



Cultural participation as an indicator of local government performance: evidence from Italian municipalities

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Abstract

This paper investigates whether cultural participation can be interpreted as an outcome-based indicator of local government efficiency in the cultural policy domain. Rather than focusing solely on budgetary effort, the study examines the extent to which municipal cultural expenditure is associated with observable behavioral responses by citizens, interpreted as a proxy for the efficiency of public cultural expenditure. Using an original panel dataset covering Italian provincial capitals from 2010 to 2022, the study analyzes the relationship between per capita cultural expenditure and cultural participation. The empirical strategy combines fixed-effects panel regressions with the Generalized Propensity Score (GPS) method for continuous treatments, improving covariate balance across key socio-economic and institutional characteristics. The results show a positive and statistically significant association between municipal cultural expenditure and participation. Cities that invest more in culture tend to display higher participation, even after controlling for contextual factors. Some evidence of spatial interdependence also emerges, suggesting that cultural investments may attract participation from neighboring areas, while current expenditure is more closely associated with local engagement. The robustness of this relationship is further supported by the application of GPS reweighting. These findings suggest that cultural participation can function as an outcome-based proxy for the efficiency of public cultural expenditure, capturing the extent to which local governments translate financial resources into participation outcomes.

Keywords Cultural participation · Public cultural expenditure · Local government efficiency · Generalized Propensity Score · Decentralized governance

JEL Classification Z11 · Z18 · H72 · H76 · H83

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1 Introduction

Public intervention in cultural markets represents a cornerstone of contemporary cultural policy, justified by the need to address market failures and enhance social welfare through increased access to cultural goods and services. Culture generates positive externalities and exhibits merit good characteristics that private markets alone cannot adequately provide (Throsby 2001; Towse 2019). As a result, governments at different institutional levels allocate substantial resources to cultural activities with the aim of fostering participation and maximizing societal benefits. Even when primarily oriented toward the supply side, cultural policy ultimately seeks to expand opportunities for cultural consumption (Rushton 2023).

The literature has examined this public–private dynamic from multiple perspectives, including the determinants of cultural expenditure, the drivers of cultural participation, and the political economy of cultural policy. A growing body of research highlights the positive effects of cultural participation on well-being and broader socio-economic outcomes (Fujiwara et al. 2014; Morea et al. 2023), reinforcing the economic rationale for public cultural expenditure.

Despite these advances, limited attention has been devoted to the direct relationship between public cultural expenditure and participation outcomes, particularly from an efficiency-oriented perspective. While these dimensions are conceptually linked, empirical evidence on how public resources translate into observable social outcomes remains limited, particularly when this relationship is interpreted as an indicator of policy efficiency, especially in decentralized governance contexts, where the quality of local institutions plays a crucial role (Arif et al. 2022; Cerruti 2024).

This gap is particularly relevant in countries such as Italy, where municipalities play a central role in the design and implementation of cultural policies. Municipal intervention operates through both current cultural expenditure, which sustains daily activities and events, and capital cultural expenditure, which supports longer-term investments in the sector (Dalle Nogare and Galizzi 2011; Ardizzone et al. 2025). Local governments account for a large share of public cultural expenditure and operate within highly heterogeneous socio-economic, spatial and institutional environments. In such contexts, evaluating the efficiency of public expenditure—understood as the ability to transform financial inputs into observable participation outcomes—requires moving beyond input-based measures and focusing on outcome-based indicators that capture citizens' engagement with cultural opportunities.

This paper addresses this issue by investigating whether cultural participation can serve as an outcome-based proxy for the efficiency of public cultural expenditure, defined as the ability of municipalities to translate financial inputs into observable participation outcomes. Specifically, it examines the relationship between municipal cultural expenditure and cultural participation using panel data on Italian provincial capitals over the period 2010–2022.

This paper makes three main contributions. First, it provides empirical evidence on the relationship between public cultural expenditure and participation, thereby bridging strands of research that have often been treated separately. Second, it adopts a rigorous empirical strategy based on the Generalized Propensity Score (GPS), a

relatively recent approach in this field, which enhances the robustness of estimates in non-experimental settings by improving covariate balance and represents a methodological contribution to the analysis of cultural policy. Third, it proposes a novel interpretation of cultural participation as an empirical indicator of policy efficiency, offering a practical tool for evaluating public cultural expenditure.

The findings have implications for both research and policy. From a research perspective, they support the use of participation data as a proxy for assessing the efficiency of cultural policies. From a policy perspective, they provide local governments with a measurable indicator to evaluate the social returns of cultural expenditure and improve resource allocation decisions. While the analysis does not aim to establish causal effects, the observed relationship between public cultural expenditure and participation provides an empirical proxy consistent with an efficiency-based interpretation of public spending.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on cultural expenditure determinants, cultural participation and cultural policy, establishing the theoretical framework for the empirical analysis. Section 3 presents the methodology, including data construction and the GPS approach. Section 4 discusses the empirical results, while Sect. 5 concludes with policy implications and directions for future research.

2 Literature review on local public expenditure on culture and cultural participation

The role of public intervention in cultural markets is a central topic in cultural economics. Cultural policy, while often supporting the supply side, is ultimately directed at increasing opportunities for cultural consumption, in order to enhance social welfare, broadly defined (Rushton 2023). Thus, the literature can be organized into three complementary research streams, focusing, respectively on the determinants of public cultural expenditure, the drivers of cultural participation, and the political economy of cultural policy. In recent years, the interplay between these dimensions has gained renewed relevance in debates on cultural accessibility, policy efficiency, and broader socio-economic impacts. However, despite these advances, the three strands only partially address how public authorities convert financial resources into social outcomes.

The first stream of research focuses on the determinants of public cultural expenditure. In decentralized governance systems such as Italy's, municipalities are key actors in cultural provision and account for the majority of local public expenditure in this domain (Dalle Nogare and Galizzi 2011; Ardizzone et al. 2025). The importance of municipalities lies not only in their budgetary responsibility but also in their capacity to tailor cultural policies to local needs and identities. Several studies have identified sociodemographic and fiscal determinants of municipal cultural expenditure. For instance, Kopańska (2018) and Depalo and Fedeli (2011) highlight how population size, education, wealth, and fiscal autonomy affect local cultural budgets. Larger and wealthier municipalities tend to invest more in culture, and the share of young or educated residents also positively correlates with expenditure. The

availability of external funding, particularly from the European Union, further enables municipalities to expand their cultural budgets (Kopańska 2018).

A spatial perspective further enriches this understanding. Cultural policies are not implemented in isolation; municipalities often respond to the actions of their neighbors. Werck et al. (2008) and Ferraresi et al. (2018) find strong evidence of spatial interdependence in local expenditure, particularly in polycentric urban systems. Central cities may act as cultural hubs, drawing audiences from surrounding areas and prompting neighboring municipalities' free-riding behaviors. The presence of "central places" (Werck et al. 2008) influences not only expenditure patterns but also strategic positioning in cultural offerings. Cerisola and Panzera (2022) add that cultural participation can generate positive regional spillovers, especially in creative cities, although these benefits may be offset by congestion effects related to over-tourism and rising living costs.

