



Stronger together? Assessing the causal impact of inter-municipal cooperation on the efficiency of small Italian local administrations

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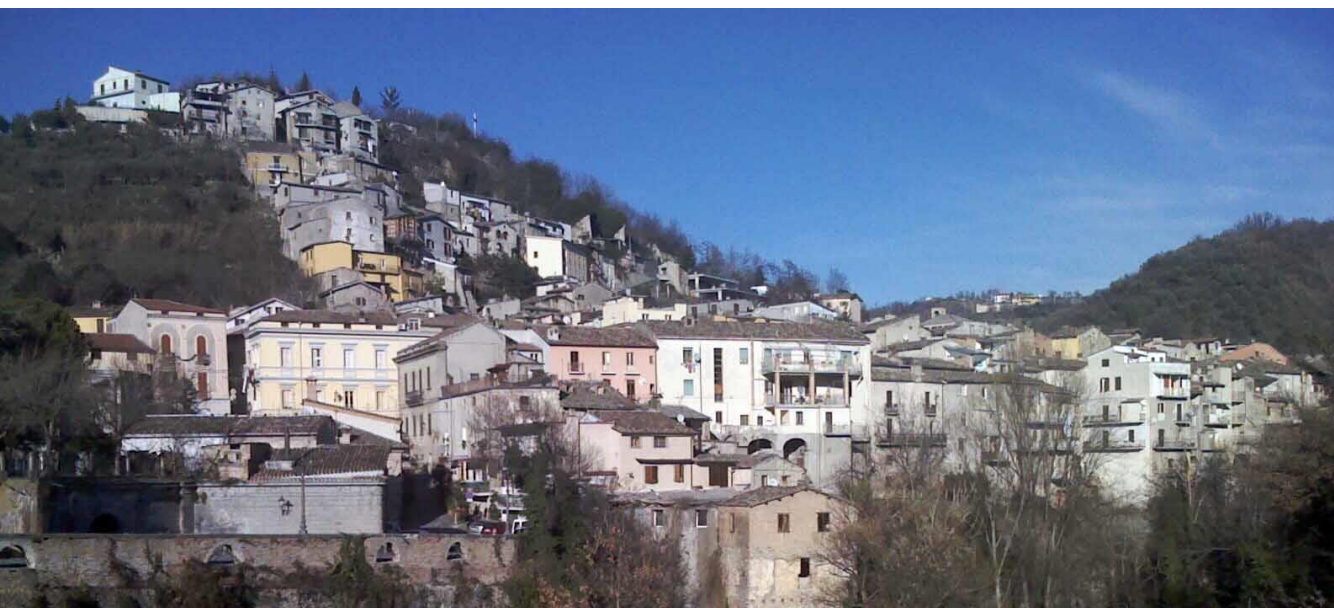
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Motivation



- More than 8,000 municipalities in Italy.
- 345 in Chile (18 M inhabitants).
- 70% of them has less than 5,000 inhabitants.
- 10% in Chile.

Motivation



- Increasing demand for locally-provided public services.
- But budget constraints limit possibilities of local public administrations.
 - EU guidelines on fiscal austerity (particularly after the crisis), transmitted from central to local governments.
- **Small municipalities particularly challenged!**

The optimal scale of local administrations

- Fiscal federalism: Smaller jurisdictions are more competent in providing local public goods, particularly in the light of heterogeneous local preferences (Tiebout, 1956; Oates, 1972).
- Yet, **excessive fragmentation** may lead to an **inefficient provision of public goods**, particularly for public goods with large economies of scale and scope (Ahrend et al., 2014; Allers & Geetsema, 2016; Bel et al., 2010; Ivaldi et al., 2016).
- Inter-municipal cooperation for service provision as a way to:
 - Achieve economies of scale and scope;
 - Internalize externalities;
 - And do so without compromising the local political authority (as happens with mergers).

Does the increase of the scale of public administrations work?

MERGERS:

- Roesel (2016) finds no effect of mergers of large districts on per capita expenditures in Saxony (Germany).
- Moisio and Muutalo (2013) find no economies of scale from municipal mergers in Finland; on the contrary an increase in per capita spending in many budget categories.

MUNICIPAL COOPERATION:

- Frere et al. (2014) report no significant effect of intermunicipal cooperation on municipal spending in France;
- Ivaldi et al (2016): non-unionized municipalities are 4 percent point more efficient than unionized ones
 - **But they do not provide a causal impact estimation of the *Unioni di Comune*;**
- Ferraresi et al. (2018) report a 5% reduction in per capita expenditure due to unionizing for municipalities of Emilia-Romagna.
 - **None of these focuses on the efficiency of spending**



The Unioni di Comuni (UdC)

- Governance arrangement of inter-municipal cooperation for the joint organization of functions and provision of services.
- UdC is a formal, independent, entity with which municipalities establish a formal agreement. Municipalities transfer the provision of some services (and the money) to the Union.
- Italy: initially established in 1990 by Law 142 “Ordinamento delle autonomie locali”.

The Unioni di Comuni (UdC)

Regione	N. unioni	N. comuni 2015		
		In regione (a)	In unioni (b)	% comuni in unioni (b/a)
Piemonte	98	1.206	713	59,1%
Valle d'Aosta	8	74	73	98,6%
Lombardia	77	1.530	289	18,9%
Trentino-Alto Adige	2	326	8	2,5%
Veneto	41	579	214	37,0%
Friuli-Venezia Giulia	4	216	9	4,2%
Liguria	23	235	115	48,9%
Emilia-Romagna	45	340	295	86,8%
Toscana	24	279	149	53,4%
Umbria	1	92	8	8,7%
Marche	22	236	129	54,7%
Lazio	22	378	108	28,6%
Abruzzo	11	305	63	20,7%
Molise	8	136	54	39,7%
Campania	16	550	93	16,9%
Puglia	23	258	113	43,8%
Basilicata	2	131	16	12,2%
Calabria	10	409	51	12,5%
Sicilia*	52	390	187	47,9%
Sardegna	35	377	282	74,8%
Totale	524	8.047	2.969	36,9%

- Currently 524 Unions including almost 3,000 municipalities (37% of total) and 19% of Italian population
- Regional authorities can promote unionizing through financial incentives



Research question

Have Municipality Unions (UdC) had a positive effect on the efficiency of municipal services provision in Italy?



