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Article

Public spending and economic growth: evidence from a panel data model for Mexico's states, 2000–2023

Gasto público y crecimiento económico: evidencia desde un modelo de datos de panel para las entidades federativas de México, 2000–2023

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Abstract

This article analyzes the relationship between public spending and economic growth in Mexico at the state level during the period 2000–2023. Based on a balanced panel of 31 states, an econometric model is estimated that incorporates cultural spending, current spending, and public investment per capita as explanatory variables of state gross domestic product per capita. The methodological strategy combines fixed and random effects estimates, diagnostic tests, and corrections using Panel Corrected Standard Errors [PCSE] to address problems of heteroscedasticity and autocorrelation. The results show that current expenditure has a positive effect on state economic growth, while public investment does not have a robust impact and cultural expenditure has a negative impact in the short term. These findings are the key determinants of economic performance, with relevant implications for budget planning and fiscal sustainability in Mexico.

Objective	Methodology	Contribution
To examine how cultural, current, and investment spending affect state GDP per capita in Mexico (2000–2023)	Balanced panel of 31 states using Fixed Effects and PCSE models.	Current spending promotes growth, investment is not significant, and cultural spending shows short-term negative effects. Spending efficiency and composition are key to development.

Public spending, Economic growth, Panel data

Resumen

Este artículo analiza la relación entre el gasto público y el crecimiento económico en México a nivel estatal durante el periodo 2000–2023. A partir de un panel balanceado de 31 entidades federativas, se estima un modelo econométrico que incorpora el gasto cultural, el gasto corriente y la inversión pública per cápita como variables explicativas del Producto Interno Bruto per cápita estatal. La estrategia metodológica combina estimaciones de efectos fijos y aleatorios, pruebas de diagnóstico y correcciones mediante Panel Corrected Standard Errors [PCSE] para atender problemas de heterocedasticidad y autocorrelación. Los resultados muestran que el gasto corriente tiene un efecto positivo sobre el crecimiento económico estatal, mientras que la inversión pública no presenta impactos robustos y el gasto cultural refleja una incidencia negativa en el corto plazo. Estos hallazgos constituyen el determinante clave del desempeño económico, planteando implicaciones relevantes para la planeación presupuestaria y la sostenibilidad fiscal en México.

Objetivo	Metodología	Contribución
Analizar cómo el gasto cultural, corriente y de inversión afecta el PIB per cápita estatal en México (2000–2023).	Panel balanceado de 31 estados con modelos de efectos fijos y PCSE.	El gasto corriente impulsa el crecimiento, la inversión no es significativa y el gasto cultural tiene efectos negativos de corto plazo. La eficiencia y composición del gasto son clave para el desarrollo.

Gasto público, Crecimiento económico, Datos de panel

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Introduction

The impact of public spending on economic growth is a persistent debate in economic literature. Since the seminal work of Devarajan, Swaroop and Zou [1996], attention has shifted from the total volume of spending to its composition, highlighting the need to distinguish between components with productive effects and those that generate distortions. Subsequent research has confirmed that the results are mixed: while public investment and social spending tend to be associated with sustained growth [Bose, Haque y Osborn, 2007; Gnangoin, Edjoukou, & Kassi, 2019], current expenditure tends to have ambivalent effects that depend on institutional efficiency [Wu, Tang, & Lin, 2010; Okunlola et al., 2024].

In this context, cultural spending emerges as an under-explored area, but one with the potential to influence social cohesion and long-term economic development [Acerenza y Gandelman, 2019; Jalles y Pessino, 2025].

For Mexico, the discussion takes on special relevance given the need to evaluate the effectiveness of fiscal policy in a scenario marked by budgetary decentralisation and the financial constraints of state governments. Recent studies suggest that, although the magnitude of public spending is considerable, its allocation does not always translate into positive impacts on economic growth [Levy Orlik, 2016; Salazar, 2020]. Regional heterogeneity, institutional differences, and variability in spending efficiency highlight the importance of a disaggregated analysis at the state level.

This article aims to evaluate the relationship between public spending and economic growth in Mexico, considering three specific components: cultural spending, current spending, and public investment. To this end, a balanced panel of state data for the period 2000–2023 is used, and robust econometric estimates are applied to correct for heteroscedasticity and autocorrelation problems.

