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Redistribution and risk-sharing effects of intergovernmental transfers: an empirical analysis based on Italian municipal data

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Abstract

This paper studies the redistributive and risk-sharing effects of intergovernmental grants at the municipal level, taking advantage of the 2015 reform of the Italian municipal equalisation system. The reform introduces formula grants to equalise the fiscal gap only in municipalities in standard regions, but not in municipalities located in special autonomous regions. We can, therefore, use difference-in-differences estimators to identify the causal relationship between formula grants and local GDP thanks to this asymmetric pattern. Final results show that formula grants lead to greater redistribution than pre-reform transfers. On the contrary, new transfers have low risk-sharing effects, due to the lag in data available to evaluate fiscal capacity and expenditure needs.ⁱ

Keywords: intergovernmental grants, redistribution, risk-sharing, fiscal capacity, standard expenditure needs

JEL classification: H70, H73, H77, H84.

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1. Introduction

The economic crisis following the outbreak of the Covid-19 pandemic hit local economies asymmetrically, as a result of the epidemic spreading more severely in some areas than in others. The mitigation and confinement measures affected local economies more heavily, where the sectors which entailed a greater exposure to the risks of contagion weighed the most (for example, tourist areas).

Given the asymmetric impact of the Covid-19 pandemic, it is natural that subnational governments were at the forefront in implementing policies to prevent the spread of the virus (especially where public healthcare responsibilities are decentralised) and to provide financial support to citizens and businesses affected by the economic crisis, by tailoring emergency measures to the specificities of local needs. The rise in needs and fall in revenues put subnational governments' budgets under strain, with a different impact across jurisdictions.

The episode of the Covid-19 crisis has added further interest to a more general issue: how the fiscal arrangements can absorb idiosyncratic shocks hitting local economies and, in this way, affect the fiscal position of subnational governments. Here, we investigate in particular the role of intergovernmental equalisation schemes in providing risk-sharing and stabilisation across local jurisdictions by means of local budget interventions. The ability of intergovernmental grants to shield subnational governments and local economies from the fiscal impact of an idiosyncratic shock depends critically on whether they have pro-cyclical or counter-cyclical design features, the latter being desirable to assure smoothing effects.

This paper provides new evidence on the redistributive and insurance effects of intergovernmental transfers by focusing on the case of Italian municipalities. Italy is an interesting case study for two reasons. Firstly, it implemented a broad reform of intergovernmental transfers to municipalities that replaced fixed grants, based on historical expenditure, with a formula-based equalisation system based on fiscal gap – the difference between expenditure needs and fiscal capacity. This reform was not applied to all Italian municipalities since those located in two special autonomous regions (Sicily and Sardinia) continued to receive their grants according to the previous regime. Hence, by comparing the years before and after the reform and using the municipalities in those two special regions as a control group, we can identify the redistributive and risk-sharing impact of the equalisation formula grants based on the fiscal gap. Secondly, municipalities were subjected to strict rules that severely limited debt financing. Consequently, any change in intergovernmental transfers

directly impacted the net contribution of the municipalities to their respective local economies, thus providing an ideal setting for evaluating the redistributive and insurance effect of this level of government.

As the main contribution, we show that the switch from fixed grants based upon historical expenditure to an equalisation system based on formula has increased the interregional redistribution carried out by the budget of the lowest tier of government, that is municipalities. At the same time, it did not significantly change the degree of risk-sharing due to the lag in income values entering the estimation of fiscal capacity.

The paper is organised as follows. The initial section places the issues addressed here within the framework of the relevant economic literature. The third section incorporates a brief overview of the fiscal residua algebra and highlights the paper's primary focus. Section 4 sketches the main features of the Italian institutional framework with particular reference to the system of intergovernmental fiscal relations and describes the reform of fiscal equalisation across municipalities recently implemented. Section 5 illustrates the empirical model, whereas section 6 describes the data used in the empirical analysis. The main results of the estimation of redistributive and risk-sharing effects are discussed in section 7. Section 8 concludes.

2. Literature review

The literature has long investigated the role of the public budget in redistributing income across territories and providing insurance against idiosyncratic shocks (Andersson & al., 2008; Bayoumi & Masson, 1995; Melitz & Zumer, 2002; Sala-i-Martin & Sachs, 1991; Feld & al., 2020). In addition to the overall impact of public policies, several studies have also analysed the differential effects of specific items of the central government budget (public consumption, direct taxes, social insurance, and monetary transfers).

Although the results differ significantly across countries and periods, they suggest that direct taxes, public consumption, and intergovernmental transfers contribute substantially to interregional redistribution. In contrast, the evidence on the risk-sharing effect is somewhat mixed. Some studies have found that some public budget components may amplify regional shocks in economic activity. In particular, in the case of Italy, Decressin (2002) and Gandullia & Leporatti (2020) found that fiscal revenues (and also public investment) have a risk enhancing effect on regional economic activity, while Arachi & al. (2010) show that vertical fiscal flows from central governments to local governments are significantly pro-cyclical.

Most of the literature contributions share a common empirical strategy. Redistribution and risk-sharing are usually investigated by analysing the relationship between fiscal flows across territories (usually measured by the fiscal residua) and a variable related to local activity (usually local GDP). Following Bayoumi & Masson (1995) and Melitz & Zumer (2002), the redistribution effect is commonly estimated through cross-sectional regressions on long-run average levels of per-capita GDP before and after interregional fiscal flows. While risk-sharing is assessed using panel regressions on the first differences of the same variables, including, as in Asdrubali et al. (1996) year fixed effects to capture the year-specific impact on growth ratesⁱⁱ, thus isolating the impact of the national growth rate in case of regional data.ⁱⁱⁱ The existing studies largely disregard heterogeneity: the degree of redistribution and risk-sharing are assumed to be uniform among territories and constant in time. However, some recent studies on Italian data have shown that there could be significant differences in the degree of risk-sharing among territories (Gandullia & Leporatti, 2020) and that the degree of redistribution and risk-sharing has differed considerably over time (Giannola & al., 2016; Petraglia & al., 2018; Petraglia & al., 2020).

