Political Representation and Effects of Municipal Mergers

Oskari Harjunen[1]

Tuukka Saarimaa[2]

Janne Tukiainen[3]

Supporting Information

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This document includes Online Appendices to paper "Political Representation and Effects of Municipal Mergers" published in *Political Science Research and Methods*. Appendix A includes additional results and Appendix B includes results for the validity checks discussed in the main text.

[1] Aalto University School of Business and City of Helsinki – Urban Research and Statistics. P.O. Box 5500, 00099 City of Helsinki. Email: oskari.harjunen@hel.fi.

[2] Aalto University School of Business and School of Engineering, Helsinki Graduate School of Economics and VATT Institute for Economic Research. P.O. Box 21210, FI-02150 Espoo Finland. Email: tuukka.saarimaa@aalto.fi.

[3] Corresponding author. Department of Government, London School of Economics and Political Science, and VATT Institute for Economic Research. P.O. Box 1279 (Arkadiankatu 7), FI-00101 Helsinki, Finland. Email: janne.tukiainen@vatt.fi.

Online Appendix A. Additional results.

Table A1. Number of hypothetical, matched and actual mergers by merger size.

Number of municipalities	Hypothetical mergers	Matched controls	Actual mergers
2	277	70	14
3	432	35	7
4	687	20	4
5	1,090	5	1
6	1,643	10	2
10	3,836	5	1
Total	7,965	145	29

Table A2. Regression DID results with merger level data.

	Expenditures	Operating margin	Tax rate	House price
	[1]	[2]	[3]	[4]
Constant	3313.1**	-2664.1**	18.26**	6.739**
	[31.3]	[18.7]	[0.046]	[0.018]
Merger	86.18	-6.88	-0.229	0.084
	[86.80]	[62.41]	[0.131]	[0.045]
Merger * 2009	132.7	87.93**	-0.236**	0.029
	[99.4]	[32.06]	[0.085]	[0.017]
Merger * 2010	174.8	30.19	-0.044	0.029
	[117.5]	[36.22]	[0.115]	[0.018]
Merger * 2011	152.5	27.89	-0.038	0.033
	[125.4]	[41.15]	[0.114]	[0.021]
Merger * 2012	162.1	-58.06	0.088	0.044*
	[138.5]	[47.71]	[0.124]	[0.021]
Merger * 2013	38.09	-6.36	0.146	0.027
	[142.5]	[58.58]	[0.119]	[0.026]
Merger * 2014	89.24	-147.21	0.272*	0.033
	[142.3]	[90.51]	[0.129]	[0.025]
Merger * 2015	27.88	-52.64	0.300*	0.021
	[145.3]	[64.36]	[0.139]	[0.030]
Merger * 2016	37.69	-59.37	0.395**	0.054
	[154.2]	[75.37]	[0.142]	[0.033]
R^2	0.74	0.85	0.68	0.30
N	2958	2958	2958	2802

Notes: The results are from OLS models. The non-merged control group is constructed using nearest neighbor matching algorithm. All the models include year dummies. Standard errors are clustered at the merger level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table A3. Tests for pre-treatment common trends for expenditures, operating margin, tax rate and house prices with merger level data.

	Expenditures	Operating margin	Tax rate	House price
	[1]	[2]	[3]	[4]
Constant	3322.40**	-2669.32**	18.26**	6.743**
	[30.18]	[18.05]	[0.049]	[0.018]
Merger	30.36	24.62	-0.245*	0.059
	[73.62]	[55.68]	[0.122]	[0.037]
Merger * 2001	32.83*	-26.58	-0.012	0.026*
	[15.11]	[14.66]	[0.019]	[0.011]
Merger * 2002	56.93*	-32.61	-0.045	0.011
	[22.47]	[17.78]	[0.043]	[0.012]
Merger * 2003	27.2	-24.52	-0.031	0.018
	[26.44]	[19.69]	[0.050]	[0.017]
Merger * 2004	28.81	-16.74	-0.035	0.026
	[34.77]	[22.64]	[0.056]	[0.019]
Merger * 2005	74.71	-30.41	0.054	0.027
	[42.00]	[27.54]	[0.076]	[0.021]
Merger * 2006	75.5	-34.26	0.082	0.037
	[47.56]	[31.95]	[0.094]	[0.024]
Merger * 2007	78.2	-38.75	0.046	0.043
	[51.69]	[32.24]	[0.101]	[0.025]
Merger * 2008	128.20*	-79.62*	0.087	0.036
	[59.13]	[35.01]	[0.107]	[0.026]
R^2	0.68	0.77	0.26	0.24
N	1566	1566	1566	1482