The second stream of research focuses on the determinants and effects of cultural participation. Cultural engagement is increasingly viewed by policymakers not only as a personal or leisure activity but also as a marker of social inclusion and civic vitality. Fujiwara et al. (2014) show that participation in cultural events enhances well-being, health, and even economic productivity, providing a strong rationale for public support. Martin et al. (2023) systematically review the empirical evidence on the benefits of cultural participation and find that most studies document positive effects, spanning from public health and subjective well-being to economic local development, civic engagement, and identity. These contributions highlight how participation outcomes represent a crucial component of cultural policy evaluation, aligning with the growing literature on measuring the social impact of culture (O'Hagan 1998; Bakhshi et al. 2015; Towse 2019). From a public governance perspective, participation can also be interpreted as a behavioral response to public service provision. This view is consistent with the literature on citizen satisfaction, where individuals form a cumulative evaluation of public services based on their experiences and perceived performance (Van Ryzin 2004). Building on this approach, the expectancy–disconfirmation framework suggests that satisfaction depends on the gap between expectations and actual outcomes, shaping citizens' responses to public services (Van Ryzin 2013). In this sense, participation in cultural activities can be interpreted as an observable outcome reflecting the extent to which public cultural provision meets citizens' expectations, linking service performance to user engagement (Boyne and Law 2005). Gallo et al. (2025) propose a comparative framework for identifying the most reliable indicators of cultural engagement, demonstrating that composite indices capturing multiple forms of participation provide a more accurate and consistent basis for policy evaluation. From a governance perspective, behavioral responses are increasingly interpreted as indirect indicators of policy efficiency, as shown by recent evidence linking municipal action to civic behavior (Aprile and Fiorillo 2025).

The determinants of participation are multifaceted. Traditional variables such as income and education consistently emerge as strong predictors (Falk and Katz-Gerro 2016; Feder 2020), but context and access also play a central role. Martinez-Martinez et al. (2021) identify logistical and structural barriers, such as distance, transport, and safety, as critical in explaining non-participation, especially in

underserved communities. Getzner (2020, 2022) adds that proximity to infrastructure and urban centrality significantly increase participation, with cultural activities being more accessible and attractive in cities with high-quality facilities. These findings stress the role of urban planning and local development strategies in shaping cultural engagement.

The role of inequality has also received attention. Cultural policies alone may reinforce existing inequalities. Bertacchini et al. (2022) find that acculturation factors (e.g., language proficiency, years of residence) are more predictive of immigrant participation than nationality or religion, suggesting that inclusive and context-sensitive policies are key for cultural integration. Fujiwara et al. (2014) and Getzner (2022) emphasize that culturally deprived groups may gain disproportionately from participation yet are often the least able to access cultural opportunities. These findings highlight the need for policies that address both demand- and supply-side barriers to participation.

Mafrolla and D'Amico (2016) emphasize that not all public expenditure leads to improved well-being. Positive impacts emerge only when certain thresholds are met, suggesting diminishing returns or underinvestment risks. This non-linearity is a reminder that the relationship between expenditure and outcomes is mediated by context, capacity, and complementarities with other policies.

The third stream of research adopts a political economy perspective, examining how governments use cultural expenditure to pursue strategic and electoral objectives. This perspective is closely related to the broader literature on electoral budget cycles, which highlights how public expenditure may be strategically adjusted in response to electoral incentives (Stastná 2009; Benito et al. 2013; Kopańska 2018; de Gier 2020; Getzner 2022). Beyond structural determinants, cultural expenditure may reflect governments' strategic priorities and electoral incentives, rather than purely socio-economic needs (Benito et al. 2013; García and Hayo 2025). Dalle Nogare and Galizzi (2011) document a negative electoral cycle: expenditure on culture tends to decline in election years, likely due to its lower political visibility compared to other sectors. Kopańska (2018, 2022) further shows how electoral dynamics and institutional features, such as fiscal and expenditure autonomy, shape local cultural expenditure decisions across municipalities. Empirical evidence on electoral cycles in cultural expenditure, however, remains mixed. While some studies find a reduction in expenditure in election years (Dalle Nogare and Galizzi 2011; Kopańska 2018), others report increases associated with political competition and strategic signaling (Benito et al. 2013; Getzner 2022).

Institutional conditions also play a key role: Evan and Holý (2023) show that cultural and social diversity can influence the quality of governance, affecting how local administrations allocate and manage resources in public policy domains. Institutional variables such as governance quality, fiscal rules, and intergovernmental transfers play a significant role in enabling or constraining cultural expenditure (Sacchi and Salotti 2016), while Janberg and Värja (2023) find that the composition of municipal budgets, not just their volume, influences local development outcomes.

Cultural expenditure typically includes both current and capital components (Ardizzone et al. 2025; Lerouge and Arnaboldi 2026). While current expenditure

has been studied more extensively (Dalle Nogare and Galizzi 2011), comparative evidence on their respective effects on cultural participation remains limited.

Despite the depth of these findings, the direct empirical link between public cultural expenditure and participation remains underexplored. The existing evidence points to a nuanced and potentially bidirectional relationship. Rius-Ulldemolins et al. (2019) analyzed cultural expenditure in Europe as a proxy for cultural policy and linked different models of public expenditure to cultural participation. Their analysis reveals a significant association between cultural policy models, such as the Nordic, Central European, Southern European, and post-Soviet variants, and levels of cultural participation, suggesting a link between public spending patterns and engagement in artistic activities. Notably, the Nordic model shows higher expenditure and participation, while the Southern and Balkan models lag behind, reflecting both current policy orientations and deep-rooted historical legacies. Del Barrio-Tellado et al. (2023) further demonstrate that the efficiency of cultural institutions depends on their ability to transform financial resources into participation outcomes, underscoring that efficiency assessments must incorporate both input and output dimensions of cultural performance. Biferale et al. (2024) and Lerouge and Arnaboldi (2026) find that participation responds more to bundled policies (e.g., combining cultural with educational and transport services) than to standalone investments. From a governance perspective, this insight points to the relevance of integrated and multi-sectoral policy strategies. They note that public expenditure may not always translate into higher participation, especially in contexts where structural or socio-economic barriers limit access. Thus, they conclude that measuring participation outcomes is essential for evaluating cultural investment, and future research should explore the relationship between public expenditure and participation more directly. Previous work by Getzner (2020) on the spatial dynamics of cultural demand also finds that municipal cultural expenditure is a key determinant of attendance frequency, together with other public finance variables.

Taken together, these studies provide a rich but still fragmented understanding of the relationship between cultural expenditure and participation. They suggest that while both dimensions are conceptually linked, empirical evidence on their direct association, especially in decentralized systems, is still scarce. This paper builds on and extends this literature by providing an explicit test of whether local public cultural expenditure is related to higher cultural participation, using Italian provincial capitals as a case study. By integrating fiscal, socio-economic, and spatial perspectives, the study contributes to cultural economics and to the economics of governance in three key ways: (i) it quantifies the link between cultural inputs and outcomes at the municipal level; (ii) it introduces a rigorous empirical method (GPS) rarely applied in this field; and (iii) it interprets cultural participation as an outcome-based proxy for the efficiency of public cultural expenditure, offering both conceptual and practical implications for theory and policy evaluation.

3 Methodology

3.1 Database

To investigate the link between municipal cultural expenditure and local cultural participation, the study uses an original panel dataset covering Italian provincial capitals ($N = 106^1$) over the period 2010–2022. Together with the national government, municipalities play an active and central role in the promotion and administration of cultural activities, managing the vast majority of Italy's public cultural expenditure (Dalle Nogare and Galizzi 2011; Ardizzone et al. 2025).