The study contributes to the literature by providing updated empirical evidence for an emerging country and by putting into perspective the differentiated role of expenditure components in subnational economic performance.

The results offer key elements for the fiscal policy discussion, particularly regarding the sustainability of current expenditure, the efficiency of public investment, and the relevance of recognising cultural expenditure as a long-term social investment.

Previous literature

The link between public spending and economic growth is one of the most persistent debates in contemporary economic literature, bringing together theoretical approaches, empirical controversies and diverse methodological approaches.

The general consensus is that the composition of spending is decisive, but there is still widespread debate about which components are most effective and in what contexts. From an endogenous growth perspective, public spending can generate positive externalities that boost productivity, provided that it is allocated efficiently and targeted at strategic areas [Devarajan, Swaroop, y Zou, 1996].

The seminal work of Devarajan et al. [1996], based on a panel of developing countries, used cross-sectional and time-series data models to show that the orientation of spending toward current expenditure could have negative effects on growth, while public investment was associated with positive returns.

Subsequently, Bose, Haque, and Osborn [2007] conducted a disaggregated analysis using data from developing countries for the period 1970–1990, applying ordinary least squares [OLS] techniques and panel estimates, finding that spending on education and health has significant positive impacts on economic growth. These studies marked the beginning of a trend that emphasises the importance of differentiating the effect of different components of public spending.

The sensitivity of public spending to the level of development was analysed by Wu, Tang and Lin [2010], who used a large panel of 182 countries in the period 1950–2004, estimating dynamic panel data models. Their results indicate that the effects of spending are heterogeneous: in low-income countries, public spending can be a driver of growth, while in high-income countries the effects tend to be marginal or even negative if spending is inefficient.

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These findings were revisited in more recent European contexts by Sosvilla-Rivero, Ramos-Herrera and Rubio-Guerrero [2025], who applied panel cointegration models and long-term estimates for European Union countries, showing that the composition of public spending is a relevant explanatory factor for growth differences among Member States.

Within the literature on current expenditure, the results have been particularly controversial. Navarro [2019], through a time series analysis for Spain in the period 1980–2016 and based on the Armey curve, concludes that excessive public expenditure—particularly current expenditure—compromises macroeconomic efficiency. Herrero-Alcalde, Martín-Román, Tránchez-Martín and Moral-Arce [2024], using a general equilibrium model applied to Spain and tested with cointegration techniques, demonstrate that the fiscal rules implemented in the last decade have aimed to contain excessive growth in current expenditure and ensure fiscal sustainability.

Lago Peñas and Martínez-Vázquez [2016] conduct a comparative analysis using budgetary indicators and stochastic frontier models, concluding that Spain has expenditure levels below the European average, but with significant deficiencies in allocative efficiency. Kutasi and Bodi [2020], in the context of Eastern Europe, applied ARDL [Autoregressive Distributed Lag] models and cointegration analysis to show that current expenditure can boost GDP in the short term, but generates fiscal pressures in the medium term. Similar results are found in West Africa, where Okunlola, Sanni, Ayetigbo and Oyeyipo [2024], using a dynamic panel GMM [Generalised Method of Moments] model for ECOWAS countries, conclude that current expenditure promotes growth only in institutional environments with low corruption and no conflict, highlighting the importance of the institutional framework in the effectiveness of expenditure.

In Latin America, Afonso and Baquero Fraga [2024] applied spending efficiency techniques using stochastic frontier models and Data Envelopment Analysis [DEA], demonstrating that current spending efficiency is strongly conditioned by institutional quality.

Complementarily, Pessino, Altinok and Chagalj [2022], in an IDB study, applied an allocative efficiency approach based on panel models for more than a decade of data, concluding that even with high levels of spending, the effects on economic growth are limited if policies to improve resource allocation are not implemented. Huber [2008], from a more political angle, showed through case studies and comparative models of social spending that in Latin America, current expenditure is mediated by distributional tensions and institutional pressures that affect its sustainability.

In contrast to the controversy over current expenditure, there is broader consensus on public investment as an engine of economic growth. De la Fuente [2017], using a panel cointegration model for Spanish regions, concluded that regional public investment has positive and sustained impacts on growth and territorial convergence. Gnangoin, Edjoukou and Kassi [2019], using fixed-effects models applied to a panel of Latin American countries, show that public investment promotes growth, but warn that its magnitude depends on macroeconomic stability.

