

Supplemental Appendix

Fiscal Transfers to Local Government and the Distribution of Economic Activity

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Overview

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A Grant reform of 2015

The bill for reforming the system of central government transfers to municipalities was given to the parliament in April 2014, it was passed in August, and came into force in 2015. The purpose of the reform was to simplify and update grant allocation rules. The old system included separate complicated formulae for different service classes 1) social services 2) healthcare 3) preschools and primary schools 4) libraries and culture. In addition, the system included a tax base equalization scheme and a small general component. These formulae included more than 50 parameters for often overlapping grant determinants. The reform replaced the separate formulae for different services with a single formula for all basic services. The parameters of this new formula were based on research on the association of service expenditure and municipality characteristics, but expert views and political interference also played a role.

The new formula had only 19 determinants and parameters, and a tax base equalization scheme. For instance, compensation for the share of population with a native language other than Finnish, Swedish, or Sámi languages was introduced to address the special needs of non-native residents. Additionally, a compensation for workplace self-sufficiency (the ratio of jobs to employed residents) was included to incentivize municipalities to foster local economic development.¹ The new formula also had fewer discontinuities that lead to changes in grants in the case of municipality mergers.

We do not attempt to fully describe the pre- and post-reform grant allocation rules, but Table A.1 describes the importance of different municipality characteristics in the grant allocation formula before and after the reform. The reform placed more emphasis on tax base equalization, which shifted from a zero-sum redistribution model to a source of net financing for municipalities.² Also the morbidity index and some other more defined cost determinants received more weight. At the same time, compensation based on age-group specific imputed costs was cut.

Figures A.1 and A.2 show the development of important grant determinants over time in the winner, middle and loser groups. The pre-reform trend of tax-base equalization payment is different for the middle group than for the other groups, suggesting that equalization is one reason. Table A.2 shows the differences between these groups in terms of several municipality characteristics.

¹The incentive created by this grant component was similar to all municipalities and very weak. A one percentage point increase in the ratio of jobs to employment would lead to a grant increase of mere €0.63 per capita.

²Before the reform, the equalization limit was 91.86 % of mean imputed tax revenue per capita, and grant increases to municipalities with low tax base could be funded by grant decreases from high tax base municipalities. After the reform, the equalization limit was raised to the national average of imputed revenue per capita. This implied that the central government had to cover part of the grant increases to low tax base municipalities.

Table A.1: Fiscal importance of grant determinants before and after the reform

	2014 grant system		2015 grant system	
	EUR, million	Share of total	EUR, million	Share of total
Age structure	6252	0.727	4591	0.545
Morbidity index	705	0.082	1552	0.184
Basic compensations	290	0.034		
Unemployment rate	143	0.017	121	0.014
Population density	86	0.010	48	0.006
Child protection	80	0.009		
Remoteness	63	0.007	113	0.013
Built-up area	38	0.004		
Bilinguality	30	0.003	24	0.003
Disability	28	0.003		
Archipelago area	17	0.002	4	0.000
Foreign language share	13	0.002	133	0.016
Population change	4	0.000		
Sámi homeland	4	0.000	4	0.000
Tax base equalization	-50	-0.006	673	0.080
Workplace self-sufficiency			195	0.023
Adults without a degree			41	0.005
Additions and reductions	892	0.104	927	0.110
Total	8594		8425	

Notes: The table shows the amount of funding allocated to municipalities based on different municipality characteristics before and after the reform of 2015. Transition financing related to the 2015 reform is not included (€29 million in 2015).

Figure A.1: Development of grant determinants

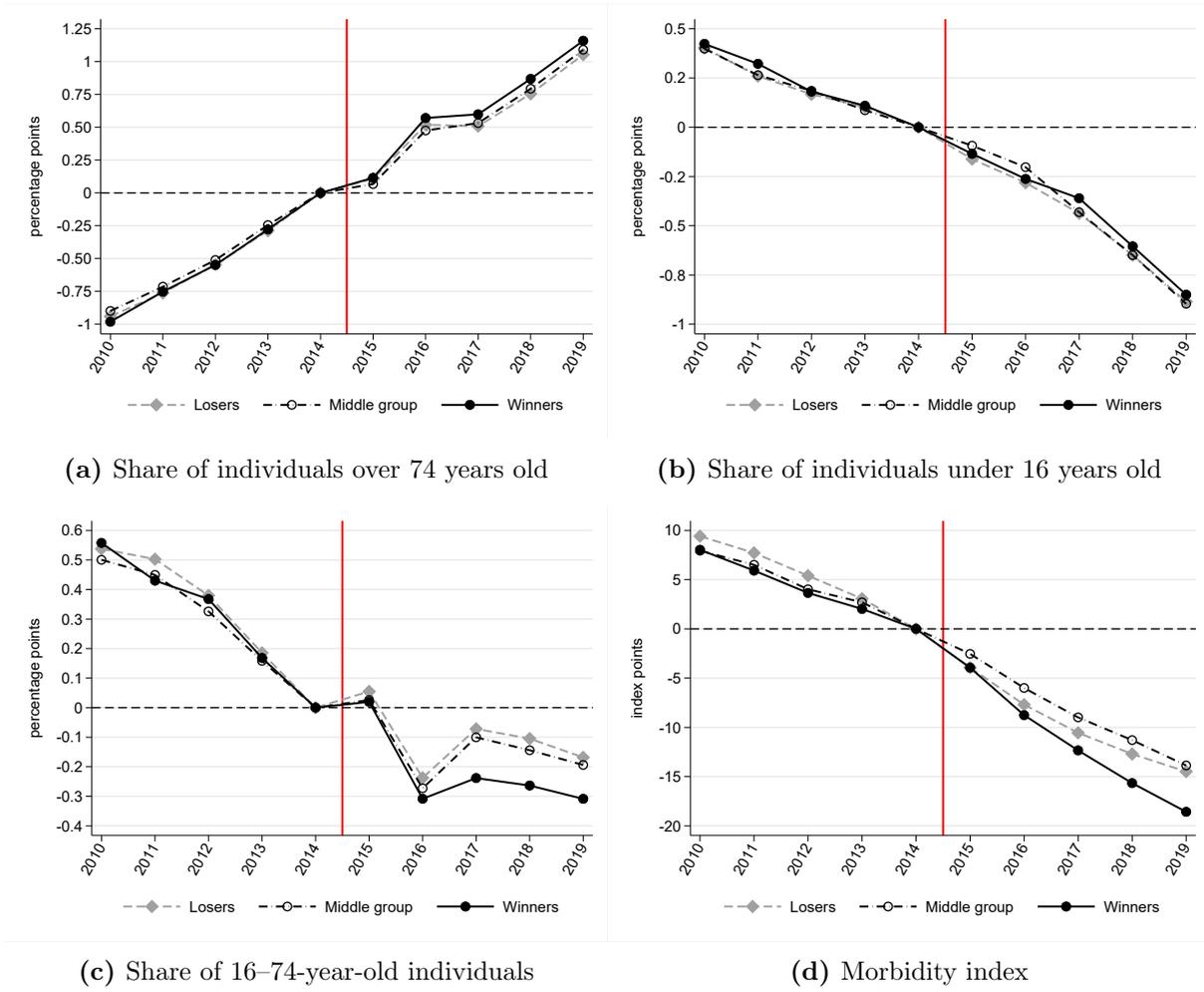


Figure A.2: Tax-base equalization per resident

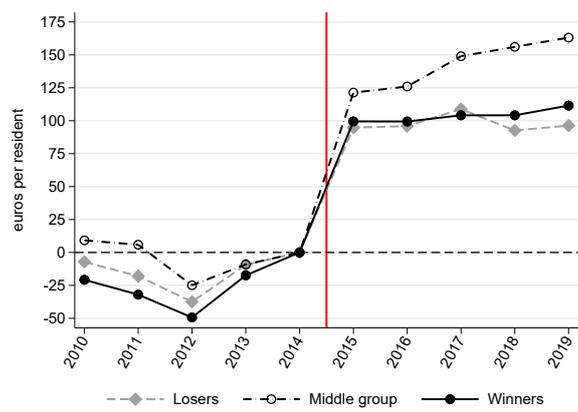


Table A.2: Means of dependent variables and other municipality characteristics in 2014: differences between municipality groups

	W-L	W-M	L-M
1. Municipal finances			
Central government transfers per resident (€)	-111	451	562
	162	178	157
Municipal income tax rate (%)	0.41	0.13	-0.28
	0.12	0.14	0.12
General property tax rate (%)	0.09	-0.01	-0.10
	0.02	0.03	0.02
Tax revenue per resident (€)	70	-132	-202
	79	79	79
Collected service fees per resident (€)	58	25	-33
	25	28	21
Operating expenses per resident (€)	160	455	295
	133	142	124
Annual contribution margin per resident (€)	1	7	6
	36	36	33
Net long-term borrowing per resident (€)	45	-19	-64
	63	78	55
2. Labor market outcomes			
Jobs per 1,000 residents	51	20	-31
	11	12	9
Private sector jobs per 1,000 residents	32	9	-23
	9	10	8
Municipal sector jobs per 1,000 residents	11	8	-3
	3	3	3
Employment rate of 20- to 64-year-old individuals (%)	-0.9	-2.2	-1.2
	0.9	1.0	0.9
Share of out-commuters (%)	-10.9	-7.8	3.1
	2.6	3.0	2.7
Mean disposable cash income per resident (€)	-305	-587	-282
	308	264	313

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Table A.2 – *Continued from previous page*

