



Mining Concession Fee Transfers and Departmental Non-Extractive GDP in Peru, 2007–2024

Transferencias por derecho de vigencia minera y PBI no extractivo departamental en el Perú, 2007-2024

Condori-Sotacuro, Daria¹

Ramos-Kerhuayo, Valeria Julian^{1*}

Zamora-Concha, Letizia Rocío¹

¹Escuela Profesional de Economía, Universidad Ricardo Palma, Lima, Perú

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Corresponding author*: j202320780@urp.edu.pe

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ABSTRACT

Mining concession fee transfers constitute a source of resources for subnational governments, although their contribution to regional growth has received limited attention. This study aimed to estimate their effect on departmental non-extractive GDP per capita in Peru between 2007 and 2024. A balanced panel comprising 19 departments and 342 observations was constructed using information from INEI, MEF, MINEM, and IPE. Unit root and cointegration tests were applied, followed by the estimation of pooled, fixed-effects, and random-effects models. The Hausman test favored the fixed-effects specification, while heteroskedasticity and cross-sectional dependence were addressed using Driscoll-Kraay standard errors. The results showed that a 1% increase in per capita transfers was associated with an approximate 0.13% rise in non-extractive GDP per capita. Positive effects were also identified for public investment, labor participation, and access to electricity, whereas poverty and illiteracy showed negative effects. It was concluded that these transfers supported non-extractive economic activity, although their impact depended on public management and the structural conditions of each department.

Keywords: panel data; regional development; econometrics; fixed effects; public investment

RESUMEN

Las transferencias por derecho de vigencia minera constituyen una fuente de recursos para los gobiernos subnacionales, aunque su contribución al crecimiento regional ha sido poco examinada. El estudio tuvo como objetivo estimar su incidencia sobre el PBI no extractivo per cápita de los departamentos del Perú entre 2007 y 2024. Se construyó un panel balanceado de 19 departamentos y 342 observaciones con información del INEI, MEF, MINEM e IPE. Se aplicaron pruebas de raíz unitaria y cointegración, y posteriormente se estimaron modelos agrupados, de efectos fijos y de efectos aleatorios. La prueba de Hausman favoreció la especificación de efectos fijos, mientras que los problemas de heterocedasticidad y dependencia transversal se corrigieron mediante errores estándar de Driscoll-Kraay. Los resultados mostraron que un incremento de 1 % en las transferencias per cápita se asoció con un aumento aproximado de 0.13 % en el PBI no extractivo per cápita. También se identificaron efectos positivos de la inversión pública, la participación laboral y el acceso a electricidad, así como efectos negativos de la pobreza y el analfabetismo. Se concluyó que estas transferencias favorecieron la actividad económica no extractiva, aunque su impacto dependió de la gestión pública y de las condiciones estructurales de cada departamento.

Palabras clave: datos de panel; desarrollo regional; econometría; efectos fijos; inversión pública



1. INTRODUCTION

The availability of natural resources represents an opportunity to finance infrastructure, public services, and productive activities. However, their presence alone does not guarantee higher economic growth. The effects depend on governments' capacity to manage the revenues obtained and allocate them to uses that enhance productivity. Singh et al. (2024) argue that the relationship between natural resource wealth and growth varies according to institutional quality, while Zallé (2019) highlights the importance of human capital in preventing resource abundance from generating unfavorable economic outcomes.

At the local level, mining activity generates fiscal revenues, employment, and demand for goods and services; however, its benefits differ across territories. Coulibaly et al. (2024) show that mining contributes to increasing household income and reducing poverty when extractive revenues are incorporated into the economies of producing areas. Similarly, Lapeyronie and Szedlacsek (2025) point out that territorial governance conditions the capacity of mining to promote development, while Murillo et al. (2024) associate its favorable effects with the ability of local governments to convert the resources received into public investment.

In Peru, mining occupies an important position because of its contribution to production, exports, and tax revenues. Part of the resources associated with this activity is distributed among subnational governments through mining canon transfers, royalties, and mining concession fees. The latter are linked to the payments made by concession holders to keep a mining concession in force and constitute a source of financing for beneficiary jurisdictions. Therefore, it is necessary to determine whether these transfers are associated with the growth of economic activities other than mining extraction.

Studies conducted in the Peruvian context show that the territorial effects of mining do not follow a uniform pattern. Aragón and Rud (2013) identify economic linkages around a mining operation that improve the income of nearby communities. Loayza and Rigolini (2016) report better consumption and poverty indicators in mining districts, although they caution that the effective use of fiscal transfers depends on the management capacity of subnational governments.