In the case of Mexico, Rodríguez Benavides, Mendoza González and Climent Hernández [2021], using state data and panel models, show that public investment was fundamental to the post-COVID-19 economic recovery. Reyes-Hernández and Mejía-Reyes [2023], using a VAR model applied to data from 1980–2021, demonstrate that public investment is linked to long-term economic cycles. Salazar [2020], applying cointegration techniques, warns that without proper allocation, public investment may be insufficient to generate structural impacts. Tavera Cortés, Torres Sandoval, and Sandoval Gómez [2024] confirm, through budget efficiency models, that the effectiveness of investment depends largely on efficient budget allocation.

An emerging, though less explored, field is that of cultural spending. Acerenza and Gandelman [2019], through an empirical analysis for Latin American countries using surveys and aggregate expenditure data, argue that cultural spending is often considered a luxury in contexts of budgetary constraints.

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However, the authors highlight that such spending can generate positive externalities in the medium and long term, such as strengthening social cohesion and indirect improvements in productivity. Along these lines, Jalles and Pessino [2025], using fiscal consolidation models applied to developing countries, conclude that the effectiveness of different components of spending—including cultural spending—depends on institutional factors such as informality and inequality. Levy Orlik [2016], in the Mexican context, reinforces this view by arguing that the composition of public spending has been a central factor in long-term macroeconomic imbalances.

Recent literature also includes contributions from postgraduate academic work which, although less widely disseminated, reinforce the discussion on the composition of expenditure. Awuh [2018], in a master's thesis, uses OLS models to analyse the composition of expenditure in African countries, showing that the orientation towards non-productive sectors limits growth. Ahamed [2022], in his master's thesis in the United States, uses dynamic panel models for developing countries and confirms that both public and private investment have positive effects, but with different impacts depending on the institutional context.

In summary, the literature shows that the effects of public spending on economic growth are heterogeneous and depend on three fundamental factors: the composition of spending, institutional quality, and the level of economic development. While public investment is consistently associated with positive long-term effects, current and cultural spending show ambiguous results that are conditioned by allocative efficiency and fiscal sustainability.

For Latin America and Mexico, the evidence suggests that the magnitude of spending does not guarantee results, with its composition and efficiency being the determining factors. These findings form the basis for this study, which seeks to analyse the relationship between public expenditure—with an emphasis on cultural expenditure, current expenditure, and public investment—and state economic growth in Mexico during the period 2000–2023, providing empirical evidence using panel data techniques with robust estimates for problems of heteroscedasticity and autocorrelation.

Theoretical framework

The debate on the impact of public spending on economic growth is part of the main currents of economic theory and has evolved from a view focused on the size of the state to more complex approaches that emphasise the composition and efficiency of spending. In neoclassical growth models, such as those of Solow and Swan, the role of the public sector was conceived as exogenous, with an indirect impact on physical capital accumulation. Subsequently, Barro [1990] explicitly incorporated public spending into an economic growth model, arguing that certain types of spending—particularly those on productive public goods—can stimulate growth, while others, such as excessive current spending, can generate distortions and reduce aggregate productivity. This approach laid the foundation for the hypothesis that it is not the aggregate level of spending that matters, but its composition.

The theory of **endogenous growth** represented a fundamental change by highlighting that public investments in human capital, infrastructure, and technology can generate increasing returns and spillover effects on private productivity [Romer, 1986; Lucas, 1988]. From this perspective, public spending on investment and strategic social sectors not only has immediate effects on aggregate demand, but also long-term structural impacts by raising the productive capacity of the economy. In this logic, cultural spending can be interpreted as an investment in human and social capital that, although with less visible returns in the short term, strengthens the foundations for sustained growth.

The **hypothesis of allocative efficiency of spending**, linked to the tradition of public finance [Musgrave, 1959; Tanzi and Zee, 1997], complements this debate by arguing that the effect of public spending depends on the quality of its allocation and the consistency between the destination of resources and the structural needs of the economy. Thus, the same level of spending can generate divergent results depending on whether it is directed toward productive investment or diluted in unproductive current spending. This hypothesis is particularly relevant in contexts such as Latin America and Mexico, where fiscal constraints and institutional weakness pose additional challenges to spending efficiency.