The dataset integrates multiple administrative and statistical sources, most of which are open access, allowing for a systematic and replicable analysis at the city level. This multi-source structure ensures comparability and transparency of the empirical evidence. Table 1 provides an overview of the variables included, their respective sources, time coverage, and some descriptive statistics.

Cultural participation is the dependent variable under study. It is measured as the total number of attendances at cultural events (both paid and free) recorded in each province during a given year, normalized by the *Population Size* of the provincial capital. Data come from the Italian Society of Authors and Publishers² (SIAE), a public organization that manages the rights of authors and publishers in Italy, which systematically records every registered cultural event in Italy. Although participation is observed at the provincial level due to data availability, this indicator is interpreted as a proxy for participation associated with the cultural system of the provincial capital city, implying that the estimated relationship may reflect not only residents' responses to municipal expenditure, but also demand from surrounding areas, potentially leading to an upward bias in the estimated coefficients. This choice reflects the spatial organization of cultural supply in Italy, where major cultural infrastructures and organized cultural events are highly concentrated in provincial capitals. These cities typically host the main theaters, museums, concert halls, and cultural institutions serving both urban residents and surrounding municipalities. While this measure may capture attendance originating from neighboring areas, it reflects the functional role of provincial capitals as cultural hubs and allows consistent comparison across cities and over time.

Cultural expenditure represents the main independent variable and measures per-capita municipal expenditure on culture of the provincial capital city, including both current expenditure for operations and capital investment for long-term development projects. Municipal cultural expenditure is used as the main explanatory variable, as the SIAE data primarily capture live cultural events, which are largely organized and financed at the local level, while regional governments mainly play a programming role, and national and EU-related cultural funding is often directed through multi-level mechanisms or toward institutions such as museums and heritage sites.

¹ The province of Carbonia-Iglesias is excluded from the analysis due to harmonisation issues across the different sources.

² <https://www.siae.it/it/>.

Table 1 Variables

Variable	Source	Years	Description	N	Mean	SD	min	max
Cultural participation	SIAE	2010–2024	Number of participants in cultural events in the province, divided by the population of the provincial capital	1378	4.135	5.171	0.022	34.623
Cultural expenditure	AIDA PA	2010–2022	City's expenditure in culture (current, investments and total), divided by its population	1367	12.738	16.830	0.115	108.518
Current cultural expenditure	AIDA PA	2010–2022	City's expenditure in culture (current, investments and total), divided by its population	1367	10.321	13.995	0.111	89.837
Cultural investments	AIDA PA	2010–2022	City's expenditure in culture (current, investments and total), divided by its population	1367	2.417	5.985	0	90.248
Neighb. Cultural expenditure	AIDA PA and ISTAT	2010–2022	Average cultural spending per capita (current, investments and total) in neighboring provincial capitals	1378	3.891	4.957	0.241	72.499
Neighb. current cultural expenditure	AIDA PA and ISTAT	2010–2022	Average cultural spending per capita (current, investments and total) in neighboring provincial capitals	1378	3.183	4.241	0.239	63.169
Neighb. cultural investments	AIDA PA and ISTAT	2010–2022	Average cultural spending per capita (current, investments and total) in neighboring provincial capitals	1378	0.707	1.257	0	20.298
Population (log)	Istat	2010–2022	Number of residents	1378	13.418	0.659	11.209	15.003
Financial autonomy	AIDA PA	2010–2022	Total city's expenditure in culture, divided by its population	1378	0.707	0.144	0.101	0.942
Local elections_no	National online archives	2010–2022	Indicates the years when the local elections took place	1378	0.799	0.401	0	1
Local elections_yes	National online archives	2010–2022	Indicates the years when the local elections took place	1378	0.201	0.401	0	1
Tourism_Q3	Istat	2022	Municipalities are assigned to quintiles based on tourism density	1378	0.067	0.251	0	1
Tourism_Q4	Istat	2022	Municipalities are assigned to quintiles based on tourism density	1378	0.441	0.497	0	1
Tourism_Q5	Istat	2022	Municipalities are assigned to quintiles based on tourism density	1378	0.491	0.500	0	1
Graduates pc	Ministry of Education	2010–2022	Number of graduates per 1000 inhabitants	1378	1.312	1.326	0.107	7.042
Average income	Ministry of Finance	2010–2022	Total declared income divided by the number of taxpayers	1378	22.775	3.265	14.32	39.039
Gini	Ministry of Finance	2010–2022	Total declared income divided by the number of taxpayers	1378	0.431	0.027	0.382	0.553
Poverty rate	Ministry of Finance	2010–2022	Total declared income divided by the number of taxpayers	1378	27.70	5.10	17.90	45.60
Motorway access	Istat	2022	Indexes on the accessibility of each city to motorway, railway and airport infrastructures	1378	65.037	78.028	0.001	449.466
Train access	Istat	2022	Indexes on the accessibility of each city to motorway, railway and airport infrastructures	1378	1.390	1.578	0.016	16.446
Airplane access	Istat	2022	Indexes on the accessibility of each city to motorway, railway and airport infrastructures	1378	11.137	12.004	0.035	56.61

To provide more detail on which component is more associated with cultural participation, this variable is decomposed into two sub-components: *Current cultural expenditure* and *Cultural investments*, both expressed in a per-capita dimension. Following standard practice in public finance analysis, all values are expressed in constant 2022 prices to account for inflation effects. Few missing data are found and subsequently excluded from the analysis, mainly referring to the autonomous region of Aosta.

Then, to account for the potential spatial spillover of cultural expenditure, *Neighbors' cultural expenditure* variable is introduced. This measure is defined as the average cultural expenditure (per capita) in the neighboring provincial capitals. With the same approach, *Neighbors' current cultural expenditure* and *Neighbors' cultural investments* are defined.

Socio-economic conditions of the provincial capital cities are captured through multiple indicators: *average income*, *Gini index* and *the poverty rate*. These metrics are based on open data from the Italian Ministry of Finance, and measure respectively the average income values declared by taxpayers (level of wealth), the overall distribution of income, and the percentage of people with the lowest income (under 10,000 €/year).

The variable *university graduates* measures the number of residents of the provincial capital cities who graduated from university, divided by the total population and multiplied by 1000, and serves as an estimate of the general education level of the population.

City accessibility is captured through three indicators measuring the accessibility of the municipality to motorway, railway, and airport mobility infrastructure. They are used as socio-economic estimates strictly related to residents' occupational status. Those indices are based on the gravitational law and calculated based on a cost function of time spent to reach the closest three transport infrastructures (i.e., train station, airport or motorway), weighted on the supply size of each infrastructure.

Tourism intensity is measured through an index developed by the Italian National Institute of Statistics (Istat), which classifies Italian cities based on their tourist level. This index considers the intensity of touristic demand, supply, and related economic activities, and classifies each city into five quintiles. Specifically, municipalities are assigned to quintiles (Q1–Q5) based on tourism density, defined as the ratio of over-night stays to resident population, with Q5 identifying cities characterized by the highest intensity of tourist flows and a strong tourism-oriented vocation (e.g., cities of art or major holiday destinations).

Political and institutional factors are also included. *Municipal elections* indicate the years when local elections took place in each provincial capital city and are used as a proxy for political cycles, accounting for the potential influence of electoral dynamics on both spending and participation.