Notes: The results are from OLS models and correspond to the results in Table A2. The data are from 2000–2008. The non-merged control group is constructed using nearest neighbor matching algorithm. All the models include year dummies. Standard errors are clustered at the merger level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table A4. Regression DID results with pre-merger municipality level data.

	Administration	Schooling	Health and social care
	[1]	[2]	[3]
Constant	-0.001	-0.001	0.005
	[0.003]	[0.004]	[0.007]
Merger	0.010**	0.013**	0.027**
	[0.002]	[0.003]	[0.006]
Seat share	0.011**	0.022**	0.037**
	[0.003]	[0.004]	[0.007]
Merger*2009	-0.008**	-0.006**	-0.014**
	[0.001]	[0.001]	[0.003]
Merger*2010	-0.006**	-0.001	-0.010**
	[0.001]	[0.001]	[0.003]
Merger*2012	-0.007**	-0.002	-0.011**
	[0.001]	[0.001]	[0.003]
Merger*2014	-0.007**	-0.001	-0.009**
	[0.002]	[0.001]	[0.002]
Merger*2015	-0.006**	-0.0002	-0.012**
	[0.002]	[0.001]	[0.003]
Seat share*2009	0.013**	0.007**	0.029**
	[0.002]	[0.002]	[0.005]
Seat share*2010	0.012**	0.001	0.021**
	[0.002]	[0.002]	[0.004]
Seat share*2012	0.014**	0.004	0.024**
	[0.002]	[0.002]	[0.004]
Seat share*2014	0.014**	0.002	0.023**
	[0.002]	[0.002]	[0.005]
Seat share*2015	0.012**	0.001	0.027**
	[0.002]	[0.002]	[0.005]
R^2	0.04	0.08	0.12
N	4968	4968	4968

Notes: The results are from OLS models. The non-merged control group is constructed using nearest neighbor matching algorithm All the models include year dummies. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table A5. Tests for pre-treatment common trends for number of jobs per capita with pre-merger municipality level data.

	Administration	Schooling	Health and social care
	[1]	[2]	[3]
Constant	-0.000	0.001	0.005
	[0.003]	[0.004]	[0.007]
Merger	0.009**	0.013**	0.026**
	[0.002]	[0.003]	[0.006]
Seat share	0.011**	0.020**	0.037**
	[0.002]	[0.004]	[0.007]
Merger*2003	-0.001	-0.003	0.002
	[0.001]	[0.002]	[0.002]
Merger*2005	0.001	-0.002	0.001
	[0.001]	[0.001]	[0.002]
Merger*2007	-0.001	-0.001	0.001
	[0.002]	[0.001]	[0.002]
Seat share*2003	0.002	0.004	-0.001
	[0.001]	[0.003]	[0.003]
Seat share*2005	-0.000	0.001	-0.002
	[0.002]	[0.002]	[0.003]
Seat share*2007	0.001	0.002	0.003
	[0.003]	[0.002]	[0.004]
R^2	0.03	0.08	0.08
N	2208	2208	2208

Notes: The results are from OLS models and correspond to the results in Table A4. The data are from 2000, 2003, 2005 and 2007. The non-merged control group is constructed using nearest neighbor matching algorithm All the models include year dummies. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table A6. Regression DID results for house prices with pre-merger municipality level data.