	W-L	W-M	L-M
3. Migration			
In-migration rate (%)	-0.16	-0.32	-0.16
	0.20	0.21	0.19
Out-migration rate (%)	0.05	0.01	-0.04
	0.16	0.19	0.15
Net migration rate (%)	-0.21	-0.33	-0.12
	0.12	0.12	0.12
Log of population	0.46	-0.34	-0.80
	0.16	0.20	0.15
4. Socioeconomic characteristics			
Population share of individuals under 15 years old (%)	-0.3	-1.3	-1.0
	0.7	0.6	0.6
Population share of 15–64-year-old individuals (%)	1.2	-0.9	-2.0
	0.5	0.6	0.4
Population share of individuals over 64 years old (%)	-0.9	2.1	3.0
	0.9	1.0	0.8
Share of individuals aged 15 or older with a tertiary degree (%)	-0.1	-2.3	-2.2
	1.0	1.0	1.0
Share of residents with foreign native language (%)	1.0	0.2	-0.8
	0.3	0.4	0.3
Share of households living in rental apartments	3.6	0.8	-2.8
	0.9	1.2	0.9
Cumulative population change in 2010–2014 (%)	-0.1	-2.0	-1.9
	0.7	0.8	0.7
Cumulative natural population growth in 2010–2014 (%)	0.5	-1.1	-1.5
	0.5	0.5	0.4
Cumulative net inter-municipality migration in 2010–2014 (%)	-1.0	-1.2	-0.2
	0.4	0.4	0.4
5. Geographical characteristics			
Log of population density	0.01	-0.66	-0.67
	0.22	0.28	0.21
Log of land area	0.45	0.32	-0.13
	0.16	0.19	0.14

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Table A.2 – *Continued from previous page*

	W-L	W-M	L-M
Mean latitude of municipality's centroid	0.96	0.83	-0.12
	0.29	0.34	0.26
Mean longitude of municipality's centroid	1.14	1.01	-0.13
	0.34	0.38	0.32
Share of residents living in the built-up area (%)	4.4	-7.7	-12.1
	2.8	3.3	2.7

Notes: This table shows the differences in the means of the dependent variables and other municipality characteristics between the three municipality groups and the standard errors of the means. For each variable, the first row tells the difference in the means, and the second row is for the standard error of the difference. Column *W-L* is the difference between winners and losers, *W-M* is the difference between winners and the middle group, and *L-M* is the difference between losers and the middle group. Winner municipalities are defined as those municipalities seeing an increase in imputed transfer revenue over €50 per capita while loser municipalities are those that lost over €50 per capita and the middle group lies in between.

Table A.3 shows results from regressions where we regress either the grant change in the reform or the dummy for being a winner on the components included in the grant formula³. The values of the variables are measured at the end of 2013 (workplace self-sufficiency in 2012), which were the values used for determining grants for year 2015, the first ones after the reform. The regressions are performed using the winner and loser municipalities only, dropping the middle group and municipalities involved in a municipality merger.

Share of foreign language speakers and morbidity index are strongly positively associated with the grant change and winner status, whereas share of over 74-year-old population, population density and unemployment rate are negatively correlated. The positive (negative) association with workplace self-sufficiency (share of under-16-year old population) is less clear. We control for these features by interacting the prereform values of these variables with year dummies to account for the fact that underlying trends might be driven by these features. Imputed tax revenue per resident has no significant association with grant changes, but we also include it as a control. Note that we use the prereform value interacted with year dummies instead of time-varying values, because values of the variables after the reform might be endogenous to it.

³The formula has nine different age groups, but we simplify here to three (share of 16–74-year-old population the omitted category) to have less noisy estimates.

Table A.3: Grant reform changes regressed on grant determinants

	Regression estimates		Mean and sd of the variable	
	Grant change	Prob(winner)	Mean	SD
Imputed tax revenue (€1,000/resident)	14.1 (28.6)	0.019 (0.079)	2.83	0.55
Workplace self-sufficiency	116.2 (68.7)	0.420 (0.198)	0.86	0.18
Under 16-year-old population (%)	-9.4 (4.2)	-0.008 (0.011)	17.06	4.50
Over 74-year-old population (%)	-44.2 (7.2)	-0.097 (0.019)	11.59	3.30
Bilingual (0/1)	-47.6 (31.3)	-0.195 (0.101)	0.10	
Foreign language speakers (%)	30.0 (6.6)	0.083 (0.020)	2.11	1.90
Morbidity index	391.0 (75.3)	1.155 (0.173)	1.22	0.32
Unemployment rate (%)	-8.7 (4.2)	-0.019 (0.011)	11.38	3.56
Adults without a degree (%)	-5.8 (4.1)	-0.011 (0.011)	15.37	3.63
Population density (1000/sq. km.)	-136.0 (39.8)	-0.183 (0.122)	0.05	0.24
Remoteness index	-18.0 (33.7)	-0.043 (0.088)	0.33	0.51
Archipelago area (0/1)	107.6 (66.6)	0.445 (0.169)	0.03	
Number of municipalities	198	198	198	198

Notes: This table reports the regression coefficients and their robust standard errors from regressions where we regress the grant change in the reform or the propensity to be a winner in the reform on the components used for determining grants in 2015. Only the winner and loser municipalities are included in the regressions. Some definitions. Workplace self-sufficiency: number of jobs in the municipality relative to municipality's employed population (independent of where they are employed). Bilingual: both Finnish and Swedish are official languages. Foreign language speaker: someone with native language other than Finnish, Swedish, or Sámi languages. Morbidity index: age-controlled morbidity in the population, considering several disease groups. Adults without a degree: share of 30–54-year-old population without a secondary-degree. Remoteness index: an index based on how few people live within a certain radius of municipality's population weighted centroid; the larger the index, the more remote the municipality is considered.

B Local fiscal Multiplier

Subject to certain conditions, Chodorow-Reich (2019) argues that cross-sectional multipliers can be considered a lower bound for national multiplier estimates in a zero lower bound setting, i.e. when monetary policy is accommodating of fiscal stimulus. Restrict-

ing the set of papers in his review to those studying transitory shocks, and making a small adjustment to account for the spending being financed outside the treated areas, he lands on a multiplier effect of 1.7.

To convert our cost-per-job to an output multiplier, we follow the approach proposed by Chodorow-Reich (2019). For a change in spending of ΔG_t , define the output multiplier as $\beta_{t+h}^Y = \frac{\Delta Y_{t+h}}{\Delta G_t}$ and the employment multiplier $\beta_{t+h}^E = \frac{\Delta E_{t+h}}{\Delta G_t}$. Let $e_{t+h} = \frac{\Delta E_{t+h}}{E_t}$ denote the percent change in employment caused by spending and $y_{t+h} = \frac{\Delta Y_{t+h}}{Y_t}$ the percent change in output, and $g_t = \frac{\Delta G_t}{Y_t}$ the change in spending relative to output. It follows that $e_{t+h} = \beta_h^E \frac{Y_t}{E_t} g_t$. Now assume a production function of the form $Y_t = A(H_t E_t)^{1-\xi}$, which links output (Y_t) to hours worked per employee (H_t), employment (E_t) and productivity (A), without capital adjustment in the short run. Following previous notation, $n_t = \frac{\Delta N_{t+h}}{N_t}$. Then the output multiplier β_h^Y relates to the employment multiplier β_h^E through the following equation:

$$\beta_h^Y = \frac{y_{t+h}}{g_t} = \frac{y_{t+h}}{e_{t+h}} \frac{e_{t+h}}{g_t} \approx (1 - \xi)(1 + \chi) \cdot \frac{Y}{E} \cdot \beta_h^E,$$

where ξ denotes the capital share in production, χ is the elasticity of hours worked per employee with respect to total employment (n_t/e_t), and Y/E is output per employed worker.

To parameterize the equation, Chodorow-Reich (2019) assumes a standard value of 1/3 for ξ and a value of 0.5 for χ , based on Elsby et al. (2010). For Brazil, Corbi et al. (2019) uses 0.12 to parameterize χ . Based on these parameters, our output multiplier would range between 1.95 and 2.61, given a cost-per-job of €33,000 and GDP per worker €82,014. Labor adjustments along the intensive margin are generally thought to be more important in Europe but Van Rens (2012) shows it is relatively unimportant both in Europe and the US.

Note finally that in a discussion of the ARRA spending multiplier in Chodorow-Reich (2019), Ramey (2019) argues the denominator (ΔG_t) should be corrected to include any additional local and state spending triggered by federal spending. Since we observe a wide range of local fiscal policy changes, we simply use the amount of transfers gained.

Our multiplier effect is relatively large. There are several reasons for this and why it may exceed what would be a nationally representative multiplier effect. First and foremost, we do not study a transitory fiscal shock but a relatively permanent shift in funds. Indeed, our findings are more in line with other work that has studied persistent funding changes, namely Adelino et al. (2017) and Serrato and Wingender (2016), who estimate a cost-per-job of \$20,000 resp \$30,000.⁴ Beyond the expectation that a persistent change in funds is more likely to spur firm investment and yield a larger multiplier, persistency

⁴Adelino et al. (2017) look at the employment effects of spending changes driven by exogenous upgrades in U.S. municipal bond ratings. Serrato and Wingender (2016) use spending changes triggered by census-based population count revisions, similar to Gordon (2004).

matters for two reasons. First, the tax burden of these funds are borne (also) by residents outside the affected areas. In line with Nakamura and Steinsson (2014) and Farhi and Werning (2016), Chodorow-Reich (2019) argues that outside-financed spending - when transitory - generates only marginally higher multiplier effects than deficit-financed spending. However, a persistent increase in funds is likely to trigger much stronger Ricardian effects and our multiplier would need to be adjusted downwards considerably more in order to be nationally representative.⁵ Secondly, a persistent change in funds is more likely to affect household and firm location decisions, which would generate negative spillover effects and lead us to overestimate a nationally representative multiplier effect. While we find no evidence of changes in location patterns, commuting patterns are affected. At the same time, household consumption and firm input purchases may occur outside the affected areas, which would bias the nationally representative multiplier downwards.