More recent evidence also emphasizes that the allocation of mining resources does not automatically generate social and economic improvements. Cruz-Lauracio and Garabito-Montegudo (2025) link mining canon transfers to regional development but indicate that their outcomes depend on how resources are allocated and on the quality of public management. Likewise, Huacani Sucasaca et al. (2024) show that the effects of mining canon transfers and royalties on poverty vary across departments because of differences in the amounts received and in the efficiency with which they are managed.

Most of these studies analyze mining canon transfers, royalties, poverty, consumption, or household income. In contrast, there is less evidence regarding mining concession fee transfers and their relationship with non-extractive GDP per capita. This indicator makes it possible to assess the performance of activities outside the extractive sector and to approximate the capacity of mining transfers to promote productive diversification at the departmental level.

This lack of evidence limits understanding of a distribution mechanism that remains relevant to subnational public finances. It also makes it difficult to determine whether the resources received generate benefits beyond mining activity itself. In this context, the purpose of this study was to analyze the effect of mining concession fee transfers on the non-extractive GDP per capita of Peruvian departments during the 2007–2024 period using an econometric panel-data model.

2. MATERIALS AND METHODS

2.1 Study area

The study was conducted in Peru and considered annual information for the 2007–2024 period. The territorial units consisted of departments with complete records for all variables included in the analysis. Based on this criterion, a balanced panel dataset was constructed comprising 19 departments and 18 years of observation.

2.2 Research type and design

A quantitative approach was adopted because the analysis was based on statistical information and the estimation of econometric relationships. The study had an explanatory scope, as it examined the effect of mining concession fee transfers on non-extractive GDP per capita while controlling for other factors associated with departmental economic performance.

A non-experimental and longitudinal design was employed. The variables were observed without researcher intervention and analyzed throughout the established period. The combination of territorial and temporal information made it possible to apply panel-data models and control for unobserved departmental characteristics that remained relatively constant over the years studied.

2.3 Population and sample

The population included the 24 departments of Peru and the Constitutional Province of Callao. The non-probability sample consisted of 19 departments with complete time series. Amazonas, Lambayeque, Loreto, Tumbes, and Ucayali were excluded because of missing information for at least one variable, while Callao did not correspond to the territorial unit defined for the analysis. Each observation represented one department in a given year.

2.4 Study variables

Table 1. System of variables analyzed

Function	Variable	Unit or transformation	Source
Dependent	Non-extractive GDP per capita	Natural logarithm	INEI
Main explanatory variable	Mining concession fee transfers per capita	Natural logarithm	MINEM
Control	Public investment per capita	Natural logarithm	MEF
Control	Illiteracy	Percentage	INEI
Control	Proportion of the economically active population	Proportion	INEI
Control	Electricity	Percentage of households	INEI
Control	Poverty	Percentage	IPE

2.5 Data collection and processing techniques

The records were obtained through documentary review of institutional databases. The information came from public statistical databases of the National Institute of Statistics and Informatics (INEI), the Ministry of Economy and Finance (MEF), the Ministry of Energy and Mines (MINEM), and the Peruvian Institute of Economics (IPE).

The data were organized by department and year and integrated using common territorial and temporal identifiers. During data cleaning, units of measurement, continuity of the time series, missing values, and consistency of departmental names were reviewed.

2.6 Econometric model specification

To estimate the relationship between mining concession fee transfers and non-extractive economic performance, the following model was specified:

$$\ln(\text{nonextractiveGDP}_{pc,it}) =$$

$$\beta_0 + \beta_1 \ln(\text{concessionfee}_{pc,it}) + \beta_2 \ln(\text{publicinvestment}_{pc,it}) + \beta_3 \text{illiteracy}_{it} + \beta_4 \text{laborforceproportion}_{it} + \beta_5 \text{electricity}_{it} + \beta_6 \text{poverty}_{it} + u_{it} \quad \text{Where:}$$

- $i = 1, \dots, 19$ represents each department.
- $t = 2007, \dots, 2024$ represents each year of the study period.
- $\ln(\text{nonextractiveGDP}_{pc,it})$ represents the natural logarithm of non-extractive GDP per capita, used as the dependent variable.
- $\ln(\text{concessionfee}_{pc,it})$ represents the natural logarithm of mining concession fee transfers per capita.
- $\ln(\text{publicinvestment}_{pc,it})$ represents the natural logarithm of public investment per capita.
- illiteracy_{it} represents the percentage of the illiterate population.
- $\text{laborforceproportion}_{it}$ represents the proportion of the economically active population.
- electricity_{it} corresponds to the percentage of the population with access to electricity.
- poverty_{it} represents the percentage of the population living in monetary poverty.
- β_0 corresponds to the model intercept.
- $\beta_1, \beta_2, \dots, \beta_6$ represent the parameters associated with each explanatory variable.
- u_{it} represents the error component associated with each unit and period.