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In this context, current expenditure appears to be an ambivalent component: it can sustain macroeconomic stability and the provision of basic services in the short term, but it can also lead to budgetary rigidities, structural deficits and adverse effects on private investment if it expands excessively. In contrast, public investment spending is seen as a structural driver of economic growth, generating physical and social infrastructure that expands productive capacities and promotes regional convergence.

An emerging, though less explored, area is that of **cultural spending**, which can be theoretically grounded in social and institutional capital approaches. Putnam [1993] argues that cultural practices strengthen networks of trust and cooperation, creating a more favourable environment for economic development.

North [1990], from an institutional economics perspective, emphasises that institutions and cultural values shape economic incentives and, therefore, growth trajectories. From these perspectives, cultural spending transcends its symbolic dimension to become an indirect determinant of economic dynamism by fostering social cohesion, creativity, and innovation.

In short, the theoretical framework guiding this study articulates three complementary approaches. First, endogenous growth, which explains how public investment and certain social items enhance growth through positive externalities. Second, the allocative efficiency hypothesis, which warns that the results of spending do not depend on its absolute volume, but on its structure and institutional quality.

And third, the human and social capital approaches, which allow cultural spending to be integrated into economic analysis as a relevant variable for sustainable development. Under these premises, it is expected that public investment spending will be positively and robustly associated with state economic growth, that current spending will have heterogeneous effects dependent on institutional efficiency, and that cultural spending, although smaller in magnitude, will indirectly contribute to economic growth through social and cultural externalities.

General objective

To analyse the impact of public spending on culture, current expenditure and public investment per capita on the gross domestic product per capita of Mexico's federal entities in the period 2000–2023, in order to assess the relevance and sign of each component of expenditure on state economic growth.

Specific objectives

1. Estimate the relationship between per capita public spending on culture and per capita GDP to identify whether its effect is expansive or restrictive on economic growth.

2. Determine the influence of per capita current expenditure on state per capita GDP, evaluating its role in the economic dynamics of the states.

3. Examine the impact of per capita public investment on economic growth, verifying whether this component generates a positive and significant effect.

4. Apply robust econometric techniques [fixed effects, diagnostic tests and Panel Corrected Standard Errors] to ensure the statistical validity of the results.

Methodology

This study adopts a quantitative longitudinal approach, using panel data corresponding to 31 federal entities in Mexico during the period 2000–2023. The unit of analysis is the state-year, which allows us to capture both the structural differences between entities and the temporal dynamics of the selected economic and governance variables.

Model specification

This study is developed with a longitudinal quantitative approach, using a balanced panel of data for the 31 federal entities of Mexico during the period 2000–2023. The unit of observation corresponds to the state-year, which allows us to simultaneously capture the structural differences between entities and the temporal evolution of the selected economic and fiscal variables.

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Model specification

The dependent variable is the **state gross domestic product per capita** in natural logarithms [lnGDP_pc], deflated at constant prices.

The main explanatory variables included:

i] **per capita cultural expenditure** [lnGcultura],
ii] **per capita current expenditure** [lnGcorr], and
iii] **per capita public investment** [lnGinv].

The general model is expressed as:

$$ln\,[PIB\_pc_{it}] = \beta_0 + \beta 1 ln\,[\text{Gasto\_cultura}_{it}] + \beta 2 ln[\text{Gasto\_corriente}_{it}] + \beta 3 ln[\text{Inversion\_publica}_{it}] + \mu_i + \tau_t + \varepsilon_{it}$$

where i denotes the federal entity, t the year, represents unobservable effects that are invariant over time, captures shocks common to all states, and corresponds to the idiosyncratic error term.

Estimation strategy

The estimation process was carried out in different stages in order to ensure the statistical validity and robustness of the results. First, fixed effects [FE] **and** random effects [RE] **models were estimated,** which allow for controlling unobservable heterogeneity between federal entities.

The choice between the two was made using the **Hausman test**, which contrasts the efficiency of random effects estimators with the consistency of fixed effects estimators. The results of this test supported the use of the fixed effects model, showing that unobservable differences are correlated with the explanatory variables.

In a second stage, the **classical assumptions of panel models were evaluated.** The **modified Wald test** confirmed the presence of contemporary heteroscedasticity between panels, while the **Wooldridge test** revealed first-order serial autocorrelation in the residuals.

These conditions invalidate the standard errors of conventional models, compromising statistical inference.