Method I: The spending efficiency score

- Data Envelopment Analysis (DEA) (Farrell, 1957) to get spending efficiency scores for 5,673 Italian municipalities with data from 2013.
- DEA is a non-parametrical, distribution-free and multi-input/multi-output technique used to assess the relative technical efficiency of decision making units (DMU's).
- Efficiency is understood here in the sense of Koopmans (1951) and Debreu (1951), i.e. as a technical relationship between inputs used and outputs produced.
- DEA is not based on regression analysis, but on linear programming.



DEA: Implementation issues

- VRS against CRS or NIRS DEA supported by the test proposed by Simar and Wilson (2002; 2008)
- We calculate both standard (“naïve”) and bias-corrected (“robust”) efficiency scores
- Robust efficiency scores using the bootstrap-based method by Simar and Wilson (1998; 2000).
 - Robust-efficient DEA is based on the idea that observed technology set is really a subset of an unknown “true” optimal technology
 - And therefore the standard DEA would be a biased, lower bound, estimate of the true maximal efficiency frontier
 - Robust DEA rests on the premise that the empirical distribution of the difference between naïve scores and bootstrapped scores mimics the unknown distribution of the difference between the unobservable true frontier and the naïve estimated frontier

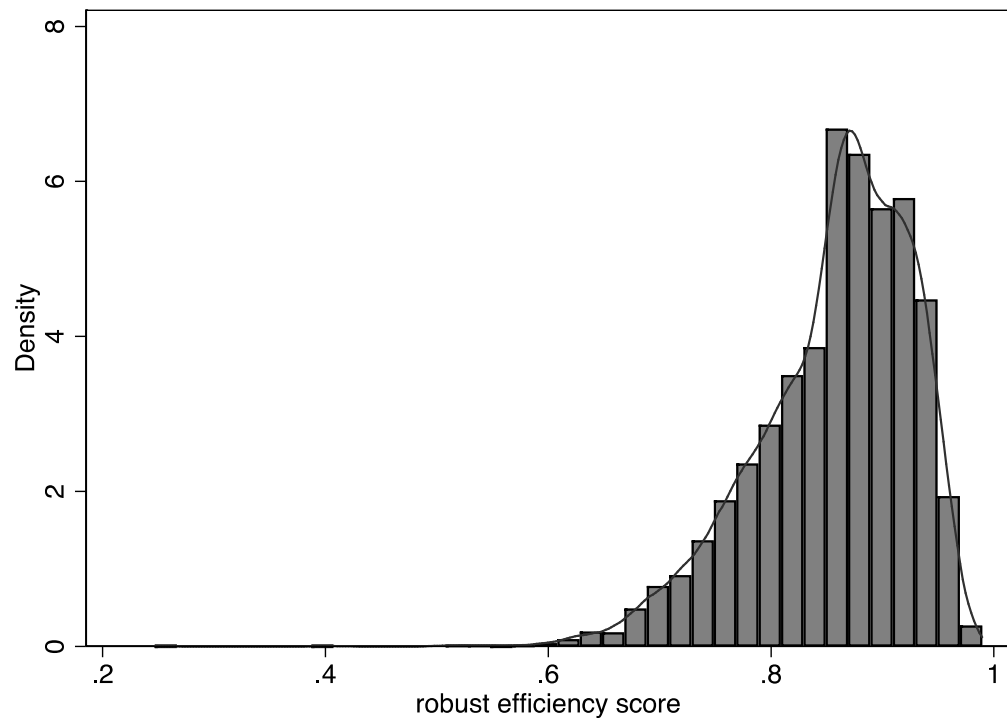
The efficiency score

- We use **1 input and 12 output** variables
- Source: Opencivitas Open Database
- Output: levels of services provision, one for each of 12 ‘essential’ policy area (e.g. tax collection, civil registry, waste collection, planning, kindergarten provision, etc.)
- DEA implemented with the R package rDEA