We add to the existing literature in two ways. Firstly, we provide new evidence on the role of a specific intergovernmental flow, namely equalisation transfers to local governments, which has been disregarded by existing studies, except for Blochliger & Egert (2017). Secondly, by exploiting a reform enacted in Italy in the mid-2010s, we can shed some light on the features of the intergovernmental transfers that may account for the change in the degree of redistribution and risk-sharing through time. Italian data allows us to use a difference-in-difference technique to identify formula grants' redistributive and risk-sharing effect (based on fiscal gap equalisation). The crucial aspect of the Italian institutional framework is that the reform did not affect municipalities located in special autonomous regions, allowing the identification of a control group.

3. Theoretical framework

Starting from the literature reviewed in section 2, on the role of the public budget in providing redistribution and risk-sharing across territories, this paper focuses on a specific component of the public intervention, namely intergovernmental transfers at the municipal level.

The literature has usually relied on fiscal residua to evaluate redistribution and risk-sharing brought about by the public budget. In a specific jurisdiction, the fiscal residuum is the difference between the total expenditure of a particular tier of government (net of interest payments

and transfers to other levels), which benefits the residents of that jurisdiction, and the total revenues (again net of transfers) collected from residents. A positive residuum means that the residents benefit from resources provided by the rest of the country (expenditures in the jurisdiction exceed revenues collected there); a negative residuum implies that the territory gives up part of its resources to finance expenditures elsewhere (see De Simone and Liberati 2020 for a detailed analysis of the decomposition of Italian fiscal residua at regional level).

Focusing on just two tiers of government, the central government (denoted by C) and the municipal level (denoted by M), the fiscal residuum of municipality i can be calculated by means of equation (1),

$$R^i = G_C^i - T_C^i + G_M^i - T_M^i \quad (1)$$

where G_C^i, G_M^i denotes public spending (net of intergovernmental transfers) in the municipal area i by the central and the municipal governments respectively, and T_C^i, T_M^i denotes the tax yield collected in the municipal area i by the central government and the municipal government respectively.

Assuming that a balanced budget constraint holds for municipal governments, we have

$$G_M^i - T_M^i \mp TR_{i \rightarrow j}^i - TR_{C \rightarrow i}^i = 0 \quad \forall i \quad (2)$$

where $TR_{C \rightarrow i}^i$ denotes intergovernmental transfers paid by the central government in favour of municipality i (vertical transfers) and $TR_{i \rightarrow j}^i$ denotes intergovernmental transfers paid/drawn by the municipality i to/from municipality j (horizontal transfers). Substituting equation (2) into (1), the fiscal residuum can be written as in equation (3):

$$R^i = (G_C^i - T_C^i) + (TR_{C \rightarrow i}^i \mp TR_{i \rightarrow j}^i) \quad (3)$$

Hence the fiscal residuum of municipality i is given by the difference between public spending and taxes levied by the central government in the municipality, plus the sum of net vertical and horizontal transfers received or paid by the municipality. For the rest of the analysis, we focus on the last component $(TR_{C \rightarrow i}^i \mp TR_{i \rightarrow j}^i)$ of the fiscal residuum by studying its redistributive and risk-sharing effects.

4. The Italian institutional framework

The lowest of the subcentral levels of government in Italy is represented by 7,903 municipalities (1,339 of which are located in the territories of the five autonomous special regions provided for by the Italian Constitution^{iv}), which manage 6.8% of total current public expenditure (54.8 billion euros in 2019). They are responsible for the provision of services in significant sectors of public intervention, such as environmental protection and waste management, social care, childcare and nursery schools, school-related services, local police, local transport, maintenance of local roads, land registry, town planning, culture and recreation and economic development.

The financing system of the Italian municipalities follows two different arrangements.^v The funding of the 6,565 municipalities located in the fifteen ordinary regions (henceforth referred to as OR municipalities) and of the 767 in the two autonomous special regions of Southern Italy, Sicily and Sardinia (SR municipalities) is mainly based on local taxes assigned by the central government and on equalisation grants equally managed at the central level. Otherwise, the 571 municipalities located in the three autonomous special regions of Northern Italy (Aosta Valley, Friuli Venezia Giulia, Trentino-South Tyrol) draw their funding directly from the corresponding regional budgets, and these municipalities are excluded from the equalisation grants managed by the central government. Hence, since we aim to investigate the redistributive and insurance effects of intergovernmental transfers, we restrict our analysis to the former group of municipalities (as mentioned, OR municipalities plus SR municipalities, corresponding to 93% of the total).

However, an essential feature of the operation of the equalisation mechanism distinguishes OR municipalities from SR municipalities: for the former, equalisation grants are determined as the difference between standard expenditure needs and standard fiscal capacity following the recently introduced methodology, whereas for the latter, grants continue to be assigned to the amounts stabilised in the past, based on historical resources assessed in 2012. More specifically, up to 2014, the municipal equalisation mechanism, named the Municipal Solidarity Fund (MSF), operated similarly for all OR and SR municipalities.^{vi} Starting in 2015, the MSF reform changed the allocation criteria of equalisation grants for OR municipalities gradually. According to a subsequent revision of the reform^{vii} for OR municipalities, the transitional period will end in 2030 when equalisation grants will close the fiscal gap between standard expenditure and fiscal capacity exclusively. More details regarding the structure of the MSF are reported in Appendix A.

Figure 1 shows the distribution across municipalities (as mentioned, OR municipalities plus SR municipalities) of the two relevant components of the new equalisation mechanism as applied in 2020: standard expenditure needs and fiscal capacity. Standard expenditure needs (reported in per capita terms in panel *a*) appear more evenly distributed over the peninsula, with municipalities above the average mainly located in inland and mountainous areas. Fiscal capacity (reported again in per capita terms in panel *b*) instead shows a neat segmentation between the municipalities above the national average, mainly located in the Centre-North of Italy, and municipalities below the national average in Southern Italy.