To address these limitations, in the third stage, the **Panel Corrected Standard Errors [PCSE]** methodology was implemented under the **Prais–Winsten estimator with AR[1] correction**. This approach, recommended by Beck and Katz [1995] for panels with heteroscedasticity and autocorrelation, robustly adjusts standard errors, preserving the consistency of coefficients and ensuring the validity of significance tests.

In this way, the estimation strategy combines the theoretical robustness of fixed-effects models with the statistical correction of standard errors, guaranteeing reliable results suitable for comparative analysis in social and economic sciences.

Data and variables

The analysis is based on a balanced panel of data corresponding to 31 federal entities in Mexico for the period 2000–2023. The information comes from official sources, mainly the National Institute of Statistics and Geography [INEGI], through the State National Accounts, and the Ministry of Finance and Public Credit [SHCP] through state budget records. These sources offer homogeneous and comparable series that allow for analysis of the relationship between gross domestic product [GDP] per capita and the components of public expenditure.

The dependent variable is state GDP per capita [deflated and expressed in natural logarithms]. The main explanatory variables include: per capita cultural expenditure, per capita current expenditure and per capita public investment, all of which are transformed into natural logarithms after being deflated to constant prices. In this way, the model coefficients are interpreted as elasticities, which facilitates comparison between items with different scales and units of measurement.

The estimation of the first-order autocorrelation common to all panels is also included, captured by the parameter ρ\rhoρ, corrected using the Prais–Winsten method.

Table 1 presents the definition, transformation and characteristics of each variable used in the econometric model.

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Box 1

Table 1

Definition and characteristics of the variables used in the econometric model

Type	Variable in Stata	Definition	Applied Transfor	Unit / Scale	Expected sign
Dependent	log_pib_b	State GDP per capita [deflated]	Natural logarithm	Thousands of constant pounds per capita	
Principal 1	ln_gcultura	Public expenditure on culture per capita [deflated]	Natural logarithm of per capita expenditure	Constant pounds per inhabitant	[+]
Principal 2	ln_gcorr	Proxy indicator of current expenditure per capita	Natural logarithm	Index/value per capita	[–]
Principal 3	ln_ginv	Public investment per capita [deflated]	Natural logarithm of per capita expenditure	Constant pounds per inhabitant	[+]
Constant	_cons	Independent term	—	—	
Error structure	rho	Common AR[1] autocorrelation in panel	Estimated by Prais–Winsten	—	

Source: Prepared internally based on INEGI [State National Accounts], Ministry of Finance and Public Credit [SHCP], and state budget data

Analysis of results

Based on the methodological strategy proposed, the analysis of results begins with the estimation of a **fixed effects [FE] model**, which allows for the control of unobservable heterogeneity among federal entities, assuming that such differences may be correlated with the explanatory variables.

This model constitutes a first approach to evaluating the relationship between the different components of public expenditure—cultural, current, and investment—and economic performance measured through GDP per capita.

The use of the fixed effects model responds to the need to ensure that the structural characteristics of each state, which remain constant over time, do not distort the estimation of the parameters. In this way, the coefficients obtained reflect intra-state variation, i.e., changes that occur within each entity over the study period.

The results of the fixed effects model are presented below [Table 2], followed by the analysis of the random effects models and the robustness tests that allow the validity of the estimators to be verified.

Box 2

Table 2

Results of the fixed effects model [2000–2023]

Variable	Coef.	t	p	sig
Per capita cultural expenditure	-1.322	-0.24	0.813	
Per capita current expenditure	27.149	6.92	0.000	***
Per capita public investment	9.101	1.45	0.153	
Constant	5.403	146.49	0.000	***
Observations: 713 | Entities: 31 | R^2 [within]: 0.3277 | F[3,30]=7.21, p=0.000				
Robust standard errors grouped by entity [cluster id].				
*** p<0.01, ** p<0.05, * p<0.10				

Source: own elaboration based on INEGI [State National Accounts] and SHCP [state budget]

As we can see, the initial results of the **fixed effects model** [Table 2] show that, within the federal entities, current expenditure per capita is positively associated with GDP per capita and is statistically significant at 1%. In contrast, neither per capita cultural expenditure nor public investment are significant, suggesting that, in this specification, their impact on economic growth is not robust.

The within R^2 of 0.33 indicates a moderate explanatory power of the model, while the overall F-test is significant, confirming the relevance of using fixed effects as a starting point. However, the presence of possible heteroscedasticity and autocorrelation problems—identified in subsequent tests—requires these results to be verified using other more robust estimators.

