

## **DO ROYALTIES IMPROVE LOCAL SOCIO-ECONOMIC CONDITIONS? EVIDENCE FROM MUNICIPALITIES IN BASILICATA <sup>1</sup>**

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**Abstract.** This study aims to analyze the economic impact of royalties on local territories, with particular focus on the shares allocated directly to municipalities where hydrocarbon deposits are located. Following an initial descriptive analysis of the royalties paid by oil companies to local authorities over the period 2008-2024, the study proceeds with non-parametric analyses conducted on a set of municipal-level variables. The objective is to assess whether significant socio-economic differences exist between municipalities that receive royalties and those that do not. The data used originate from the "A misura di Comune" information system – ISTAT's system of municipal indicators – as well as from official statistical sources such as Demographic Balances and the Population Census, and open data provided by the Ministry of Economy and Finance and the Ministry of the Environment and Energy Security.

### **1. Introduction**

Italy exhibits marked socio-economic inequalities, with further differentiation stemming both from the North–South divide and the condition of inner areas, which often require additional financial resources to address such structural imbalances (Istat, 2024; Accetturo, 2022; Fiascinoro, 2024). In some cases, local authorities may benefit from additional funding linked to the presence and exploitation of hydrocarbon deposits within their jurisdiction.

In Italy, as established by Article 826 of the Civil Code, hydrocarbon deposits are considered inalienable property of the State. Although the State does not directly manage hydrocarbon exploration and production activities, it delegates their execution to private companies through a concession-based system. These companies are required to comply with specific obligations, including the submission of work programs, the payment of fees based on the surface area covered by mining titles, and the payment of royalties proportional to the quantity of hydrocarbons extracted.

From 2008 to 2024, oil companies paid a total of nearly 5 billion euros in royalties,

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with the resulting revenues distributed among the State, Regions, and Municipalities located in the areas where the hydrocarbon deposits are found<sup>2</sup>.

Although several studies have examined the impact of these financial flows on local authorities (Pellegrini, 2021; Percoco, 2012; Catullo, 2022), most analyses focus on the regional level. This is due both to the economic relevance of the regional shares and to the difficulty in accessing official statistical data at the municipal level.

However, although municipalities receive only 15% of total royalties (with 30% allocated to the State and 55% to the Regions), the amount of royalties can become economically relevant for many of them, especially considering that a large share of beneficiary municipalities is small or very small in size. The recent availability of municipal-level data has made it possible to study the impact of royalties directly allocated to specific municipalities.

This analysis is relevant given that the beneficiary municipalities, besides their small size, are also targeted by the National Strategy for Inner Areas (SNAI)<sup>3</sup>, as they are classified as peripheral or ultra-peripheral areas. These municipalities are characterized by limited access to essential services such as education, healthcare, and transportation. The shares allocated to Municipalities, unlike those assigned to Regions or the State, are not earmarked for specific uses. The main legal constraints<sup>4</sup> are rather general, thereby allowing the use of these funds for current expenditures such as employment and economic development, or for investments in infrastructure, including environmental improvements (Montanari, 2007). Furthermore, these resources are not subject to specific oversight mechanisms, other than the general controls applied to municipal budgets.

This suggests that the management of these funds may lead to either highly positive or disappointing outcomes, depending on the political decisions made, potentially contributing to a reduction in territorial inequalities or, in the worst-case scenario, to the emergence of the well-known resource curse (Van Der Poley, 2019; Svampa, 2015; Poncian, 2019; Pellegrini, 2021). In this framework, the present study aims to apply non-parametric methods to examine whether municipalities receiving royalties experience better socio-economic conditions than non-beneficiary ones.

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<sup>2</sup> The State is entitled to 30% of the royalties from hydrocarbons extracted onshore, while the Regions receive 55% and the Municipalities 15%. However, starting from January 1, 1999, for concessions located within ordinary statute Regions included in Southern Italy (Mezzogiorno), the share allocated to the State is paid directly to the Region, pursuant to Article 20, paragraph 1-bis, of Legislative Decree No. 625/1996.