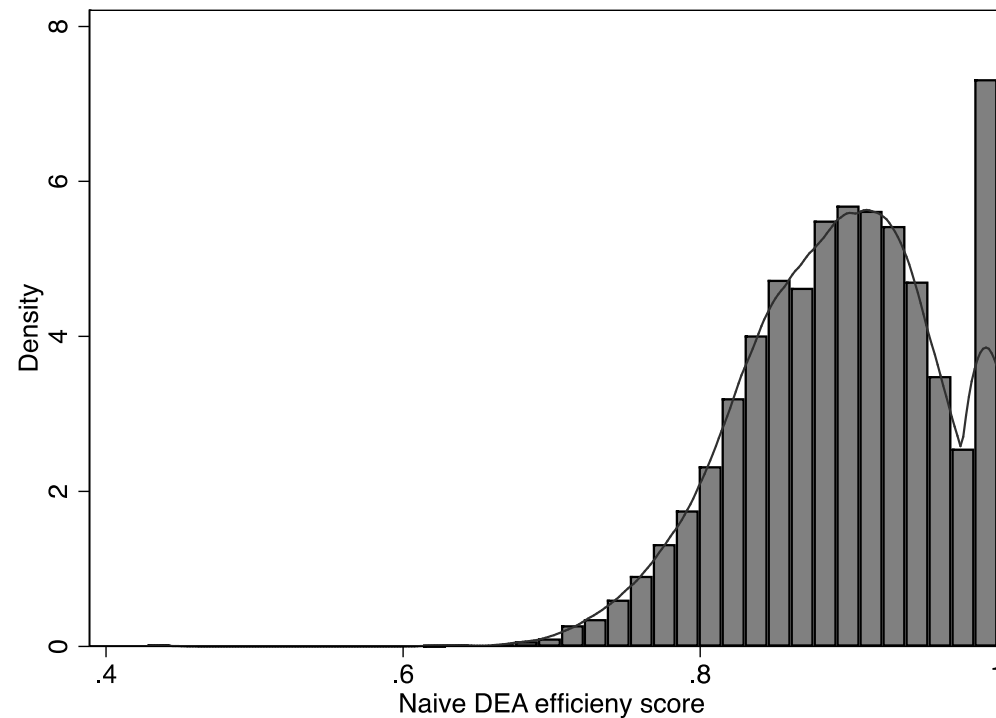
Variable	Expenditure category	Number of observations	Mean	Standard deviation	Minimum	Maximum
<i>Input variable</i>						
Spesa storica della funzioni fondamentali per abitante	Servizi Generali (generical)	6,700	635.3	465.0	1.6	19684.3
<i>Output variables</i>						
Velocità di riscossione delle imposti locale	Servizi di Gestione	6,268	69.5	63.2	0	3222.3
Numero di permessi di costruire rilasciati ogni 1,000 abitanti	Servizi di Ufficio Tecnico	6,312	6.3	9.2	0	256.4
Numero di certificazioni di stato civile ogni 1,000 abitanti	Segizi di Anagrafe, stato civile, elettorale	6,312	92.1	112.3	0	2682.1
Numero di delibere ogni 1,000 abitanti	Altri Servizi Generali	6,312	92.1	138.3	0	2777.8
Numero di sanzioni elevate processate ogni 1,000 abitanti	Funzioni di Polizia	6,312	142.8	526.7	0	22500.4
Percentuale di studenti frequentati la scuola comunale	Istruzione pubblica	6,176	0.7	4.5	0	100.0
Totale della spese relative alle funzioni nel campo della viabilità su km di rete stradale urbana e extraurbana comunale	Viabilità	6,312	3411.5	3057.2	0	69489.3
Km percorsi (da contratto di servizio) su km di rete stradale urbana e extraurbana comunale	Trasporte	6,312	3232.1	76996.0	0	5127586.0
Mq di verde urbano per abitante	Medio ambiente	6,312	35.9	891.9	0	66409.3
Percentuale di rifiuti differenziati raccolti sul totale di rifiuti raccolti e trasportati	Smaltimento rifiuti	6,298	45.4	22.9	0	100
Percentuale di utente serviti dal settore sociale sulla popolazione residente	Asili	6,312	5.6	39.4	0	2973.2
Percentuale de bambini que usufruisce del servizio di asili nido.	Asili nido	6,277	5.4	16.5	0	457.6

The efficiency score

Robust



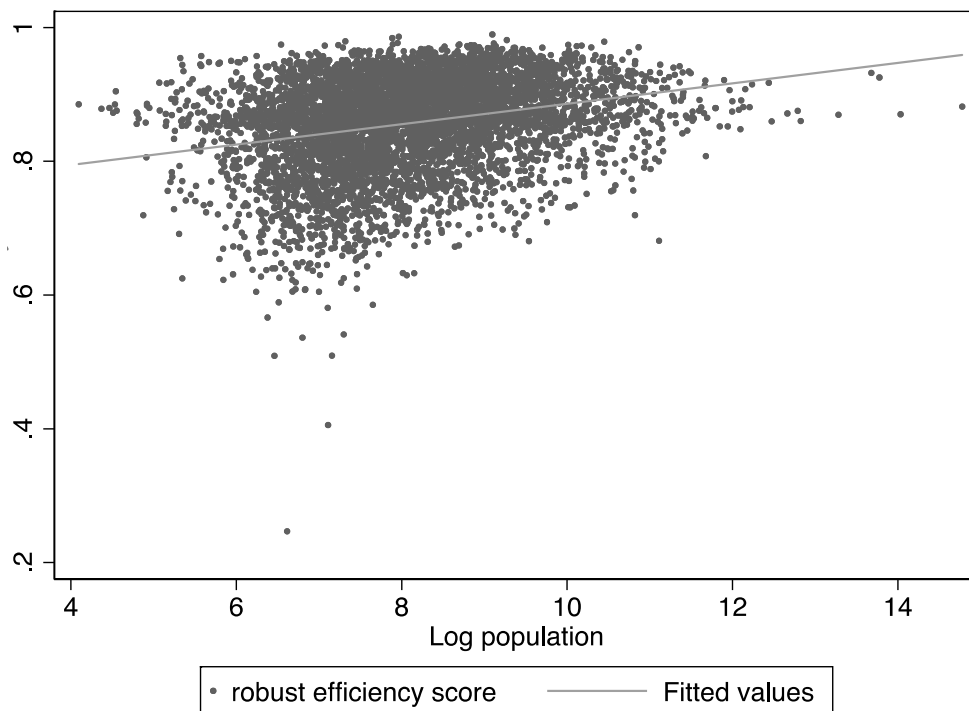
'Naïve'