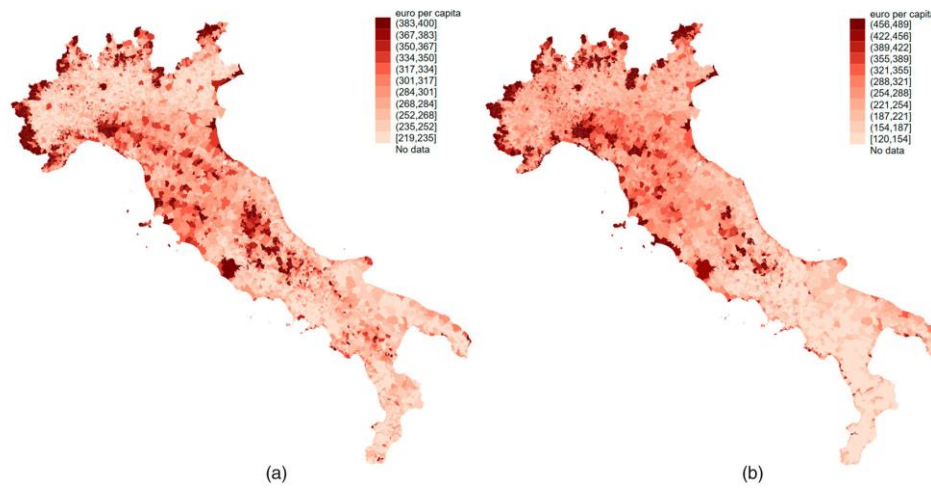


Figure 1. Municipal standard expenditure needs and fiscal capacity, 2020, euros per capita: (a) standard expenditure needs; and (b) fiscal capacity.
Source: Italian Ministry of Economy and Finance.

Standard expenditure needs and fiscal capacity result from complex statistical exercises. Appendix B reports the details regarding the econometric models.^{viii} One feature common to standard expenditure needs and fiscal capacity computation is that variables included in the models, although dynamically updated yearly, lag by three (and in some cases four) years. Therefore, the fiscal gap in year t reflects the socio-economic conditions featuring municipalities in year $t-3$ with a delay of three periods. This point lies at the centre of our analysis, and will be discussed in greater detail in section 7.2, where we will investigate the risk-sharing effects of the new equalising mechanism.

Although standard expenditure needs and fiscal capacity are highly correlated (at 65% at 2020 values), they direct equalisation grants in different ways, given their distinct correlation with the average reported

municipal income that we adopt in the analysis as a proxy for municipal GPD.^{ix} As a result, the fiscal gap will be more pronounced in municipalities located in the Southern regions. Therefore, as Figure 2 shows, the flow of equalisation grants will redistribute in favour of municipalities located in the Southern regions, especially at the end of the transition period. Panel *a*) of Figure 2 displays the distribution of per capita MSF equalisation grants as applied in 2020 at 27.5% of the transition, while panel *b*) shows how the distribution should change in 2030 at the end of the transition period.

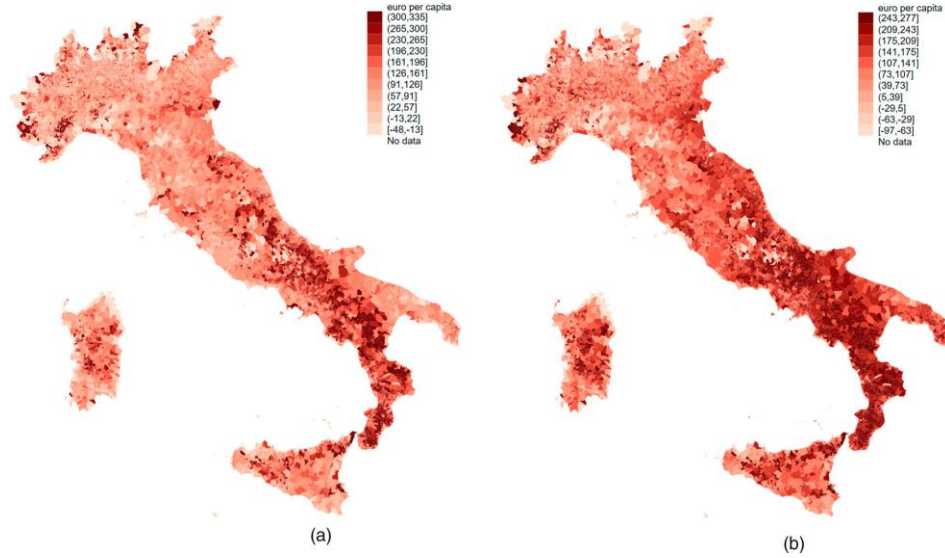


Figure 2. Municipal Solidarity Fund (MSF): evolution of grants redistributions (gross endowment), euros per capita: (a) 2020MSF gross endowment; and (b) 2030 MSF gross endowment (simulation based on 2020 regulations).

Source: Authors' elaboration of data from the Italian Ministry of Interior

5. Empirical framework

Our empirical strategy aims to identify the impact of fiscal gap equalisation on the redistributive and risk-sharing effect of intergovernmental grants. Italian data allows us to use a difference-in-difference technique since OR municipalities will constitute the treated group and SR municipalities the control group. Instead, introducing fiscal gap equalisation in 2015 will represent our treatment effect. Our final regression sample will include only OR and SR municipalities located in the Southern regions, so as to make the municipalities in the treated and the control groups more comparable and satisfy the pre-treatment common trend conditions.

Following the literature (see section 2 for more details), we estimate the redistributive effect of equalisation transfers by regressing the levels of a variable measuring local economic activity plus transfers on the same local variable of economic activity before the transfers. Given that GDP data is not available at the municipal level, we use the per-capita average base of the income tax as the proxy for local economic activity. In the standard approach, first proposed by Bayoumi and Masson (1995), data is averaged over time, leading to a cross-sectional regression. To identify the impact of the 2015 reform of the equalising transfers, we apply OLS to the two-periods linear model specified in equation (4):

$$Y_{ip} = \gamma_0 + \gamma_1 X_{ip} + \gamma_2 X_{ip} \cdot D_{ip} + \gamma_3 D_{ip} + \gamma_4' Z_{ip} + R_i + T + \varepsilon_{ip} \quad (4)$$

where the subscript i denotes the municipalities, p the time period (before or after 2015) and:

T = a dummy variable which takes the value zero before 2015 and one from 2015 on;

Y_{ip} = income plus equalisation transfers per capita (averages before and after 2015);

X_{ip} = income per capita (averages before and after 2015);

D_{ip} = treatment dummy (equal to one after 2015 for OR municipalities located in Southern regions, zero otherwise);

Z_{ip} = control variables (averages before and after 2015);

R_i = dummy equal to one for OR municipalities, zero otherwise;

ε_{ip} = idiosyncratic error component.