<sup>3</sup> <https://www.agenziacoesione.gov.it/strategia-nazionale-aree-interne/>

<sup>4</sup> Article 20 of Legislative Decree 625/1996 establishes that "municipalities allocate these resources to the development of employment and economic activities, to industrial growth, and to environmental improvement interventions in the territories where exploration and extraction activities take place."

## 2. Data

The Ministry of the Environment and Energy Security annually publishes data on hydrocarbons extracted, royalties, and their allocation. The data, provided in open format and released as time series with granular territorial detail, enable timely descriptive analysis of the phenomenon.

Italy in 2024 (the most recent year available) has extracted nearly 3 billion standard cubic meters (scm) of natural gas were extracted, along with over 4,300 million kilograms of crude oil, 79 million kilograms of Lpg, and 8 million kilograms of gasoline.

Extraction activities took place in 11 Italian regions (Abruzzo, Basilicata, Calabria, Emilia-Romagna, Lombardia, Marche, Molise, Puglia, Sicilia, Toscana, and Veneto), with a strong concentration in Basilicata (over one million scm of natural gas, 3,700 million kilograms of crude oil, in addition to the entire Lpg production) (Table 1).

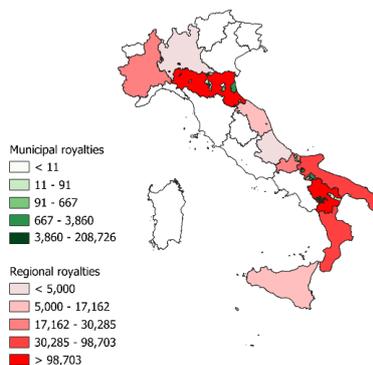
**Table 1** – National hydrocarbon production – Year 2024. Distribution of production by regions and marine areas.

Regions	Natural gas production (Scm)	Crude oil production (kg)	Gasoline production (kg)	Lpg production (kg)
Abruzzo	14,164,092			
Basilicata	1,050,746,614	3,703,668,586		79,667,740
Calabria	5,506,436			
Emilia Romagna	117,312,129	14,603,822	511,094	
Lombardia	20,722,042		37,804	
Marche	3,504,213			
Molise	47,500,882	5,677,246	752	
Puglia	29,457,138			
Sicilia	146,230,182	254,159,710	8,060,433	
Toscana	1,339,492			
Veneto	379,180			
<b>TOTAL LAND</b>	<b>1,436,862,400</b>	<b>3,978,109,364</b>	<b>8,610,083</b>	<b>79,667,740</b>
<b>TOTAL SEA</b>	<b>1,444,670,983</b>	<b>388,769,209</b>	<b>141,227</b>	<b>-</b>

Source: Ministry of the Environment and Energy Security

Royalties are determined on the basis of hydrocarbon production, using the average market prices of oil and gas. These payments are then distributed among the State, Regions, and Municipalities in accordance with Articles 20 and 22 of Legislative Decree No. 625/1996. Excluding royalties collected directly by the State, between 2008 and 2024 the regions that received the highest disbursements were Basilicata (1,893,931,944 euros), Emilia-Romagna (106,218,560 euros), and Calabria (96,824,190 euros). Notably, Basilicata (combining both regional and municipal payments) received 86% of the total disbursements, amounting to over 2 billion of euros (Figure 1).

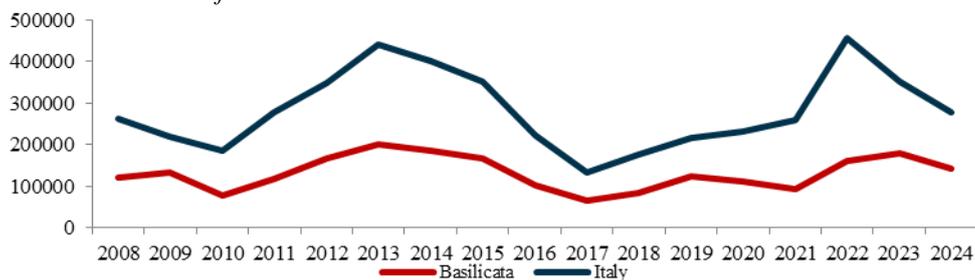
**Figure 1** – Distribution of regional and municipal royalties. Years 2008-2024. Values in thousands of euros.