Financial autonomy measures the capacity of a municipality to finance itself autonomously without depending on state or regional transfers. Specifically, it indicates the percentage of own-source revenues (from taxes, tariffs, etc.) out of total current revenues.

A preliminary analysis revealed that socio-economic variables included in the study are strongly correlated. Figure 1 displays the correlation matrix, showing the

pairwise correlations among variables. To limit multicollinearity issues and avoid model overspecification, principal component analysis (PCA) is applied to define synthetic and independent socio-economic dimensions. The PCA is applied exclusively to socio-economic variables since they exhibit high levels of correlation, while key policy and institutional variables are retained in their original form to preserve their direct economic interpretation and policy relevance. This approach allows us to reduce multicollinearity in the data while accounting for confounding factors and maintaining the economic meaning of the core regressors included in the model.

Once PCA is performed, parallel analysis indicates the existence of two principal components explaining about 65% of the total variance. Variance explained (after rotation) is reported in Table 2. Each component is a linear combination of the initial set of socio-economic variables and can be interpreted based on the corresponding loadings reported in Table 2.

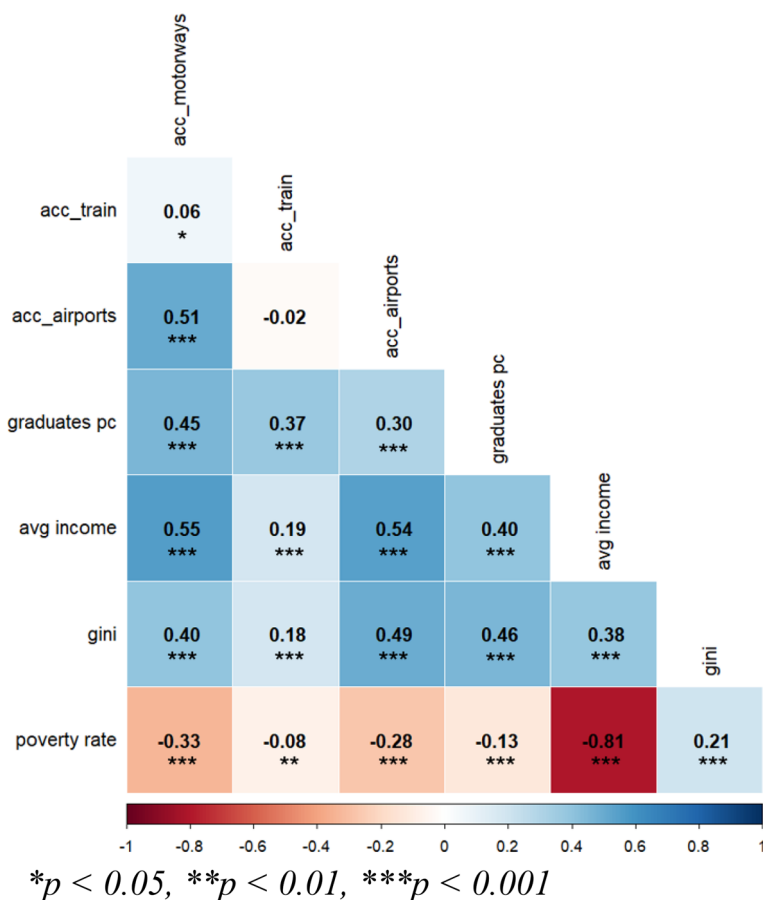


Fig. 1 Correlation matrix between variables. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Table 2 Rotated principal component loadings

	Component 1: “Wealth”	Component 2: “Economic inequality”
Accessibility to motorways	0.437	
Accessibility to train stations	0.163	0.262
Accessibility to airports	0.415	0.339
Graduates per capita	0.379	
Average income	0.496	– 0.323
GINI	0.353	0.515
Poverty rate	– 0.311	0.669
Variance explained	44%	21%

Component 1 is a weighted average of all variables and can be interpreted as an indicator of the overall *Wealth* of the provincial capital. The wealthier the city, the better the accessibility to transport infrastructures, the average income and education of its population, the higher the Gini index (reflecting greater dispersion in income distribution), the lower the poverty rate.

Component 2 is instead highly characterized by the Gini index and Poverty rate, and is interpreted as an indicator of *Economic Inequality* of the city. The higher the scores on this dimension, the higher the economic imbalances of a city.

These components are then used as covariates in the regression models to mitigate multicollinearity among socioeconomic variables and improve the stability and interpretability of the estimated coefficients. While some loss of information is unavoidable, the retained components capture the majority of the variance in the original variables, thus preserving the main structure of the data while ensuring more robust estimation and limiting confounding bias³. Remaining regressors exhibit only moderate correlations, which do not affect the stability and interpretability of the estimates.

Figure 2 displays the spatial distribution of these dimensions across Italian provincial capitals. In the map on the left, provincial capitals with high wealth are represented in blue, while low values of wealth are marked in red. In the second map, instead, provinces in blue have a capital with lower economic inequalities. It highlights a marked North–South divide, with higher levels of population wealth concentrated in northern cities and substantially higher economic inequality characterizing southern ones.

These components are then used as covariates in the regression models to mitigate multicollinearity and simplify interpretation.

³ The regression models were also run using the original socio-economic variables prior to PCA. However, the high degree of multicollinearity among these variables results in unstable coefficients, making their individual interpretation unreliable. The corresponding regression tables are available in the Appendix.

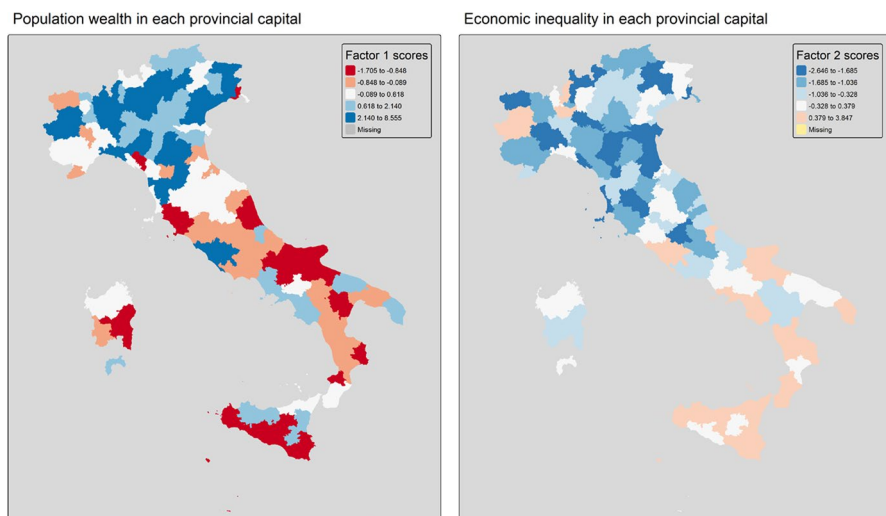


Fig. 2 Component 1 (wealth) and Component 2 (economic inequality) across Italian provincial capitals

3.2 Empirical strategy

The empirical analysis aims to estimate the relationship between municipal cultural expenditure and cultural participation as an outcome of local public action, while controlling for a broad set of socio-economic, political, and territorial characteristics. The baseline specification follows a panel regression framework, where participation is modeled as a function of spending and control variables, including wealth, inequality, tourism, financial autonomy, and local elections, thereby capturing variation in the association between municipal financial inputs and observable participation outcomes.