The coefficients have the usual interpretation. The redistributive effect of historical transfers is measured by $1 - \hat{\gamma}_1$: a municipality with income 1 euro higher than average ends up with disposable resources $\hat{\gamma}_1$ cents higher than average. By the same token, the redistributive effect of formula transfers will correspond to $1 - \hat{\gamma}_1 - \hat{\gamma}_2$.

As highlighted in section 2, the degree of risk-sharing is usually estimated through a linear panel data model using first differences and year fixed effects to capture the year specific impact on growth rates as in Asdrubali et al. (1996) or, as suggested by Melitz & Zumer (2002), differences from the mean. In line with previous literature we adopt a linear panel data specification using within-the-group estimator, that automatically generates differences from the mean. Moreover, we also include time fixed effects that allows to de-mean data in the sense of controlling for common shocks and isolating idiosyncratic

variables. Once again, we augment the standard specification by using dummy variables to identify the impact of the reform. The model is reported in equation (5):

$$\Delta E_{it} = \beta_0 + \beta_{1\kappa} \Delta X_{ik} + \beta_{2\kappa} \Delta X_{ik} \cdot D_{it} + \beta_3 D_{it} + \beta_4' Z_{it-1} + \alpha_i + \tau_t + \varepsilon_{it} \quad (5)$$

where the subscript t is the year, κ is the lag which goes from 0 to 5, Z_{it-1} are control variables lagged by one period, α_i are municipal fixed effects and τ_t year fixed effects.^x

We insert the percentage deviation of per capital equalisation transfers from the national mean, ΔE_{it} , on the left-hand side and the percentage deviation of per capita income from the national mean, ΔX_{ik} (with up to 5 lags) on the right-hand side. Therefore, the coefficient $\beta_{1\kappa}$ represents the average income elasticity of equalisation grants at different lags before the reform. The elasticity provides a straightforward measure of the risk-sharing effect of grants. If $\beta_{1\kappa}$ is equal to zero, the equalisation grants do not react to income changes and therefore do not absorb any risk. If $\beta_{1\kappa}$ is negative, the grants increase when income decreases, thus reducing the impact of income fluctuations. In contrast if $\beta_{1\kappa}$ is positive the equalisation grants are pro-cyclical by amplifying short-run reduction or increase in municipal income. The sum $\widehat{\beta}_{1\kappa} + \widehat{\beta}_{2\kappa}$ corresponds to the estimated average income elasticity of equalisation grants at different lags after the reform, and therefore provides a measure of the risk-sharing effect of formula grants.

Finally, we decompose the redistributive effect and the degree of risk-sharing between the contributions of fiscal capacity and standard expenditure needs using the following procedure. As a first step, we compute the grants' distribution from 2015 and 2020, replacing the actual standard expenditure needs with uniform standard expenditure needs in per-capita terms. As a second step, we use this distribution to obtain $\widetilde{Y}_{ip}$ as a new dependent variable in equation (4) and $\widetilde{\Delta E}_{it}$ as a new dependent variable in equation (5). We run the two models to obtain an estimate of $\widehat{\gamma}_1, \widehat{\gamma}_2, \widehat{\beta}_{1\kappa}$ and $\widehat{\beta}_{2\kappa}$ that we can use to isolate the impact produced exclusively by fiscal capacity, then we obtain the impact of standard expenditure needs by difference.

6. Data

Our study is based on collecting financial and socio-economic data of OR municipalities located in Southern regions and SR municipalities over nine years, from 2012, which marked the implementation of the MSF, up to 2020. Therefore, the complete sample is a balanced panel that includes 2,542 municipalities for nine years (we exclude municipalities that underwent an amalgamation process between 2010 and 2020 from the regression sample).

Table 1 reports the descriptive statistics of the variables included in the dataset while Table 2 gives a detailed description of each variable. General statistics are presented for two distinct groups: OR municipalities representing our treatment group and SR municipalities representing our control group. Data sources are from the Ministry of the Interior, the Ministry of Economy and Finance and ISTAT (the Italian National Statistical Office).

Table 1 shows: MSF grants, considering 2020 values; reported income (tax base of the personal income tax) that we use as a proxy of GDP at the municipal level and control variables related to the structure of the resident population. Variable means are comparable between OR and SR municipalities, respectively, in our treatment and control groups.

Figure 3 shows the time series of MSF grants and municipal reported income, expressed in real per capita terms, to support the difference-in-difference empirical strategy. We compare the average values recorded in the treated and control groups to verify the common trend assumption in the pre-treated period. As mentioned the treated group is restricted only to OR municipalities located in Southern regions. The presence of a pre-treatment common trend is particularly evident in MSF grants. After the 2015 reform, we observed a substantial increase in grants in the treated group compared to the average amount allocated to SR municipalities.

Moreover, both groups show a drop in 2014 and 2015, caused by the fiscal consolidation process. Instead, in 2016 we observed an increase due to the transformation of the property tax's revenue on the owner-occupied main residence in grants from the central government. However, the fiscal consolidation process and the 2016 property tax reform do not operate as confounding factors since their effects are commonly spread in municipalities belonging to both groups. Therefore, our results did not change upon depurating MSF grants from these components, and for the sake of simplicity we decided to consider only the gross flow of MSF grants. A more formal analysis of the pre-treatment common trend assumption is reported in section 7.3 devoted to the robustness check.

Table 1. Descriptive statistics for municipalities included in the regression sample, 2012–20.

