Online Appendix

VII ALTERNATIVE OUTCOME MEASURES

This appendix presents the results for several alternative outcome measures. The baseline specification uses arrests of blacks per thousand black county residents (the black arrest rate) as the outcome of interest and controls for arrests of whites per thousand white county residents. Two alternative measures are the natural log of the number of black arrests and the ratio of black arrests to all arrests. I also examine the robustness of the results to altering the outcome measures by including arrests for unclassified crimes and to winsorizing observation years that are outliers relative to office averages.

The arrest rate outcome measure will give the most weight to counties in which sheriffs account for a high fraction of overall arrests for the population. Using the natural log of arrests in a specification with agency fixed effects abstracts from the population size. The specification includes the natural log of arrests of whites in order to measure relative changes in the black arrest rate.

$$log(BlackArrests)_{a,c,y} = \alpha_a + \alpha_y + \delta X_{c,y} + \gamma log(whitearrests)_{a,c,y} + \beta BlackSheriff_{a,y} + \varepsilon_{a,c,y} \qquad (3)$$

The coefficient of interest β represents the percent change in black arrests when there is a black sheriff. Changes in the arrest rates over time common to all residents are accounted for by the inclusion of the natural log of the arrests of whites. The year fixed effects, α_y, account for changes in black arrests from year-to-year and depend on the control group being used (within-state sheriffs, within-county local law enforcement, or other sheriffs' offices that experience transitions in other years). The standard errors are estimated using two-way clustering at the county and year levels. The results of using this outcome measure are presented in the top panel of Table A1. The estimates range from 8.2 to 11.7 percent, which is a slightly larger reduction than when using the black arrest rate. The results are consistent across the within-state, within-county, and within-treated designs, and with and without controls for the fraction of residents of each race, the natural log of the population, the natural log of average household income, and the number of sworn officers in each law enforcement agency.

An alternative outcome measure is the ratio of black arrests to total arrests. The primary drawback of this approach is that it is challenging to interpret, as a reduction in black arrests reduces both the numerator and denominator. Thus, for example, an office for which there are only arrests of blacks will always have a ratio of 1, even if there is change in the black arrest rate. However, using the ratio of black to white arrests

is not feasible, as counties with a low fraction of white arrests will have highly inflated ratios. The ratio of black to total arrests is appealing because it mechanically accounts for changes in arrests that are common to blacks and whites.

$$\frac{BlackArrests_{a,c,y}}{TotalArrests_{a,c,y}} = \alpha_a + \alpha_y + \delta X_{c,y} + \beta BlackSheriff_{a,y} + \varepsilon_{a,c,y} \tag{4}$$

The coefficient of interest β represents the change in the ratio of black arrests to total arrests, thus capturing relative changes in the arrest rate of blacks. The year fixed effects, α_y, account for changes in the ratio of black to total arrests that are common to within-state sheriffs, within-county local law enforcement, or other sheriffs' offices that experience transitions in other years. The standard errors are estimated using two-way clustering at the county and year levels. The results of this outcome measure with and without socio-demographic controls are presented in the bottom panel of Table A1. The estimates range from -0.020 to -0.029. These effects can be converted to percentages using the mean ratio and accounting for the fact that black arrests must be accounted for in both the numerator and denominator. This reveals that the estimated reductions range from 7.3 to 11.0 percent. These magnitudes are similar to those generated by the black arrest rate and natural log outcome measures.

The primary analysis omits arrests for unclassified crimes. These arrests appear to vary dramatically from year to year and may include incidents that are not reported consistently within or across agencies. The top panel of Table A2 presents estimates for each of the three outcome measures introduced above but with arrests for unclassified crimes included in the outcome measure. The results are largely consistent with those that exclude these arrests. Specifically, the coefficient on black sheriff for the natural log of black arrests and ratio of black arrests to all arrests are about one-fifth smaller in magnitude, but remain statistically significant for the within-state, within-county, and within-treated specifications. For the black arrest rate, the estimate is similar in magnitude and significant for the within-state and within-county specifications and smaller and insignificant for the within-treated specification.

