Supplementary Materials

October 10, 2013

1 Ballot Language

The exact language on the ballot in Milwaukee was as follows:

> Shall the City of Milwaukee adopt Common Council File 080420, being a substitute ordinance requiring employers within the city to provide paid sick leave to employees?

2 Legislative District Exact Matches Maps

Here, we include maps of the legislative districts in Milwaukee county that overlap. Figure 2 shows the areas where all three districts intersect. All matches occur within these areas in orange in Figure 2.
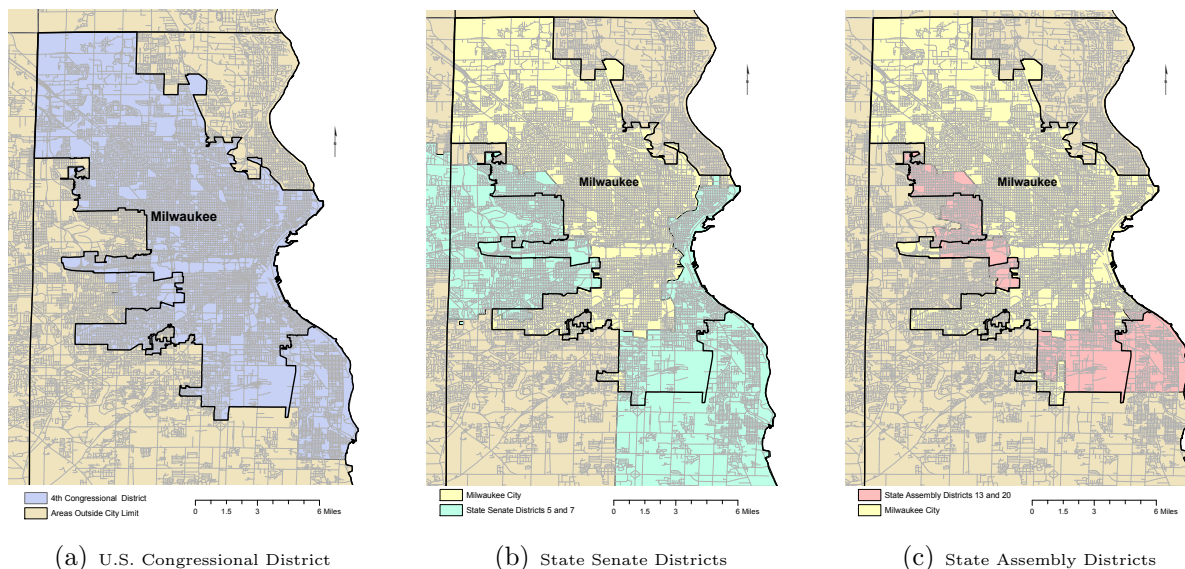

(a) U.S. Congressional District   (b) State Senate Districts   (c) State Assembly Districts

Figure 1: State Assembly, State Senate, and U.S. Congressional Districts in Milwaukee County that Overlap.