	Southern ordinary regions (treatment group municipalities)					Special regions municipalities (control group municipalities)				
	Observations	Mean	SD	Minimum	Maximum	Observations	Mean	SD	Minimum	Maximum
MSF (€ per capita)	15,984	169.59	179.42	−1743.44	2670.71	6894	108.97	156.78	−1001.47	1031.99
MSF property tax comp. (€ per capita)	15,984	17.48	20.01	0.00	186.26	6894	13.71	15.29	0.00	101.88
Reported PIT income (€ per capita)	15,984	8,735	1572	4446	17,409	6894	8,533	1,444	605	17,002
Population 0–2 (% of total population)	15,984	2.20	0.67	0.00	5.87	6894	2.13	0.62	0.00	5.22
Population 3–14 (% of total population)	15,984	10.10	2.34	0.79	18.69	6894	9.93	2.03	0.62	16.84
Population over 75 (% of total population)	15,984	12.98	4.77	3.03	45.63	6894	12.68	3.81	3.48	35.59
Net population variation	15,984	−5.29	6.84	−69.31	15.75	6894	−5.21	5.77	−44.87	16.95
Net migration	15,984	−0.24	12.69	−120.67	133.81	6894	−0.41	11.05	−127.60	110.22
Resident population/1000	15,984	7.83	28.06	0.07	989.11	6894	8.73	30.66	0.08	678.49

Note: Municipalities in the treatment group are the 1776 local authorities located in Abruzzo, Molise, Campania, Puglia, Basilicata and Calabria; municipalities in the control group are the 766 local authorities in Sicily and Sardinia. Observations are related to our dataset's longitudinal structure, which includes nine years from 2012 to 2020.
Sources: Ministry of Economy and Finance, Ministry of Interior and ISTAT.

Table 2. Description and sources of variables.

Variables	Description	Sources	Availability
MSF (€ per capita)	Gross flow of municipal Solidarity Funds grants	Ministry of Interior (https://finanzalocale.interno.gov.it) and www.opencivitas.it	2012–20
MSF property tax comp. (€ per capita)	Municipal Solidarity Funds grants without equalization purpose		
Reported PIT income (€ per capita)	Total reported income, tax base of the national personal income tax	Ministry of Finance and Economy, Department of Finance (https://www1.finanze.gov.it/finanze/analisi_stat/public)	2008–18
Resident population/1000	Total resident population	Italian National Institut of Statistics (http://dati.istat.it/)	2012–20
Population 0–2 (% of total population)	Resident population by age brackets as a percentage of total resident population		
Population 3–14 (% of total population)			
Population over 75 (% of total population)			
Net population variation	Natural balance per 1000 inhabitants		
Net migration	Net migration rate per 1000 inhabitants		

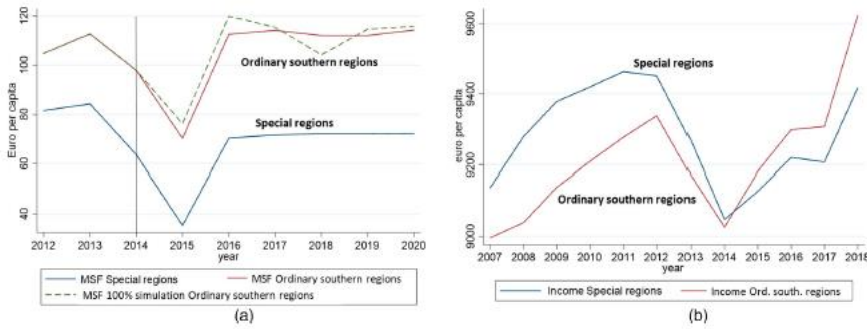


Figure 3. Time series of intergovernmental grants of the Municipal Solidarity Fund (MSF) and average reported income: comparison between the control group and the treated group (only municipalities located in Southern regions): (a) MSF; and (b) average reported income.

Source: Ministry of Economy and Finance and Ministry of Interior.

7. Results

7.1 Redistributive effects

Table 3 reports the point estimates of the relationship between income and intergovernmental grants and their interaction with the treatment dummy. In column (1) we report the point estimates related to the 2020 structure of grants. In column (2) we simulate the level of grants distributed at the end of the transitional period.^{xi}

Table 3. Analysis of the redistributive effect, point estimates of the relationship between municipal reported income and intergovernmental grants (only Southern regions).

Dependent variable (Y_{ip}) = income plus equalization transfers per capita	(1) MSF in 2020	(2) MSF in 2030 (100% simulation)
Income effect ($\hat{\gamma}_1$)	0.95 [0.000]***	0.96 [0.000]***
Income effect in treated municipalities ($\hat{\gamma}_2$)	-0.00 [0.722]	-0.01 [0.018]**
Observations	5084	5084
Controls	Yes	Yes
Regional dummies	Yes	Yes
Estimator	OLS	OLS

Note: We estimate the following model: $Y_{ip} = \gamma_0 + \gamma_1 X_{ip} + \gamma_2 X_{ip} \cdot D_{ip} + \gamma_3 D_{ip} + \gamma_4 Z_{ip} + R_i + T + \varepsilon_{ip}$, where X_{ip} = income per capita and D_{ip} = treatment dummy. Ordinary least squares (OLS) estimates with robust standard error p -value in brackets * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The treated group includes municipalities in the following regions: Abruzzo, Molise, Campania, Puglia, Basilicata and Calabria. The control group includes municipalities in the following regions: Sicily and Sardegna. The set of control variables includes: % of population 0–2, % of population 3–14, % of population over 75, net population variation and net migration.

Subsequently, we use the point estimates reported in Table 3 to evaluate the redistributive effect of historical and formula grants, decomposing this effect between the contribution of standard expenditure needs and fiscal capacity respectively. These final computations are reported in Table 4. Formula grants that dynamically equalise the fiscal gap generate a more substantial redistributive effect than static equalisation grants based on historical expenditure. However, this divergence is visible only when we simulate formula grants at the end of the transition period. In this case, we show an increase of the redistributive effect from 4.5% to 5.7%, moving from historical expenditure equalisation to fiscal gap equalisation. Moreover, following the decomposition procedure described at the end of section 5, it is interesting to point out that fiscal capacity shows a positive redistributive effect due to the correlation with local income. Instead, standard expenditure needs show a negative redistributive effect since they aim to equalise differences in the provision costs.

Table 4. Computation of the redistributive effect of intergovernmental grants.

	MSF in 2020	MSF in 2030 (100% simulation)
Redistributive effect of historical grants	4.6%	4.5%
Redistributive effect of formula grants	4.6%	5.7%
... of which standard expenditure needs		-1.4%
... of which fiscal capacity		7.1%

Note: After the estimation of the following model: $Y_{ip} = \gamma_0 + \gamma_1 X_{ip} + \gamma_2 X_{ip} \cdot D_{ip} + \gamma_3 D_{ip} + \gamma_4 Z_p + R_i + T + \varepsilon_{ip}$, the redistributive effect of historical transfers is measured by $1 - \hat{\gamma}_1$, and the redistributive effect of formula grants will correspond to $1 - \hat{\gamma}_1 - \hat{\gamma}_2$.

