

## **THE REVENUES OF LOCAL GOVERNMENTS IN THE STATISTICAL REGISTER FOR PUBLIC ADMINISTRATIONS: INEQUALITY DECOMPOSITION BY SOURCES**

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### **1. Introduction**

During the last decade, the Italian national institute of statistics (Istat) has been engaged in a modernization program involving the revision of the statistical production model<sup>1</sup>. The main goal behind this program is the use of statistical registers integrated into a single logical environment, the Italian Integrated System of Statistical Registers (ISSR), for supporting the consistency of statistical production processes and improving the quality of information for users. One object of the ISSR is the satellite statistical REgister for Public Administrations (REPA) that contains information on structural and economic variables on a subset of the Italian PA.

The public institutions are different from each other in structures, dimensions, and scopes. In the present paper, these differences are analysed by looking at their revenues. For this aim, the inequality in the revenues, measured with the Gini index, is decomposed “by sources” (Rao, 1969). Since the total revenues is the sum of several components, the contribution of each source to the overall inequality can be identified. The sources considered in this context are i) current revenue tax based, contributory and equated, ii) the current transfers, iii) the non-tributary revenue. The results provide an explanation of the differences in the revenues of local governments and can help politicians and policymakers to better allocate resources. The structure of the paper is as follows. Section 2 describes the REPA informative contents, that is the data used in this analysis. In Section 3, the decomposition of Gini inequality index is performed for studying the differences between public institutions in terms of revenues and Section 4 reports the obtained results. Section 5 contains concluding remarks.

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<sup>1</sup> [https://ec.europa.eu/eurostat/cros/system/files/building-italia-integrated-system\\_istat\\_0.pdf](https://ec.europa.eu/eurostat/cros/system/files/building-italia-integrated-system_istat_0.pdf).

## 2. The statistical register for public administrations

The statistical register for Public Administrations (REPA) contains information on structural and economic variables on a subset of the Italian PA Institutions. REPA includes different sub-populations, such as local governments, regions and autonomous provinces, ministries, constitutional bodies, social security funds, sanitary districts, etc. Each subpopulation has a particular structure and classification of its economic data: by aggregating a selection of items, the economic variables of Frame PA are obtained. These variables are harmonized for all the Italian PA Institutions.

REPA is still under development, the design and implementation of the register is at a good stage for the subpopulation of local governments, i.e. municipalities, unions of municipalities, provinces, mountain communities and metropolitan cities (Varriale et al., 2021). Therefore, in the following, we will refer to REPA local governments simply as REPA.

Structural information includes the address of the institution, the institutional type, the economic activity (Ateco 2007), the number of employees and the resident population. The latter two variables come from two other registers of SIR.

The economic variable is the result of integration and treatment (imputation) of data coming from administrative sources. It includes accrual and cash values, for both revenues and expenditures. The accrual data for the revenue are the assessments (E1) while the cash data are the collections in accrual (E2) and the residual accounts (E3). For expenditures, the accrual data are the commitments (S1), the cash data are the payments on accrual (S2) and the residual accounts (S3).

The information for both revenues and expenditures is organized into several hierarchical levels. It follows the structure of the certified balance sheet that all local governments are required to publish on an annual basis to certify their primary accounting data for the previous fiscal year. The certified balance sheet, the structure of which is defined in the Legislative Decree no.118 of 2011, modified by Legislative Decree no.126 of 2014, shows the financial flows of salaries and cash flow for the main economic categories and revenue and expenditure items. For each statistical unit (local governments), there are 148 items for revenues and 1431 items for expenditures. By aggregating a selection of items, we obtain the economic variable of Frame PA.

Concerning the revenues, the highest level of aggregation of the items identified by the certified balance sheet is the Titles (1, 2, ..., 7 and 9). The Frame PA variable is the total characteristics revenue (current revenue), and it is the sum of the first three titles:

- Title 1 – current revenue tax based, contributory and equated;
- Title 2 – current transfers

- Title 3 – Non-tributary revenue.

### 3. Inequality decomposition by sources

The decomposition by sources, sometimes also called factor components, is based on the hypothesis that the total of a continuous variable  $X$  is the sum of various sources. Then, as the total of the  $X$  variable, also the inequality in the distribution of  $X$  can be decomposed into the contribution of each source to the overall inequality.

This decomposition is mainly useful to know how the different sources play in determining the inequality in the distribution of the  $X$  and, moreover, it represents an important tool for better understanding the phenomenon.