The final outcome measure attempts to rule out the possibility that the results are driven by erroneous arrest rate reports or outlier years. For example, a large and incorrectly reported arrest total for blacks or whites could bias the estimates. To identify relative outliers, I generate the ratio of arrests in each year relative to the average arrest rate across all years for each agency. The outcomes in the highest and lowest five percent of years are winsorized. The bottom panel of Table A2 reveals that the resulting estimates are

very similar to those without adjustment across the within-state, within-county, and within-treated control groups and across each of the three outcome measures. Thus there is no evidence that the results are biased upward or downward by erroneous reporting or outlier years.

VIII ALTERNATIVE MATCHING METHODS

The within-state approach matches treated sheriffs' offices to potential control offices on the basis of their propensity to experience a transition between a white and a black sheriff. Matching entails a number of options, including the variables used to determine the match and the number of controls matched to each treated sheriff. The primary matching approach presented in the body of the paper links the transition sheriffs to control sheriffs using weights based on an Epanechnikov kernel. As alternatives, this section presents estimates based on nearest-neighbor matching, radius caliper matching, and Gaussian kernel matching. In practice, with the exception of Gaussian matching, each of these approaches results in a control group that is balanced with the transition counties across an array of demographic, economic, and crime characteristics.

The propensity to experience a race transition is estimated based on the characteristics of each sheriff's office in the first observed year (i.e. 1991). The propensity is estimated as a function of the fraction of residents who are black, the population of the county, the average income of the county, the number of arrests made by the office, the ratio of black arrests to all arrests, and the number of officers in the office. In practice, the fraction of residents in the county who are black is the dominant predictor of experiencing a transition (as shown in Figure 1 of the paper). Counties with a high fraction of black residents are likely to have both a black and a white sheriff at some point during the 25 year period, while counties that have a low fraction of black residents rarely have a black sheriff.

Table A3 presents the results for each of four common methods of matching. Column 1 presents estimates based on nearest-neighbor matching without replacement. That is, each transition sheriff is matched to a single non-transition sheriff in the same state that has the same propensity to experience a transition. The results from this method are nearly identical to those from radius matching with a caliper of 0.05, to Gaussian kernel matching, and to Epanechnikov kernel matching. This holds for alternative outcome measures, including the arrest rate of blacks, the natural log of the arrest rate, and the ratio of black arrests to all arrests. The robustness of the estimates to these alternatives indicates that the estimates are being driven by a change in the relative arrests rate of blacks and whites for the treated sheriffs' offices, and not by the

specific method by which matched controls are selected.

IX EMPIRICAL DESIGN: PRE-TRENDS

Identification is dependent on the parallel trends assumption for sheriffs' offices that experience transitions and control agencies. Specifically, this requires that the relative black-white arrest rate for control agencies is similar to what would have been experienced by treated sheriffs' offices in the absence of transitions. These control agencies include sheriffs in the same states serving counties with similar demographics (within-state), local law enforcement agencies operating in the same counties as affected sheriffs (within-county), and other treated sheriffs that experience transitions in different years (within-treated). This section presents several tests of the validity of the parallel trends assumption and the timing of the change in black arrests.

First, I examine whether affected and unaffected agencies experience similar changes in observables during periods when transition agencies have a black sheriff. The primary specification is replicated using observable demographic, economic, and staffing characteristics as the outcome variables. Note that changes in county demographic characteristics cannot be examined for the within-county design. As shown in Table A4, the tests reveal no evidence that counties that experience a change in the race of the sheriff have different trends in the racial composition of the population, the size of the population, average income, and the number of officers employed by the law enforcement agency. This is consistent with the robustness of the results to the inclusion of controls in the primary estimates presented in Table 4.

Second, I examine whether the pre-trends in the relative arrest rate of blacks and whites, and law enforcement staffing levels, are similar prior to the transition. A "years to treatment" variable is created with a value of 0 for the transition year and a negative value corresponding to the number of years until the transition. The within-state and within-county control agencies are assigned the same "years to treatment" values as their corresponding treated sheriff's office. To test for differential trends, I estimate a specification that includes years to treatment and the interaction of this variable with an indicator for being a treated sheriff's office. As shown in Table A5, there is no statistically significant difference in pre-trends for the relative arrest rate in control agencies. There is also no statistically significant difference in the pre-trends for law enforcement officers (deputies or officers) or total staff working in law enforcement offices. The lack of differential pre-trends reveals that race transitions are not preceded by reduced staffing levels, suggesting that financial problems do not precipitate the election of a black sheriff. This alleviates concerns that changes

in the arrest patterns of black sheriffs are caused by reduced staffing or the need to generate greater revenue.