Milwaukee

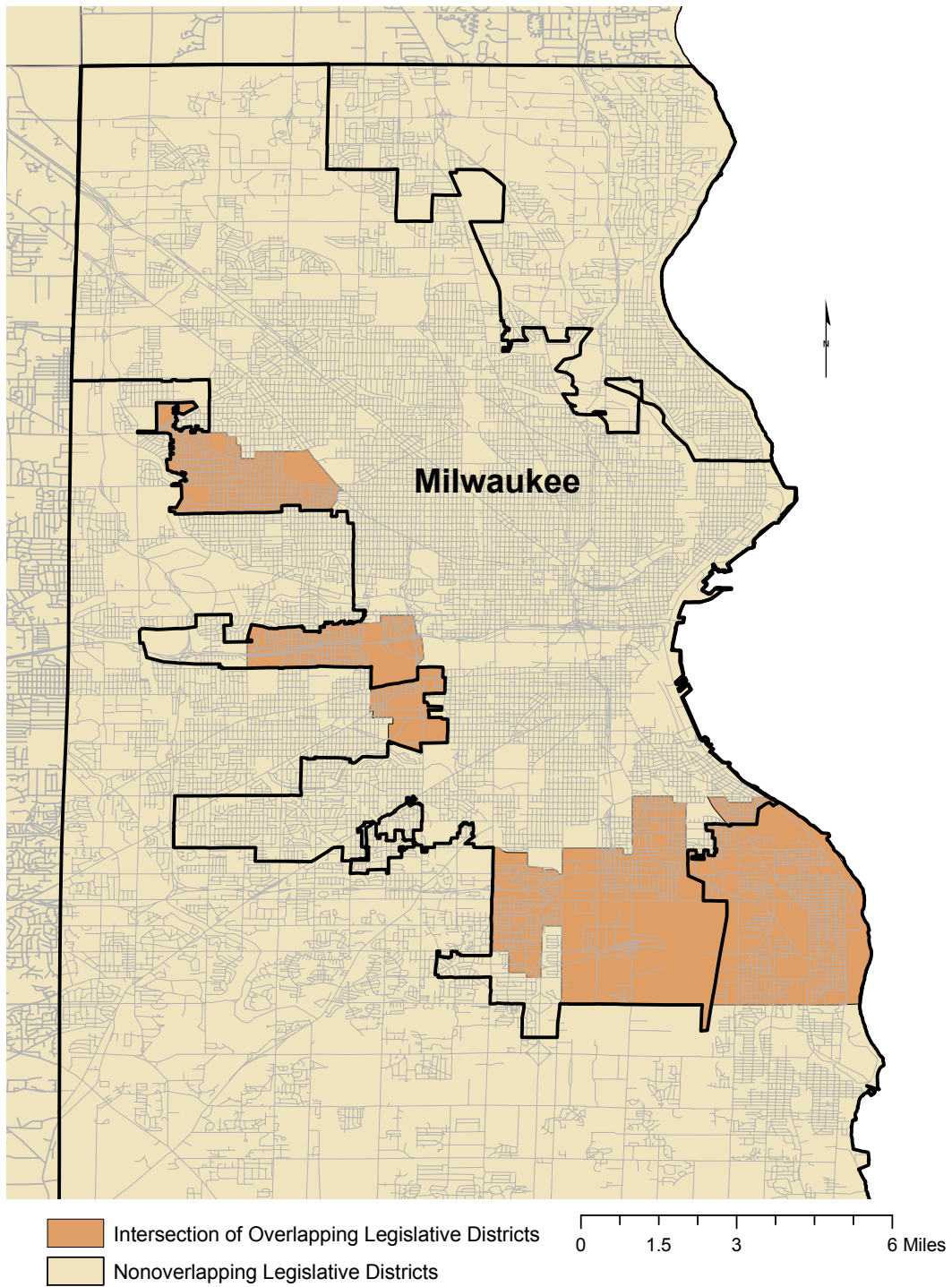|	
�	Intersection of Overlapping Legislative Districts
	Nonoverlapping Legislative Districts

0   1.5   3   6 Miles

Figure 2: Intersection of State Assembly, State Senate, and U.S. Congressional Districts in Milwaukee County.

3 Additional Balance Results

3.1 Balance From Legislative Exact Matches

Table 1 reports pre-matching covariate balance between treated and control units in the full dataset, and in the *Legislative District Exact Match I* and *Legislative District Exact Match II* subsets. In the full unmatched data, the treatment group includes all citizens in the city of Milwaukee and the control group is comprised of the all citizens in the adjacent suburbs. As shown in the first panel of Table 1, the differences between voters in the city and those in the suburbs are large. Voters in the city are younger, more likely to be male, voted less often in prior elections and have houses that cost less. The two lower panels of the table show that matching exactly on legislative districts is extremely successful in removing age, gender, turnout, and housing price mean differences in the *Legislative District Exact Match I* subset, but less successful in the *Legislative District Exact Match II* subset.

3.2 Balance Results for Age

In the main text, we do not report how the various designs altered the balance in age. We omit age since housing value is a more important covariate and the patterns in balance are the same. Instead we report the age balance results in Table 2.

3.3 Fine Balance on Housing Values

As we mentioned in the text, for housing values we might prefer to not only have similar mean matches but that the distribution of housing values across the treated and control groups to be similar. To enforce a distributional constraint, we use fine balance and required that house prices have the same distribution in treated and control groups without constraining how units are matched (Rosenbaum et al. 2007; Rosenbaum 1989, §3.2). We matched with fine balance for seven categories of housing price. Tables 3 and 4 show the distribution of the seven category measure before matching as well as with and without fine balance. All the results in the main text except for matches on distance alone include fine balance.