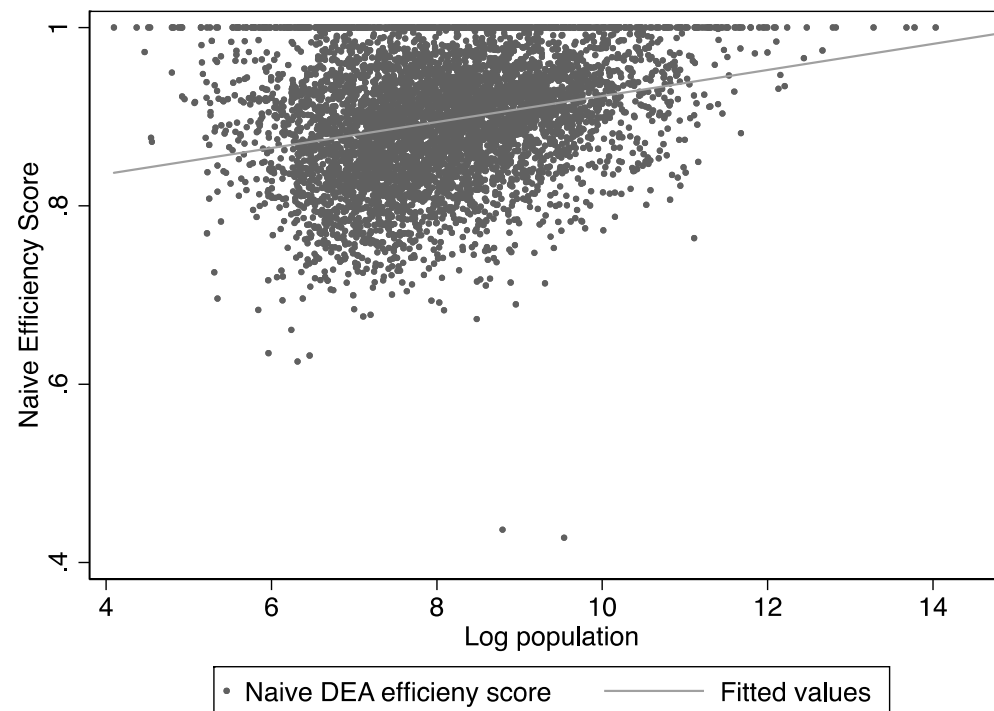
Variable	N	Mean	Std. Dev.	Min	Max
Robust efficiency score	5,673	0.856	0.070	0.247	0.990
Naïve efficiency score	5,673	0.895	0.067	0.428	1

Efficiency score and municipal size

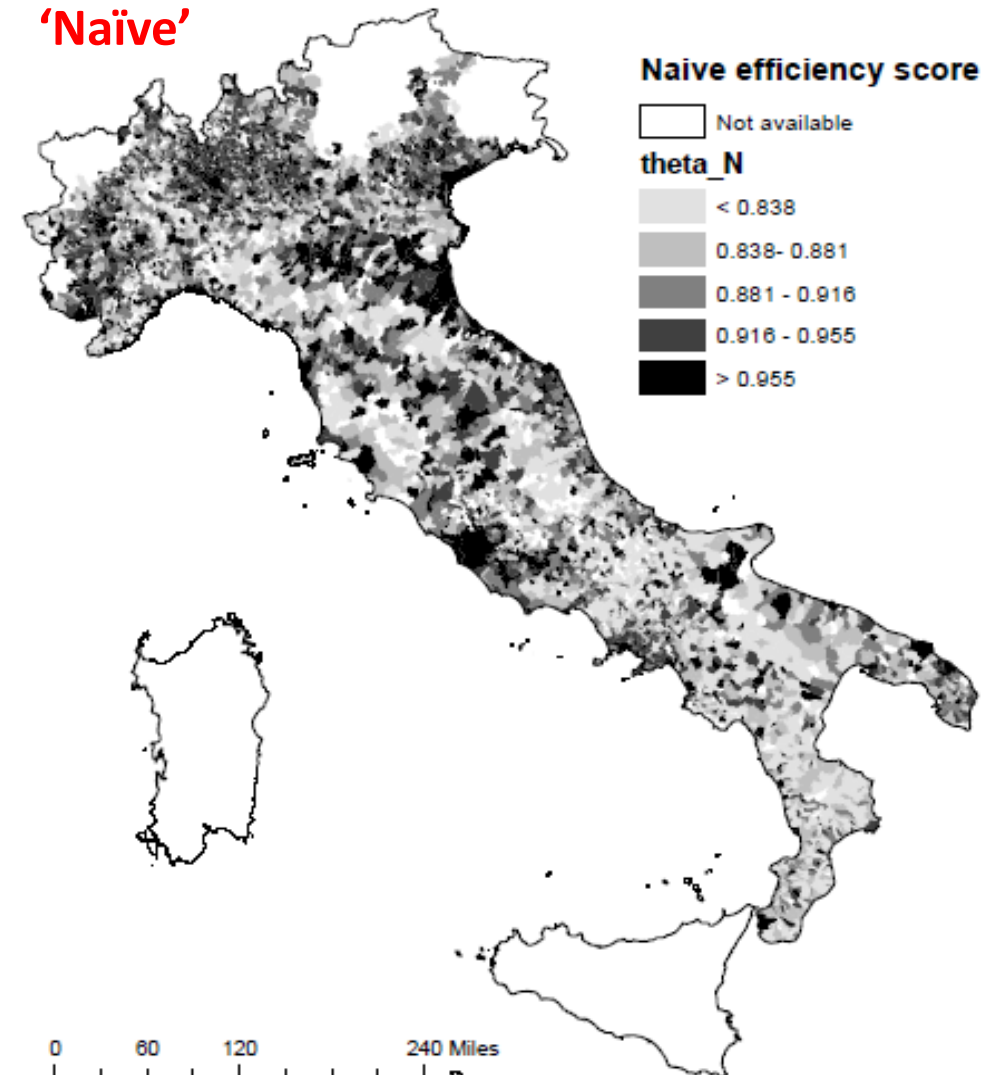
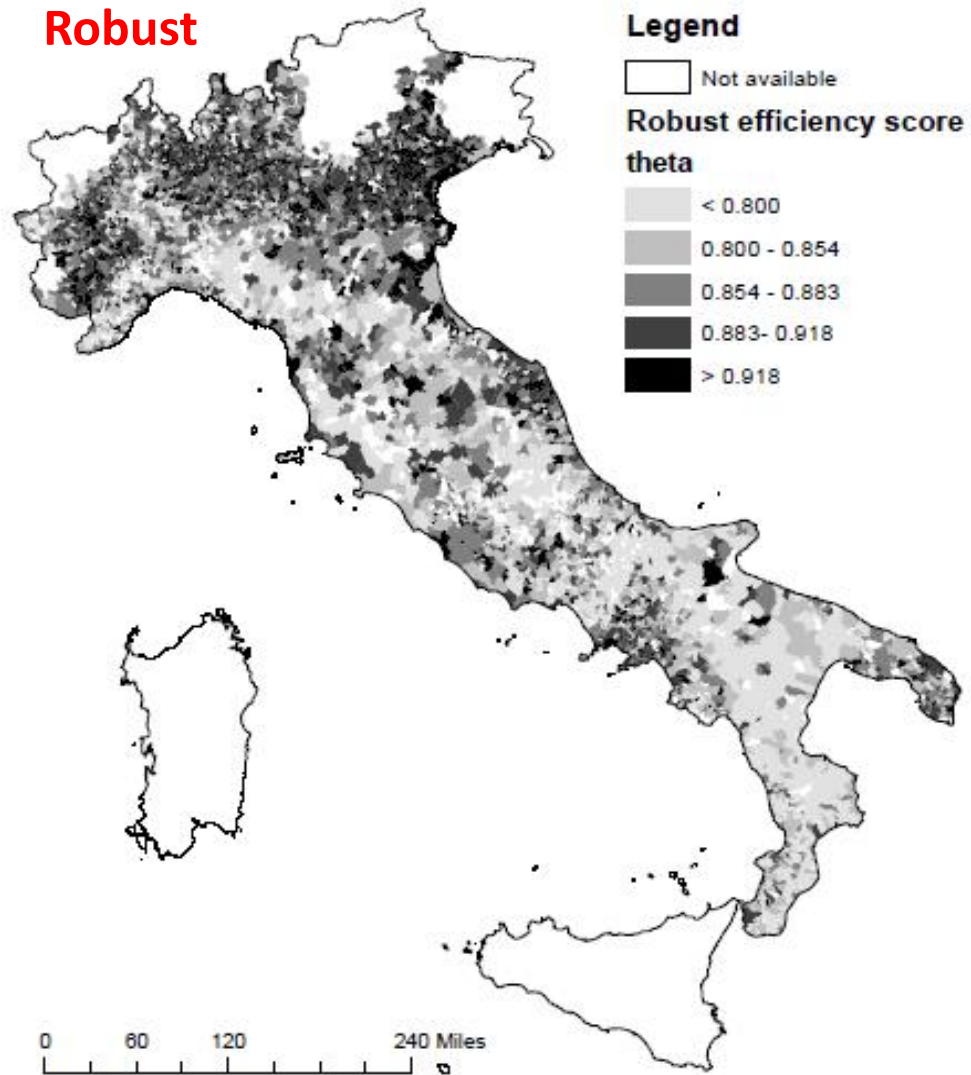
Robust