	House prices [1]		House prices [2]
Constant	6.501**	Constant	6.684**
	[0.090]		[0.042]
Merger	0.165*		
	[0.068]		
Seat share	0.253**	Population share	0.209*
	[0.084]		[0.086]
Merger * 2009	-0.012		
	[0.021]		
Merger * 2010	-0.03		
	[0.026]		
Merger * 2011	-0.002		
	[0.032]		
Merger * 2012	-0.03		
	[0.040]		
Merger * 2013	-0.082		
	[0.050]		
Merger * 2014	-0.112*		
	[0.053]		
Merger * 2015	-0.104		
	[0.055]		
Seat share*2009	0.067*	Population share*2009	0.025
	[0.032]		[0.038]
Seat share*2010	0.089*	Population share*2010	0.025
	[0.037]		[0.032]
Seat share*2011	0.057	Population share*2011	0.04
	[0.046]		[0.031]
Seat share*2012	0.093	Population share*2012	0.056
	[0.056]		[0.037]
Seat share*2013	0.150*	Population share*2013	-0.022
	[0.063]		[0.056]
Seat share*2014	0.206**	Population share*2014	0.11
	[0.066]		[0.066]
Seat share*2015	0.164*	Population share*2015	0.057
	[0.069]		[0.045]
R^2	0.31		0.35
N	4624		3968

Notes: The results are from OLS models and correspond to Fig. 4 in the main text. The non-merged control group is based on nearest neighbor matching algorithm All the models include year dummies. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table A7. Tests for pre-treatment common trends for house prices with pre-merger municipality level data.

	House prices [1]		House prices [2]
Constant	6.527**	Constant	6.681**
	[0.078]		[0.039]
Merger	0.147**		
	[0.056]		
Seat share	0.228**	Population share	0.218**
	[0.071]		[0.072]
Merger * 2001	0.012		
	[0.015]		
Merger * 2002	-0.013		
	[0.011]		
Merger * 2003	0.003		
	[0.016]		
Merger * 2004	0.006		
	[0.021]		
Merger * 2005	-0.017		
	[0.022]		
Merger * 2006	-0.016		
	[0.026]		
Merger * 2007	-0.018		
	[0.031]		
Merger * 2008	-0.018		
	[0.031]		
Seat share * 2001	0.008	Population share * 2001	0.0003
	[0.024]		[0.016]
Seat share * 2002	0.039*	Population share * 2002	0.003
	[0.018]		[0.021]
Seat share * 2003	0.001	Population share * 2003	-0.015
	[0.026]		[0.036]
Seat share * 2004	-0.0003	Population share * 2004	-0.017
	[0.032]		[0.039]
Seat share * 2005	0.047	Population share * 2005	-0.026
	[0.035]		[0.043]
Seat share * 2006	0.052	Population share * 2006	0.009
	[0.040]		[0.053]
Seat share * 2007	0.043	Population share * 2007	-0.01
	[0.046]		[0.056]
Seat share * 2008	0.038	Population share * 2008	-0.022
	[0.048]		[0.058]
R^2	0.27		0.29
N	2601		2232

Notes: The results are from OLS models and correspond to Fig. 4 in the main text and Table A6. The data are from 2000–2008. The non-merged control group is based on nearest neighbor matching algorithm All the models include year dummies. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