Spillover effects have been examined in several studies on local fiscal multipliers. While the evidence is mixed, it predominantly points towards positive effects. Dupor and McCrory (2018) study the effect of ARRA on local economic activity and identify strong positive spillover effects on the wage bill and employment within the local labor market. Auerbach et al. (2020) finds strong positive spillover effects of US Department of Defense contracts on GDP and labor earnings in neighboring cities (core-based statistical areas). Shoag (2010) finds strong positive effects on income in economically-linked counties of spending triggered by windfalls in pension plan returns. He reports little evidence of a migration response however. Clemens et al. (2024) examine cross-state spillovers of pandemic-era federal aid, finding only small effects on public employment, weak evidence of private employment effects and virtually no effects on income or output, possibly due to interrupted supply chains and limited opportunities for travel or cross-border shopping in the context of the pandemic. Acconcia et al. (2014) find no significant spillovers of spending cuts in Italian provinces triggered by a law combating political corruption (mafia infiltration). Studying local effects of persistent federal spending changes due to census-based population revisions, Serrato and Wingender (2016) find negative but economically small and statistically insignificant spillover effects on employment and income. In a follow-up paper however, Serrato and Wingender (2014) show the spending changes cause shifts in population. Finally, Corbi et al. (2019) study local fiscal multipliers exploiting discontinuities in the allocation mechanism of federal transfers in Brazil. They find small negative effects on employment and earnings in surrounding municipalities.

A second reason for large multiplier effects may be state dependence. A growing literature is studying whether fiscal multipliers vary depending on circumstances. One

⁵Clemens and Miran (2012) are one of the few to study subnational variation in spending that is not due to windfalls but rather due to institutional rules on budget deficits, effectively finding substantially lower multiplier effects.

strand of literature has studied whether multipliers are stronger in periods of economic slack, when fiscal expansions are likely to crowd out private consumption or investment (see e.g. Auerbach and Gorodnichenko (2012); Auerbach et al. (2022); Jo and Zubairy (2025); Owyang et al. (2013); Ramey and Zubairy (2018) for work looking at periods of slack and Brückner and Tuladhar (2014); Nakamura and Steinsson (2014); Serrato and Wingender (2016) for work studying places experiencing more slack). Another has studied multipliers when monetary policy is constrained, e.g. at the zero lower bound, or is otherwise accommodating of fiscal stimulus (see e.g. Christiano et al. (2011); Miyamoto et al. (2018); Ramey and Zubairy (2018); Woodford (2011)). In a review of this work, Ramey (2019) concludes first that the evidence for higher multipliers during recessions is fragile.⁶ Secondly, the evidence for higher multipliers during zero lower bound periods is relatively strong. Finally, although the literature studying state dependence on tax multipliers is small, they fairly uniformly find them to be pro-cyclical (see Alesina et al. (2018); Bonam and Konietzschke (2020); Demirel (2016); Eskandari (2015); Sims and Wolff (2018)). At least the latter two conclusions support our multiplier effect, since we analyze a period in which Finland saw modest growth following some time of post-crisis stagnation, with nominal interest rates at the zero lower bound.

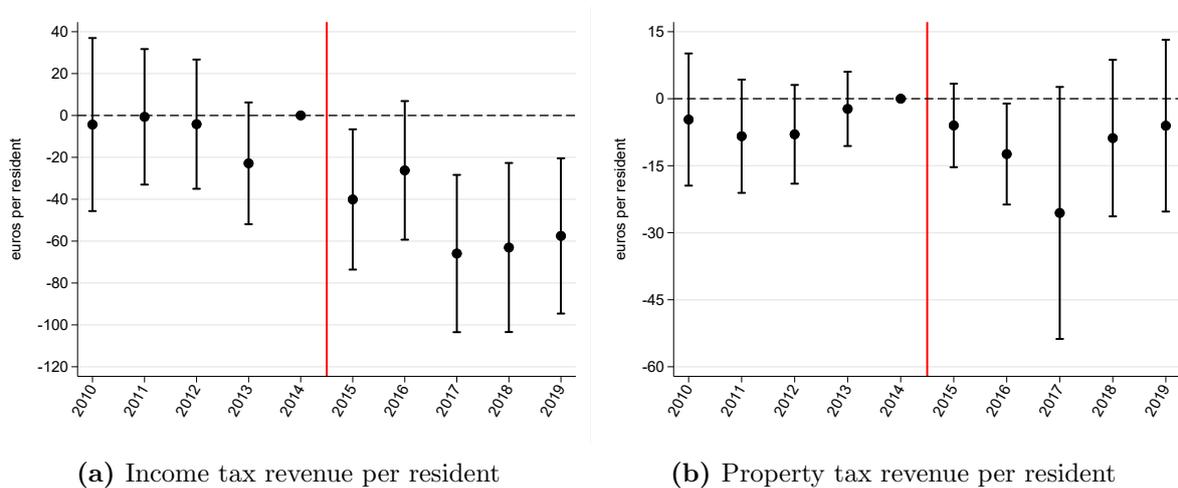
Finally, the fact that we do not study pure (local) spending or tax effects complicates the calculation of a multiplier. Indeed, we found that the change in funds affected spending, revenue raising and deficits in equal measure. Tax multipliers estimated using time series methods are considerably larger than spending multipliers. However, more recent estimates using New Keynesian DSGE models are much smaller and more comparable to spending multipliers (Ramey 2019). Either way, we urge to take our fiscal multiplier estimate with a grain of salt. The fact remains however, that fiscal stimulus funds are often spent on, or with the help of, state and local government. While the majority of the literature estimating subnational multipliers has only looked at spending, it is likely that other dimensions of state and local public finance are affected by fiscal stimulus. Our work suggests money does not completely stick where it hits, so taking into account subnational tax responses may be important to estimate the overall impact of stimulus funding.

⁶Ramey (2019) argues early findings of state dependence were not robust to small specification changes. However, Berge et al. (2021) suggests conflicting findings can be reconciled by decomposing the business cycle in four stages, where the multiplier effect depends on whether the unemployment rate is rising or decreasing and above or below its trend rate.

C Additional results

C.1 Breakdown of tax revenue effects

Figure C.1: Tax revenues per resident: winner vs. loser municipalities



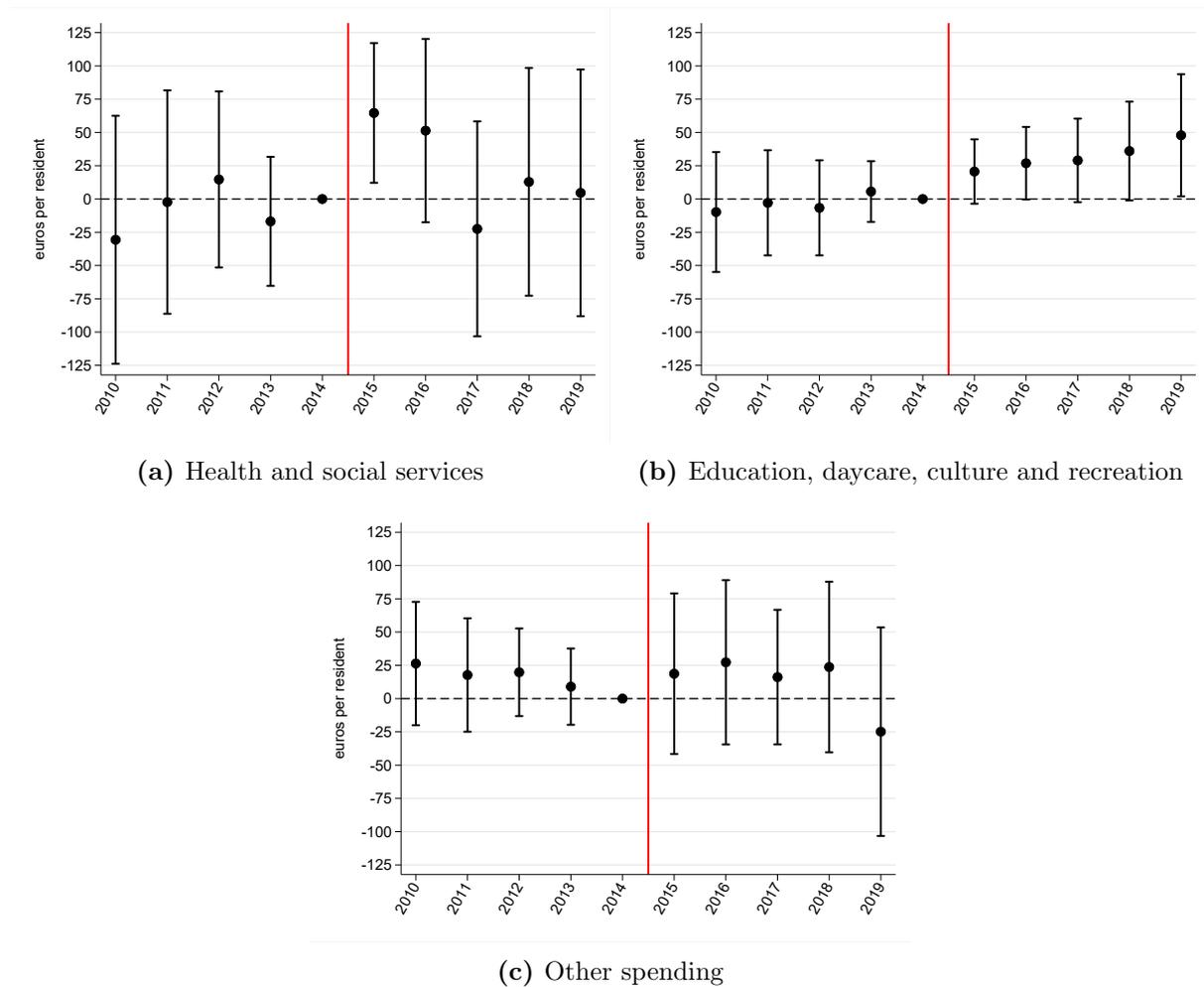
Notes: The mean income tax revenue per resident in 2014 was €2,843 in the winner group and €2,784 in the loser group. The mean property tax revenue per resident in 2014 was €295 in the winner group and €283 in the loser group. Property tax revenue includes all the different property tax categories.