Source: Ministry of the Environment and Energy Security

An analysis of the time series data for the years 2008–2024, at both the Basilicata and national levels (Figure 2), reveals a high degree of temporal irregularity, due to the correlation with the volume of hydrocarbons extracted in the previous year.

**Figure 2** – Distribution of royalties in Italy and Basilicata. Years 2008-2024. Values in thousands of euros.



Source: Ministry of the Environment and Energy Security

This variability is likely to pose challenges for multi-year planning by beneficiary territorial authorities, also due to the inherent unpredictability of the phenomenon.

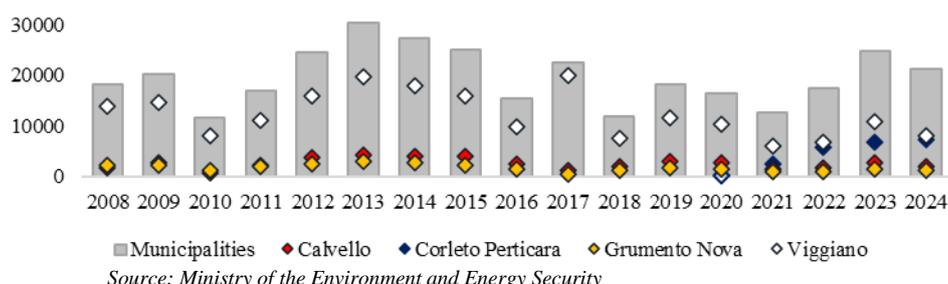
Given the significant weight of Basilicata in this variable, national trends closely mirror those observed in the region. In Basilicata 15% of royalties are paid directly to municipalities, while the remaining 85% is allocated directly to the Region (see Note 2), 12 municipalities received royalty allocations between 2008 and 2024, 60% of which are located in the province of Potenza, accounting for over 99% of the total resources received (Figure 1).

Approximately 90% of total municipal royalties are allocated to just four municipalities (Figure 3 and Table 2). These municipalities are small or very small in size and,

according to the classification of the National Strategy for Inner Areas (SNAI), are categorized as peripheral or ultra-peripheral. They are also characterized by a significant demographic decline, with population decreases ranging from  $-22.5\%$  to  $-55.6\%$  between 2023 and 1951. The very small size of the beneficiary municipalities suggests that royalties have a substantial economic impact on municipal budgets. For example, in 2024 the municipality of Viggiano received 8 million euros. Distributed across a population of approximately 3,200 inhabitants, this corresponds to about 2,500 euros per capita per year.

This specific distribution of royalties—despite significant territorial and temporal variability—cannot be considered an outlier, as it reflects a real and structural characteristic of the phenomenon under observation.

**Figure 3** - Distribution of municipal royalties in the main 4 municipalities in Basilicata. Years 2008-2024. Values in thousands of euros.



### 3. Methodology

This study sought to explore potential behavioural differences between royalty-receiving and non-receiving municipalities in the province of Potenza.

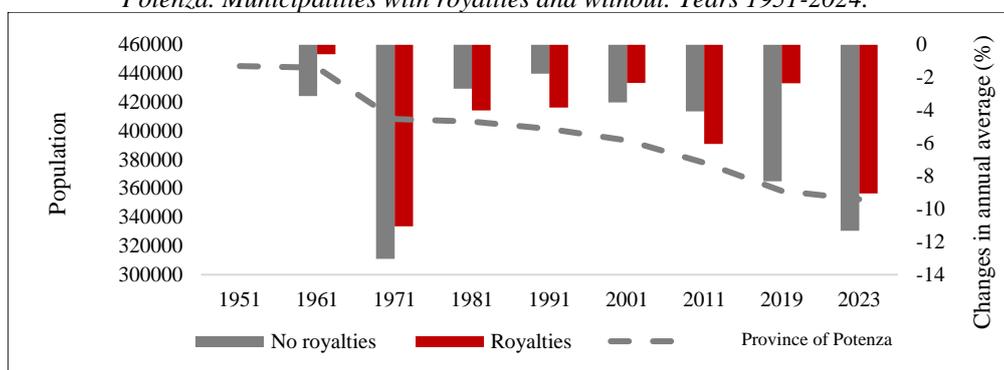
The strong concentration of royalties in a limited number of municipalities (49 at the national level, 12 in Basilicata, and 7 in the province of Potenza alone), the irregular temporal distribution of these resources, and the limited availability of demographic, social, and economic data at the municipal level do not allow for multivariate analyses capable of identifying structured differences between the two groups (royalty beneficiary municipalities vs. non-beneficiary municipalities). Nonetheless, despite being aware of the limitations and acknowledging that the analysis cannot be considered exhaustive, it is still deemed useful to attempt to identify potential demographic and economic differences between the two subpopulations.