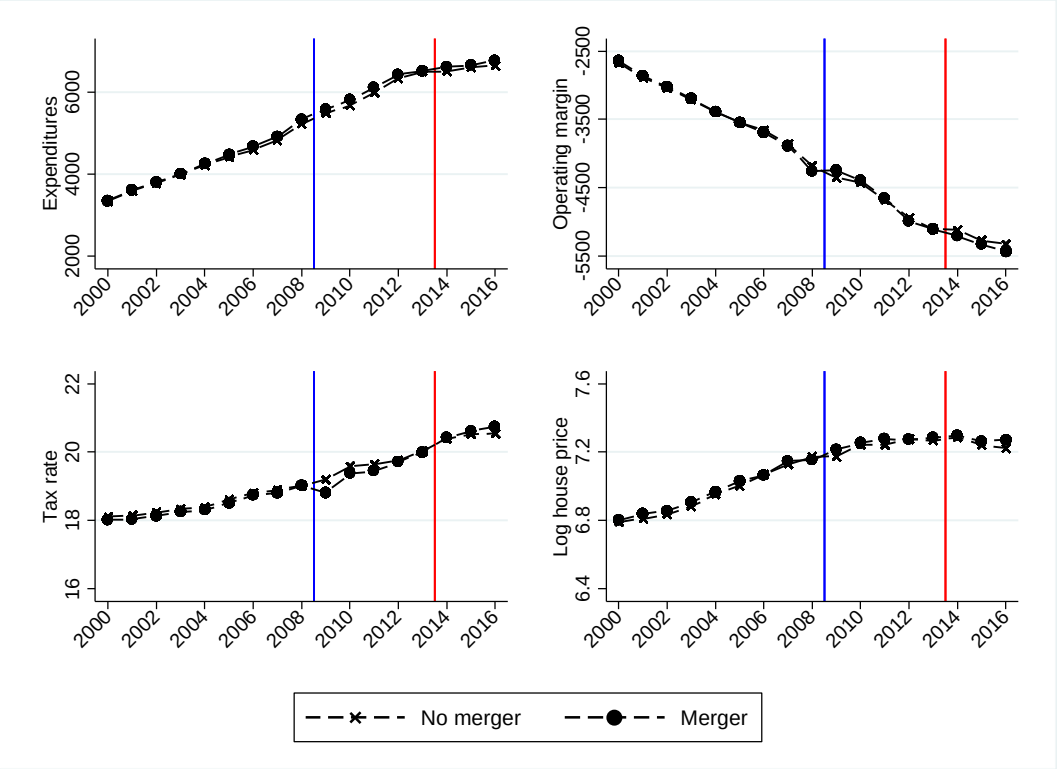

Fig. A1. Graphical DID results with an alternative control group.

Note: The non-merged control group is constructed using nearest neighbor matching algorithm where the control units are individual municipalities instead of hypothetical mergers. The variables used for matching in this case are population, income tax base and income tax rate. The blue vertical lines highlight the post-merger period and the red vertical lines the end of the 5-year layoff protection period for municipal employees.

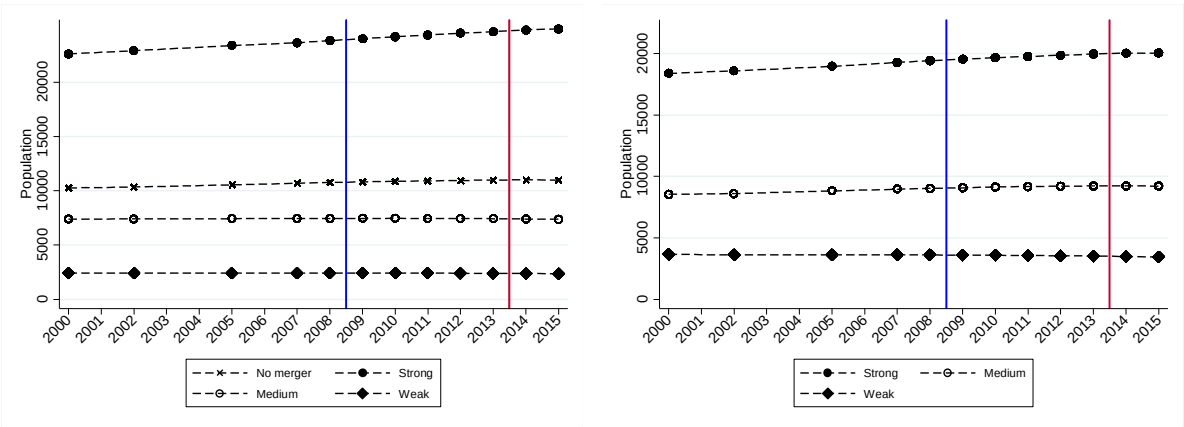

Fig. A2. Population with pre-merger municipality level data.