C.2 Breakdown of spending effects

In Figure C.2 we break down the effect on spending into three different categories. Health and social services are the most important spending type, accounting for about 55% of total spending. Education, daycare, culture and recreation were 30% of total spending and other spending (e.g., infrastructure, support services and administration) about 15%.

Spending is calculated net of sales revenue, because those revenues correspond to expenses provided for other municipalities or other entities and do not represent services provided for the residents. Eight municipalities (four in both the winner and loser group) from the region of Kainuu are left out of the regressions, because their cost allocation to different categories was erroneous in years 2010–2012. This is why the point estimates in Figure C.2 do not sum up to the point estimates of total operating expenses (Figure 7c), where the omitted municipalities are included. Also, Figure 7c uses operating expenses from the income statement, which slightly differs from total expenses aggregated from the activity-specific accounts.

Figure C.2: Operating expenses per resident by activity type: winner vs. loser municipalities



Notes: The mean spending on health and social services in 2014 was €3,893 in the winner group and €3,750 in the loser group. The mean spending on education, daycare, culture and recreation in 2014 was €1,905 in the winner group and €1,839 in the loser group. The mean of other spending (e.g., administration and infrastructure) in 2014 was €994 in the winner group and €958 in the loser group. Spending by activity is net of sales revenue. Eight municipalities (four in both the winner and loser group) from the region of Kainuu are left out of the regressions, because their cost allocation to different categories was erroneous in years 2010–2012.

C.3 Disposable income and population

Figure C.3: Mean disposable income per resident: winner vs. loser municipalities

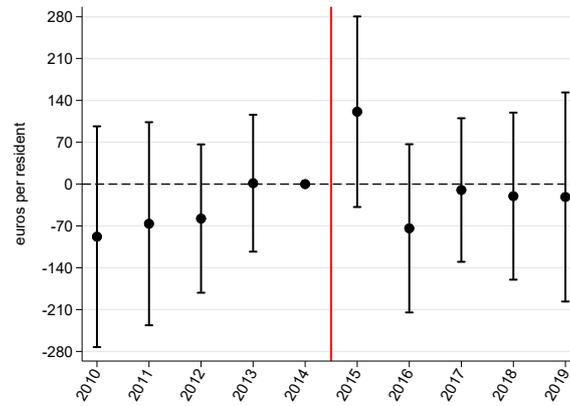
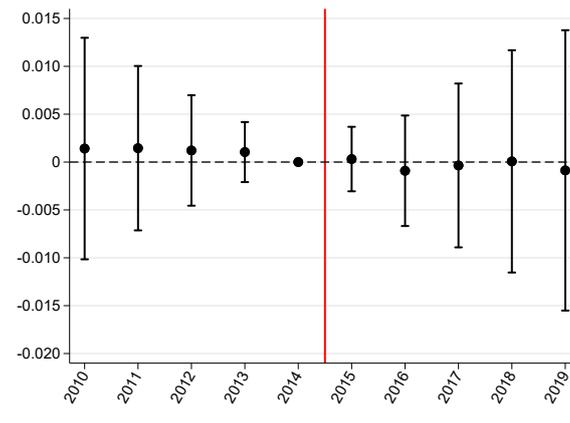


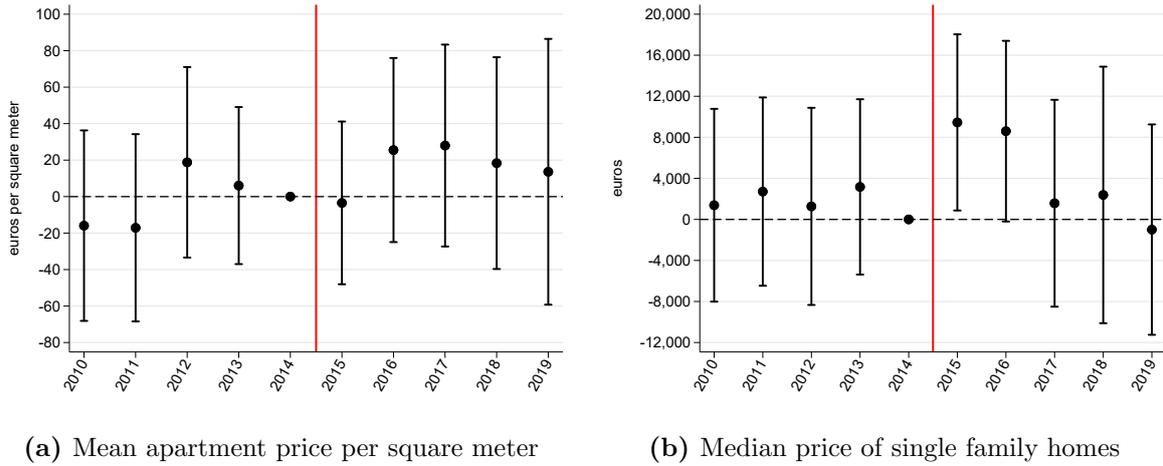
Figure C.4: Logarithm of population: winner vs. loser municipalities



C.4 Housing prices

Figure C.5 shows DiD estimates for the effect on housing prices. Prices of apartments and single family homes are analyzed separately, because they come from different data sources. Panel (a) shows the development of mean apartment price per square meter. Panel (b) shows median single family house price. We use median price of the whole property because statistics on price per square meter are not available at the municipality level. Observations based on less than ten transactions are omitted.

Figure C.5: Housing prices: winner vs. loser municipalities



Notes: The outcome is mean apartment price per square meter published by Statistics Finland and median single family house prices by the National land survey. The sample includes only municipalities with at least 10 transactions in the observation year. Mean apartment price per square meter in 2014 was €1,332 in the winner group and €1,302 in the loser group. Mean of median single family home prices was €149,483 in the winner group and €153,396 in the loser group.

The DiD estimates for the effect on apartment prices per square meter (Fig. C.5a) are positive but close to zero. For median single family house price (Fig. C.5b), the estimates are positive in 2015 and 2016 but close to zero in later years. Standard errors seem large in both figures. To analyze whether strong capitalization of the grant shock is likely, we perform a simple calculation comparing the upper bounds of the confidence intervals of the price effect estimates to the size of the grant shock.

Starting from apartment price results in Figure C.5a, the upper bound of the confidence band of the DiD estimate in 2019 is roughly €100 per square meter. Mean housing space per resident in Finland is approximately 40 square meters. Thus the upper bound corresponds to a €4,000 increase in housing value per person. Relating this estimate to the difference in grant shocks per person (€300) gives that the implied discount rate consistent with full capitalization would be 7.5%. Turning to single family housing prices in panel (b), the upper bound of the confidence band in 2019 is roughly €9,000. Assuming 2.5 persons per single family house means an increase of €3,600 per person in single family house values. The discount rate consistent with full capitalization of the

€300 grant shock would be 8.3%. These discount rates seem overly large to be true, especially in the period of low interest rates we study. Thus, the results suggest less than full capitalization, but it is evident that we cannot rule out economically significant effects on housing prices.

C.5 Accounting for the bilateral nature of migration

To account for the bilateral nature of migration, we draw on recent work by Borusyak et al. (2022) by controlling for the average imputed grant change in other municipalities, weighted by migration intensity, \overline{G}_i , which we interact with time dummies.

Specifically, we estimate:

$$Y_{it} = \sum_{t \neq 2014} \beta_t * winner_i * D_{it} + \sum_{t \neq 2014} \gamma_t * \overline{G}_i * D_{it} + \delta_t + \eta_i + \epsilon_{it}, \quad (9)$$

where \overline{G}_i is calculated as follows:

$$\overline{G}_i = \sum_{k \neq i} \frac{(M_{ik} + M_{ki})}{\sum_{k \neq i} M_{ik} + M_{ki}} * \hat{g}_k,$$

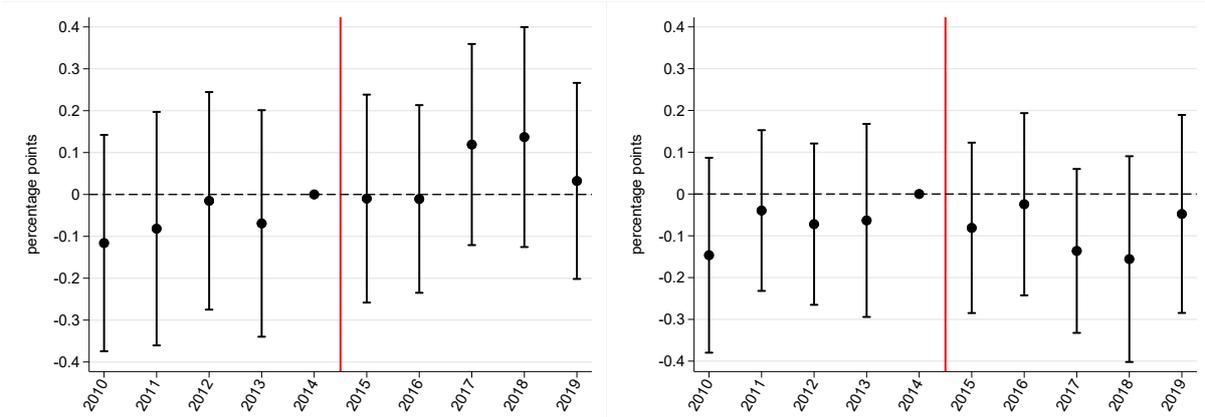
where M_{ik} represents the pre-reform migration flow from municipality i to municipality k , M_{ki} is the pre-reform migration flow from municipality k to municipality i , and \hat{g}_k is the imputed grant change of municipality k .⁷ Thus, the weight municipality k 's grant change receives, reflects the share of pre-reform migration between i and k relative to total inwards and outwards migration of i . This means that more weight is put on municipalities that were important migration destinations or origins for residents in municipality i prior to the reform.

