
constant	-0.020 (0.019)	-0.020 (0.027)	-0.185*** (0.025)	-0.185*** (0.028)	-0.151* (0.086)	-0.151** (0.076)
Minority	0.973*** (0.109)	0.973*** (0.190)	1.556*** (0.147)	1.556*** (0.108)	1.407*** (0.152)	1.407*** (0.113)
Minority <sup>2</sup>	-0.915*** (0.123)	-0.915*** (0.171)	-1.323*** (0.166)	-1.323*** (0.114)	-1.264*** (0.168)	-1.264*** (0.126)



# Shelby and Underrepresentation - Extra

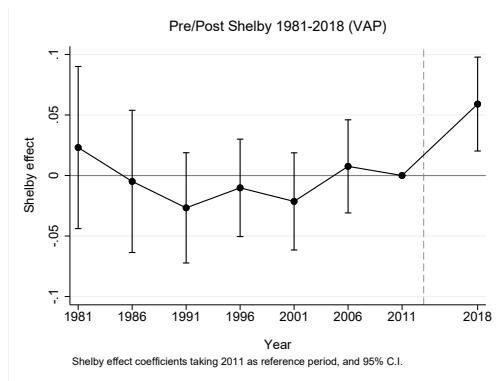
Table A15: Minority Underrepresentation Pre/Post Shelby (2013) - Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
Minority	0.841*** (0.023)	0.841*** (0.070)	1.236*** (0.036)	1.236*** (0.037)	1.152*** (0.043)	1.152*** (0.031)
Minority <sup>2</sup>	-0.696*** (0.039)	-0.696*** (0.061)	-1.029*** (0.064)	-1.029*** (0.061)	-1.052*** (0.066)	-1.052*** (0.053)
Covered	-0.002 (0.006)	-0.002 (0.008)				
Covered × Minority	-0.134*** (0.048)	-0.134 (0.139)	0.088 (0.085)	0.088 (0.083)	0.057 (0.085)	0.057 (0.068)
Covered × Minority <sup>2</sup>	-0.015 (0.069)	-0.015 (0.174)	-0.134 (0.129)	-0.134 (0.101)	-0.085 (0.128)	-0.085 (0.089)
Post	-0.003 (0.004)	-0.003 (0.003)	-0.020*** (0.006)	-0.020*** (0.006)	-0.016** (0.006)	-0.016** (0.006)
Post × Minority	0.183*** (0.048)	0.183*** (0.050)	0.105* (0.054)	0.105** (0.047)	0.084 (0.056)	0.084* (0.048)
Post × Minority <sup>2</sup>	-0.293*** (0.065)	-0.293*** (0.045)	-0.205*** (0.071)	-0.205*** (0.063)	-0.193*** (0.074)	-0.193*** (0.065)
Post × Covered	-0.008 (0.019)	-0.008 (0.023)	-0.024 (0.026)	-0.024 (0.029)	-0.021 (0.026)	-0.021 (0.028)
Post × Covered × Minority	0.082 (0.119)	0.082 (0.103)	0.127 (0.134)	0.127 (0.119)	0.114 (0.134)	0.114 (0.119)
Post × Covered × Minority <sup>2</sup>	0.089 (0.142)	0.089 (0.081)	0.046 (0.149)	0.046 (0.106)	0.066 (0.148)	0.066 (0.121)



# Shelby and Underrepresentation - Extra

$$u_{mt} = \sum_{T=\{1981,\dots,2018\}} Y T_t \left[ \beta_{0,T} + \beta_{1,T} p_{mt} + \beta_{2,T} p_{mt}^2 + \gamma_{0,T} VRA_m + \gamma_{1,T} (VRA_m \times p_{mt}) + \gamma_{2,T} (VRA_m \times p_{mt}^2) \right] + \varepsilon_{mt}. \quad (\text{A9})$$