Therefore, data on the amount of royalties at the municipal level were cross-referenced with “*A misura di comune*”, a system of municipal indicators developed by Istat and available since 2014. These were supplemented with additional sources of official statistics, such as Demographic Balances, the Population Census (Carucci, 2025; Istat,

2012; Crescenzi, 2020), and open data from the Ministry of Economy and Finance.

Among the various demographic aspects considered, a particularly significant element is the population trend, based on the assumption that municipalities with greater resources to allocate to their residents should experience population growth and improved welfare conditions. Since 1951 Basilicata has experienced a steady and marked decline in its resident population.

**Figure 4 - Percentage changes in population and changes in annual average. Province of Potenza. Municipalities with royalties and without. Years 1951-2024.**



Source: Authors' elaborations on Istat data.

This phenomenon appears systemic, and the analysed data do not reveal differences attributable to whether a municipality is a beneficiary of royalties or not (Figure 4). The remaining socio-demographic and economic characteristics of the two groups of municipalities (comprising 7 and 92 statistical units, respectively<sup>5</sup>) were examined using non-parametric statistical tests, which are particularly suitable for small sample sizes. Specifically, the Wilcoxon test and the Kruskal-Wallis test are effective tools for comparing two independent groups, especially when the data do not follow a normal distribution or exhibit heterogeneous variances (Siegel, 1957).

These tests are particularly robust (Fay, 2010), as they do not require strict assumptions about the data distribution and are not affected by the presence of outliers. In particular, “*indicators derived from official statistical sources do not exhibit data considered to be ‘outliers’; maximum and minimum values are linked to the structure of the indicator and are all considered acceptable*”, and they have already undergone processes of compilation, validation, and harmonisation by the producing institutions<sup>6</sup>. Considering also the relatively limited sample size, the risk that potential outliers may significantly influence the results is extremely low. For these reasons, at this exploratory

<sup>5</sup> The municipality of Potenza was excluded from the analysis due to its socio-economic and demographic characteristics being markedly different from those of the other municipalities in the province.

<sup>6</sup> <https://www.istat.it/wp-content/uploads/2025/06/Nota-metodologica.pdf>

stage of the study, it is not deemed necessary to implement additional outlier detection analyses, without compromising the methodological soundness of the conclusions.

Therefore, the variables considered, sourced from ISTAT and the Ministry of Finance, can be regarded as robust and methodologically reliable, and as meeting the official statistical data quality criteria set out in the European Statistics Code of Practice<sup>7</sup>: relevance, accuracy, timeliness, punctuality, coherence, and accessibility.

Regarding the two non-parametric tests employed in the analysis, the underlying statistical hypotheses are as follows:

- Null hypothesis ( $H_0$ ): there are no significant differences between the two groups;
- Alternative hypothesis ( $H_1$ ): there are significant differences between the two groups.

To determine whether to reject the null hypothesis, the values of the dependent variable are first ranked regardless of group membership. Subsequently, the mean rank for each group is calculated, which serves as the basis for computing the test statistic.

Specifically, the Wilcoxon test compares the mean ranks between the two groups, and two scenarios may arise:

- The mean ranks are similar, providing no evidence of a difference between the groups (leading to acceptance of  $H_0$ );
- The mean ranks differ significantly, indicating that one group tends to have higher values than the other (leading to rejection of  $H_0$ ).