2.7 Statistical analysis

The analysis began with descriptive statistics and the Levin–Lin–Chu, Breitung, Im–Pesaran–Shin, Fisher–ADF, and Fisher–PP unit root tests. For non-stationary series, the Kao and Pedroni cointegration tests were applied. Subsequently, pooled OLS, fixed-effects, and random-effects models were estimated, and the Hausman test guided model selection. Diagnostic testing included the Variance Inflation Factor (VIF), the Modified Wald test, and the Pesaran CD test. Finally, a fixed-effects model with Driscoll–Kraay standard errors and two lags was estimated. All analyses were performed in Stata 16.

3. RESULTS AND DISCUSSION

3.1 Descriptive statistics

Table 2 presents the descriptive statistics for the variables corresponding to the 19 departments and 18 years analyzed. The dataset consisted of 342 observations and maintained a balanced panel structure.

Table 2. Descriptive statistics of the model variables

Variable	N	Mean	Standard deviation	Minimum	Maximum
Logarithm of non-extractive GDP per capita	342	9.0784	0.4887	8.0062	10.5208
Logarithm of mining concession fee transfers per capita	342	2.2832	0.9812	-0.2199	4.2974
Logarithm of public investment per capita	342	7.1048	0.6571	4.9372	8.7178
Poverty rate	342	29.9152	16.2469	2.4000	85.0000
Illiteracy rate	342	8.2213	4.3555	2.0000	19.9000

Proportion of the economically active population (EAP)	342	0.5441	0.0747	0.3591	0.9554
Access to electricity	342	89.687	8.8164	46.5627	99.7625

Poverty showed the greatest territorial heterogeneity, with values ranging from 2.4% to 85.0%. Electricity coverage reached a mean of 89.69%, although its minimum value was 46.56%. Mining concession fee transfers also exhibited considerable dispersion across departments.

3.2 Unit root tests

The stationarity of the series was examined using the Levin–Lin–Chu, Breitung, Im–Pesaran–Shin, Fisher-ADF, and Fisher-PP tests. The tests were applied in levels and first differences, considering specifications with an intercept, an intercept and trend, and no deterministic components. Table 3 summarizes the results obtained.

Table 3. Unit root tests

Variable	Method	Specification					
		Intercept		Intercept and trend		None	
		Levels	Differences	Levels	Differences	Levels	Differences
ln(Non-extractive GDP per capita)	Levin, Lin & Chu t	-6.759	-8.406	-3.52	-9.998	7.87	-8.60
	Breitung t-stat	—	—	1.60	-8.923	—	—
	Im, Pesaran and Shin W-stat	-2.467	-7.248	1.32	-8.216	—	—
	ADF - Fisher Chi-square	54.858	118.659	24.29	127.19	1.60	134.14
	PP - Fisher Chi-square	179.62	519.969	63.40	289.09	0.80	255.56
ln(Mining concession fee transfers per capita)	Levin, Lin & Chu t	-2.507	-4.749	-0.95	-3.62	5.77	-10.68
	Breitung t-stat	—	—	-0.78	-3.11	—	—
	Im, Pesaran and Shin W-stat	-0.148	-7.471	0.78	-6.40	—	—
	ADF - Fisher Chi-square	31.644	122.305	30.40	104.05	5.67	153.94
	PP - Fisher Chi-square	73.446	313.858	62.41	244.36	7.40	322.29
ln(Public investment per capita)	Levin, Lin & Chu t	-4.409	-15.473	-9.144	-13.95	4.34	-17.752
	Breitung t-stat	—	—	-2.323	-4.363	—	—
	Im, Pesaran and Shin W-stat	-3.839	-11.552	-5.909	-8.593	—	—
	ADF - Fisher Chi-square	89.547	158.805	67.383	118.412	4.355	213.354
	PP - Fisher Chi-square	171.83	269.59	148.93	242.148	1.392	301.71
Illiteracy	Levin, Lin & Chu t	-3.518	-10.257	-3.347	-8.825	-8.33	-13.201
	Breitung t-stat	—	—	-2.929	-4.176	—	—
	Im, Pesaran and Shin W-stat	-0.353	-10.397	-2.270	-7.614	—	—
	ADF - Fisher Chi-square	31.908	165.801	56.886	120.008	106.34	201.605
	PP - Fisher Chi-square	62.895	502.016	92.102	267.40	192.74	330.109