Third, I examine whether allowing for differential time trends for treatment and control agencies affects the estimated effect of sheriff race. The primary specification is replicated with the addition of a separate time trend for treated sheriffs' offices and control agencies. As shown in Table A6, the resulting estimates are very similar to those present in Table 4, suggesting that differential trends do not significantly bias the estimates. In fact, the estimates across the three potential control groups are more similar in this specification than in the baseline estimates, potentially indicating that allowing for differential trends reduces bias and brings the estimates into alignment.

Fourth, I examine the timing of the reduction in black arrests. Figure 2 indicates that there is no trend in the relative rate of black arrests in the years prior to the election of a black sheriff and that there is a sharp change in the first year after the transition. Table A7 presents the estimates corresponding to this graph for agencies that transitioned from a white to a black sheriff. The estimates reveal no significant change in the relative arrest rate of blacks in the year prior to the election or in the year of the election. Conversely, the effects are statistically significant in the first year after the transition and grow in size in the two subsequent years. Separating the effects by three month quarters reveals that the effects are negative in the first quarter after the transition and become statistically significant by the third quarter after the transition.

TABLE A1
All Classified Crimes: Alternative Outcome Measures

	Baseline Specification			With Socioeconomic Controls		
	Within State (1)	Within County (2)	Within Treated (3)	Within State (4)	Within County (5)	Within Treated (6)
Natural Log of Black Arrests						
Black Sheriff	-0.082***	-0.108***	-0.098***	-0.083***	-0.117***	-0.098***
	(0.027)	(0.031)	(0.027)	(0.027)	(0.031)	(0.027)
R-Squared	.956	.963	.962	.956	.965	.963
Mean Dep	5.340	5.525	5.426	5.340	5.525	5.426
Observations	17,270	2,960	1,511	17,270	2,960	1,511
Ratio of Black to All Arrests						
Black Sheriff	-0.020**	-0.027***	-0.026***	-0.021***	-0.029***	-0.027***
	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
R-Squared	.859	.833	.871	.862	.837	.875
Mean Dep	.557	.593	.569	.557	.593	.569
Observations	17,270	2,960	1,511	17,270	2,960	1,511

Note: This table presents estimates of the effect of a black county sheriff on the natural log of the number of arrests of black people and the ratio of black arrests to total arrests. The estimates in columns 1-3 of the top panel are from a specification that includes agency fixed effects, year fixed effects, and the agency arrest rate per thousand white residents. Columns 4-6 add socioeconomic county controls including the fraction of residents of each race, the natural log of the population, the natural log of average household income, and the number of sworn officers in each law enforcement agency. The estimates in columns 1-3 of the bottom panel includes agency fixed effects, year fixed effects, and the fraction of residents that are black. Columns 4-6 add socioeconomic county controls including the fraction of residents of each race, the natural log of the population, the natural log of average household income, and the number of sworn officers in each law enforcement agency. The within-state specification includes matched county sheriffs' offices in states that had at least one county sheriff transition between 1991 and 2015. Matching weights are based on an Epanechnikov kernel and the probability of having experienced a transition. The within-county specification includes sheriffs' offices and municipal police departments operating in counties that experienced a sheriff race transition. The within-treated specification restricts attention to treated sheriffs' offices and exploits the differential timing of the transition. Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE A2
Alternative Data Samples: Including Unclassified Offenses and Winsorization

	Arrest Rate			Natural Log			Ratio		
	Within State (1)	Within County (2)	Within Treated (3)	Within State (4)	Within County (5)	Within Treated (6)	Within State (7)	Within County (8)	Within Treated (9)
Including Unclassified Offenses									
Black Sheriff	-1.288*	-1.423*	-0.940	-0.058*	-0.084**	-0.076**	-0.017**	-0.023**	-0.023***
	(0.753)	(0.836)	(0.783)	(0.031)	(0.034)	(0.032)	(0.007)	(0.008)	(0.008)
R-Squared	.903	.922	.906	.958	.964	.965	.881	.843	.884
Mean Dep	32.951	36.527	33.494	5.708	5.827	5.778	.570	.602	.581
Observations	17,270	2,960	1,511	17,270	2,960	1,511	17,270	2,960	1,511
Winsorizing at the 5th and 95th Percentile									
Black Sheriff	-1.823***	-1.692**	-1.821***	-0.084**	-0.110***	-0.102***	-0.022**	-0.031***	-0.028***
	(0.547)	(0.616)	(0.555)	(0.031)	(0.033)	(0.031)	(0.009)	(0.009)	(0.009)
R-Squared	.885	.923	.897	.956	.962	.960	.871	.828	.866
Mean Dep	21.861	25.980	22.497	5.347	5.529	5.434	.556	.592	.567
Observations	17,270	2,960	1,511	17,270	2,960	1,511	17,193	2,958	1,511