# Shelby and Underrepresentation - Extra

Table A16: Minority Underrepresentation Pre/Post Shelby (2013) - Balanced

	(1)	(2)	(3)	(4)	(5)	(6)
	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>Max (Pre, VRA non-covered)</i>	0.259*** (0.013)	0.259*** (0.027)	0.348*** (0.019)	0.348*** (0.014)	0.315*** (0.113)	0.315*** (0.085)
<i>Max (Pre, VRA covered)</i>	0.173*** (0.010)	0.173*** (0.013)	0.261*** (0.035)	0.261*** (0.007)	0.231** (0.112)	0.231*** (0.089)
<i>Max (Post, VRA non-covered)</i>	0.255*** (0.009)	0.255*** (0.014)	0.307*** (0.012)	0.307*** (0.013)	0.277** (0.112)	0.277*** (0.082)
<i>Max (Post, VRA covered)</i>	0.233*** (0.012)	0.233*** (0.028)	0.282*** (0.028)	0.282*** (0.016)	0.254** (0.112)	0.254*** (0.090)
<b>Shelby</b>	<b>0.063*** (0.018)</b>	<b>0.063*** (0.024)</b>	<b>0.062*** (0.022)</b>	<b>0.062*** (0.019)</b>	<b>0.061*** (0.021)</b>	<b>0.061*** (0.016)</b>
Population	VAP	VAP	VAP	VAP	VAP	VAP
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Municipality FE	-	-	X	X	X	X
Controls	-	-	-	-	X	X
Obs.	11,730	11,730	11,683	11,683	11,544	11,544
Clusters	2,396	48	2,349	48	2,332	48
Cluster level	Municipality	State	Municipality	State	Municipality	State



# Shelby and Underrepresentation - Extra

Table A17: Minority Underrepresentation Pre/Post Shelby (2013) - 200 miles

	(1)	(2)	(3)
	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>Max (Pre, VRA non-covered)</i>	0.246*** (0.007)	0.323*** (0.012)	0.277*** (0.098)
<i>Max (Pre, VRA covered)</i>	0.169*** (0.009)	0.235*** (0.022)	0.205** (0.100)
<i>Max (Post, VRA non-covered)</i>	0.254*** (0.010)	0.301*** (0.012)	0.258*** (0.100)
<i>Max (Post, VRA covered)</i>	0.229*** (0.013)	0.263*** (0.022)	0.229** (0.101)
<b><i>Shelby</i></b>	<b>0.052*** (0.018)</b>	<b>0.050*** (0.018)</b>	<b>0.043** (0.017)</b>
Population	VAP	VAP	VAP
Sample	200 miles	200 miles	200 miles
Municipality FE	-	X	X
Controls	-	-	X
Obs.	20,198	19,139	19,051
Clusters	5,571	4,512	4,499
Cluster level	Municipality	Municipality	Municipality





# Shelby and Underrepresentation - Extra

Table A18: Minority Underrepresentation Pre/Post Shelby (2013) - 100 miles

	(1)	(2)	(3)
	Minority Underrep.	Minority Underrep.	Minority Underrep.
<i>Max (Pre, VRA non-covered)</i>	0.234*** (0.008)	0.311*** (0.015)	0.260** (0.130)
<i>Max (Pre, VRA covered)</i>	0.192*** (0.014)	0.249*** (0.024)	0.216 (0.133)
<i>Max (Post, VRA non-covered)</i>	0.242*** (0.012)	0.291*** (0.015)	0.244* (0.132)
<i>Max (Post, VRA covered)</i>	0.251*** (0.016)	0.286*** (0.024)	0.245* (0.133)
<b><i>Shelby</i></b>	<b>0.052** (0.022)</b>	<b>0.058*** (0.021)</b>	<b>0.044** (0.020)</b>
Population	VAP	VAP	VAP
Sample	100 miles	100 miles	100 miles
Municipality FE	-	X	X
Controls	-	-	X
Obs.	11,717	11,131	11,076
Clusters	3,174	2,588	2,581
Cluster level	Municipality	Municipality	Municipality



# Shelby and Underrepresentation - Extra

Table A19: Minority Underrepresentation Pre/Post Shelby (2013) - Rep./Dem.

	(1) Minority Underrep.	(2) Minority Underrep.	(3) Minority Underrep.	(4) Minority Underrep.	(5) Minority Underrep.	(6) Minority Underrep.
<i>Max (Pre, VRA non-covered)</i>	0.246*** (0.007)	0.269*** (0.019)	0.309*** (0.016)	0.364*** (0.028)	0.273 (0.197)	0.299*** (0.103)
<i>Max (Pre, VRA covered)</i>	0.182*** (0.009)	0.163*** (0.007)	0.196*** (0.063)	0.242*** (0.023)	0.181 (0.199)	0.210** (0.105)
<i>Max (Post, VRA non-covered)</i>	0.270*** (0.011)	0.244*** (0.019)	0.299*** (0.015)	0.282*** (0.018)	0.260 (0.199)	0.241** (0.102)
<i>Max (Post, VRA covered)</i>	0.293*** (0.023)	0.223*** (0.012)	0.251*** (0.060)	0.272*** (0.024)	0.231 (0.202)	0.238** (0.106)
<b>Shelby</b>	<b>0.086*** (0.025)</b>	<b>0.085*** (0.029)</b>	<b>0.065** (0.026)</b>	<b>0.112*** (0.031)</b>	<b>0.063*** (0.024)</b>	<b>0.087*** (0.026)</b>
Population	VAP	VAP	VAP	VAP	VAP	VAP
Sample	Dem. advantage	Rep. advantage	Dem. advantage	Rep. advantage	Dem. advantage	Rep. advantage
Municipality FE	-	-	X	X	X	X
Controls	-	-	-	-	X	X
Obs.	9,913	17,459	8,275	15,734	8,219	15,662
Clusters	4,189	6,044	2,551	4,319	2,541	4,307
Cluster level	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality



Time is discrete,  $t = 0, 1, \dots$ . We consider a population of  $T$  cohorts,  $\tau = 1, 2, \dots, T$ , and describe its evolution with a [Leslie \(1945\)](#) matrix:

$$\begin{bmatrix} N_1(t+1) \\ N_2(t+1) \\ \vdots \\ N_T(t+1) \end{bmatrix} = \begin{bmatrix} f_1 & f_2 & \cdots & f_{T-1} & f_T \\ s_1 & 0 & \cdots & 0 & 0 \\ 0 & s_2 & \cdots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \cdots & s_{T-1} & 0 \end{bmatrix} \begin{bmatrix} N_1(t) \\ N_2(t) \\ \vdots \\ N_T(t) \end{bmatrix}$$

Define  $\lambda$  the dominant eigenvalue of  $\mathbf{L}$ , then  $\mathbf{N}(t+1) = \lambda \mathbf{N}(t)$ .

# Shelby and Registration - Extra (cont.)

Consider a change from  $\mathbf{L}$  to  $\tilde{\mathbf{L}}$  taking place at time  $t - g$ , with  $g < T$  and  $g$  is known. Assuming constant survival rates  $s$  across cohorts, while allowing for a break at  $t - g$ , we can write the ratio between the size of the cohort entering at  $t - g$  and still living at  $t$  relative to the cohort entering at  $t - T + 1$  and still living at  $t$  as:

$$\left(\frac{\lambda}{s}\right)^{T-g-1}.$$

For any vintage  $\tau = 1, \dots, g$  born after the event and surviving at  $t$ , we have:

$$\frac{\tilde{N}_1(t - \tau + 1)}{\tilde{\zeta}^{g-\tau+1} s^{T-g-1} N_1(t - T + 1)}.$$

With this, we can define the treatment effect as:

$$TE_\tau = \frac{\tilde{N}_1(t - \tau + 1)}{\tilde{\zeta}^{g-\tau+1} s^{T-g-1} N_1(t - T + 1)} - \left(\frac{\lambda}{s}\right)^{T-\tau}. \quad (\text{A10})$$

We can estimate the treatment effect with a one-step joint GMM based on the following ratios:

$$R(\tau) = \left(\frac{\lambda}{s}\right)^{T-\tau} \quad (\text{A11})$$

$$R(\tau) = TE_{\tau} + \left(\frac{\lambda}{s}\right)^{T-\tau} \quad (\text{A12})$$



# Shelby and Registration - Extra (cont.)

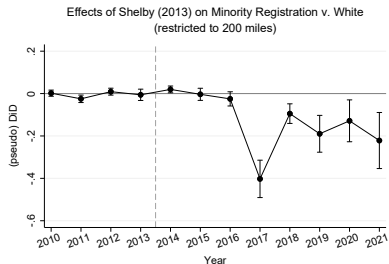
Table A20: Minority Underregistration Pre/Post Shelby (2013)