Similarly, the Kruskal-Wallis test assesses differences among multiple groups (typically two or more), also based on ranks, but focuses on medians rather than means. This test is particularly useful when asymmetric distributions or heterogeneous variances are suspected.

#### 4. Results

Based on data availability, a set of socio-economic and structural variables referring to the year 2022 was identified. For each variable, the two non-parametric tests (Wilcoxon and Kruskal-Wallis) were applied to assess the presence of significant differences between the two groups of municipalities (royalty recipients and non-recipients)<sup>8</sup>.

The results reveal statistically significant differences, both in means (Wilcoxon test) and medians (Kruskal-Wallis test), for several key dimensions, notably:

- Labor and enterprises: entrepreneurship rate, employment rate, employee compensation, value added per employee;
- Social expenditure: social spending per capita;
- Demographic mobility: migration rate.

Detailed results are presented in Tables 2 and 3.

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<sup>7</sup> European Statistics Code of Practice — revised edition 2017 - Products Catalogues - Eurostat

<sup>8</sup> The non-parametric test aims to test the difference in terms of socio-demographic characteristics

**Table 2 - Characteristics of Municipalities: Wilcoxon Two-Sample Test. Year 2022.**

Variables	Two samples Test of Wilcoxon					Test outcome
	Z	Pr>Z	Pr> Z	Approximation t		
				Pr > Z	Pr >  Z	
Percentage change in population between 2001 and 2022	0.4163	0.3386	0.6772	0.339	0.6781	Non-significant difference
<i>Social services expenditure per inhabitant</i>	<i>2.2319</i>	<i>0.0128</i>	<i>0.0256</i>	<i>0.014</i>	<i>0.0279</i>	<i>Significant difference</i>
Incidence of taxpayers with income less than 10,000 €	0.4982	0.3092	0.6183	0.3097	0.6194	Non-significant difference
Taxable income per taxpayer	1.1125	0.133	0.2659	0.1343	0.2686	Non-significant difference
<i>Entrepreneurship rate</i>	<i>2.7233</i>	<i>0.0032</i>	<i>0.0065</i>	<i>0.0038</i>	<i>0.0077</i>	<i>Significant difference</i>
Density of local units	0.1433	0.443	0.886	0.4432	0.8863	Non-significant difference
<i>Employment rate</i>	<i>2.382</i>	<i>0.0086</i>	<i>0.0172</i>	<i>0.0096</i>	<i>0.0191</i>	<i>Significant difference</i>
Children taken in by social services	1.1711	0.1208	0.2416	0.1222	0.2444	Non-significant difference
Secondary qualification incidence	-0.567	0.2855	0.5711	0.2862	0.5724	Non-significant difference
Tertiary qualification incidence	0.1024	0.4592	0.9185	0.4593	0.9187	Non-significant difference
Old age index	-0.867	0.193	0.386	0.1941	0.3882	Non-significant difference
Birth rate	1.5767	0.0574	0.1149	0.059	0.1181	Non-significant difference
Mortality rate	0.0614	0.4755	0.951	0.4756	0.9511	Non-significant difference
<i>Migration rate</i>	<i>1.9179</i>	<i>0.0276</i>	<i>0.0551</i>	<i>0.029</i>	<i>0.058</i>	<i>Significant difference</i>
<i>Added value per employee</i>	<i>1.903</i>	<i>0.0285</i>	<i>0.057</i>	<i>0.03</i>	<i>0.06</i>	<i>Significant difference</i>
Added value on sales	0.1115	0.4556	0.9112	0.4557	0.9114	Non-significant difference
Purchases on sales	0.8967	0.1849	0.3699	0.1861	0.3721	Non-significant difference
Salary on added value	-0.881	0.1891	0.3783	0.1903	0.3806	Non-significant difference
<i>Wage per employee</i>	<i>1.9011</i>	<i>0.0286</i>	<i>0.0573</i>	<i>0.0302</i>	<i>0.0604</i>	<i>Significant difference</i>

Source: Authors' elaborations on Istat data.