'Naïve'



The efficiency score





Method II: A quasi-experimental approach to measure the effects of UdCs

- Estimates of the effects of the Unions following a **Fuzzy Regression Discontinuity** Design (F-RDD) (Angrist and Krueger, 1991).
- RDD runs local polynomial regressions in the neighborhood of any threshold which ‘arbitrarily’ defines participation/non-participation in a policy program, and looks for “jumps” in the outcome variable: **local** average treatment effect (LATE).
- **Sharp vs Fuzzy RDD**: sharp when all units allocated to treatment received it; fuzzy RDD assumes that there are ‘non-compliers’.



Fuzzy RDD

- Fuzzy RDD does not require the predictor to perfectly predict treatment assignment.
- It only rests on the mild assumption that there is also a (possibly small) shift in the probability of assignment to the treatment at the threshold.
- This probably shift can be predicted using a suitable instrumental variable.
- So Fuzzy-RDD is essentially a **local IV regression method**.

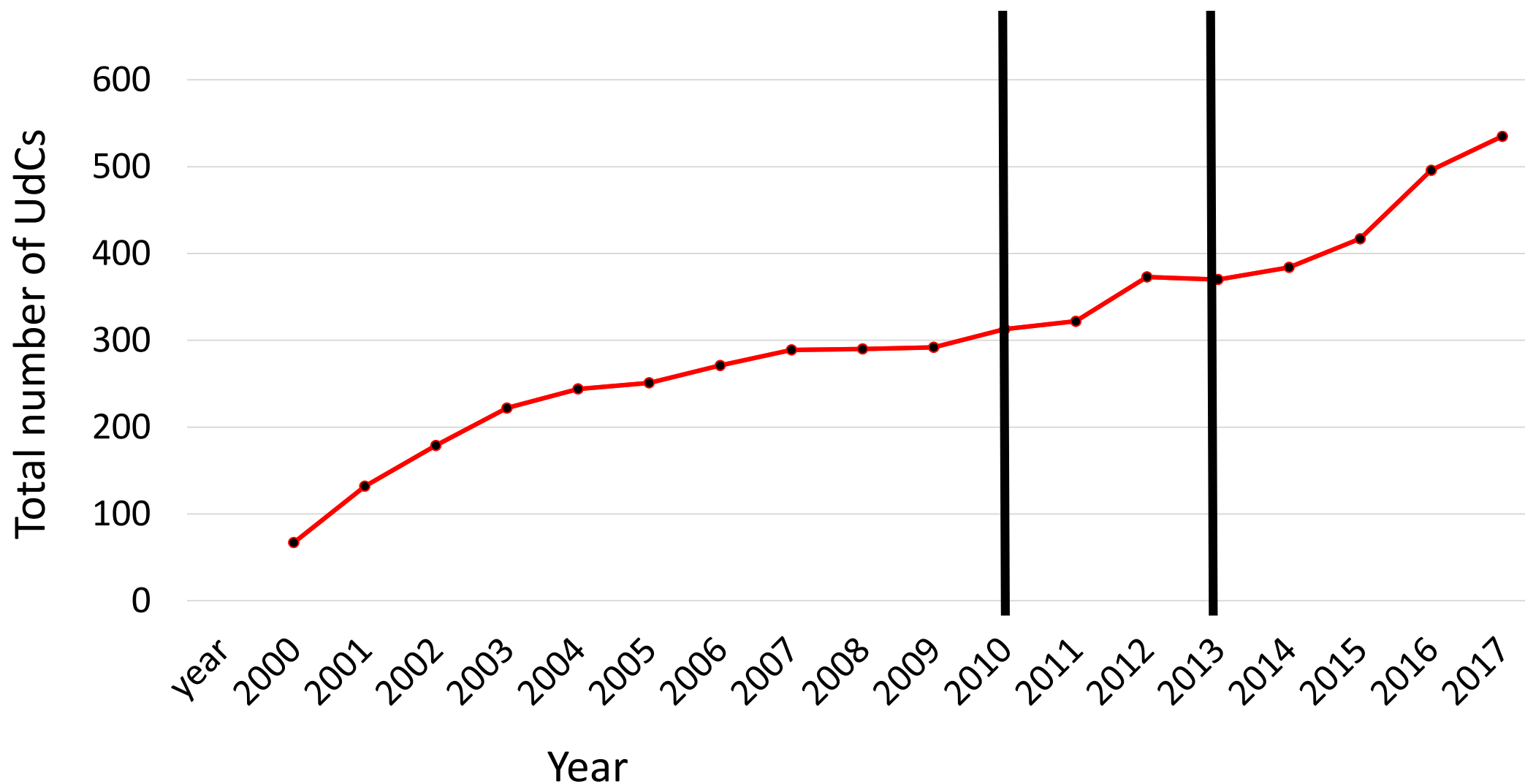
Fuzzy RDD: the policy cut-off

- Law 142/1990: municipalities below 5.000 inhabitants **can** form a UdC (one municipality up to 10.000 inhabitants was also allowed) as a first step to full merger.
- Law 265/1999: size limitations are abolished.