	(1) White (non-covered)	(2) White (covered)	(3) White (difference)	(4) Minority (non-covered)	(5) Minority (covered)	(6) Minority (difference)	(7) DiD (pseudo)
2009 (pre)	-0.494*** (0.004)	-0.507*** (0.005)	-0.014** (0.006)	-0.510*** (0.006)	-0.520*** (0.006)	-0.010 (0.008)	0.003 (0.007)
2010 (pre)	-0.147*** (0.004)	-0.156*** (0.006)	-0.009 (0.007)	-0.182*** (0.006)	-0.211*** (0.007)	-0.028*** (0.009)	-0.019** (0.008)
2011 (pre)	-0.106*** (0.004)	-0.093*** (0.006)	0.013* (0.007)	-0.123*** (0.007)	-0.097*** (0.007)	0.026*** (0.010)	0.013* (0.008)
2012 (pre)	0.595*** (0.009)	0.627*** (0.008)	0.032*** (0.012)	0.667*** (0.012)	0.666*** (0.012)	-0.001 (0.017)	-0.033** (0.013)
2013 (pre)	0.152*** (0.007)	0.129*** (0.006)	-0.023** (0.009)	0.148*** (0.009)	0.161*** (0.007)	0.014 (0.012)	0.036*** (0.008)
2014	0.467*** (0.011)	0.437*** (0.009)	-0.030** (0.014)	0.480*** (0.015)	0.454*** (0.013)	-0.026 (0.020)	0.004 (0.014)
2015	0.569*** (0.020)	0.492*** (0.008)	-0.077*** (0.022)	0.570*** (0.020)	0.473*** (0.013)	-0.097*** (0.024)	-0.021 (0.015)
2016	1.934*** (0.046)	1.581*** (0.024)	-0.352*** (0.052)	2.242*** (0.067)	1.469*** (0.033)	-0.773*** (0.075)	-0.421*** (0.044)
2017	0.842*** (0.028)	0.816*** (0.025)	-0.026 (0.037)	0.862*** (0.036)	0.767*** (0.024)	-0.094** (0.043)	-0.069*** (0.023)
2018	1.992*** (0.076)	1.501*** (0.038)	-0.491*** (0.085)	2.061*** (0.089)	1.400*** (0.040)	-0.661*** (0.099)	-0.170*** (0.039)
2019	1.893*** (0.101)	1.357*** (0.048)	-0.536*** (0.112)	1.922*** (0.118)	1.282*** (0.047)	-0.640*** (0.127)	-0.103** (0.044)
2020	3.466*** (0.121)	2.287*** (0.060)	-1.179*** (0.135)	3.387*** (0.144)	1.926*** (0.058)	-1.461*** (0.155)	-0.282*** (0.062)
Obs. (per year)	5,032	1,359	.	4,847	1,361	.	.
Cluster level	County	County	County	County	County	County	County

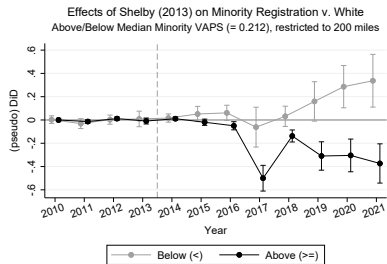


# Shelby and Registration - Extra (cont.)

Figure A1: Registration and Shelby (2013) - 200 miles



C.I. 95%, standard errors clustered at County level. Sample restricted to municipalities within 200 miles of the VRA coverage border at the time of Shelby (2013).

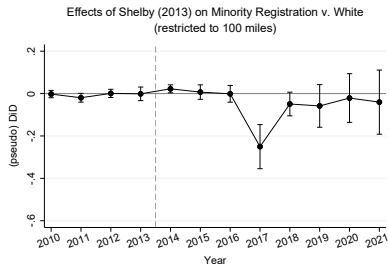


C.I. 95%, standard errors clustered at County level. Sample restricted to municipalities within 200 miles of the VRA coverage border at the time of Shelby (2013).

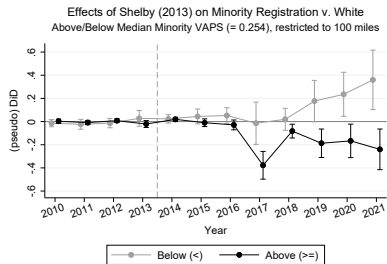


# Shelby and Registration - Extra (cont.)

Figure A3: Registration and Shelby (2013) - 100 miles



C.I. 95%, standard errors clustered at County level. Sample restricted to municipalities within 100 miles of the VRA coverage border at the time of Shelby (2013).



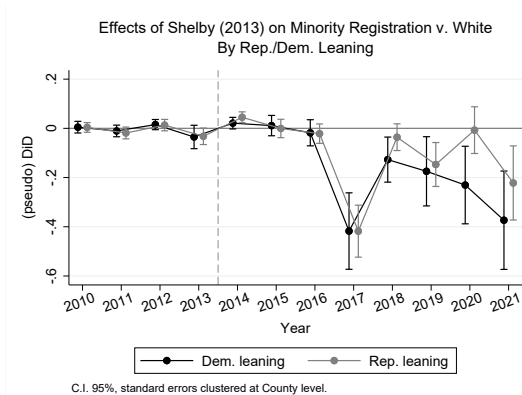
C.I. 95%, standard errors clustered at County level. Sample restricted to municipalities within 100 miles of the VRA coverage border at the time of Shelby (2013).





# Shelby and Registration - Extra (cont.)

Figure A5: Registration and Shelby (2013) - By Rep./Dem. Leaning



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