Specifically, the box plots corresponding to the Wilcoxon test scores (Figure 5) provide an effective graphical representation of the differences between the two groups for each variable, visually highlighting the separation between the distributions.

Based on the statistical significance observed for the year 2022, it was appropriate to investigate whether such differences between royalty recipient and non-recipient municipalities were already present in the past, regardless of royalties received, or if an evolution over time occurred that effectively "rewarded" recipient municipalities with relatively better socio-economic performance.

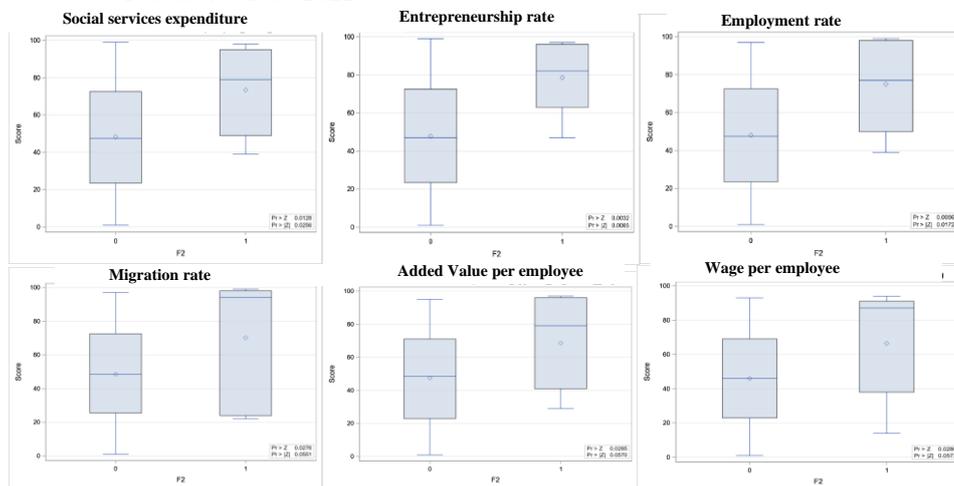
The analysis was repeated considering the average values of municipal rankings, applying the statistical tests once again for a baseline year and an intermediate year, in order to observe any changes in the comparative dynamics between the two groups.

**Table 3 - Characteristics of Municipalities: Kruskal - Wallis Test. Year 2022.**

Kruskal-Wallis Test				
Variables	X <sup>2</sup>	DF	Pr > X <sup>2</sup>	Test outcome
% change in population between 2001 and 2022	0.1791	1	0.6722	Non-significant difference
Social services expenditure per inhabitant	5.0117	1	0.0252	Significant difference
Incidence of taxpayers with income less than 10,000 €	0.2551	1	0.6135	Non-significant difference
Taxable income per taxpayer	1.2529	1	0.2630	Non-significant difference
Entrepreneurship rate	7.4534	1	0.0063	Significant difference
Density of local units	0.0225	1	0.8806	Non-significant difference
Employment rate	5.7065	1	0.0169	Significant difference
Children taken in by social services	1.3928	1	0.2379	Non-significant difference
Secondary qualification incidence	0.3287	1	0.5664	Non-significant difference
Tertiary qualification incidence	0.0119	1	0.9130	Non-significant difference
Old age index	0.7632	1	0.3823	Non-significant difference
Birth rate	2.5075	1	0.1133	Non-significant difference
Mortality rate	0.0047	1	0.9456	Non-significant difference
Migration rate	3.7046	1	0.0543	Significant differences
Added value per employee	3.6480	1	0.0561	Significant difference
Added value on sales	0.0140	1	0.9057	Non-significant difference
Purchases on sales	0.8164	1	0.3662	Non-significant difference
Salary on added value	0.7892	1	0.3744	Non-significant difference
Wage per employee	3.6414	1	0.0564	Significant difference

Source: Authors' elaborations on Istat data.

**Figure 5 - Characteristics of Municipalities: Siegel Boxplot of the Wilcoxon Two-Sample Test score. Year 2022.**



Source: Authors' elaborations on Istat data.

The baseline year selected was 2001, as it corresponds to the year for which census data at the municipal level are available. The year 2012 was chosen as the intermediate point because, from that period onward, Istat made available a particularly extensive and structured municipal-level information base on enterprises, in addition to data collected during the Population and Housing Census (Table 4).