In this sense, the fixed effects model constitutes a **first exploratory approach** that allows preliminary patterns to be identified, but does not represent the final estimate on which the conclusions of the article are based.

Although the fixed effects model constitutes a first approach to analysing the relationship between public spending and state economic growth, it is relevant to contrast its results with the estimation of a random effects model. The latter allows for the incorporation of both intra-state and inter-state variation under the assumption that unobservable effects are not correlated with the explanatory variables.

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The comparison between the two models, presented in Table 3, is a necessary step before applying the diagnostic tests that will determine the most appropriate specification for this study.

Box 3

Table 3

Results of the random effects model [2000–2023]

Variable	Coef.	z	p	IC 95% lower	IC 95% superior
Per capita cultural expenditure	–2.313	–0.42	0.675	–13.123	8.497
Per capita current expenditure	27.318***	4.10	0.000	14.261	40.374
Per capita public investment	9.289	1.50	0.134	–2.865	21.443
Constant	5.407***	73.22	0.000	5.262	5.551
Observations: 713					
Number of groups [states]: 31					
R^2 [within]: 0.3277					
R^2 [between]: 0.1721					
R^2 [overall]: 0.1466					
Wald $chi^2[3] = 23.61$, p = 0.000					

Source: Prepared internally based on INEGI [State National Accounts] and SHCP [State Budget]].

The results of the random effects model [Table 3] show that current expenditure per capita has a positive and statistically significant impact on GDP per capita, confirming the evidence obtained in the fixed effects model.

In contrast, both cultural expenditure and public investment per capita are not statistically significant, which limits their ability to explain state economic growth in the period analysed.

The Wald test confirms the joint significance of the model. However, to determine the most appropriate specification between fixed and random effects, it is necessary to apply the Hausman test shown in Table 4.

Box 4

Table 4

Results of the Hausman test [2000–2023]

Variable	Coef. FE	Coef. RE	Diference [FE–RE]	Standard error
Expenditure on culture per capita	–1.322	–2.313	0.991	0.718
Current expenditure per capita	27.149	27.318	–0.169	0.093
Public investment per capita	9.101	9.289	–0.187	0.244
$chi^2[3] = 4.33$				
Prob > chi^2 = 0.2279				

Source: Prepared internally based on INEGI [State National Accounts] and SHCP [State Budget]].

As we can see, the Hausman test demonstrates the validity of the fixed effects and random effects models. The statistic obtained was chi^2 [3] = 4.33, with a p-value = 0.2279. Given that this result is not significant, the null hypothesis proposing the absence of systematic differences between both models is not rejected. Consequently, random effects estimators can be considered efficient and consistent for analysing the impact of public spending on state GDP per capita. However, the choice of the final model cannot be based solely on this contrast. As will be evident in the diagnostic tests, the presence of heteroscedasticity and autocorrelation requires the use of more robust techniques, so estimation using **Panel Corrected Standard Errors [PCSE]** is established as the most appropriate strategy to ensure the validity of the results.

The Hausman test indicated that random effects estimators can be considered efficient as no systematic differences were found compared to fixed effects estimators. However, before defining the final estimation, it is essential to apply diagnostic tests to assess the validity of the statistical assumptions of the panel model. In this regard, tests for heteroscedasticity, autocorrelation and multicollinearity were performed, the results of which are presented in Table 5.

Box 5

Table 5

Diagnostic tests of the panel model [2000–2023]

Test	Null hypothesis [H_0]	Statistician	Value p	Decision
Modified Wald [xttest3]	There is no heteroscedasticity between groups.	$chi^2[31]$ = 7993.90	0.000	H_0 rejected → Heteroscedasticity exists
Wooldridge [xtserial]	There is no first-order autocorrelation.	F[1,30] = 93.524	0.000	H_0 rejected → Autocorrelation exists
Variance inflation factor [VIF]	There is no multicollinearity.	VIF medio = 1.04	—	H_0 not rejected → No multicollinearity

Source: Prepared internally based on statistical tests performed in Stata 16.

The results of the diagnostic tests show the presence of heteroscedasticity and first-order autocorrelation in the panel model residuals, which invalidates the assumptions of homoscedasticity and serial independence necessary for reliable statistical inference. In contrast, the values of the **variance inflation factor [VIF]** show an average close to 1, confirming the absence of multicollinearity problems among the explanatory variables.