The overall mean weighted transfer change in other municipalities is €35 per resident for the winners and -€18 per resident for the losers. In other words, there is indeed a positive correlation between winner status and grant changes in relevant migration destinations and origins. This means that the relative attractiveness of the winner municipalities is exaggerated without the control variable.

Nevertheless, when we account for grant changes in other municipalities, the estimated effects on migration rates change only slightly, as shown in Figure C.6. The DiD estimates for neither the in-migration rate nor the out-migration rate show significant effects. However, in 2017 and 2018, the two rates diverge so that the point estimates regarding the net migration rate are almost statistically significant for those two years. The estimates are, however, somewhat sensitive to the specification as the significance disappears when we use logs of migration, as shown Figure C.8.

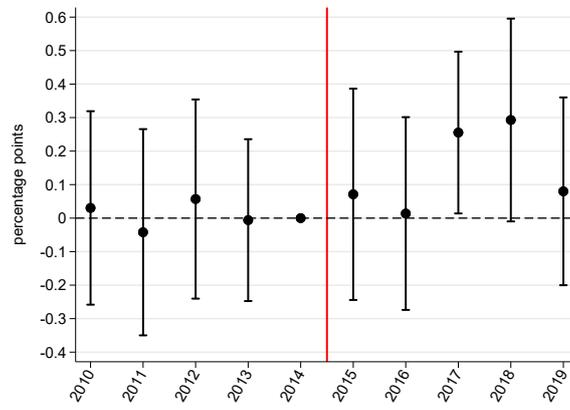
⁷In this formula, we also include those municipalities excluded from the analysis whose imputed grant change fell within the range of -50 to 50 euros per resident.

Figure C.6: Migration rates controlling for transfer changes in other municipalities:
winner vs. loser municipalities



(a) In-migration rate

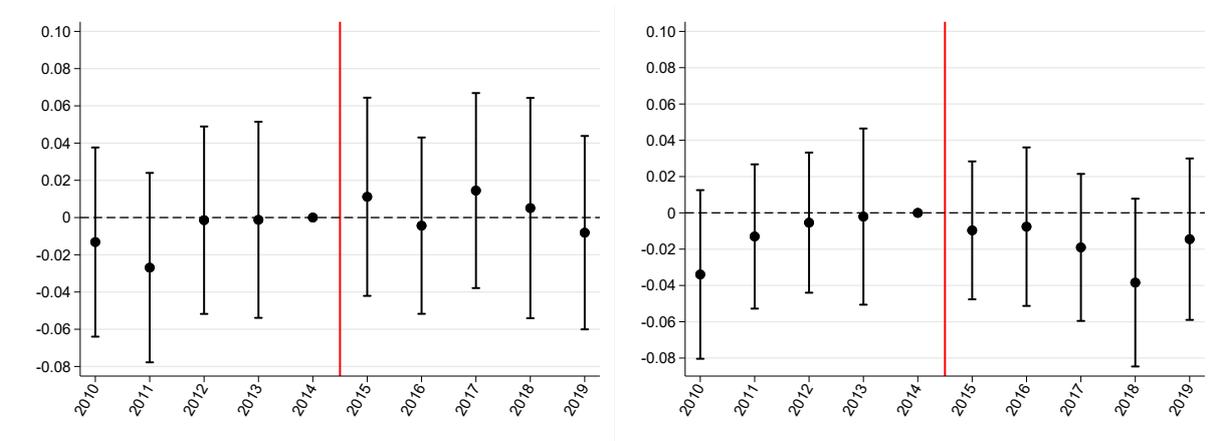
(b) Out-migration rate



(c) Net migration rate

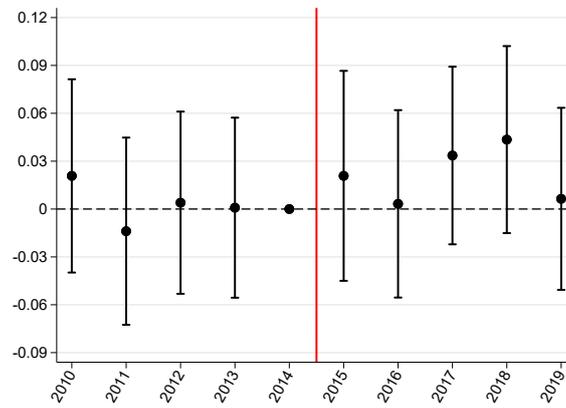
C.6 Logarithm of migration

Figure C.7: Log of migration: winner vs. loser municipalities



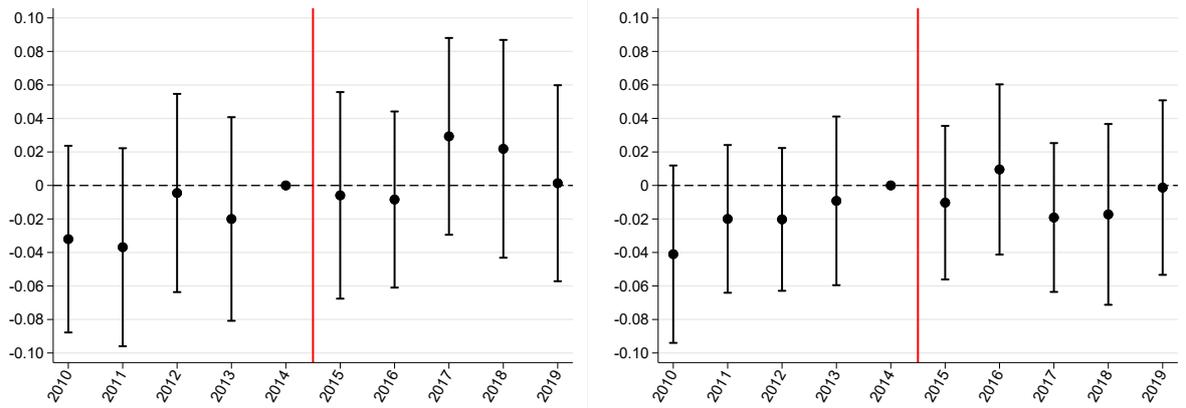
(a) Log of in-migration

(b) Log of out-migration



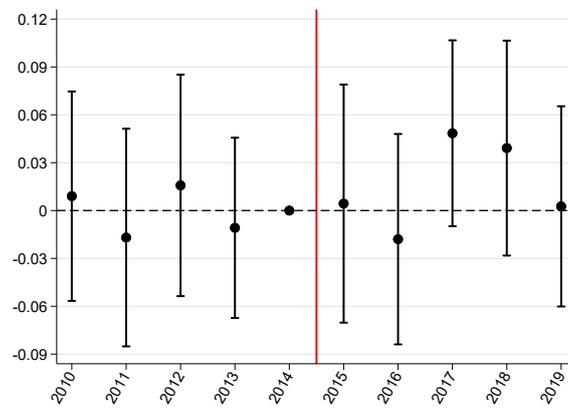
(c) Log of in-migration to out-migration

Figure C.8: Log of migration controlling for transfer changes in other municipalities:
winner vs. loser municipalities



(a) Log of in-migration

(b) Log of out-migration



(c) Log of in-migration to out-migration

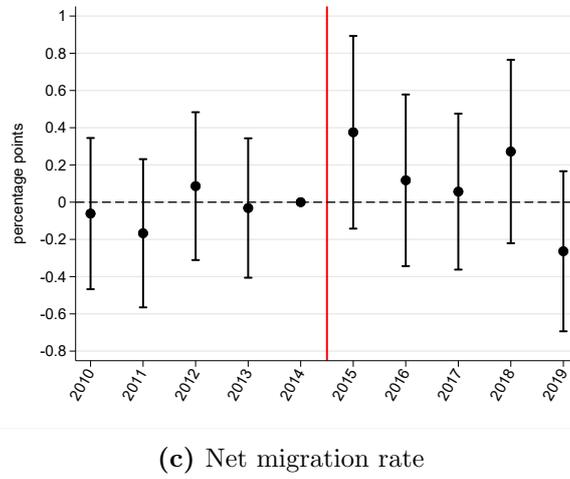
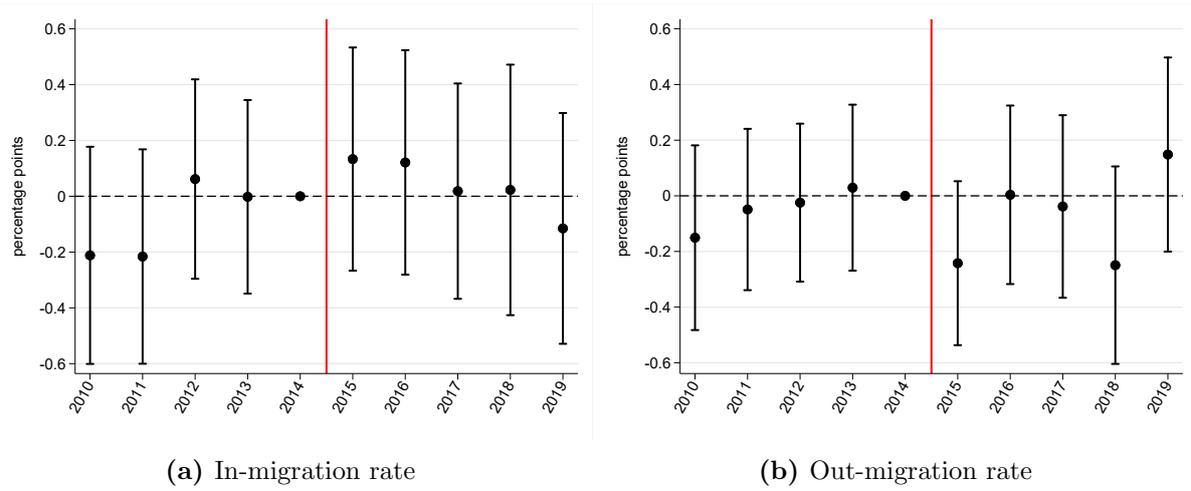
C.7 Migration response in prime-working-aged population