Table 1: Change in balance as a function of exact matching on legislative districts.

	Milwaukee County		
	Mean Treated	Mean Control	Abs. Std. Diff.
Age	38.0	45.7	0.36
Male	0.80	0.57	0.15
Turnout 2006	0.46	0.61	0.29
Turnout 2004	0.69	0.77	0.18
Housing Value	154605	218870	0.34
	Legislative District Exact Match I		
	Mean Treated	Mean Control	Std. Diff.
Age	49.8	50.3	0.03
Male	0.48	0.47	0.01
Turnout 2006	0.64	0.60	0.10
Turnout 2004	0.84	0.81	0.07
Housing Value	164302	160801	0.16
	Legislative District Exact Match II		
	Mean Treated	Mean Control	Abs. Std. Diff.
Age	48.0	47.2	0.05
Male	0.45	0.51	0.12
Turnout 2006	0.64	0.52	0.25
Turnout 2004	0.83	0.73	0.23
Housing Value	158736	144570	0.70

Note: In *Legislative District Exact Match I*, all voters are in the 4th Congressional district, the 7th State Senate district, and the 20th State Assembly district. In *Legislative District Exact Match II*, all voters are in the 4th Congressional district, the 5th State Senate district, and the 13th State Assembly district. Std. Diff.= absolute standardized difference.

Table 2: Balance Results for Age Across All Matched Designs

	Age			Pairs
	Mean Treated	Mean Control	Abs. Std. Diff	
	Legislative District Exact Match I			
Unmatched	53.83	54.33	0.03	–
Design 1	53.26	53.47	0.01	2704
Design 2	52.65	54.41	0.10	2524
Design 3	52.93	53.90	0.06	1939
	Legislative District Exact Match II			
Unmatched	51.9	51.1	0.05	–
Design 1	51.6	51.1	0.02	1667
Design 2	50.1	51.1	0.06	1663
Design 3	50.2	50.9	0.04	536

Note: Covariate balance in three matched comparisons. For all designs, exact matching was done on sex, Congressional district, State Senate district, and State Assembly district, and only for observations within 750 meters from the border of each legislative district triplet. Design 1 additionally matches exactly on voting history and minimizes the total sum of covariate distances based on a rank-based Mahalanobis distance; it also contrains the means of age and housing price to be less or equal than 1 year and $1000, respectively, and matches with fine balance for seven categories of housing price. Design 2 minimizes the total sum of geographic distances between matched pairs. Design 3 additionally matches exactly on voting history, and minimizes the total sum of geographic distances between matched pairs plus simultaneously matching on the same covariates as in Design 2. In *Legislative District Exact Match I*, all voters are in the 4th Congressional district, the 7th State Senate district, and the 20th State Assembly district. In *Legislative District Exact Match II*, all voters are in the 4th Congressional district, the 5th State Senate district, and the 15th State Assembly district. Abs. Std. Diff.= absolute standardized difference. Distance is measured in kilometers from control voter to treated voter residence. In the unmatched designs, *Pairs* shows the original number of treated observations; original number of controls is 7396 in Legislative District Exact Match I and 9089 in Legislative District Exact Match II.

Table 3: Fine Balance for Seven Categories of Housing Value in Thousands of Dollars Legislative District Exact Match I

	[0, 140)	[140, 150)	[150, 160)	[160, 175)	[175, 195)	[195, 220)	[220, 324]
Treated Before Matching	250	1313	850	485	314	22	96
Control Before Matching	156	992	3064	951	1013	1201	19
Treated no Fine Balance	149	1281	717	265	128	0	0
Control no Fine Balance	13	910	1428	177	12	0	0
Treated Fine Balance	13	911	719	255	126	0	0
Control Fine Balance	13	911	719	255	126	0	0

Table 4: Fine Balance for Seven Categories of Housing Value in Thousands of Dollars Legislative District Exact Match II