Notes: The left-hand side figures illustrate the true treatment effects based on municipal seat shares in the post-merger councils. The right-hand side figures illustrate the placebo treatments for the non-merged control group based on municipal population shares. The non-merged control group is based on nearest neighbor matching algorithm. The blue vertical lines highlight the post-merger period and the red vertical lines the end of the 5-year layoff protection period for municipal employees.

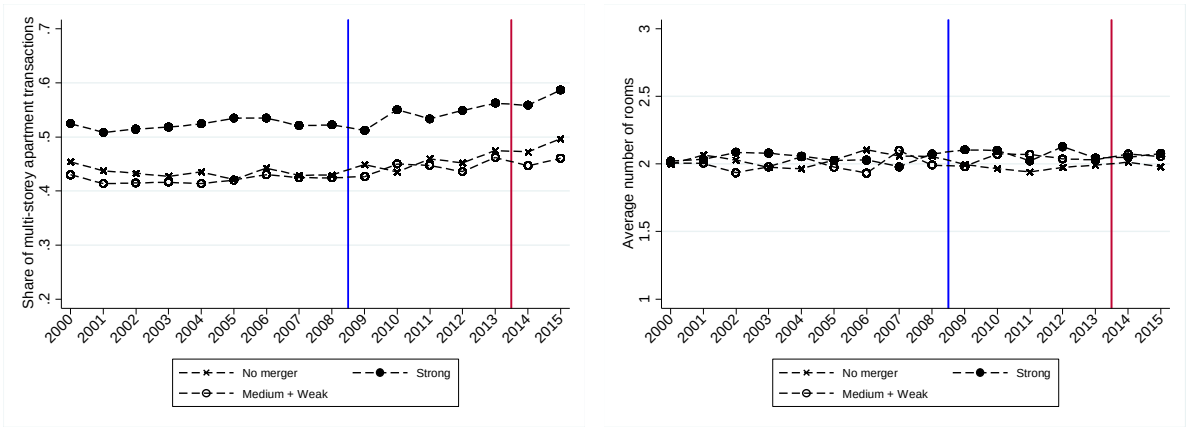

Fig. A3. Composition of housing transactions.

Notes: The left-hand side figure illustrates the share of apartments in multi-storey buildings out of all transactions. The right-hand side figure illustrates the average number of rooms in the transactions of apartments in multi-storey buildings. Due to small number of observations in the Weak representation group, Medium and Weak groups are combined in the figure. The blue vertical lines highlight the post-merger period and the red vertical lines the end of the 5-year layoff protection period for municipal employees.

Online Appendix B. Validity checks.

This Appendix presents results for the validity checks discussed in Section 4.3 in the main text. We have conducted three additional validity checks. The first concern is that the small merged municipalities are in a different business cycle compared to their larger partners, which have impacts also on local public jobs and house prices. We address this issue by analyzing the number of other jobs in the municipalities, defined as all jobs minus the job categories analyzed in Fig. 3 and Table A4. These jobs, although they may include some municipal jobs, can be seen as a placebo outcome in the sense that merging should not have a direct effect on them.

According to Fig. B1 below, nothing happened to these jobs in any of the representation subgroups or in the control group and its subgroups. This adds credibility to our results as it suggests that the different-sized merged municipalities are in the same business cycle with respect to labor market outcomes.