So far, we have considered the migration response in the entire population, but some groups of individuals might be very unresponsive to changes in local public services or taxes. Young adults are very mobile, but their moving decisions are related to leaving their parents and/or going to study. Moreover, their incomes are often such low that they pay only little local taxes. Retirees, instead, are generally very immobile, and unlikely to move because of small changes in municipal taxes and spending. Total population also includes underage children that do not make moving decision themselves. For these reasons, we estimate the effects of the reform on the migration rates of individuals in the prime working age (25–54-year-old population). At this age, people usually have families and might put more weight on public services and amenities in the municipality, and they are also often net tax payers. These individuals, who usually consume only little costly public health and social services, are also the ones that municipalities usually would like to tempt to move in or prevent from moving out.

The mean migration rates of prime-working-aged individuals were larger than in the total population before the reform. The mean in-migration rate in 2014 was 5.40% in the winner group and 5.78% in the loser group. The mean out-migration rate was 5.49% in the winner municipalities and 5.45% in the loser municipalities. However, the pre-reform difference in the levels between the winners and the losers was similar to the aggregate migration rates. Losers had a slightly larger mean in-migration rate, and the mean out-migration rates were equal.

In Figure C.9 we see that the DiD estimates considering the 25–54-year-old population are very similar to the ones estimated with total population. Point estimates fluctuate around zero and are statistically insignificant. With aggregate population, the DiD estimate for out-migration (net migration) in year 2018 was significantly negative (positive), but now even that effect disappears. Given that the prime-working-aged are likely to be more responsive to municipal finances than the population on aggregate, our conclusions remain robust: changes in central government transfers to municipalities did not affect migration, or affected only in an economically insignificant magnitude.

Figure C.9: Migration rates of 25–54-year-old individuals: winner vs. loser municipalities



C.8 Conditioning on covariates

In this exercise, we aim to reduce concerns for selection bias and relax the strong parallel trend assumption by flexibly controlling for trends that may be correlated with winning or losing grant revenue, and our outcomes of interest. To that end, we collected the most important grant change determinants of the reform: share of under-16-year-old individuals, share of over-74-year-old individuals, morbidity, unemployment rate, workplace self-sufficiency, population density, share of population with foreign native language, and imputed tax revenue per resident (cf. Online Appendix A). We then measured values for these variables at the end of 2013 - a year before the reform (workplace self-sufficiency measured at the end of 2012). Finally, to our main regression specification, we added the interaction between these variables and year dummies. The estimates for our main outcomes are presented in Figures C.10-C.12. The results are quantitatively similar except for the effect on the number of jobs which has increased from 9 to 12 jobs per 1000 residents in 2019.

Figure C.10: Municipal finances: controlling for trends driven by grant determinants

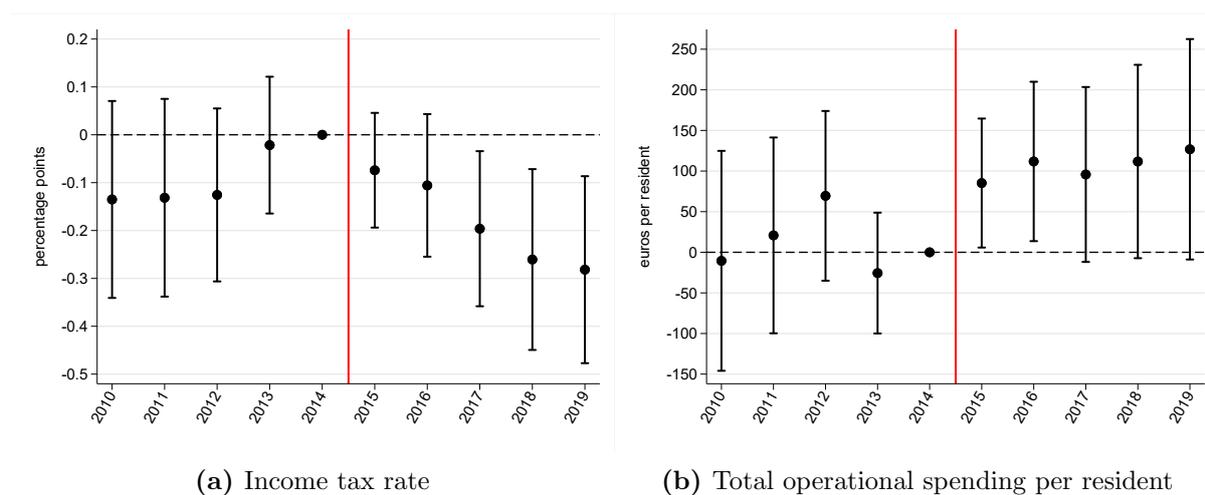


Figure C.11: Labor market outcomes: controlling for trends driven by grant determinants

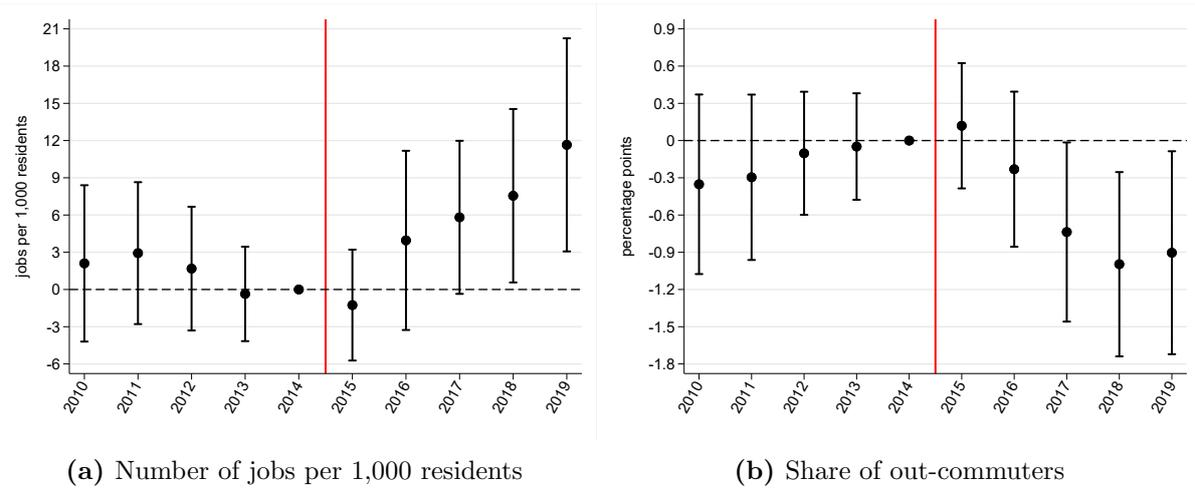
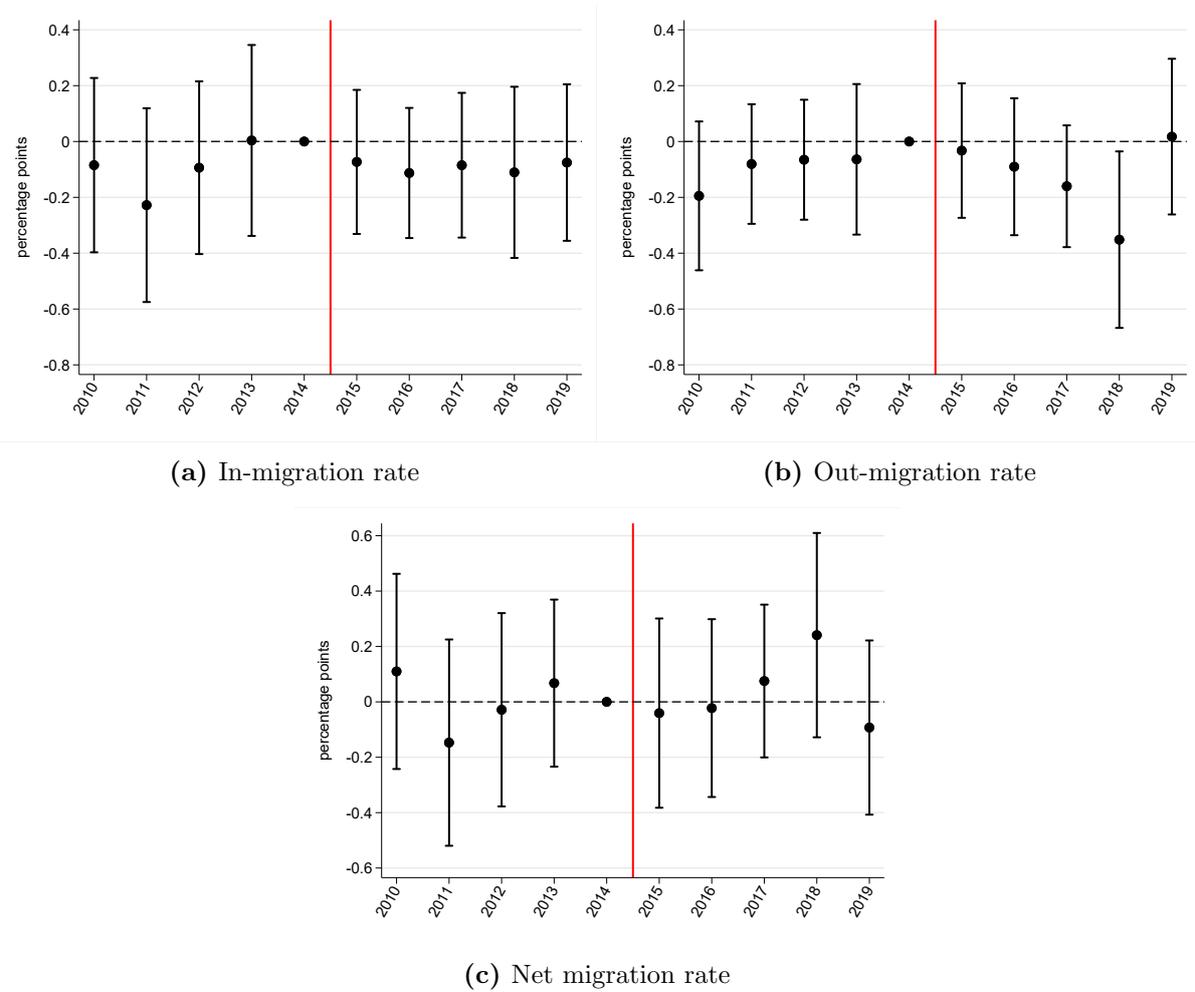