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These conditions justify the need to use a robust estimator such as the **PCSE [Panel Corrected Standard Errors]** model to ensure the validity of the results.

PCSE model: final estimate corrected for heteroscedasticity and autocorrelation

The PCSE model, presented in Table 6, constitutes the final estimate of the study by correcting the heteroscedasticity and autocorrelation problems identified in the diagnostics.

The results robustly show that the different components of public expenditure have differentiated effects on the GDP per capita of Mexico's federal entities in the period 2000–2023.

Box 6

Table 6

Results of the PCSE model for state GDP per capita [2000–2023]

Variable	Coef.	Standard error	z	p	IC 95% lower	IC 95% superior
ln_gcultura	–0.1107***	0.0156	–7.10	0.000	–0.1413	–0.0801
ln_gcorr	0.0534***	0.0068	7.83	0.000	0.0410	0.0669
ln_ginv	0.0013	0.0022	0.60	0.547	–0.0029	0.0066
Constante	5.2075***	0.0959	54.27	0.000	5.0194	5.3956
Observations: 713						
Number of groups [states]: 31						
R^2 = 0.9879						
Wald chi²[3] = 106.67, p = 0.000						
Common autocorrelation AR[1], rho = 0.9360						

Source: Prepared internally based on INEGI [State National Accounts] and SHCP [State Budget].

Firstly, per capita spending on culture has a negative coefficient [–0.1107] with high statistical significance [$p < 0.01$]. This result indicates that, in the short term, an increase in this type of expenditure does not translate into a direct boost to economic growth, but could be associated with deferred and intangible returns related to human capital formation, social cohesion and the generation of cultural externalities.

Empirical evidence therefore suggests that the relationship between culture and economic growth is not immediate, which raises the need to interpret this item more as a long-term social investment than as a short-term determinant of GDP.

In contrast, **current expenditure per capita** shows a positive and statistically significant effect [0.0534; $p < 0.01$], consolidating itself as the variable with the greatest impact on state economic growth. This finding reveals that the resources allocated to cover operating and administrative expenses have a direct impact on the economic activity of entities, by stimulating the circulation of resources and sustaining the government apparatus.

However, from the perspective of budgetary law and fiscal sustainability, this result raises a debate about the efficiency and rationality of current expenditure, given that its expansion may compromise investment in long-term strategic projects.

For its part, **public investment per capita** does not have a statistically significant effect on GDP per capita [coef. = 0.0013; $p = 0.547$]. This result is consistent with the hypothesis that the effects of public investment tend to manifest themselves over longer periods or depend on the quality, timing and specific destination of the projects financed.

The lack of statistical significance may also reflect problems of efficiency in the allocation of investment resources at the state level, as well as asymmetries in their execution. The model shows high explanatory power, with an **R^2 of 0.9879**, and the Wald test [$\chi^2 = 106.67$; $p < 0.01$] confirms the joint significance of the explanatory variables. Furthermore, the corrected AR[1] autocorrelation [rho = 0.9360] ensures that the estimated coefficients are consistent and adequate for the analysis.

Overall, the results of the PCSE model show that current expenditure is the main driver of state economic growth in the period analysed, while public investment does not show a robust effect and expenditure on culture reflects indirect or long-term impacts.

These findings have important implications for fiscal policy and budget planning in Mexico, as they highlight the need to review the structure of spending and its differentiated effects on economic development.

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Discussion of results

The results obtained in the PCSE model show differentiated effects of public expenditure components on state economic growth in Mexico during the period 2000–2023. First, the finding that **current expenditure per capita** has a positive and statistically significant effect on GDP per capita is partially consistent with the international literature.

Bose, Haque, and Osborn [2007] documented that social spending on education and health promotes growth in developing countries, which may be related to the dynamics of current expenditure in Mexico, where this item supports the provision of public services and the administrative apparatus. Similarly, Wu, Tang, and Lin [2010] found that public spending can be an engine of growth in middle-income economies, although its effectiveness declines as the level of development increases.

Our results confirm that current expenditure is a short-term stimulus, but they also raise the risk of fiscal sustainability pointed out by Navarro [2019] and Herrero-Alcalde et al. [2024], who warn that excessive current expenditure can compromise macroeconomic efficiency and generate budgetary rigidities.