- Law 122/2010: limitations are re-introduced. Municipalities **below 5.000 inhabitants** are **compulsorily** required to join a UdC (3.000 inhabitants if in mountainous areas), initially by the end of 2016.

We will analyse **municipalities which unionized between 2010 and 2013.**



The increase in unionization over time



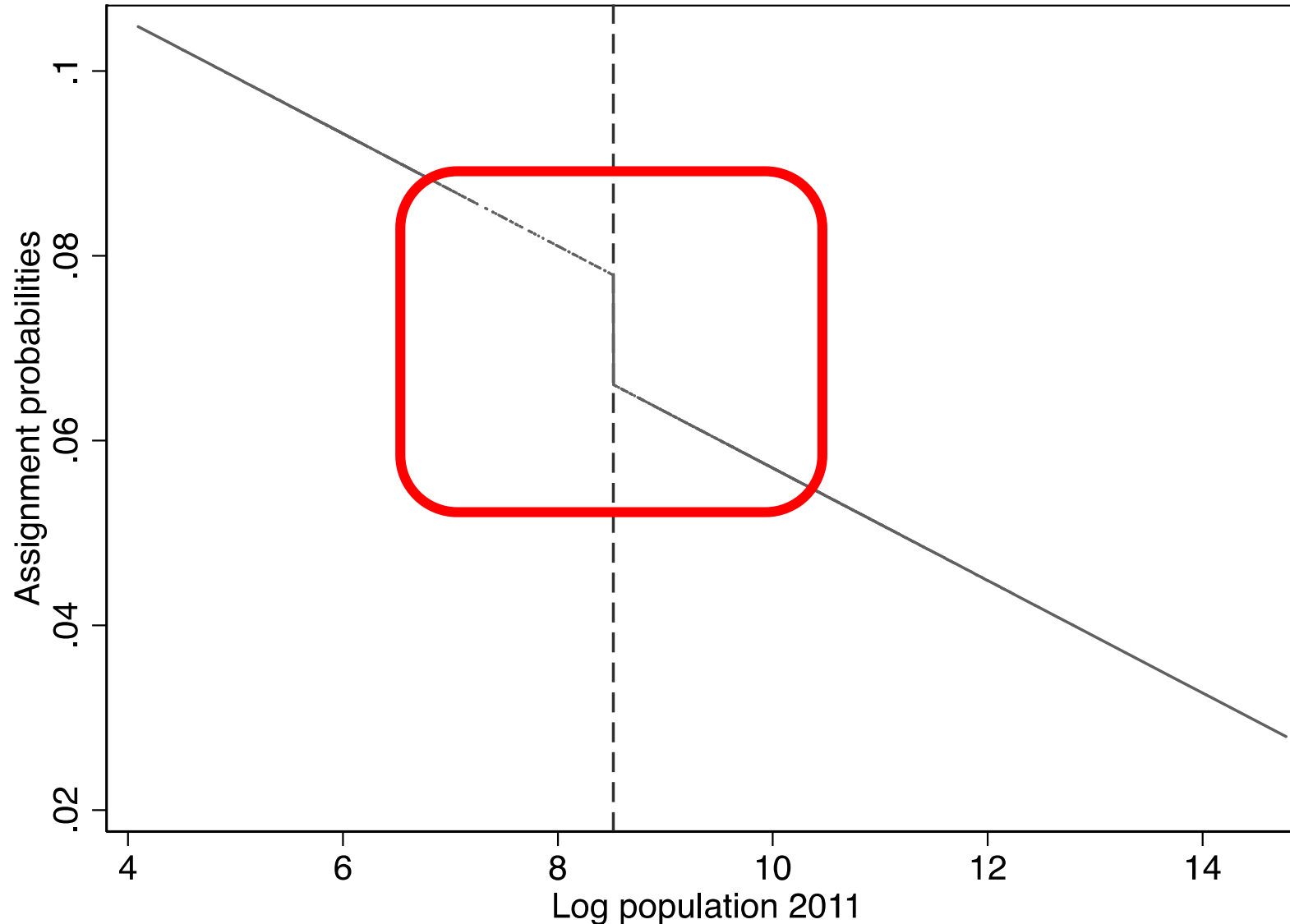


Size and Unionization (unionized between 2010-2013 only)

Below 5,000 inhabitants			
Unionized comuni	No	Yes	Total
No	1,544	2,900	4,444
Yes	99	269	368
Total	1,643	3,169	4,812

Municipal size and unionization

(threshold of 5.000 inhabitants. Unionized between 2010 and 2013)





Bandwidth selection

- RDD fits local polynomial regressions using observations “**in the neighborhood**” of the predictor’s threshold (5.000 inhabitants).
- How to define that “neighborhood”? Imbens and Lemieux (2008) propose an objective, “goodness of fit”-based criterion to choose the optimal bandwidth (h) defining which observations to include in the regression at both sides of the threshold.
- The validation criterion chooses a bandwidth h such that the mean square error of the regression is minimized. Calonico et al. (2014) propose alternative selection criteria, including different bandwidths at both sides.