7.2 Risk-sharing effects

Table 5 reports the point estimates of the average income elasticity of grants considering different income lags. In column (1) we report the point estimates related to the 2020 structure of grants. In column (2) we simulate the level of grants at the end of the transitional period. Figure 4 summarises the final estimates of the income elasticity at different intertemporal lags and its decomposition between the two components: standard expenditure needs and fiscal capacity.

Considering income at year t , equalisation grants based on historical expenditure are pro-cyclical, with an average income elasticity of 0.5%. Instead, equalisation grants based on fiscal gap equalisation are moderately counter-cyclical, with an average income elasticity of -0.1%, but only at the end of the transition period. Otherwise, in 2020 we do not observe any difference between the two equalisation structures. Moreover, we notice that the counter-cyclical property of fiscal gap equalisation is particularly evident considering $t-3$ income values, with an average income elasticity of -1.4%, because of the time lag in standard expenditure needs and fiscal capacity variables, as well as the specific trend observed in GDP growth. Finally, our results show that the counter-cyclical effect of fiscal gap equalisation is entirely due to fiscal capacity as a result of its positive correlation with local GDP. Instead, standard expenditure needs show a pro-cyclical impact due to local cost equalisation. The decomposition follows the procedure described at the end of section 5.

Table 5. Analysis of the risk-sharing effect, within-group point estimates of the income elasticity of intergovernmental grants.

Depend variable (ΔE_R) = percentage deviation of per capita equalization transfers from the national mean	(1) MSF in 2020	(2) MSF in 2030 (100% simulation)
Income effect ($\widehat{\beta}_{1t}$)	0.53 [0.000]***	0.65 [0.002]***
Income effect in treated municipalities ($\widehat{\beta}_{2t}$)	-0.08 [0.048]**	-0.82 [0.000]***
Income effect ($\widehat{\beta}_{1(t-1)}$)	0.29 [0.001]***	0.13 [0.481]
Income effect in treated municipalities ($\widehat{\beta}_{2(t-1)}$)	-0.06 [0.096]*	-0.78 [0.000]***
Income effect ($\widehat{\beta}_{1(t-2)}$)	0.00 [0.142]	-0.49 [0.001]***
Income effect in treated municipalities ($\widehat{\beta}_{2(t-2)}$)	0.00 [0.143]	-0.74 [0.000]***
Income effect ($\widehat{\beta}_{1(t-3)}$)	-0.28 [0.001]***	-0.64 [0.000]***
Income effect in treated municipalities ($\widehat{\beta}_{2(t-3)}$)	-0.06 [0.087]*	-0.72 [0.000]***
Income effect ($\widehat{\beta}_{1(t-4)}$)	-0.20 [0.020]**	-0.28 [0.098]*
Income effect in treated municipalities ($\widehat{\beta}_{2(t-4)}$)	-0.07 [0.067]*	-0.72 [0.000]***
Income effect ($\widehat{\beta}_{1(t-5)}$)	0.00 [0.160]	0.00 [0.328]
Income effect in treated municipalities ($\widehat{\beta}_{2(t-5)}$)	-0.06 [0.080]*	-0.70 [0.000]***
Municipal fixed effect	Yes	Yes
Time fixed effect	Yes	Yes
Controls	Yes	Yes
Observations	22,878	22,878

Note: We estimate the following model: $\Delta E_{it} = \beta_0 + \beta_{1t}\Delta X_{it} + \beta_{2t}\Delta X_{it} \cdot D_{it} + \beta_3 D_{it} + \beta_4 Z_{it-1} + \alpha_i + \tau_t + \varepsilon_{it}$, where ΔX_{it} = percentage deviation of per capita income from the national mean, and D_{it} = treatment dummy. Within-group estimator with standard errors clustered at the municipal level, p -value in brackets * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The treated group includes municipalities in the following regions: Abruzzo, Molise, Campania, Puglia, Basilicata and Calabria. The control group includes municipalities in the following regions: Sicily and Sardinia. The set of control variables includes: % of population 0–2, % of population 3–14, % of population over 75, net population variation and net migration.

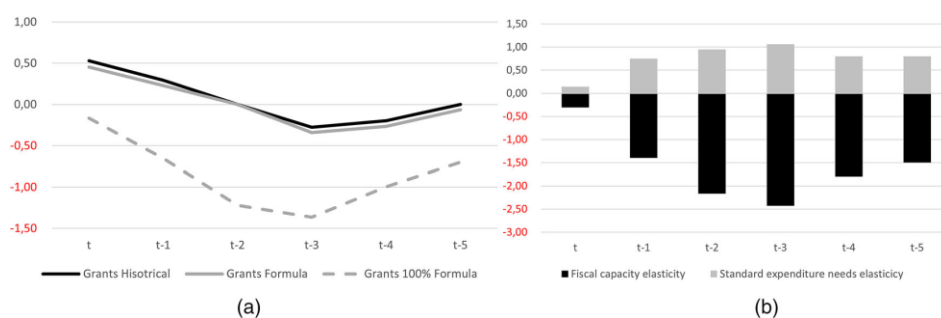


Figure 4. Point estimates of income elasticity of intergovernmental grants and its decomposition between standard expenditure needs and fiscal capacity (only municipalities located in Southern regions): (a) income elasticity of grants; and (b) decomposition of income elasticity.

7.3 Robustness checks

To test the validity of the local parallel trends between treatment and control units, we estimate the difference between MSF grants and income

between the two groups of municipalities for each year in our analysis. In Figure 5, the vertical line separates the pre-treatment from the post treatment period. For each variable, the graphs dots correspond to the coefficient of the treatment effect estimated with OLS in a difference-in-differences specification for each year. The regression includes year dummies and robust standard errors. We report the point estimate and the 95% confidence interval for each year. The coefficient in the year 2014 is the omitted category, for which confidence interval is obtained as the mean of the confidence interval in the years 2013 and 2015. Evidence supporting the parallel trend assumption requires that we do not reject the null hypothesis that the treatment effect is equal to zero in all periods between 2012 and 2014. In other words, the distance of the outcome variables between the treatment and control group should remain constant in the pre-treatment periods. This evidence is verified for MSF grants and income.