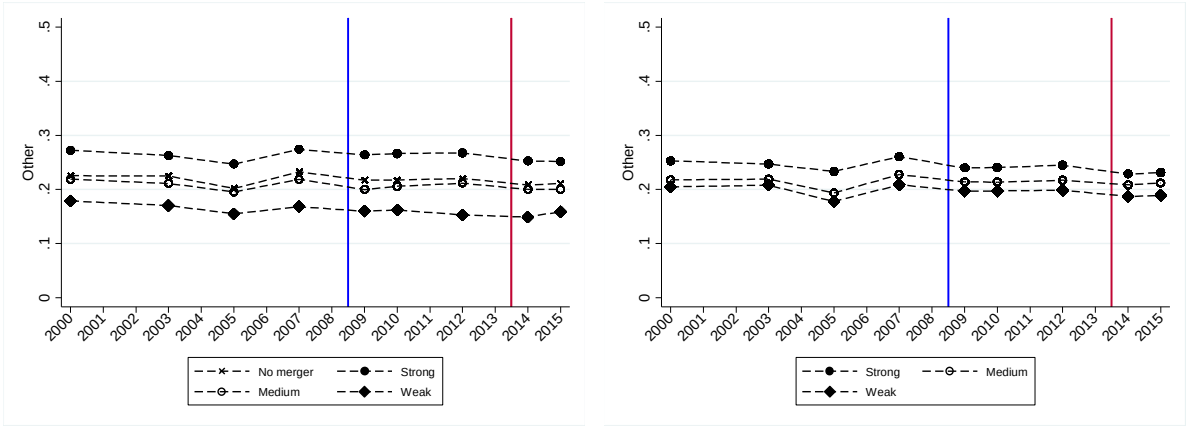

Fig. B1. Number of jobs in all other sectors with pre-merger municipality level data.

Notes: The left-hand side figure illustrates the true treatment effects based on municipal seat shares in the post-merger councils. The right-hand side figure illustrates the placebo treatments for the non-merged control group based on municipal population shares. The non-merged control group is based on nearest neighbor matching algorithm. The blue vertical lines highlight the post-merger period and the red vertical lines the end of the 5-year layoff protection period for municipal employees.

The second set of validity checks addresses the interpretation of the results. The results suggest that political representation is an important driver of what happens to local services after the merger, but it is not the only explanation consistent with these findings. One alternative explanation is that due to economies of scale it makes sense to concentrate some services to larger municipalities and shutdown facilities in smaller ones. Under this interpretation, the effects would still be due to merging, but they would not be related to political representation *per se*.

We test this possibility using two alternative model specifications based on the observation that economies of scale work through population size, not the relative size of the municipalities in a merger. A particular merger can enhance economies of scale from the point of view of a particular municipality if the municipality itself is small before merging and/or if the merger results in a large increase in population size, i.e. the merger as a whole is much bigger then the individual municipality.

We measure the potential for economies of scale in two ways. First, we estimate a model where we include the pre-merger population *level* of the municipality (the 2007 population) as an additional treatment variable in the DID regression. In the second alternative specification, we add the population difference of the municipality and the total population of the merger. We add these variables to the model along with the seat share measure and subject these treatments into a horse race. If the results are driven by municipal size and the associated economies of scale, the two population treatments should capture the effects and we should observe a zero effect for the seat share treatment.

The results from these models are presented in Tables B1 and B2. In Table B1, we include population level of the municipality (*Population*). The pre-merger population level of the municipality is correlated (0.58) with the post-merger council seat share, but we are able to identify both of these effects quite precisely. The results suggest that the post-merger council seat share is driving the results instead of population. In the second specification reported in Table B2, we add both population and the population difference of the municipality and the entire merger (*Pop_diff*). Again, seat share is driving the results instead of the variables measuring the potential for

economies of scale. These tests rule out the most obvious alternative explanations concerning economies of scale in service production.

Finally, we test for the possibility that municipal jobs are simply centralized to the largest municipality of the merger. This may be the case especially for some administration jobs, such as administrating municipal finances, as there may be scale economies from centralization, but citizens do not consume these services at the production site. We estimate a model that involves a dummy variable indicating whether the municipality is the largest municipality in the merger as an additional DID treatment variable. The interpretation is the same as before: If the results are not driven by political representation, the additional treatment should capture the effects and we should observe a zero effect for the seat share treatment.

The results from these models are presented in Table B3. The largest municipality dummy variable is highly correlated (0.86) with the post-merger council seat share, which makes it difficult to identify both effects with precision. Thus, we discuss only the joint significance tests for the alternative treatments, i.e. we test whether the DID interaction variables for seat share and largest population are jointly significant. The *p*-values for administration jobs are 0.479 for the seat share treatment and 0.0007 for the largest municipality treatment, respectively. The *p*-values for health and social care jobs are 0.0501 for seat share and 0.0020 for largest municipality. This suggests that administration jobs are centralized to the largest municipality regardless of post-merger council seat shares, but seat shares matter for health and social care even when we control for the largest municipality treatment.