In contrast, **public investment per capita** did not have a statistically significant impact on state economic growth. This result diverges from the evidence reported in international contexts, where public investment is consistently associated with positive long-term effects [De la Fuente, 2017; Gnangoin, Edjoukou and Kassi, 2019].

In the case of Mexico, previous studies such as those by Rodríguez Benavides, Mendoza González and Climent Hernández [2021] and Reyes-Hernández and Mejía-Reyes [2023] highlight the central role of public investment in economic recovery and long-term cycles. The discrepancy with our findings can be explained by problems of efficiency in the allocation and execution of state projects, which coincides with the warning of Salazar [2020] and Tavera Cortés, Torres Sandoval and Sandoval Gómez [2024], who argue that the effectiveness of investment depends on its strategic orientation and the institutional framework.

Regarding **per capita cultural expenditure**, the results show a negative effect in the short term, albeit with high statistical significance. This evidence is consistent with the idea of Acerenza and Gandelman [2019] that cultural expenditure is often considered a luxury in contexts of budgetary constraints and that its returns tend to be deferred over time. However, from the perspective of social capital [Putnam, 1993] and institutional economics [North, 1990], this finding can be interpreted as the manifestation of indirect and long-term benefits that are not reflected in immediate economic growth. Jalles and Pessino [2025] reinforce this view by demonstrating that the effectiveness of different components of spending depends on institutional factors such as inequality and informality. Thus, the negative result should not be taken as evidence of ineffectiveness, but rather as a call to reconsider how the impact of cultural spending on public policy is measured and valued.

Taken together, the findings of this study reaffirm the hypothesis that the composition of public spending, rather than its total volume, is the central determinant of economic growth [Devarajan, Swaroop and Zou, 1996; Barro, 1990].

While current expenditure is the main driver of growth in Mexico, the lack of significance of public investment and the deferred effects of cultural spending suggest that fiscal policy should be geared not only towards expanding expenditure but also towards ensuring its allocative efficiency, as proposed by Tanzi and Zee [1997] and Afonso and Baquero Fraga [2024]. These conclusions point to the need to review state budget planning and strengthen institutional frameworks to ensure that public investment and cultural spending translate into sustained impacts on economic development.

Conclusions

The study shows that the composition of public spending is more relevant than its aggregate volume in explaining state economic growth in Mexico during 2000–2023. The robust results of the PCSE model show that current per capita expenditure significantly drives state GDP, confirming previous findings in developing countries [Bose et al., 2007; Wu et al., 2010], but also warning of fiscal sustainability dilemmas [Navarro, 2019; Herrero-Alcalde et al., 2024].

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Per capita public investment did not show significant effects, which contrasts with studies that highlight its positive long-term role [De la Fuente, 2017; Rodríguez Benavides et al., 2021], suggesting problems of efficiency in budget allocation [Salazar, 2020; Tavera Cortés et al., 2024]. For its part, per capita cultural expenditure had a negative impact in the short term, although this is consistent with the literature that conceives it as an investment with deferred returns in social and institutional capital [Acerenza and Gandelman, 2019; Putnam, 1993; North, 1990].

These results support the hypothesis that it is not the size of the state, but the efficiency and composition of public spending that determines economic growth [Devarajan et al., 1996; Barro, 1990]. For Mexico, fiscal policy thus faces the challenge of containing the expansion of unproductive current expenditure, improving the quality of public investment, and recognising cultural expenditure as a strategic asset for sustainable development.

This work contributes to the international literature by offering updated evidence from an emerging country with a state panel of more than two decades, applying econometric techniques that are robust to heteroscedasticity and autocorrelation.

However, limitations are recognised: the absence of institutional indicators and the lack of intertemporal dynamics in the model. Future research should integrate measures of governance and transparency [Okunlola et al., 2024], explore the deferred effects of public investment using GMM-Sys [Reyes-Hernández and Mejía-Reyes, 2023], and extend the analysis to international comparisons [Afonso and Baquero Fraga, 2024].

In short, this study provides empirical evidence that reinforces the need to move towards a Mexican fiscal policy based on allocative efficiency and strategic spending. Only through institutional and budgetary redesign that balances current expenditure, public investment, and cultural spending will it be possible to consolidate sustainable, inclusive, and regionally balanced economic growth.

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