The model specification is defined as follows:

$$CP_{it} \sim CE_{it} + NCS_{it} + W_{it} + IN_{it} + T_i + El_{it} + A_{it}$$

CP_{it} is the cultural participation at year t related to city i

CE_{it} is the cultural expenditure of city i at year t

NCS_{it} is the cultural expenditure of neighboring cities of city i at year t

W_{it} is the wealth conditions of city i at year t

IN_{it} is the income inequalities in city i at year t

T_i is the touristic classification of city i

El_{it} indicates whether some local elections occurred in city i at year t

A_{it} is the degree of financial autonomy of city i at year t

To test this specification, five main statistical models are used and compared. First, a baseline OLS model is estimated. The second model introduces regional fixed effects to control for unobserved heterogeneity due to regional disparities. The third includes both regional and year fixed effects, accounting also for temporal variations. Finally, the fourth and fifth models measure, respectively, the effect of current cultural expenditure and cultural investments, including both regional and year

fixed effects. Model performance is evaluated using the Root Mean Square Error (RMSE) and Bayesian Information Criterion (BIC), and standard errors are clustered by city and year to control for serial correlation and heteroscedasticity.

Compared to standard regression approaches, the Generalized Propensity Score (GPS) method ensures covariate balance in non-experimental data, making it particularly suitable for observational studies in cultural economics and for performance-orientated analyses of decentralized public policies (Zhao et al. 2021). Literature has shown how the level of cultural expenditure depends in turn on several socio-economic and demographic characteristics of the municipality (Dalle Nogare and Galizzi 2011; Depalo and Fedeli 2011; Sacchi and Salotti 2016; Kopańska 2018; Janberg and Värja 2023). Since cultural expenditure is the main independent variable examined, it is important to ensure that the observed magnitude and significance of its coefficient in the models are not biased by observable confounding related to city characteristics. Hence, as a robustness analysis and to address confounding biases that could affect the coefficient for cultural expenditures, the Generalized Propensity Score (GPS) approach is implemented as a quasi-experimental weighting method. This technique has recently gained traction in policy evaluation because it enables a more accurate estimation of associations in non-randomized settings (Zhao et al. 2021).

Specifically, we adopt recently developed algorithms of GPS for continuous exposure (Wu et al. 2024), which allow us to describe the relationship between per-capita cultural expenditure (i.e., the exposure variable) and local cultural participation. This technique is not used for causal inference purposes, but to isolate the association between policy effort and participation outcomes by limiting the potential influence of external confounding factors. In our study, we include as confounding factors all socio-economic and control variables described in Sect. 3.1, plus the regional and year variables to ensure that they remain balanced after the weighting process.

The GPS is estimated on the pooled sample including all years, and the set of covariates used for balancing includes both socio-economic variables and region and year indicators, as in Burzacchi et al. (2025). As a result, the weighting procedure ensures comparability across observations within the same temporal and spatial contexts. Accordingly, the estimated relationship can be interpreted as relying on variation in cultural expenditure across municipalities within region-year cells, net of observable confounding factors.

In practice, GPS methods work by balancing the sample through some weighting process that limits the correlation between the treatment variable and confounders. In this study, we use four weighting methods, following existing research on the subject (Burzacchi et al. 2025): generalized linear models (GLM); Covariate Balancing Propensity Score, both in the parametric (CBPS) and non-parametric case (NPCBPS); and the weight estimation from the Entropy Balancing method (EB). These techniques differ in how they achieve covariate balance across treatment levels, thereby ensuring that differences in participation are not driven by socio-economic disparities or by structural territorial conditions. Those four methods are then compared along three main criteria to select the most effective one (Zhao et al. 2021):

- *Weighted mean comparison*: authors examine the summary statistics of each confounder before and after the weighting process, ensuring that the sample remains unaffected.
- *Exposure-covariates correlation*: it evaluates the correlation between the exposure variable and confounders, which should be minimized.
- *Effective sample size (ESS)*: it quantifies the final dimension of the weighted dataset.

Once the most suitable weighting technique is selected based on those criteria, the model specification is run again. This step isolates the relationship between expenditure and participation, net of the influence of other covariates, offering a refined and robust assessment of their association as an indicator of local policy efficiency. In this step, the coefficients of other control variables are reported for completeness but are not interpreted, as the weighting procedure focuses on the main relationship of interest.

4 Results

Figure 3 maps the two main variables under examination (referring to the most recent year, 2022), visually displaying the existing correlation between them and the territorial disparities across the Italian territory. The maps confirm the traditional North–South divide of the country (Daniele 2021): northern and north-eastern cities record both higher levels of cultural expenditure and stronger participation, whereas southern and inland areas show weaker cultural engagement, both from a policy supply and a consumption perspective. This territorial configuration aligns with existing analyses of regional inequalities in Italy's cultural system, suggesting that structural

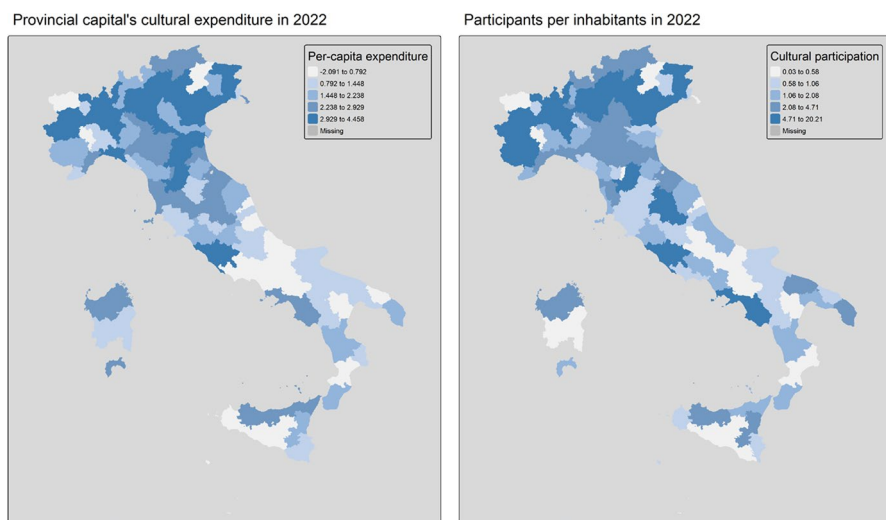
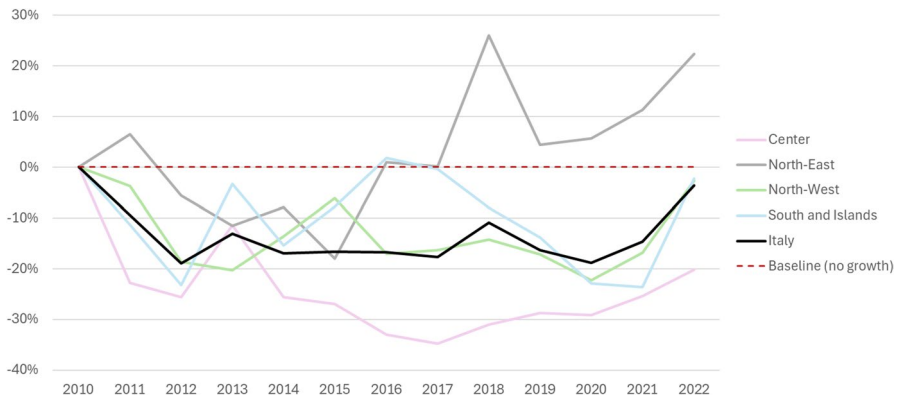