Table B1. Additional results at pre-merger municipality level using population level treatment.

	Administration	Schooling	Health and social care
	[1]	[2]	[3]
Constant	0.006	0.011**	0.021**
	[0.003]	[0.004]	[0.007]
Merger	0.004	0.002	0.012
	[0.003]	[0.003]	[0.006]
Seat share	0.005	0.010**	0.021**
	[0.003]	[0.004]	[0.007]
Population	0.002*	0.003**	0.004**
	[0.001]	[0.001]	[0.001]
Merger*2009	-0.007**	-0.006**	-0.014**
	[0.001]	[0.001]	[0.003]
Merger*2010	-0.006**	-0.001	-0.009**
	[0.001]	[0.001]	[0.003]
Merger*2012	-0.007**	-0.002	-0.011**
	[0.001]	[0.001]	[0.003]
Merger*2014	-0.007**	-0.001	-0.009**
	[0.002]	[0.001]	[0.002]
Merger*2015	-0.006**	0	-0.012**
	[0.002]	[0.001]	[0.003]
Seat share*2009	0.009**	0.007**	0.027**
	[0.003]	[0.002]	[0.006]
Seat share*2010	0.009**	0.002	0.017**
	[0.003]	[0.003]	[0.005]
Seat share*2012	0.011**	0.005*	0.024**
	[0.003]	[0.002]	[0.006]
Seat share*2014	0.010**	0.004*	0.024**
	[0.003]	[0.002]	[0.006]
Seat share*2015	0.010**	0.002	0.025**
	[0.004]	[0.002]	[0.007]
Population*2009	0.001	0.0001	0.0005
	[0.0007]	[0.0003]	[0.0008]
Population*2010	0.0006	-0.0002	0.0009
	[0.0005]	[0.0002]	[0.0008]
Population*2012	0.0007	-0.0003	0.0001
	[0.0005]	[0.0003]	[0.0008]
Population*2014	0.0009	-0.0005	-0.0001
	[0.0005]	[0.0003]	[0.0007]
Population*2015	0.0006	-0.0004	0.0003
	[0.0005]	[0.0002]	[0.0009]
R^2	0.05	0.10	0.13
N	4968	4968	4968

Notes: The results are from OLS models. The non-merged control group is based on nearest neighbor matching algorithm All the models include year dummies. Population refers to municipal population in 2007. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table B2. Additional results at pre-merger municipality level using population level and population difference treatments.

	Administration	Schooling	Health and social care
	[1]	[2]	[3]
Constant	0.004	0.014**	0.021*
	[0.004]	[0.005]	[0.009]
Merger	0.004	0.001	0.012
	[0.003]	[0.004]	[0.007]
Seat share	0.007	0.007	0.021*
	[0.004]	[0.005]	[0.009]
Population	0.001*	0.003**	0.004**
	[0.001]	[0.001]	[0.001]
Pop_diff	0.0003	-0.0004	0.000018
	[0.0005]	[0.0003]	[0.0006]
Merger*2009	-0.010**	-0.006*	-0.017**
	[0.002]	[0.003]	[0.005]
Merger*2010	-0.006**	0.003	-0.008
	[0.002]	[0.002]	[0.005]
Merger*2012	-0.007**	0.001	-0.011*
	[0.002]	[0.003]	[0.004]
Merger*2014	-0.006**	0.001	-0.005
	[0.002]	[0.002]	[0.003]
Merger*2015	-0.005**	0.003	-0.009*
	[0.002]	[0.002]	[0.005]
Seat share*2009	0.013**	0.008	0.033**
	[0.003]	[0.004]	[0.009]
Seat share*2010	0.010*	-0.004	0.016*
	[0.004]	[0.004]	[0.007]
Seat share*2012	0.011**	0.0002	0.023**
	[0.002]	[0.004]	[0.007]
Seat share*2014	0.008**	0.0002	0.015*
	[0.003]	[0.004]	[0.007]
Seat share*2015	0.008*	-0.003	0.020*
	[0.003]	[0.004]	[0.008]
Population*2009	0.0007	0.0001	0.0001
	[0.0004]	[0.0003]	[0.0008]
Population*2010	0.0005	0.0003	0.0011
	[0.0004]	[0.0004]	[0.0009]
Population*2012	0.0007	0.0001	0.0001
	[0.0004]	[0.0004]	[0.0007]
Population*2014	0.0009**	0.00003	0.0007
	[0.0003]	[0.0004]	[0.0008]
Population*2015	0.0007*	0.0002	0.0008
	[0.0003]	[0.0004]	[0.0008]
Pop_diff*2009	0.0005	0.0001	0.0007
	[0.0004]	[0.0003]	[0.0006]
Pop_diff*2010	0.000028	-0.0007	-0.0002