In our specific case, the  $X$  variable is the revenue of local governments, while the sources are the three titles listed in the previous paragraph (i.e. Title 1, Title 2 and Title 3).

The total revenue of a generic unit  $i$ , i.e. a local government, (with  $i = 1, \dots, N$ ) is denoted by  $x_i$ . The Gini concentration ratio (Gini, 1914), also referred to as the Gini index or the Gini coefficient, is defined as:

$$R = \frac{2 \sum_{i=1}^N x_i(i-1)}{(N-1) t_X} - 1 \quad 0 \leq R \leq 1 \quad (1)$$

where  $N$  is the population size,  $t_X = \sum_{i=1}^N x_i$  is the total revenue of the local government and  $i$  is its rank, within the observed population, for the generic unit, arranged in non-decreasing revenues values. The Gini index is defined between 0 and 1. It assumes a value equal to 0 when all the units in the population has the same value of  $x_i$  (equidistribution or minimum concentration), while it is equal to 1 when just one units has all the total amount of the  $X$  (maximum concentration).

There exists several alternative ways in which the Gini index can be defined (see Giorgi, 1992; Yitzhaki, 1998; Giorgi and Gagliarano, 2018). Among them, a useful expression for the present purpose equivalent to (1), is:

$$R = cov\left(\frac{i}{N}, \frac{x_i}{\mu}\right) \quad (2)$$

(De Vergottini, 1950; Piesch, 1975) that is the expression in the discrete case of the expression proposed by Yitzhaki (1985). In (2), the Gini index is computed as the covariance between the ratio between the rank of the unit  $i$  and the population size  $N$  and its revenue  $x_i$  and the population mean,  $\mu$ .

The total revenue of each unit is made up of all the sources considered, that is  $x_i = \sum_{j=1}^k x_{ij}$ , where  $x_{ij}$  is the revenue of unit  $i$  from the source  $j$ , with  $j = 1, \dots, k$ .

Then, the total revenue of a local government can be written also as  $t_X = \sum_{j=1}^k x_j$  where  $x_j = \sum_{i=1}^n x_{ij}$ .

The Gini concentration ratio in (1) or (2) can be written as the sum of the contribution of each source (Rao, 1969):

$$R = \sum_{j=1}^k F_j = \sum_{j=1}^k q_j R_j E_j. \quad (3)$$

The contribution of each source  $j$ ,  $F_j$ , is given by the product of three factors:

- $q_j = \frac{\mu_j}{\mu}$ ,  $j = 1, \dots, k$  the ratio between the mean income of the source  $j$ ,  $\mu_j$ , and of the population,  $\mu$ ;
- $R_j$  the Gini index computed only on the revenues of the source  $j$ ;
- $E_j = \frac{\underline{R}_j}{R_j}$ ,  $-1 \leq E_j \leq 1$ , the ratio between  $\underline{R}_j$ , the inequality index calculated with (2) for the source  $j$  in accordance with the ranking established on the basis of the total revenue and the Gini concentration ratio calculated for the source  $j$  in accordance with its own internal ranking. Then, it a measure of the concordance between the two ranks.

Since  $R_j = \underline{R}_j$  only when the ranking within source  $j$  coincides with the total revenue one,  $E_j$  provides a measure the “disequalizing effect” induced by the source  $j$  in the revenue distribution of the local governments. This factor is the key element in this analysis. Since  $\mu_j$  and  $R_j$  are not negative,  $E_j$  provides the sign of the contribution of the source  $j$ . When it is negative, the source  $j$  plays in reducing the total inequality. On the contrary, when it is positive source  $j$  contributes to increase the total inequality.  $E_j$  has been introduced as a measure of correlation firstly by Blitz and Brittain (1964). Subsequently, Fields (1979a, b), proposing the Factor Inequality Weights (FIW) named it “relative coefficient of variation” while Lerman and Yitzhaki (1985) and by Schechtman and Yitzhaki (1987) named it “Gini correlation”.

#### 4. Main results

In 2019, the number of local governments was equal to 8,727 (Table 1): 7,914 municipalities, 100 provinces and metropolitan cities, 562 unions of municipalities and 151 mountain communities.

**Table 1** – Number of units and current revenue of local governments by institutional type. Year 2019, values in millions of euros.