F-RDD Implementation

- Dependent variable: robust efficiency score (5,673 comuni).
- Treatment status variable: $D=1$ if a Municipality belongs to a UdC (Ancitel).
- Predictor variable (excluded instrument): Comune's population in 2011 (Istat)
 - Threshold: 5,000 inhabitants → 2010 modification of the law requiring compulsory unionizing of comune below 5,000 inhabitants (below 3,000 for mountainous).
 - Law enacted in 2010 so we exclude comuni unionized before 2010 (4,812 comune after filtering).
 - But not all comune below 5,000 are actually unionized → fuzzy RDD.
- Covariates included.

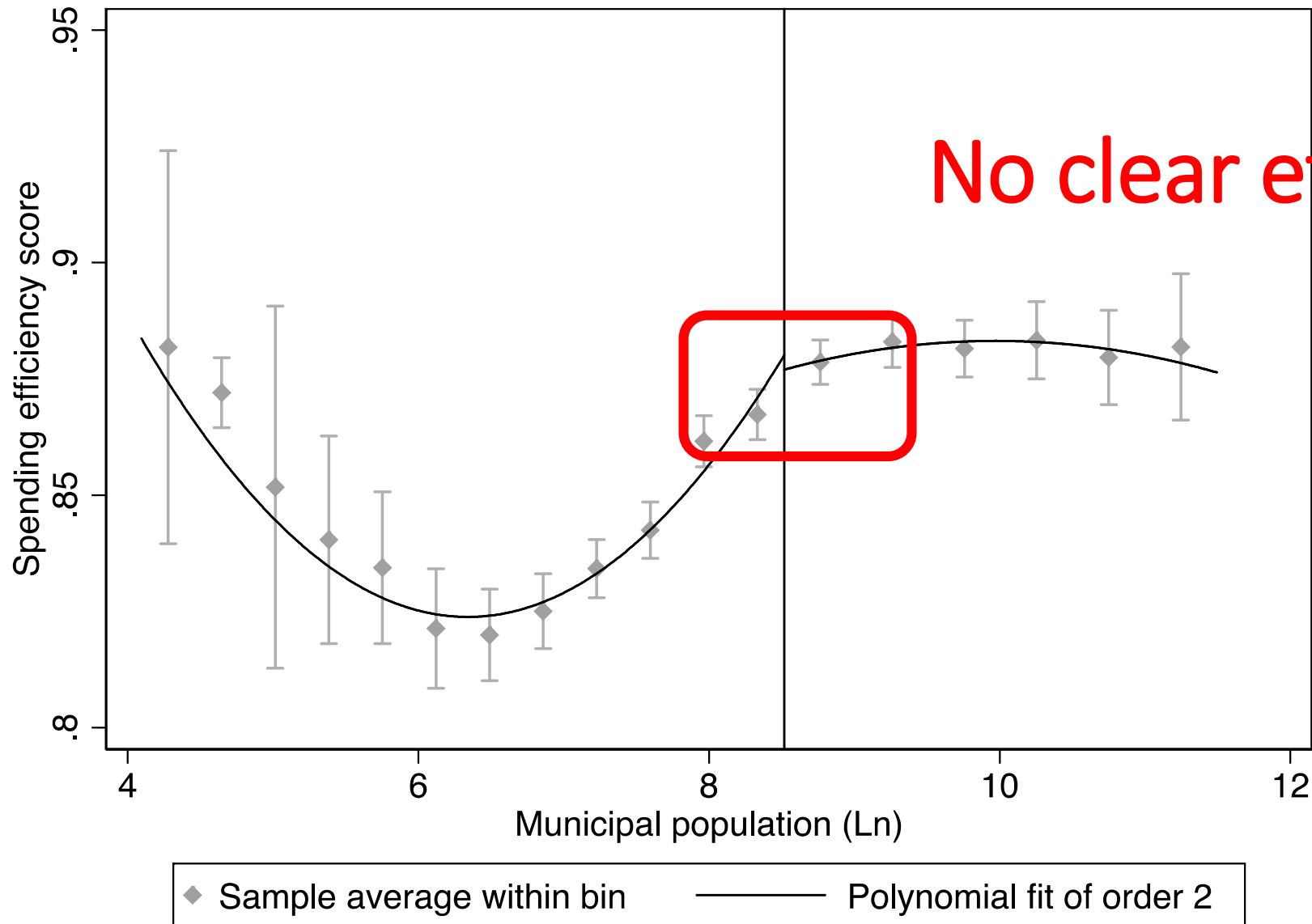
Given the local nature of the method's estimates, LATE can be interpreted as the causal effect of the Unioni on small municipalities (main focus of the policy, by the way).



Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Efficiency score	5,673	0.856	0.070	0.247	0.990
Comune population	5,673	8478.280	45871.510	60	2617175
Unmeployment rate	5,673	9.793	5.734	0	42.182
Comune having elections between 2010 and 2013	5,673	0.011	0.102	0	1
% of foreigners	5,673	7.074	4.343	0	36.274
Dummy for historic city	5,673	0.160	0.366	0	1
Altimetric zone (categorical 1 to 5)	5,673	2.872	1.618	1	5
Population Density	5,673	357.886	708.253	1.09	12220.690
Dummy of comuna commissariati	5,673	0.013	0.113	0	1
% of commuters	5,673	47.386	7.530	13.44697	76.750
Illiteracy rate	5,673	1.246	1.501	0	13.422
% of workers in primary NNRR sector	5,673	8.388	8.296	0	78.476
% of workers in industry	5,673	32.754	10.686	5.531915	74.969

The RDD plot





Results (LATE estimates)

Significant first-stage...

But no significant effects!