	[0, 140)	[140, 150)	[150, 160)	[160, 175)	[175, 195)	[195, 220)
Treated Before Matching	949	4787	791	275	0	0
Control Before Matching	245	58	887	677	399	191
Treated no Fine Balance	0	509	239	67	0	0
Control no Fine Balance	245	44	303	221	0	2
Treated Fine Balance	0	50	231	67	0	0
Control Fine Balance	0	50	231	67	0	0

4 Balance tests in geographic buffers

Balance tests for age in distance buffers
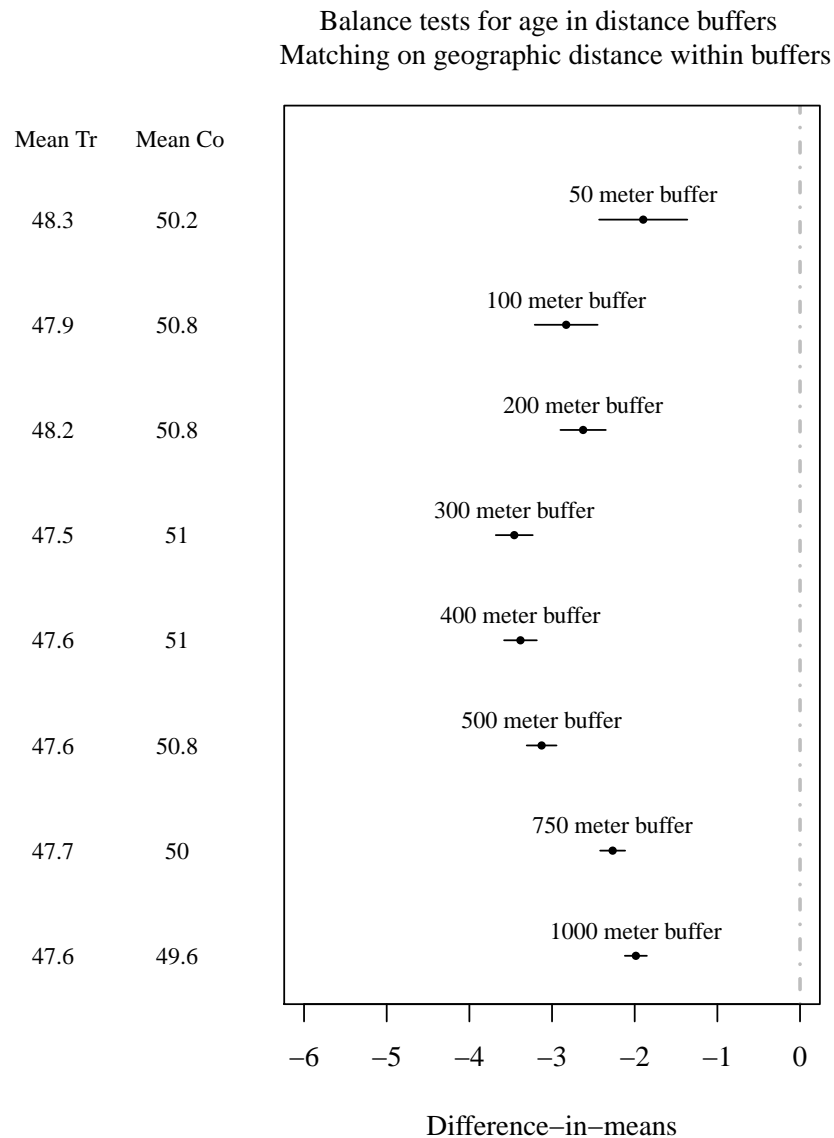Matching on geographic distance within buffers

Figure 3: Difference-in-means in age at individual level between treatment and control groups for different buffers around the Milwaukee city limit, matching on geographic distance within each buffer. Unit is years. Dots are difference-in-means and bars are 95% confidence intervals based on paired t-tests.

References

Rosenbaum, P. R. (1989), "Optimal Matching for Observational Studies," *Journal of the American Statistical Association*, 84, 1024–1032.

Rosenbaum, P. R., Ross, R. N., and Silber, J. H. (2007), "Mimimum Distance Matched Sampling with Fine Balance in an Observational Study of Treatmetnt for Ovarian Cancer," *Journal of the American Statistical Association*, 102, 75–83.