Local governments	Number of units	Current revenue
Municipalities	7,914	63,881
Provinces and metropolitan cities	100	7,052
Unions of municipalities	562	1,592
Mountain communities	151	586
<b>Total</b>	<b>8,727</b>	<b>73,111</b>

Current revenue assessed by municipalities during fiscal year 2019 was estimated at 63,881 million euros. Current revenue assessed by provinces and metropolitan cities was estimated at 7,052 million euros, while for unions of municipalities was at 1,592 million euros and for mountain communities was at 586 million euros.

**Figure 1** – Gini index by institutional type. Year 2019.

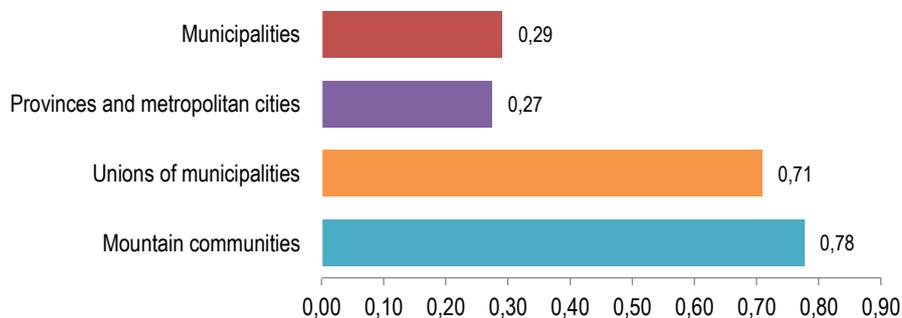
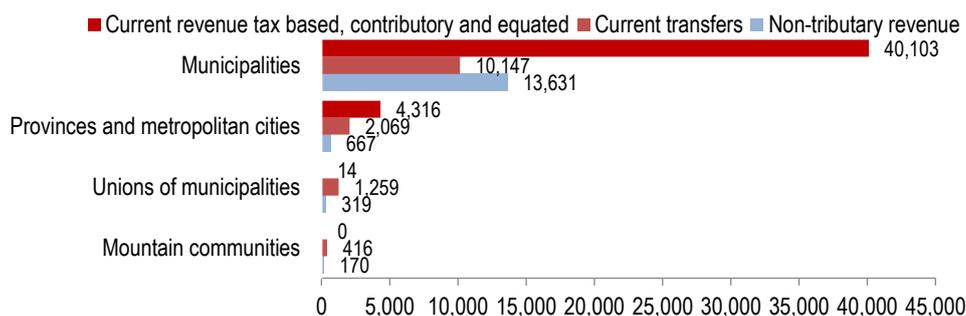


Figure notes: Gini index of municipalities, provinces and metropolitan cities is based on per capita value.

Figure 1 shows that the Gini index assumes different values in relation to the different types of local governments. In particular, the municipalities, provinces and metropolitan cities registered lower values of Gini index and, therefore, a low level of inequality in the distribution of current revenue. Unions of municipalities and mountain communities registered higher values of Gini index and more inequality in the final balance sheet structure: this result is linked to the impossibility of using the per capita values of current revenue, but also to the greater influence of the different characteristics of the territory, that causes a greater inequality of accounting structure. In particular, the Gini index for the municipalities at the national level was

equal to 0.29, while for provinces and metropolitan cities was equal to 0.27. The inequality of the current revenue for unions of municipalities and mountain communities, was respectively 0.71 and 0.78.

**Figure 2** – Current revenue by item and institutional type. Year 2019, in millions of euros.



The sources considered in this context are: (i) the current revenue tax based, contributory and equated (ii) the current transfers and (iii) the non-tributary revenue (Figure 2). The decomposition of the Gini index is useful to know how the different sources determine the inequality in the current revenue distribution and allows to provide useful information to policymakers to evaluate the efficiency in the acquisition of revenue (Figure 3). Therefore, for the municipalities, the contribution to inequality measured by the Gini index was equal to 30.4% for current revenue tax based, 38.4% for current transfers and 31.3% for non-tributary revenue.