Fig. 3 Territorial disparities in Italy of local cultural expenditure and cultural participation

Table 3 Moran's I tests

	Cultural participation	Cultural expenditure	Current cultural expenditure	Cultural investments
Moran's I	- 0.222 (0004)	0.131* (0.005)	0.102 (0.005)	0.107* (0.005)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Fig. 4** Cultural expenditure by macro-region (baseline year=2010)

socioeconomic divides translate into differences in both cultural supply and demand (Rius-Ulldemolins et al. 2019; Bertacchini et al. 2022). Starting from this descriptive result, and to provide more robust statistical evidence on the spatial dependency of cultural expenditure, Moran's I tests are performed on this variable, distinguishing between total, current, and investment expenditure components. Moreover, the same test is also run for cultural participation spillovers. The results, in Table 3, present some evidence in favor of the existing spatial spillovers, especially regarding cultural investments. This result supports the visual evidence of territorial clustering highlighted in Fig. 3 and justifies the inclusion of neighboring cities' cultural expenditure within the study's model specification. Instead, no spillover is found for cultural participation.

Figure 4 illustrates the evolution of cultural expenditure over time and across different geographical areas. Specifically, the lines represent the total amount of provincial capitals' expenditure, expressed in percentage terms relative to the baseline year 2010. To improve readability, in Fig. 4 the regions were aggregated into macro-areas according to ISTAT classification. All figures are adjusted for inflation to ensure temporal comparability. Overall, cultural expenditure contracted after 2010 but began to recover after 2020, most likely due to the influx of NextGenerationEU funds and post-pandemic recovery programs. Among macro-regions, the sharpest decline occurred in Central Italy, whereas North-Eastern provinces experienced a notable increase in cultural investment, diverging from the national trend. This temporal dynamic highlights the vulnerability of local cultural budgets to economic

shocks and fiscal consolidation policies, as already emphasized by Ferraresi et al. (2018). The recent rebound underscores the potential of extraordinary EU transfers to restore municipal investment capacity in culture.

As discussed in Sect. 3.2, five regression models were estimated to assess the link between municipal *cultural expenditure* and *cultural participation*, each including different combinations of fixed effects, and distinguishing between current expenditure and cultural investments. In Model 5, to account for the lag in their realization cycle, cultural participation was lagged by 2 years (as robustness checks, 3 and 4-year lag were also tested, producing comparable results in terms of significance and magnitude). In all estimations, standard errors are clustered by city and year to correct for autocorrelation and heteroscedasticity. Table 4 reports the results of each model.

According to RMSE and BIC criteria, Model 3, featuring both time and regional fixed effects, offers the best fit. The R-squared values increase by about 10% across models, indicating the strong explanatory power of the covariates included in the analysis. These diagnostics confirm that the inclusion of both spatial and temporal dimensions enhances model performance and robustness, while contextual conditions—especially those related to wealth, education, and inequality—emerge as key mediating factors between public cultural funds and participation outcomes, consistent with Falk and Katz-Gerro (2016) and Martinez-Martinez et al. (2021).

Distinguishing the association of current cultural expenditure and investments, two main outcomes emerge, allowing for a clearer interpretation of the relationship between cities' cultural endowment and participation patterns. On the one hand, current expenditure appears to be strongly associated with local cultural participation, and is not subject to significant spatial spillovers across nearby cities. On the other hand, cultural investments appear to be more closely associated with external attractiveness, suggesting the presence of demand dynamics extending beyond municipal boundaries, consistent with evidence on spatial interdependence and cultural centrality in urban systems (Werck et al. 2008; Ferraresi et al. 2018; de Gier 2020; Getzner 2022).

Furthermore, socio-economic dimensions are also significant. Cities with higher average wealth and greater inequality show stronger cultural participation, consistent with previous findings that cultural habits are closely linked to socio-economic stratification (Falk and Katz-Gerro 2016). This result suggests that affluence increases participation through greater access to cultural opportunities, while inequality may be associated with a stronger concentration of demand among high-income groups rather than with a generalized increase in participation. In other words, this confirms the nature of cultural consumption, characterized by socio-economic barriers excluding some groups in the population.

City size is inversely related to cultural participation, indicating that larger municipalities are associated with lower per-capita attendance. Since participation is measured at the provincial level and normalized by the population of the capital city, this negative coefficient likely reflects a dilution effect rather than lower absolute demand: in larger urban areas, participation is spread over a wider population base and across multiple venues, reducing per-capita attendance rates. This interpretation is consistent with evidence that cultural consumption is spatially concentrated

Table 4 Regressions' results

	Model 1	Model 2	Model 3	Model 4	Model 5
Cultural expenditure	0.150*** (0.007)	0.128*** (0.023)	0.113*** (0.025)		
Neighbors' cultural expenditure	0.025 (0.016)	– 0.030 (0.039)	–0.045 (0.033)		
Current cultural expenditure				0.178*** (0.036)	
Neighbors' current cultural expenditure				– 0.010 (0.048)	
Cultural investments					0.057* (0.015)
Neighbors' cultural investments					– 0.149* (0.070)
Population (log)	– 2.569*** (0.124)	– 2.714*** (0.329)	– 2.909*** (0.352)	– 2.828*** (0.308)	– 3.260*** (0.582)
Wealth	0.438*** (0.064)	0.415 (0.235)	0.688* (0.295)	0.435 (0.283)	1.270*** (0.279)
Economic inequality	0.446*** (0.068)	0.906** (0.311)	0.626* (0.273)	0.403 (0.302)	1.237** (0.344)
Tourism_Q4	0.893** (0.317)	0.551* (0.206)	0.650* (0.253)	0.711** (0.243)	0.569 (0.368)
Tourism_Q5	1.700*** (0.335)	1.146* (0.530)	1.356* (0.511)	1.571** (0.442)	1.193 (0.677)
Local elections_yes	– 0.054 (0.204)	0.111 (0.109)	– 0.001 (0.097)	– 0.006 (0.109)	0.005 (0.138)
Financial autonomy	1.577** (0.546)	2.495* (1.104)	– 2.439* (1.141)	– 2.200 (1.054)	– 4.560* (1.925)
FE: Region		X	X	X	X
FE: Year			X	X	X
R-squared	0.695	0.730	0.788	0.811	0.743
R-squared Within		0.642	0.696	0.729	0.630
RMSE	2.72	2.56	2.27	2.14	2.39
BIC	6688	6651	6408	6252	6551

$N = 1367$; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in major urban centers but exhibits decreasing marginal intensity as population size increases (Getzner 2022; Werck et al. 2008).