Note: This table presents estimates of the effect of a black county sheriff on black arrests while including "other" unclassified offenses and after winsorizing the top and bottom 5 percent of the data. Outlier data is identified as the ratio of annual arrests relative to agency means. The estimates are presented for each potential outcome measure: arrests per one thousand black residents, the natural log of the number of arrests, and the ratio of black arrests to all arrests. The within-state specification includes matched county sheriffs' offices in states that had at least one county sheriff transition between 1991 and 2015. Matching weights are based on an Epanechnikov kernel and the probability of having experienced a transition. The within-county specification includes sheriffs' offices and municipal police departments operating in counties that experienced a sheriff race transition. The within-treated specification restricts attention to treated sheriffs' offices and exploits the differential timing of the transition. Each specification includes agency fixed effects, year fixed effects, and the agency arrest rate per thousand white residents or natural log of arrests of whites. Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE A3
Alternative Matching Methods

	Nearest Neighbor (1)	Radius Caliper (2)	Gaussian Kernel (3)	Epanechnikov Kernel (4)
Arrests Per Thousand Black Residents				
Black Sheriff	-1.714**	-1.726***	-1.718***	-1.713***
	(0.643)	(0.546)	(0.546)	(0.546)
R-Squared	.876	.883	.88	.884
Mean Dep	22.846	21.938	22.112	21.943
Observations	3010	17270	17270	17270
Natural Log of Black Arrests				
Black Sheriff	-0.080**	-0.083**	-0.082**	-0.082**
	(0.034)	(0.031)	(0.031)	(0.031)
R-Squared	.955	.954	.954	.954
Mean Dep	5.485	5.334	5.289	5.340
Observations	3010	17,270	17,270	17,270
Ratio of Black to All Arrests				
Black Sheriff	-0.019**	-0.020**	-0.020**	-0.020**
	(0.008)	(0.008)	(0.008)	(0.008)
R-Squared	.891	.865	.884	.865
Mean Dep	.559	.556	.535	.557
Observations	3,010	17,270	17,270	17,270

Note: This table presents estimates of the effect of a black county sheriff for several alternative methods of matching sheriffs that experience transitions to sheriffs that did not. The first column presents the results from one-to-one nearest neighbor matching without replacement. Column 2 uses radius matches with a caliper of 0.05. Columns 3 and 4 use Gaussian and Epanechnikov kernel matching, respectively. The top panel presents arrests per one thousand black residents, the middle panel presents the natural log of the number of arrests, and the bottom panel presents the ratio of black arrests to all arrests. Each specification includes agency fixed effects, year fixed effects, and the agency arrest rate per thousand white residents (top panel) or natural log of arrests of whites (bottom panel). Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE A4
Sheriff Race and Changes in Covariates

	Fraction Am. Ind. (1)	Fraction Asian (2)	Fraction Black (3)	Fraction White (4)	Log Income (5)	Log Population (6)	Log Officers (7)
Within-State Specification							
Black Sheriff	-0.000	0.001	0.001	-0.002	0.001	0.005	-0.025
	(0.001)	(0.001)	(0.005)	(0.005)	(0.006)	(0.016)	(0.025)
Mean Dep	.010	.009	.425	.555	10.141	10.458	3.567
Within-Treated Specification							
Black Sheriff	-0.000	-0.000	-0.003	0.004	-0.002	-0.002	-0.032
	(0.001)	(0.001)	(0.005)	(0.006)	(0.006)	(0.015)	(0.025)
Mean Dep	.015	.011	.433	.541	10.158	10.473	3.592

Note: This table presents tests for whether or not years during which a county has a black sheriff differ from other years in terms of demographic composition, average income, population size, or number of deputies. The primary specification is replicated with each socio-economic characteristic as an outcome. The top panel presents the specification for matched sheriffs within the same state, while the bottom panel includes only treated counties over time. Matching weights are based on an Epanechnikov kernel and the probability of having experienced a transition. Note that characteristics are measured at the county level, so the within-county specification is not included. Each specification includes agency fixed effects and fixed effects for each year. Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE A5
Test of Differential Pre-Trends for Within-State and Within-County Controls