**Figure 3** – Composition of Gini index by item and institutional type. Year 2019, percentage values.

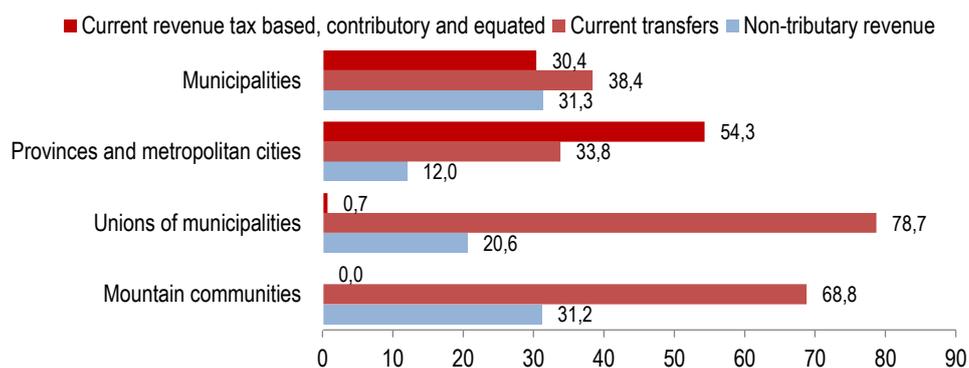


Figure 4 – Gini index of municipalities by region. Year 2019.

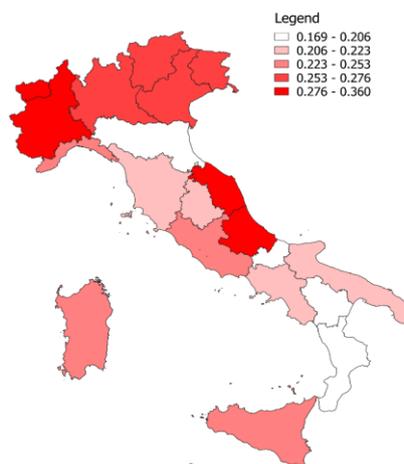
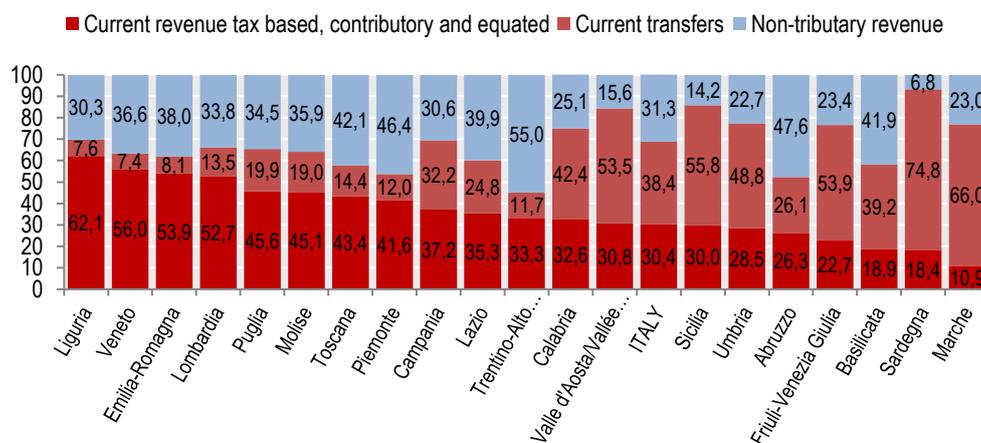


Figure 5 – Composition of municipal Gini index by item and region. Year 2019, percentage values.



The contribution of current transfers to the overall inequality was greater for municipalities, while for provinces and metropolitan cities was the contribution of current revenue tax based, contributory and equated. For unions of municipalities and mountain communities, contribution of current transfers was greater, considering the different accounting structure of these institutional types where tax revenues are limited or absent.

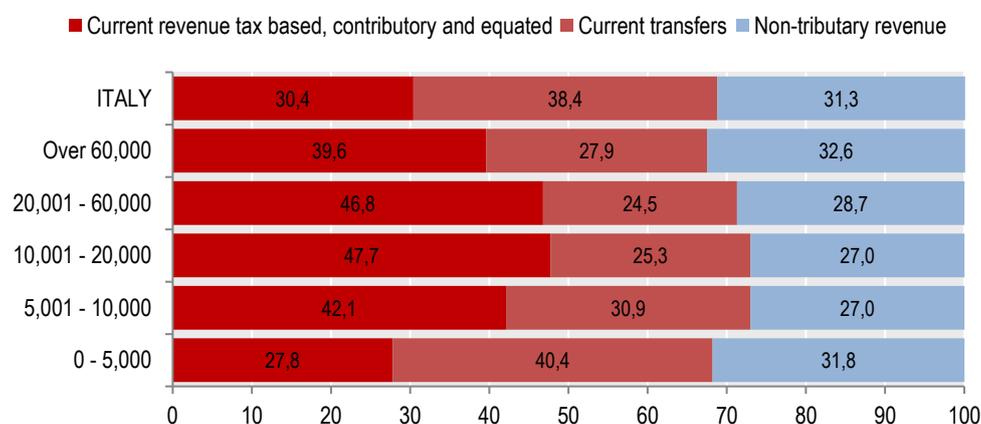
In Figure 4, municipalities were classified in five classes by Gini index and region. The highest level is in the municipalities of Valle d’Aosta/Vallée d’Aoste