Analogously, in all models with time and region fixed effects, financial autonomy emerges as negatively associated with cultural participation. This finding suggests that higher participation levels are observed in cities where central or regional funding plays a stronger role, indicating that national-level cultural policies may complement rather than substitute local expenditure in areas with more intense cultural

Table 5 Comparison of GPS methods

<i>Marginal balance</i>	Original data	CBPS	NPCBPS	EB
Population (log)	13.418	13.453	13.418	13.418
Neighbors' cultural expenditure	3.891	4.421	3.878	3.891
Financial autonomy	0.707	0.697	0.706	0.707
Local elections_yes	0.201	0.202	0.200	0.201
Tourism_Q4	0.434	0.422	0.434	0.434
Tourism_Q5	0.500	0.500	0.500	0.500
Wealth	0.019	− 0.053	0.013	0.019
Income inequality	− 0.003	− 0.211	0.001	− 0.003
Macroarea_Northeast	0.206	0.187	0.205	0.206
Macroarea_Northwest	0.231	0.261	0.231	0.231
Macroarea_Center	0.208	0.187	0.208	0.208
Local elections_yes	0.201	0.202	0.200	0.201
<i>Correlation balance</i>	Original data	CBPS	NPCBPS	EB
Population (log)	− 0.32	−0.21	− 0.18	0.00
Neighbors' cultural expenditure	0.041	−0.065	0.026	0.00
Wealth	0.73	0.27	0.40	0.00
Economic inequality	− 0.03	− 0.02	− 0.01	0.00
Financial autonomy	0.11	0.00	0.05	0.00
<i>Effective Sample Size</i>	Original data	CBPS	NPCBPS	EB
	1367	286	724	307

demand. However, this result should be interpreted with caution and does not necessarily imply a causal mechanism. This interpretation aligns with Kopańska (2018), who found that state-level institutions tend to crowd out local cultural initiatives, particularly in smaller or rural municipalities.

Finally, tourism intensity and the occurrence of local elections, instead, were not found to be significantly associated with cultural participation, suggesting that participation is not solely driven by tourism demand or electoral cycles, but is more closely related to structural and policy-related factors.

Taken together, these results confirm that cultural participation increases with greater municipal commitment to culture, but the relationship is mediated by wealth, spatial dynamics, and institutional structure.

To run a robustness check, the study explores the association between cultural expenditure and participation through GPS. Cultural expenditure is indeed strongly correlated with the other covariates, generating endogeneity issues that hamper the interpretability of its coefficient in the regressions. Although principal component analysis mitigates multicollinearity among socio-economic controls, it does not eliminate the potential confounding between cultural expenditure and contextual characteristics. The GPS methodology addresses this bias by reweighting the sample to ensure covariate balance and isolating the relationship between the exposure (cultural expenditure) and the outcome (participation).

The comparison of weighting methods (Table 5) indicates that the Generalized Linear Model (GLM) failed to generate valid weights and was therefore excluded from the analysis. Among the remaining techniques, entropy balancing (EB) performs best, achieving balance across all metrics. Specifically, EB maintains the original marginal distribution of the data while eliminating the correlation between cultural expenditure and confounders, and it retains a sufficiently large effective sample Size. The same procedure is also run separately for current cultural expenditure and cultural investments, leading to similar results indicating EB as the best-performing weighting procedure.

The five regression models are re-estimated using the selected weights estimated through EB method. Table 6 reports only the coefficients for cultural expenditure, as the weights render the other covariate coefficients unreliable (Burzacchi et al. 2025). Still accounting for time and regional fixed effects, the sign and significance of the cultural expenditure coefficient and its magnitude remain stable. The estimated coefficient can be interpreted as the marginal effect of cultural expenditure per capita: an increase of 1€ in the per-capita cultural expenditure is associated with an increase of 0.113 in the participation per capita. Distinguishing between current expenditure and investments, instead, it appears that the former is more strongly related to cultural participation, whereas investments emerge as non-significant after the weighting process that limited the confounding bias in the model.

This result reinforces the outcome of the regressions with fixed-effects: municipalities spending more in culture, and relying especially on current expenses, tend to display higher participation levels, confirming that cultural engagement can serve as an outcome-based proxy for the efficiency of public cultural expenditure.

The inclusion of regional and year fixed effects allows the estimates to net out persistent territorial differences and common temporal shocks, such as national policy changes or macroeconomic fluctuations, ensuring that the identified association reflects within-area and within-period variation in expenditure and participation.

Overall, these findings align with and extend earlier research on the determinants of cultural policy outcomes (Werck et al. 2008; Getzner 2022; Rius-Ulldemolins et al. 2019). Whereas previous studies have primarily focused on the supply side of cultural policy—how much municipalities allocate to culture—this analysis shifts

Table 6 Regressions' results after the weighting process

	Model 1	Model 2	Model 3	Model 4	Model 5
Cultural expenditure	0.106*** (0.011)	0.126*** (0.025)	0.113*** (0.023)		
Current cultural expenditure				0.192*** (0.050)	
Cultural investments					– 0.014 (0.029)
FE: Region		X	X	X	X
FE: Year			X	X	X

N= 1367; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

the focus to outcomes, examining how local expenditure translates into citizen participation. In doing so, it contributes to the growing field of cultural policy evaluation (O'Hagan 1998; Bakhshi et al. 2015; Towse 2019), proposing a methodological bridge between fiscal data and social outcomes.

Thus, the results demonstrate that cultural participation can serve as a practical and theoretically meaningful proxy for the efficiency of public cultural expenditure, particularly in contexts where financial data are incomplete or inconsistent.

5 Conclusions and policy implications

This study set out to examine whether cultural participation can be considered a meaningful and empirically valid proxy for public cultural expenditure at the local level. Using data from Italian provincial capitals from 2010 to 2022, and applying a Generalized Propensity Score methodology, the analysis demonstrates a positive and statistically significant association between per-capita city cultural expenditure and cultural participation. This relationship holds even after controlling for a wide range of socioeconomic, institutional, and territorial characteristics, although the analysis does not aim to establish causal effects.

The results consistently support the idea that public action in culture is associated with higher levels of cultural participation. Cities that allocate more resources to cultural services tend to display higher and more sustained levels of engagement. As cultural policy ultimately aims to stimulate demand, this association is consistent with its underlying objectives. Notably, the estimates are not only statistically robust but also economically meaningful: greater expenditure is associated with increased participation.

The paper also contributes by empirically linking three strands of research that are often treated separately: the determinants of public expenditure, the drivers of participation, and the political economy of cultural policy, thereby addressing a recognized challenge in cultural policy evaluation (Bakhshi et al. 2015; Towse 2019). While previous studies have focused on the determinants of public expenditure, the drivers of participation, or the political and institutional dimensions of cultural policy, this work contributes by empirically linking expenditure decisions to observable social outcomes. Moreover, the application of GPS methodology brings analytical rigor to a field where establishing robust empirical associations is traditionally complex. Compared with conventional OLS or IV approaches (Ferraresi et al. 2018; Getzner 2022), the GPS framework allows for a more flexible treatment of continuous exposure levels and improved covariate balancing, thereby enhancing the robustness of the estimated associations in a non-experimental setting. By focusing on cities—the governance level closest to citizens and encompassing cultural activities beyond state-funded heritage⁴—the study offers insights directly relevant to local government efficiency.

⁴ For an updated overview of Italy's public financing for culture, see: Agenzia per la Coesione Territoriale (2023) available at https://www.agenziacoesione.gov.it/wp-content/uploads/2023/04/10-Spesa_CPT_Settori_Vol1_CULTURA-1.pdf (last accessed: July 2025).

One of the key takeaways is that cultural participation can be interpreted as an outcome-based proxy for the efficiency of public cultural expenditure in contexts where the latter is difficult to measure. This shift has conceptual relevance: it supports an alternative perspective on how the efficiency of cultural policy can be assessed, emphasizing observable behavioral outcomes rather than purely fiscal inputs. This interpretation highlights a potential complementarity between input and outcome indicators, with implications for future empirical work. It also implies that results obtained through studies of participation may inform discussions around public investment, and vice versa. This interpretation enhances the analytical and practical utility of both kinds of data, encouraging a more integrated use of cultural indicators for policy evaluation and research.