	[0.0004]	[0.0004]	[0.0006]
Pop_diff*2012	-0.000016	-0.0005	-0.0001
	[0.0004]	[0.0004]	[0.0006]
Pop_diff*2014	-0.0002	-0.0004	-0.001
	[0.0004]	[0.0003]	[0.0005]
Pop_diff*2015	-0.0002	-0.0006	-0.0006
	[0.0005]	[0.0003]	[0.0007]
R^2	0.05	0.11	0.13
N	4968	4968	4968

Notes: The results are from OLS models. The non-merged control group is based on nearest neighbor matching algorithm All the models include year dummies. Largest refers to refers to a dummy variable, which is equal to one for the largest municipality in the merger and zero for the other municipalities in the merger. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.

Table B3. Additional results at pre-merger municipality level using largest municipality treatment.

	Administration	Schooling	Health and social care
	[1]	[2]	[3]
Constant	0.012	0.003	0.024
	[0.008]	[0.007]	[0.012]
Merger	-0.002	0.009	0.01
	[0.007]	[0.006]	[0.011]
Seat share	-0.002	0.018**	0.018
	[0.008]	[0.007]	[0.012]
Population	0.009	0.003	0.013
	[0.005]	[0.004]	[0.008]
Merger*2009	-0.006**	-0.005**	-0.013**
	[0.002]	[0.001]	[0.003]
Merger*2010	-0.005**	-0.00018	-0.008**
	[0.001]	[0.002]	[0.003]
Merger*2012	-0.005**	-0.001	-0.012**
	[0.002]	[0.001]	[0.003]
Merger*2014	-0.006**	-0.001	-0.008**
	[0.002]	[0.001]	[0.003]
Merger*2015	-0.006**	-0.00003	-0.010**
	[0.002]	[0.001]	[0.003]
Seat share*2009	-0.007	-0.001	0.023*
	[0.005]	[0.005]	[0.009]
Seat share*2010	-0.006	-0.006	0.009
	[0.005]	[0.004]	[0.008]
Seat share*2012	-0.004	0.001	0.031*
	[0.007]	[0.006]	[0.013]
Seat share*2014	0.00008	-0.00004	0.012
	[0.005]	[0.004]	[0.014]
Seat share*2015	0.005	-0.001	-0.001
	[0.008]	[0.004]	[0.015]
Largest*2009	0.014**	0.006	0.004
	[0.003]	[0.004]	[0.005]
Largest*2010	0.012**	0.005*	0.009
	[0.003]	[0.002]	[0.004]
Largest*2012	0.012*	0.002	-0.005
	[0.005]	[0.004]	[0.009]
Largest*2014	0.009**	0.002	0.008
	[0.003]	[0.003]	[0.011]
Largest*2015	0.005	0.001	0.019
	[0.006]	[0.003]	[0.011]
R^2	0.05	0.08	0.12
N	4968	4968	4968

Notes: The results are from OLS models. The non-merged control group is based on nearest neighbor matching algorithm All the models include year dummies. Largest refers to refers to a dummy variable, which is equal to one for the largest municipality in the merger and zero for the other municipalities in the merger. Standard errors are clustered at the merger and municipality level and reported in brackets. ** and * indicate statistical significance at 1 and 5 percent level, respectively.