Second-stage estimates	(1)	(2)	(3)	(4)
Conventional	-0.204 (0.127)	-0.178 (0.104)	-0.210 (0.126)	-0.181 (0.107)
Bias-corrected	-0.204 (0.127)	-0.176 (0.104)	-0.210 (0.126)	-0.179 (0.107)
Robust	-0.204 (0.142)	-0.176 (0.116)	-0.210 (0.135)	-0.179 (0.114)
First-stage estimates				
Conventional	-0.054** (0.026)	-0.058** (0.024)	-0.058** (0.029)	-0.063** (0.029)
Bias-corrected	-0.058** (0.026)	-0.063*** (0.024)	-0.060** (0.029)	-0.066** (0.029)
Robust	-0.058* (0.030)	-0.063** (0.028)	-0.060** (0.031)	-0.066** (0.031)
Number of observations at the left of threshold	1273	1431	1036	1156
Number of observations at the right of threshold	1174	997	1025	867
Order of local polynomial regression	2	2	2	2
Bandwidth selection method	msetwo	msecomb2	certwo	cercomb2

*Significant at 10%, **at 5%, ***at 1%



Diagnosis tests 1: alternative polynomials?

Second-stage estimates	(1)	(2)	(3)	(4)
Conventional	-0.188 (0.101)	-0.188 (0.101)	-0.185 (0.098)	-0.185 (0.098)
Bias-corrected	-0.198* (0.101)	-0.198* (0.101)	-0.191 (0.098)	-0.191 (0.098)
Robust	-0.198 (0.119)	-0.198 (0.119)	-0.191 (0.111)	-0.191 (0.111)
First-stage estimates				
Conventional	-0.044*** (0.017)	-0.044*** (0.017)	-0.049** (0.020)	-0.049** (0.020)
Bias-corrected	-0.049*** (0.017)	-0.049*** (0.017)	-0.053*** (0.020)	-0.053*** (0.020)
Robust	-0.049*** (0.020)	-0.049*** (0.020)	-0.053** (0.022)	-0.053** (0.022)
Number of observations at the left of threshold	980	980	823	823
Number of observations at the right of threshold	761	761	662	662
Order of local polynomial regression	1	1	1	1
Bandwidth selection method	msetwo	msecomb2	certwo	cercomb2

*Significant at 10%, **at 5%, ***at 1%

Diagnosis tests 2: alternative threshold?

First stage estimates for threshold: 3,000 inhabitants

First-stage estimates	(1)	(2)	(3)	(4)
Conventional	0.003 (0.003)	0.003 (0.003)	0.003 (0.006)	0.002 (0.003)
Bias-corrected	0.003 (0.003)	0.004 (0.003)	0.002 (0.003)	0.002 (0.003)
Robust	0.003 (0.003)	0.004 (0.003)	0.002 (0.003)	0.002 (0.003)
Number of observations at the left of threshold	1622	1661	1365	1407
Number of observations at the right of threshold	1508	1508	1293	1293
Order of local polynomial regression	2	2	2	2
Bandwidth selection method	msetwo	msecomb2	certwo	cercomb2

*Significant at 10%, **at 5%, ***at 1%



Diagnosis test 3: Discontinuities in covariates?

- Sharp RDD estimates on covariates

Sharp estimates	Unemployment rate	% workers in industry	Population density	% of workers in primary sector
Conventional	-0.006 (0.014)	-0.025 (0.075)	-0.018 (0.040)	-0.018 (0.015)
Bias-corrected	-0.008 (0.014)	-0.014 (0.075)	-0.042 (0.040)	-0.021 (0.015)
Robust	-0.008 (0.015)	-0.014 (0.106)	-0.042 (0.055)	-0.021 (0.015)
Number of observations at the left of threshold	1852	11	36	703
Number of observations at the right of threshold	1164	793	3633	1316
Order of local polynomial regression	2	2	2	2
Bandwidth selection method	msetwo	msetwo	msetwo	msetwo

*Significant at 10%, **at 5%, ***at 1%

Heterogeneous impacts: Geographic areas

Second-stage estimates	North	Center	South
Conventional	-0.123 (0.077)	0.029 (0.076)	1.087 (1.757)
Bias-corrected	-0.137 (0.077)	0.046 (0.076)	0.735 (1.757)
Robust	-0.137 (0.087)	0.046 (0.079)	0.735 (1.996)
First-stage estimates			
Conventional	-0.053** (0.023)	-0.154* (0.089)	0.024 (0.045)
Bias-corrected	-0.057** (0.023)	-0.196** (0.089)	0.032 (0.045)
Robust	-0.057** (0.027)	-0.196* (0.103)	0.032 (0.052)
Number of observations at the left of threshold	780	194	396
Number of observations at the right of threshold	583	136	243
Order of local polynomial regression	2	2	2
Bandwidth selection method	mserd	mserd	mserd

*Significant at 10%, **at 5%, ***at 1%



Robustness check: Matching estimates

- Two concerns with F-RDD estimates:
 1. Large reduction of the sample due to early unionization (before 2010's change of the law).
 2. Moment of evaluation: outcomes measured in 2013 and unionization taking place between 2010 – 2013
- Also a comparison with Ferraresi et al., 2018



Matching estimates

Second-stage estimates	All comune but those unionized before 2010	Including all comune	Same sample as F-RDD
ATT	-0.044 (0.006)	0.001 (0.004)	-0.003 (0.008)
N	4439	5259	2278
% sample on common support	93.8	99.9	92.5
Post matching balance test	Y	Y	Y

Robustness check 2: Alternative efficiency score (work in progress)

- Censored variable
- F-RRD using IV tobit estimates
- Preliminary results are the same: no significant effect of Unions on spending efficiency



Conclusions

- **We do not find any spending efficiency gain** for small municipalities participating in UdC's, neither on average nor for macro geographic areas.
- Flawed theory?
 - Heterogenous preferences?
 - Absence of substantial economies of scale in services provided?
 - Incentives to unionize acting against efficiency?
- Implementation issues?
 - Coordination failures?
 - Organizational slack?
 - In depth case studies can help understanding why!



Thank you.

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