As a further robustness check, we estimate the "event study" specification of the models in equations (4) and (5). In this way, we implement an Autor (2003) test that functions as an additional check for the presence of the parallel trend, considering the years before the treatment (2012-2014) and after the treatment (2015-2020) separately.

The redistributive effect is now estimated considering the specification of equation (6):

$$Y_{it} = \gamma_0 + \gamma_1 X_{it} + \sum_{t=2012}^{2020} (\gamma_{2t} X_{it} D_{it} + \gamma_{3t} D_{it}) + \gamma_4' Z_{it-1} + \alpha_i + \tau_t + \varepsilon_{it} \quad (6)$$

where we use the panel structure over the entire sample. D_{it} is now the treatment dummy variables (equal to one for OR municipalities located in Southern regions and zero otherwise) for each year between 2012 and 2020. To avoid collinearity, we exclude D_{i2014} . Coefficient point estimates are obtained through the 'within-the-group' estimator. Table 6 reports the results for γ_{2t} that show the absence of difference in the redistributive effect between the treatment and the control group before 2015, since we cannot reject the null hypothesis that $\widehat{\gamma_{2,2012}}$, $\widehat{\gamma_{2,2013}}$ and $\widehat{\gamma_{2,2014}}$ are different from zero. The treatment effects are however all statistically significant after 2015, corroborating the presence of parallel trends before 2015 and the increase in the redistributive effect after 2014. To conclude, we conduct the risk-sharing analysis considering equation (7) specification:

$$\Delta E_{it} = \beta_0 + \beta_{1\kappa} \Delta X_{i\kappa} + \sum_{t=2012}^{2020} (\beta_{2\kappa t} \Delta X_{i\kappa} D_{it} + \beta_3 D_{it}) + \beta_4' Z_{it-1} + \alpha_i + \tau_t + \varepsilon_{it} \quad (7)$$

where D_{it} is the treatment dummy variables (equal to one for OR municipalities located in Southern regions and zero otherwise) in each year between 2012 and 2020. To avoid collinearity, we exclude D_{i2014} . Table 7 reports the results for $\beta_{2\kappa t}$ considering in each column different lags (κ) for income as we did in the baseline model. Coefficient point estimates, obtained through the "within-the-group" estimator, show that we cannot reject the null hypothesis that $\widehat{\beta_{2\kappa 2012}}$, $\widehat{\beta_{2\kappa 2013}}$, and $\widehat{\beta_{2\kappa 2014}}$ are different from zero, especially considering $t-2$, $t-3$ and $t-4$ income values. The absence of a treatment effect before 2015 corroborates the presence of parallel trends before 2015.

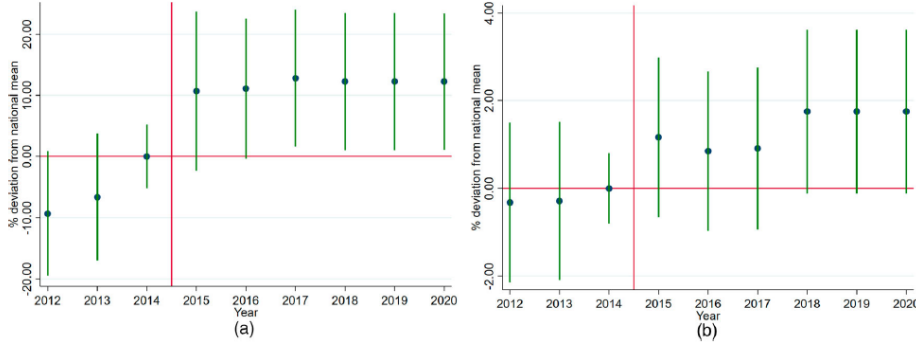


Figure 5. Pre- and post-treatment trends test, comparison between the control and treated groups (only municipalities located in Southern regions): (a) Municipal Solidarity Fund (MSF); and (b) average reported income.

Table 6. Redistributive effect analysis, within-group point estimates with different lags and leads of the treatment effect.

Lags	
$X^*D_{(2012)}$	−0.003 [0.063]*
$X^*D_{(2013)}$	−0.00179 [0.100]
Leads	
$X^*D_{(2015)}$	−0.013 [0.000]***
$X^*D_{(2016)}$	−0.00981 [0.000]***
$X^*D_{(2017)}$	−0.00846 [0.000]***
$X^*D_{(2018)}$	−0.00478 [0.039]**
$X^*D_{(2019)}$	−0.00849 [0.000]***
$X^*D_{(2020)}$	−0.00927 [0.000]***
Municipal fixed effect	Yes
Control variables	Yes
Observations	22,878

Note: Within-group estimator with standard errors clustered at municipal level, p -value in brackets * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The treated group includes municipalities in the following regions: Abruzzo, Molise, Campania, Puglia, Basilicata and Calabria. The control group includes municipalities in the following regions: Sicily and Sardegna. The set of control variables includes: % of population 0–2, % of population 3–14, % of population over 75, net population variation and net migration.

Table 7. Risk-sharing analysis, within-group point estimates of the income elasticity of intergovernmental grants at different lags and leads of the treatment effect.