Figure C.12: Migration rates: controlling for trends driven by grant determinants



C.9 Allowing for deviations from parallel trends assumption

Table C.1: Pooled effect (years 2018-2019) on municipal finances:
confidence intervals robust to violation of parallel trends

	Original		M = 0.5	
	lb	ub	lb	ub
Central government transfers received (€/resident)	247	352	182	420
Income tax rate (p.p.)	-0.398	-0.124	-0.621	0.129
General property tax rate (p.p.)	-0.084	-0.016	-0.133	0.023
Tax revenue (€/resident)	-110	-25	-204	47
Collected service fees (€/resident)	-82	-7	-121	33
Total operational spending (€/resident)	3	228	-92	323
Annual contribution margin (€/resident)	41	231	-212	440
Net long-term borrowing (€/resident)	-321	59	-687	399

Notes: This table reports the 95% confidence intervals of the equally weighted linear combination of the DiD estimates for years 2018 and 2019 that were estimated in Table 4. Column *Original* presents the original confidence intervals. The confidence intervals in column $M = 0.5$ are estimated using the method for robust inference and sensitivity analysis for differences-in-differences and event study designs developed by Rambachan and Roth (2023), and allowing the slope of the prereform trends to change no more than 0.5.

Table C.2: Pooled effect (years 2018-2019) on labor market outcomes:
confidence intervals robust to violation of parallel trends

	Original		M = 0.5	
	lb	ub	lb	ub
Jobs per 1,000 residents	2.31	15.97	-4.41	23.89
Private sector jobs per 1,000 residents	1.49	14.83	-2.23	19.84
Municipal sector jobs per 1,000 residents	-2.12	5.34	-8.93	12.68
Employment rate (%)	-0.24	0.99	-1.23	1.79
Share of out-commuters (%)	-1.38	-0.10	-1.86	0.43
Mean disposable cash income per resident (€)	-166	124	-361	339

Notes: This table reports the 95% confidence intervals of the equally weighted linear combination of the DiD estimates for years 2018 and 2019 that were estimated in Table 5. Column *Original* presents the original confidence intervals. The confidence intervals in column $M = 0.5$ are estimated using the method for robust inference and sensitivity analysis for differences-in-differences and event study designs developed by Rambachan and Roth (2023), and allowing the slope of the prereform trends to change no more than 0.5.

Table C.3: Pooled effect (years 2018-2019) on migration:
confidence intervals robust to violation of parallel trends

	Original		M = 0.5	
	lb	ub	lb	ub
In-migration rate (%)	-0.161	0.234	-0.538	0.642
Out-migration rate (%)	-0.324	0.026	-0.807	0.448
Net migration rate (%)	-0.036	0.407	-0.547	0.958
Log of in-migration	-0.052	0.049	-0.153	0.160
Log of out-migration	-0.066	0.013	-0.161	0.095
Log of in-migration/out-migration	-0.025	0.075	-0.160	0.219
Log of population	-0.013	0.013	-0.019	0.017

Notes: This table reports the 95% confidence intervals of the equally weighted linear combination of the DiD estimates for years 2018 and 2019 that were estimated in Table 6. Column *Original* presents the original confidence intervals. The confidence intervals in column $M = 0.5$ are estimated using the method for robust inference and sensitivity analysis for differences-in-differences and event study designs developed by Rambachan and Roth (2023), and allowing the slope of the pre-reform trends to change no more than 0.5.

C.10 Standard errors clustered at the district level

Table C.4: Pooled effect (years 2018-2019) on municipal finances:
standard errors clustered at the district level

	Coefficient	Standard error	Pre-reform mean
Central government transfers received (€/resident)	300	28	2888
Income tax rate (p.p.)	-0.26	0.07	20.44
General property tax rate (p.p.)	-0.050	0.016	0.94
Tax revenue (€/resident)	-68	22	3090
Collected service fees (€/resident)	-44	22	254
Total operational spending (€/resident)	115	59	6375
Annual contribution margin (€/resident)	136	58	96
Net long-term borrowing (€/resident)	-131	101	44

Notes: This table reports the equally weighted linear combination of the DiD estimates for years 2018 and 2019 that were estimated in Figures 5–8. Each regression has 1980 observations: a ten-year balanced panel of 198 municipalities. 63 municipalities belong to the winner group and 135 belong to the loser group. All the regression include municipality and year fixed effects. There are 66 districts, meaning on average 3 municipalities and 30 observations per cluster.

Table C.5: Pooled effect (years 2018-2019) on labor market outcomes:
standard errors clustered at the district level

	Coefficient	Standard error	Pre-reform mean
Jobs per 1,000 residents	9.14	4.09	321
Private sector jobs per 1,000 residents	8.16	3.88	226
Municipal sector jobs per 1,000 residents	1.61	2.19	88
Employment rate (%)	0.37	0.39	68.1
Share of out-commuters (%)	-0.74	0.36	38.9
Mean disposable cash income per resident (€)	-21	76	19237

Notes: This table reports the equally weighted linear combination of the DiD estimates for years 2018 and 2019 that were estimated in Figures 9, 10, C.3. Each regression has 1980 observations: a ten-year balanced panel of 198 municipalities. 63 municipalities belong to the winner group and 135 belong to the loser group. All the regression include municipality and year fixed effects. Standard errors are clustered at the district level. There are 66 districts, meaning on average 3 municipalities and 30 observations per cluster.

Table C.6: Pooled effect (years 2018-2019) on migration:
standard errors clustered at the district level

	Coefficient	Standard error	Pre-reform mean
In-migration rate (%)	0.037	0.110	4.29
Out-migration rate (%)	-0.149	0.087	4.74
Net migration rate (%)	0.185	0.121	-0.46
Log of in-migration	-0.002	0.029	5.47
Log of out-migration	-0.026	0.020	5.59
Log of in-migration/out-migration	0.025	0.027	-0.12
Log of population	-0.000	0.008	8.66

Notes: This table reports the equally weighted linear combination of the DiD estimates for years 2018 and 2019 that were estimated in Figures 11, C.4, C.7. Each regression has 1980 observations: a ten-year balanced panel of 198 municipalities. 63 municipalities belong to the winner group and 135 belong to the loser group. All the regression include municipality and year fixed effects. Standard errors are clustered at the district level. There are 66 districts, meaning on average 3 municipalities and 30 observations per cluster.

C.11 Breakdown of employment effects

We break down the effect on the number of jobs by industry. We use eight aggregated industry categories based on Statistics Finland's *Standard Industrial Classification TOL 2008*, which is equivalent to *NACE Rev. 2* industry classification. The data on the number of jobs does not allow us to separate the private and public sector, although jobs in public administration are observable. However, public and private are likely to be mixed mainly only in health, social and education services.

Table C.7 shows the number of jobs per capita in the eight industry classes in 2014. The winner municipalities had more jobs per 1,000 per resident in each industry, except in agriculture and forestry. This reflects the fact that the total number of jobs per 1,000 residents was higher in the winner group. But industries' shares of the total number of jobs were very similar in the two municipality groups, meaning that the industrial structures were very similar. This means that our results of increasing number of jobs in the winner municipalities is not likely to be caused by industry-specific booms or busts.

Figure C.13 then shows the development of the number of jobs in the eight industry categories, comparing winner and loser municipalities. Jobs in manufacturing, mining and utilities increase but only towards the end of the study period. The largest number of jobs were added on professional and support services and health, social and education services. Professional and support services are mainly sold to other firms and the public sector, ranging from accounting and software services to cleaning and security. The increase in health, social and education services are likely to be mostly caused by private sector jobs, because the number of municipal sector jobs in the main results showed no increase. Other industries show no clear movement.