	Black Arrest Measures			Law Enforcement	
	Arrest Rate (1)	Natural Log (2)	Ratio (3)	Deputies (4)	Total Staff (5)
Within-State Specification					
Treated * Years to Transition	-0.052	0.002	0.001	-0.001	-0.002
	(0.158)	(0.008)	(0.002)	(0.010)	(0.008)
Mean Dep	22.196	5.485	0.551	3.664	4.092
Within-County Specification					
Treated * Years to Transition	0.040	-0.009	-0.001	0.000	0.002
	(0.212)	(0.008)	(0.002)	(0.011)	(0.010)
Mean Dep	26.529	5.630	0.590	3.558	3.869

Note: This table presents a test for differential pre-trends for sheriffs offices that experience transitions and their controls. The top panel tests for differential pre-trends for matched sheriffs offices, while the bottom panel presents the tests for local law enforcement agencies located in the same county as the sheriff. Matching weights are based on an Epanechnikov kernel and the probability of having experienced a transition. Columns 1-3 present the pre-trends test for the black arrest rate, the natural log of black arrests, and the ratio of black arrests to all arrests. Each specification includes agency fixed effects and years to the race transition, where negative values are used for years prior to the transition. Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE A6
Transition Estimates with Differential Time Trends

	Arrest Rate			Natural Log			Ratio		
	Within State (1)	Within County (2)	Within Treated (3)	Within State (4)	Within County (5)	Within Treated (6)	Within State (7)	Within County (8)	Within Treated (9)
Black Sheriff	-1.582***	-1.702***	-1.642***	-0.100***	-0.105***	-0.098***	-0.025***	-0.027***	-0.026***
	(0.543)	(0.541)	(0.539)	(0.031)	(0.035)	(0.030)	(0.008)	(0.008)	(0.008)
R-Squared	.884	.921	.894	.954	.962	.959	.860	.833	.871
Mean Dep	21.943	26.052	22.558	21.943	26.052	22.558	.557	.593	.569
Observations	17,270	2,960	1,511	17,270	2,960	1,511	17,270	2,960	1,511

Note: This table presents estimates of the effect of a black county sheriff on black arrests while controlling for a separate time trend for law enforcement agencies that are and are not affected by transitions. The estimates are presented for each potential outcome measure: arrests per one thousand black residents, the natural log of the number of arrests, and the ratio of black arrests to all arrests. The within-state specification includes matched county sheriffs' offices in states that had at least one county sheriff transition between 1991 and 2015. Matching weights are based on an Epanechnikov kernel and the probability of having experienced a transition. The within-county specification includes sheriffs' offices and municipal police departments operating in counties that experienced a sheriff race transition. The within-treated specification restricts attention to treated sheriffs' offices and exploits the differential timing of the transition. Each specification includes agency fixed effects, year fixed effects, and the agency arrest rate per thousand white residents or natural log of arrests of whites. Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.

TABLE A7
Changes in Black Arrests by Year and Quarter

Natural Log of Black Arrests: Annually								
	Year -1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Within-Treated	-0.002	-0.014	-0.070*	-0.081*	-0.083*	-0.048	-0.091*	-0.076
	(0.033)	(0.032)	(0.041)	(0.041)	(0.046)	(0.055)	(0.050)	(0.053)
Natural Log of Black Arrests: Quarterly								
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7	Quarter 8
Within-Treated	-0.077	-0.008	-0.102**	-0.107**	-0.035	-0.069	-0.193***	-0.127**
	(0.050)	(0.045)	(0.049)	(0.051)	(0.057)	(0.055)	(0.061)	(0.063)

Note: This table presents estimates of the effect of a black county sheriff on the natural log of black arrests. The top panel presents the estimates annually, including two years before and six years after the transition. Year 0 corresponds to the year the sheriff was elected and Year 1 corresponds to their first year in office. The bottom panel presents estimates for the first 8 quarters after the transition. Each quarters represents a three month period. The estimates are based timing within treated agencies while controlling for the natural log of white arrests. Standard errors are based on two-way clustering at the county and year levels. The symbols *, **, and *** represent statistical significance at 10, 5, and 1 percent, respectively.