Treatment effects at different lags and leads	Income at different lags (ΔX)					
	ΔX_{it}	ΔX_{it-1}	ΔX_{it-2}	ΔX_{it-3}	ΔX_{it-4}	ΔX_{it-5}
Lags						
$\Delta X^*D_{(2012)}$	0.300 [0.024]**	0.113 [0.445]	-0.177 [0.106]	-0.179 [0.131]	-0.0362 [0.793]	0.142 [0.288]
$\Delta X^*D_{(2013)}$	0.456 [0.000]***	0.306 [0.010]**	0.0497 [0.650]	-0.0872 [0.350]	0.109 [0.344]	0.322 [0.004]***
Leads						
$\Delta X^*D_{(2015)}$	-2.439 [0.000]***	-2.551 [0.000]***	-2.834 [0.000]***	-2.869 [0.000]***	-2.738 [0.000]***	-2.545 [0.000]***
$\Delta X^*D_{(2016)}$	-1.091 [0.000]***	-1.166 [0.000]***	-1.383 [0.000]***	-1.474 [0.000]***	-1.291 [0.000]***	-1.075 [0.000]***
$\Delta X^*D_{(2017)}$	-0.724 [0.000]***	-0.865 [0.000]***	-1.041 [0.000]***	-1.113 [0.000]***	-0.977 [0.000]***	-0.744 [0.000]***
$\Delta X^*D_{(2018)}$	-0.651 [0.000]***	-0.763 [0.000]***	-0.990 [0.000]***	-1.019 [0.000]***	-0.892 [0.000]***	-0.695 [0.000]***
$\Delta X^*D_{(2019)}$	-0.00933 [0.000]***	-0.931 [0.000]***	-1.129 [0.000]***	-1.222 [0.000]***	-1.002 [0.000]***	-0.799 [0.000]***
$\Delta X^*D_{(2020)}$	-0.00990 [0.000]***	-0.0110 [0.000]***	-1.162 [0.000]***	-1.232 [0.000]***	-1.094 [0.000]***	-0.833 [0.000]***
Municipal fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,878	22,878	22,878	22,878	22,878	22,878

Note: Within-group estimator with standard errors clustered at the municipal level, p -value in brackets * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The treated group includes municipalities in the following regions: Abruzzo, Molise, Campania, Puglia, Basilicata and Calabria. The control group includes municipalities in the following regions: Sicily and Sardegna. The set of control variables includes: % of population 0–2, % of population 3–14, % of population over 75, net population variation and net migration.

8. Concluding remarks

This paper adds to the economic literature on the redistributive and stabilising effects of public budgets across jurisdictions. First, we measured redistribution and stabilisation accomplished by the lowest tier of government, the municipalities, using very granular territorial data. Previous studies have taken into account the impact of the municipal budget but, except for Rattso & Tovmo (1998) and Gandullia & Leporatti (2020), only across regional or state level territorial areas (Arachi & al. 2010). Secondly, we show that the switch from transfers based on historical expenditure, which are kept constant across time, to transfers based on a formula, which is updated annually to take into account the evolution of the fiscal gap between expenditure needs and fiscal capacity, has increased the territorial redistribution carried out by the public sector. On the contrary, the new formula-based transfers have very low contemporary risk-sharing effects. We show that this result critically depends on the specific institutional design of the equalising mechanism, which involves substantial lags in the reaction of expenditure needs and (mostly) fiscal capacity indexes to changes in income fluctuations due to the time required to collect relevant data. If we include three-time lagged municipal incomes in the specification of the risk-sharing effects, equalising transfers show strong counter-cyclical properties.

This latter result raises the issue of how to reform the municipal transfers system to improve its poor stabilisation performance. Updating the formula annually, based on current data does not seem feasible, since the basic information underpinning expenditure needs and fiscal capacity indexes cannot be collected in real-time. A more workable (but more radical) proposal is to decouple territorial redistributive function from stabilisation function and assign them to two distinct transfer mechanisms. In this alternative institutional framework, formula-based grants restrict themselves to redistributing resources while insurance against idiosyncratic shocks is provided through alternative transfers. The separation between redistribution and insurance could be achieved by calculating formula grants based on structural needs and fiscal capacity estimates, which do not vary across the business cycle. At the same time, a rainy-day fund program could handle short-run idiosyncratic fluctuations.

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- ⁱⁱ The same approach has been applied in several contributions such as Buettner, 2002 and Hepp and von Hagen, 2013.
- ⁱⁱⁱ A few studies (Decressin, 2002; Gandullia & Leporatti, 2020; Obstfeld & Peri, 1998), have relied on times series analysis. The amount of redistribution is recovered from the estimated steady-state relationship between the regional ‘activity’ variable plus intergovernmental flows and the regional activity variable alone. Risk sharing is measured by the contemporary response or from the impulse responses of the two variables.
- ^{iv} The autonomous regions are Aosta Valley, Friuli Venezia Giulia, Trentino-South Tyrol, Sardinia and Sicily.
- ^v For a general overview of the structure of the financing system of Italian municipalities in the aftermath of the COVID-19 crisis see Greco and Porcelli (2021).
- ^{vi} Law 228/2012 (art. 1, par. 380) introduced the MSF mechanism to accommodate the reform of the real estate property tax (IMU) and the abolition of existing vertical transfers, during the fiscal consolidation process that followed the EU sovereign debt crises. Instead, for a detailed analysis of the Municipal Solidarity Fund mechanism see Marchionni et al. (2017).
- ^{vii} See Law 232/ 2016.
- ^{viii} For a detailed analysis of the models adopted for the evaluation of standard expenditure needs see Porcelli (2015) and the methodological note reported in the following decree: “Decreto del Presidente del Consiglio dei Ministri del 29 Dicembre 2016 (G.U. Serie Generale n. 44 del 22-02-2017 - Suppl. Ordinario n. 12)”. For a detailed analysis of the models adopted for the evaluation of fiscal capacity see Di Liddo & al. (2016) and the methodological note reported in the following decree: “Decreto del Ministero dell’Economia e delle Finanze del 31 dicembre 2020 “Adozione della stima della capacità fiscale per singolo comune delle regioni a statuto ordinario”.
- ^{ix} The distribution of the average municipal reported income makes the stark territorial divide of Italy evident: most of the municipalities located in the Centre-North are above the national average wmost of the municipalities located in the South (including the main islands) are below the average. Standard expenditure needs are not correlated with municipal income because expenditure determinants associated with local income play a marginal role in evaluating standard expenditure needs. Instead we observe a strong positive correlation between fiscal capacity and income because reported income is the tax base of the local income tax and significantly correlates with the cadastral values representing the tax base of the property tax.
- ^x For simplicity we decided to limit the lags for income to five since we observed the maximum impact at $t-3$, as expected given the delay in the updating procedure of standard expenditure needs and fiscal capacity.
- ^{xi} We simulate the full implementation of the new equalisation system by computing the distribution of grants, setting the parameter α of equation (A2) of the Appendix A as equal to one (in 2020, instead, $\alpha = 0.275$).