Table C.7: Jobs by industry in 2014

	Jobs per 1,000 residents		Share of jobs (%)	
	Winners	Losers	Winners	Losers
Manufacturing, mining and utilities	56	49	15.0	15.2
Construction and transportation	44	40	12.7	13.4
Wholesale and retail trade	35	26	9.7	8.6
Professional and support services	39	30	10.6	10.0
Consumer services	32	24	8.8	8.1
Health, social and education services	87	74	24.8	24.7
Public administration	19	12	5.2	3.9
Agriculture, forestry or unknown	44	47	13.4	16.0

Notes: This table reports the mean number of jobs per 1,000 residents in different industry groups and industries' mean shares of total employment in 2014. Both public and private sector jobs are included in the numbers. Industries are defined based on Statistics Finland's *Standard Industrial Classification TOL 2008*, which is equivalent to *NACE Rev. 2* industry classification. Industry groups include the following level-one sections (classification letters in parentheses): manufacturing, mining and utilities (B, C, D, E), construction and transportation (F, H), wholesale and retail trade (G), professional and support services (J, K, L, M, N, U), consumer services (I, R, S, T), health, social and education services (P,Q), public administration (O), agriculture, forestry or unknown (A, X).

Figure C.13: Number of jobs per 1,000 residents by industry: winner vs. loser municipalities

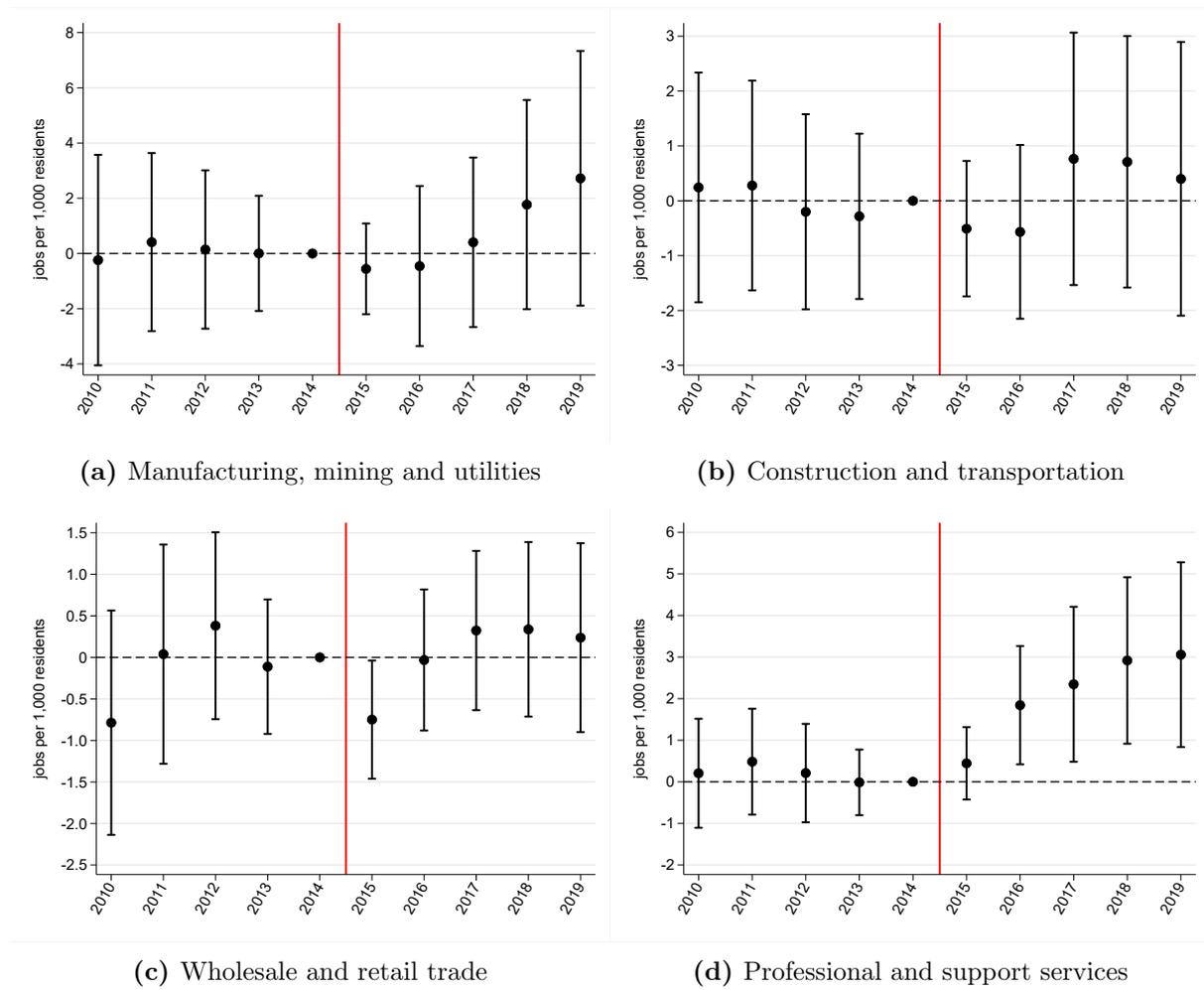
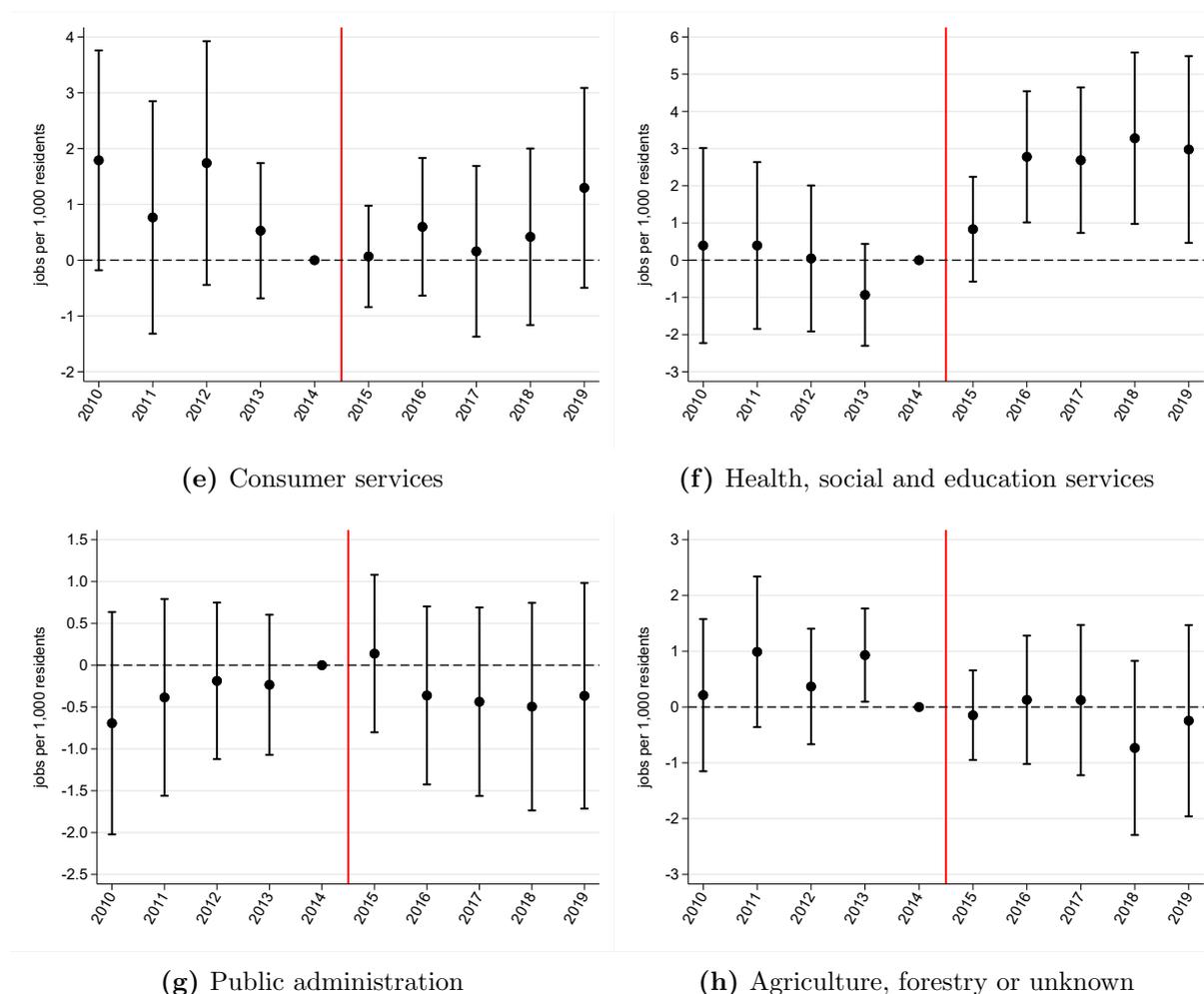


Figure C.13: Number of jobs per 1,000 residents by industry: winner vs. loser municipalities



Notes: Industry-specific results include both private and public sector jobs. Industries are defined based on Statistics Finland's *Standard Industrial Classification TOL 2008*, which is equivalent to *NACE Rev. 2* industry classification. Industry groups include the following level-one sections (classification letters in parentheses): manufacturing, mining and utilities (B, C, D, E), construction and transportation (F, H), wholesale and retail trade (G), professional and support services (J, K, L, M, N, U), consumer services (I, R, S, T), health, social and education services (P,Q), public administration (O), agriculture, forestry or unknown (A, X).

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