**Table 4 - Characteristics of Municipalities: Wilcoxon Two-Sample Test. Years 2001, 2012 and 2022.**

Variables	2001	2012	2022
	Significance		
Percentage change in population between 2022 and 2001	.	.	No
Percentage change in population between 2012 and 2001	.	No	.
Social services expenditure per inhabitant	.	No	Yes
Incidence of taxpayers with income less than 10,000 euros	No	No	No
Taxable income per taxpayer	No	No	No
Entrepreneurship rate <sup>(b)</sup>	.	Yes	Yes
Density of local units <sup>(b)</sup>	.	No	No
Employment rate <sup>(a)</sup>	No	No	Yes
Children taken in by social services	.	No	No
Secondary title incidence <sup>(a)</sup>	No	No	No
Incidence of tertiary qualification <sup>(a)</sup>	No	No	No
Birth rate	No	No	No
Mortality rate	No	No	No
Migration rate	No	No	Yes
Old age index <sup>(a)</sup>	.	No	No
Added value per employee <sup>(b)</sup>	.	Yes	Yes
Added value on sales <sup>(b)</sup>	.	No	No
Purchase on sales <sup>(b)</sup>	.	No	No
Salary on added value <sup>(b)</sup>	.	Yes	No
Salary on employee <sup>(b)</sup>	.	Yes	Yes

Source: Authors' elaborations on Istat data.

(a) For the year 2012, the data are from census sources and therefore relate to the year 2011

(b) For the year 2012, the data are from ASIA - Statistical database of active enterprises and Frame - Statistical database on the economic values of enterprises sources and therefore relate to the year 2014, the first year available

For 2001 the analysis shows no structural differences between the two subpopulations (royalty recipient and non-recipient municipalities) with respect to the variables observed.

It is only from 2012 onwards that initial signs of divergence emerge, limited to business-related variables - such as entrepreneurship rate, value added per employee, compensation on value added, and compensation per employee -with higher average values observed in the recipient municipalities.

## 5. Conclusion

This study has highlighted a slow and partial improvement in conditions for royalty-recipient municipalities compared to non-recipient ones, at least with reference to the

considered time frame and the socio-economic variables observable at the municipal level.

This improvement is mainly shown in terms of: migration rate; per capita social expenditure by municipalities; employment rate and local economic structure, with reference to business-related variables.

However, most of the analysed variables do not show significant changes, indicating a substantial underlying stability between the two groups with respect to other socio-economic aspects.

It is important to highlight that the differences observed since 2012 might be, at least in part, attributable to the expansion of the available data set: from that year onward, ISTAT made accessible a range of municipal-level data previously unavailable, enabling a more detailed and comprehensive analysis.

The findings also provide valuable insights for further investigation. In particular, the issue of higher social service expenditure in recipient municipalities and the ways in which royalty-derived resources are effectively utilized to address the population's needs merit special attention.

Moreover, the analysis highlighted how the lack of clear regulations regarding the use of royalties by municipalities—combined with the absence of specific monitoring mechanisms—can represent a critical issue.

This situation opens the possibility that resources may not always be allocated towards strategic long-term investments, risking their diversion to current expenditures with limited productivity, thereby generating inefficiencies.

This situation raises the possibility that resources may not always be allocated to long-term strategic investments, with the risk of being diverted toward low-productivity current expenditures, thereby generating inefficiencies.

In the worst-case scenario, this ambiguity could contribute to the emergence of the so-called “resource curse”; however, socio-economic problems predate the oil boom, making any causal claims difficult at this stage.

Finally, the lack of a consolidated literature on the impact of royalties at the municipal level, in contrast to the more widespread analyses at the regional level, calls for further research.

Extending the temporal scope of the analysis, supported by municipal indicators estimable through proxy variables, could enable the adoption of factual/counterfactual approaches aimed at investigating more robustly and systematically the actual influence of royalty revenues on the quality of life and socio-economic development of the local populations involved, also overcoming the limitations associated with non-parametric studies.

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