(0.36) and the lowest level in Emilia-Romagna (0.17). This result highlights that, even at the regional level, there is inequality in the distribution of current revenues among the municipalities, in consideration of the greater autonomy in budget management to meet the different needs of citizens.

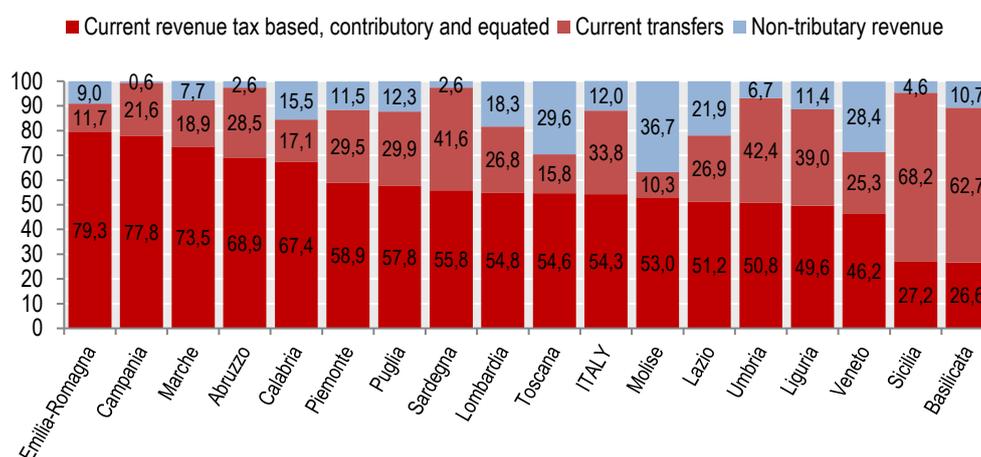
Furthermore, the inequality in the current revenue distribution could also be due to inefficient revenue management by local administrators. The greatest inequality was concentrated above all in some northern regions (Valle d'Aosta, Piemonte, Friuli-Venezia Giulia, Veneto and Lombardia) and in some regions of center/south of Italy (Marche and Abruzzo).

Figure 5 shows the role of different sources in determining the inequality at the regional level. Decomposing by sources the Gini index of the municipal revenue, it is possible to see that in Liguria the incidence of current revenue tax based, contributory and equated was the highest (62.1%), while Marche presented the lowest percentage (10.9%). The municipalities of Sardinia presented the highest percentage of current transfers. This information is particularly useful for regional and national governments who can intervene with measures aimed at reducing the weight of current revenue tax based, contributory and equated, or current transfers, to ensure greater efficiency in the accounting structure of local governments of a particular region.

**Figure 6** – *Composition of municipal Gini index by item and demographic class. Year 2019, percentage values.*



**Figure 7** – Composition of provinces and metropolitan cities Gini index by item and region. Year 2019, percentage values.



The analysis by demographic class (Figure 6) showed that the central classes 10,001-20,000 and 20,001-60,000 presented the highest incidence of current revenue tax based, contributory and equated, respectively 47.7% and 46.8%. Municipalities with more of 60,000 people registered a value of 39.6%. Municipalities in class 0-5,000 presented the highest value of current transfers. This result is probably due to the fact that in small municipalities, the use of local taxes is not sufficient to cover expenses and more transfers are needed: this impact on the inequality. Data regarding the composition of Gini index were also analysed with reference to the provinces and metropolitan cities (Figure 7).

The governments of the autonomous provinces of Trento and Bolzano-Bozen were excluded since their financial flows were already incorporated in the summary of regional and autonomous province final balance sheets. In Valle d'Aosta-Vallée d'Aoste and Friuli-Venezia Giulia, the regional government or municipalities have the jurisdiction for functions that are managed by provinces elsewhere.

More than half of contribute to inequality measured by the Gini index at national level was devoted to the current revenue tax based, contributory and equated (54.3%). The contribution of the three sources differs greatly at regional level, therefore the highest level is in the provinces and metropolitan cities of Emilia-Romagna (79.3%) and the lowest level in Basilicata (26.6%).