A second relevant implication is that where investment in culture is more sustained, these patterns may extend beyond the cultural sector. Higher expenditure is associated not only with increased participation, but may also be associated with broader local development, economic vitality and social outcomes. Importantly, the analysis also shows that these associations differ depending on the composition of cultural expenditure and its spatial dimension. In particular, current cultural expenditure shows the strongest association with local participation, whereas cultural investments are more strongly associated with inter-municipal dynamics and external attractiveness. Moreover, the presence of negative spatial spillovers suggests that higher expenditure in one city may partly attract participation away from neighboring areas, reflecting competitive dynamics and potential free-riding behavior across jurisdictions and supports an integrated vision of culture as a driver of sustainable territorial development and long-term public value. These findings reinforce the case for cross-sectoral strategies that embed cultural investment within broader social and economic planning frameworks, including education, tourism, and urban regeneration. They also point to the need for greater coordination across neighboring municipalities, as the effectiveness of cultural expenditure may depend not only on its level but also on its allocation and on spatial interdependencies. For local governments, these findings imply that cultural expenditure should be conceived as a strategic form of social investment, capable of reinforcing cohesion and competitiveness while producing measurable social returns.

Participation should be viewed not only as a goal in itself but also as an intermediate outcome capable of generating additional public value. Embedding cultural policies within integrated initiatives, such as those targeting education, urban regeneration, or social inclusion, could further enhance their impact. Municipalities with limited fiscal capacity could also use participation data as a monitoring tool for cultural impact assessment and for designing efficiency-based funding schemes, particularly in countries or regions with fragmented expenditure data.

Naturally, the study has limitations. First, while it explores the full association between expenditure and participation, causality cannot be established due to the potential bidirectional relationship between the two variables. Considering the measurement of the main variables of the study, cultural participation is here captured

through formal, mostly ticketed events, and may not fully represent informal, digital, or other forms of engagement. A further limitation concerns the mismatch between the spatial level of participation (provincial) and expenditure (municipal), which may affect the interpretation of the estimates by capturing cross-boundary demand dynamics rather than purely local effects. Moreover, municipalities may include different types of cultural activities under similar spending categories, and the analysis did not account for other expenditure areas such as tourism, youth, and social policies that may still relate to cultural goals, exerting an indirect impact on cultural participation. Similarly, the analysis does not explicitly account for cultural expenditure at higher levels of government (regional, national, or EU-related funding), which may also influence participation but cannot be consistently attributed at the municipal level. Future research addressing these dimensions through disaggregated expenditure data or cross-policy comparisons could help clarify the specific mechanisms linking public expenditure and engagement, also considering more rural and peripheral contexts. Future research could also refine the measurement of both dependent and independent variables and investigate the mutual causal relationships that may exist among them. The mediating role of local institutions, accessibility, and bundled policy strategies is also worth a more detailed examination. Cross-country comparative analyses could test whether the relationships identified for Italian municipalities hold in other decentralized systems such as Spain, Germany, or the Netherlands, extending the generalizability of the proxy approach. Moreover, applying the same framework to longitudinal data could reveal whether the participation–expenditure link changes in response to broader economic or political cycles. Future research could also further investigate the role of spatial spillovers and inter-municipal interactions, assessing whether coordinated policy frameworks may enhance the efficiency of cultural expenditure in decentralized settings.

In conclusion, this study provides robust evidence that municipal expenditure on culture is closely linked to participation outcomes. Higher levels of investment are systematically associated with higher levels of engagement. By explicitly accounting for differences between current and capital expenditure and for spatial interdependencies across municipalities, the analysis provides a more nuanced understanding of how local public spending translates into observable outcomes. By offering a conceptual and empirical framework that interprets participation as an outcome-based proxy for the efficiency of public cultural expenditure, the paper contributes to advancing the assessment of local policy efficiency and evidence-based socio-economic planning in the cultural domain. Ultimately, this approach repositions participation at the core of cultural policy evaluation, providing scholars and policymakers with a governance-oriented and empirically grounded framework to assess the social returns of public cultural expenditure.

Appendix

The regressions' results with the original socio-economic variables are presented in Table 7. While they confirm the main results obtained using PCA components, it is

Table 7 Regressions' results with original socio-economic variables

	Model 1	Model 2	Model 3	Model 4	Model 5
Cultural expenditure	0.122*** (0.007)	0.101** (0.033)	0.100** (0.034)		
Neighbors' cultural expenditure	− 0.015 (0.016)	− 0.072* (0.026)	− 0.072* (0.029)		
Current cultural expenditure				0.159*** (0.039)	
Neighbors' current cultural expenditure				− 0.054 (0.039)	
Cultural investments					0.053*** (0.012)
Neighbors' cultural investments					− 0.121* (0.053)
Population (log)	− 1.722*** (0.141)	− 1.928*** (0.319)	− 1.987*** (0.333)	− 2.088*** (0.286)	− 1.931** (0.506)
Graduates pc	1.142*** (0.098)	1.216** (0.320)	1.181** (0.324)	0.850** (0.278)	1.818*** (0.345)
Average income	− 0.386*** (0.115)	− 0.005 (0.220)	− 0.006 (0.234)	− 0.103 (0.236)	− 0.137 (0.243)
Gini	38.640*** (8.812)	25.061 (13.103)	29.439* (13.653)	34.499* (14.243)	40.448* (18.101)
Poverty rate	− 31.753*** (7.053)	− 1.005 (13.180)	− 3.414 (13.477)	− 8.278 (14.264)	− 11.953 (16.599)
Motorway access	− 0.007*** (0.001)	− 0.010*** (0.002)	− 0.010*** (0.002)	− 0.010*** (0.002)	− 0.006 (0.003)
Train access	− 0.250*** (0.054)	− 0.183* (0.069)	− 0.190* (0.072)	− 0.235** (0.076)	− 0.104 (0.106)
Airplane access	0.005*** (0.001)	0.007** (0.002)	0.006* (0.002)	0.006** (0.002)	0.006* (0.003)
Tourism_Q4	0.538 (0.307)	0.185 (0.445)	0.223 (0.456)	0.420 (0.379)	− 0.161 (0.487)
Tourism_Q5	1.221*** (0.328)	0.655 (0.520)	0.706 (0.537)	0.934 (0.461)	0.503 (0.579)
Local elections_yes	− 0.202 (0.174)	− 0.190 (0.149)	− 0.204 (0.159)	− 0.191 (0.168)	0.017 (0.108)
Financial autonomy	0.015 (0.525)	1.164 (0.907)	− 0.402 (1.388)	− 0.881 (1.416)	− 1.054 (1.587)
FE: Region		X	X	X	X
FE: Year			X	X	X
R-squared	0.732	0.763	0.765	0.773	0.783
R-squared Within		0.686	0.688	0.700	0.688
RMSE	2.56	2.40	2.40	2.35	2.19
BIC	6560	6523	6600	6550	6358

$N=1367$; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

possible to identify the high significance of graduates per capita, the Gini index and accessibility to airports.

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Data availability The data that support the findings of this study are collected from openly available sources that are disclosed in this paper. The final datasets are available from the authors upon reasonable request.

Declarations

Conflict of interest The authors declare no competing interests.

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