**Figure 8** – Gini index of mountain communities and unions of municipalities by geographical area. Year 2019.

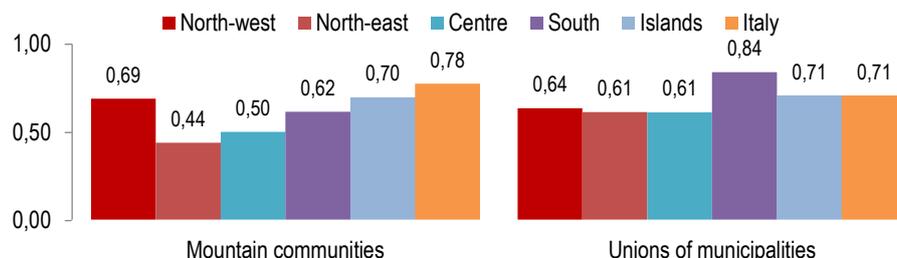


Figure 8 shows the Gini index of the revenue for mountain communities and unions of municipalities by geographical area, the data can be compared among the different areas and with the value assumed at the national level. The highest inequality was registered in mountain communities of Islands (0.70), while the unions of municipalities registered the highest value in south (0.84).

**Table 2** – Composition of mountain communities and unions of municipalities Gini index by item and geographical area. Year 2019, percentage values.

Geographical area	Mountain communities			Unions of municipalities		
	Current revenue tax based, contributory and equated	Current transfers	Non-tributary revenue	Current revenue tax based, contributory and equated	Current transfers	Non-tributary revenue
North-west	0.0	81.7	18.3	1.7	76.0	22.3
North-east	0.0	65.7	34.3	0	83.0	17.0
Centre	0.0	74.3	25.7	0.3	68.2	31.5
South	0.0	75.3	24.7	3.3	93.4	3.3
Islands	0.2	99.4	0.4	0.7	74.3	25.0
Italy	0.0	68.8	31.2	0.7	78.7	20.6

Concluding, Table 2 shows the Gini decomposition by item and geographical area related to mountain communities and unions of municipalities. Mountain communities in the Islands (99.4) and North-west (81.7) presented higher percentage values as regards the current transfers, while unions of municipalities registered higher values in the South and North-east for the same item. For mountain communities, in some areas such as Islands, the inequality produced by current transfers is very high and shows a low degree of financial and taxation autonomy.

A similar consideration can be made for the unions of municipalities of South. This result allows national and local administrators to check for inefficiencies in current revenue management in that geographical area.

## 5. Conclusions and future research

The satellite statistical register for Public Administrations REPA is an object of the Italian Integrated System of Statistical Registers. The register, containing information on structural and economic variables on a subset of the Italian PA, is still under development, and more in depth analyses will be necessary for assessing the quality of its production process and its outcomes.

In this work, we analysed the differences between public institutions in terms of current revenue, by using the decomposition of the Gini index “by sources” to identify the contribution of each title among Title 1, 2 and 3.

The obtained results can explain the differences in the current revenues of local governments and help politicians and policymakers to better allocate resources. In particular, the analyses highlight the different accounting structure of the different types of local governments and therefore the role played by tax revenues (Title 1), which represent the levy made on taxpayers at the local level, compared to the other components represented by Transfers made by both the state or the regions (Title 2) and Non-tributary revenue (Title 3).

In the future, the same methodology can be used to evaluate differences between local governments in terms of expenditures: employment income, goods and services acquisition. Furthermore, a multivariate extension of the Gini index can be used. Furthermore, it will be important to evaluate if there are some statistical units to contribute in an extreme way to the Gini index results.

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### SUMMARY

The statistical register for Public Administrations (Frame PA) contains peculiar information on structural and economic variables on a subset of the Italian PA Institutions. Moreover, Frame PA includes different sub-populations. Focusing on the subpopulation of local governments, i.e. municipalities, unions of municipalities, provinces, mountain communities and metropolitan cities, the differences between public institutions in terms of revenues are analysed. The revenues of local government stem mainly from three sources: i) the current revenue tax based, contributory and equated, ii) the current transfers, iii) the non-tributary revenue. In the present paper, the decomposition of the Gini index "by sources" is used to better understand the differences in the revenues of local governments and can help politicians and policymakers to better allocate resources.

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