Proportion of the economically active population (EAP)	Levin, Lin & Chu t	-2.622	-10.88	-2.393	-9.168	0.25	-16.58
	Breitung t-stat	—	—	1.373	-7.24	—	—
	Im, Pesaran and Shin W-stat	-1.631	-10.1302	0.882	-10.1270	—	—
	ADF - Fisher Chi-square	45.47	162.422	31.60	153.343	15.26	260.488
	PP - Fisher Chi-square	70.98	430.288	50.69	306.086	15.52	402.511
Electricity	Levin, Lin & Chu t	-10.263	-6.4776	-4.539	-8.17	5.32	-10.21
	Breitung t-stat	—	—	4.471	-5.40	—	—
	Im, Pesaran and Shin W-stat	-6.715	-6.2083	-0.56	-7.864	—	—
	ADF - Fisher Chi-square	116.66	105.98	46.73	123.807	2.280	158.761
	PP - Fisher Chi-square	411.48	237.50	101.30	254.70	0.81	232.786
Poverty	Levin, Lin & Chu t	-7.2711	-6.378	-4.662	-7.29	-7.33	-11.65
	Breitung t-stat	—	—	3.027	-7.10	—	—
	Im, Pesaran and Shin W-stat	-5.37	-6.059	0.154	-6.78	—	—
	ADF - Fisher Chi-square	93.78	100.817	35.72	109.907	105.69	171.157
	PP - Fisher Chi-square	143.67	226.371	59.51	254.103	141.37	302.174

3.3 Cointegration tests

The logarithm of non-extractive GDP per capita, the proportion of the economically active population, and the logarithm of mining concession fee transfers were classified as $I(1)$. Therefore, their long-run relationship was evaluated using the Kao and Pedroni cointegration tests.

Table 4. Kao cointegration test

Statistic	Value	p-value	Decision
Modified Dickey-Fuller t	-4.0148	0.0000	Reject H_0
Dickey-Fuller t	-4.3645	0.0000	Reject H_0
Augmented Dickey-Fuller t	-1.6400	0.0505	Reject H_0 at the 10%
Unadjusted Modified Dickey-Fuller t	-5.4857	0.0000	Reject H_0
Unadjusted Dickey-Fuller t	-4.8960	0.0000	Reject H_0

The Kao test provided evidence supporting a long-run relationship. Most of its statistics rejected the null hypothesis at the 5% level, while the ADF statistic was significant at the 10% level. Taken together, the results indicated that the series did not evolve independently during the period analyzed.

Table 5. Pedroni cointegration test

Statistic	Value	p-value	Decision
Modified Phillips-Perron t	0.8420	0.1999	Do not reject H_0
Phillips-Perron t	-3.0888	0.0010	Reject H_0
Augmented Dickey-Fuller t	-4.1911	0.0000	Reject H_0

In the Pedroni test, the Phillips-Perron and ADF statistics rejected the absence of cointegration, although the modified Phillips-Perron statistic did not reach statistical significance. Considering the Kao and Pedroni tests jointly, the evidence predominantly supported a stable long-run relationship between non-extractive GDP per capita and mining concession fee transfers.

3.4 Model estimation

As a preliminary estimation, the pooled OLS model was used, treating the 342 observations as a pooled sample without explicitly accounting for permanent differences across departments.

Table 6. Pooled OLS model estimation

Explanatory variable	Coefficient	Standard error	t	p-value
ln(Mining concession fee transfers per capita)	0.0515	0.0213	2.42	0.016
ln(Public investment per capita)	0.0350	0.0352	0.99	0.321
Illiteracy	-0.0403	0.0069	-5.78	0.000
Proportion of the economically active population (EAP)	-0.6766	0.2472	-2.74	0.007
Electricity	0.0074	0.0028	2.61	0.010
Poverty	-0.0092	0.0019	-4.79	0.000
Constant	9.0240	0.3250	27.76	0.000

Under this specification, mining concession fee transfers showed a positive and statistically significant relationship with non-extractive GDP per capita. However, the pooled model did not control for unobserved departmental characteristics; therefore, its results were considered only as an initial reference.

A fixed-effects model was subsequently estimated to control for department-specific characteristics that remained constant throughout the study period.

Table 7. Fixed-effects model estimation

Explanatory variable	Coefficient	Standard error	t	p-value	Significance
ln(Mining concession fee transfers per capita)	0.1302	0.0133865	9.73	0.000	Significant at 1%
ln(Public investment per capita)	0.0633	0.0101865	6.22	0.000	Significant at 1%
Illiteracy	-0.0167	0.0030977	-5.41	0.000	Significant at 1%
Proportion of the economically active population (EAP)	0.3763	0.0790034	4.76	0.000	Significant at 1%
Electricity	0.0055	0.0007669	7.20	0.000	Significant at 1%
Poverty	-0.0037	0.0005989	-6.29	0.000	Significant at 1%
Constant	7.88129	0.1194731	65.97	0.000	Significant at 1%

Table 8. Overall statistics of the fixed-effects model

Indicator	Value
Number of observations	342
Number of groups	19
Observations per group	18
Within R-squared	0.8982
Between R-squared	0.3305
Overall R-squared	0.3860
F-statistic	466.03
Prob > F	0.0000
sigma_u	0.3937
sigma_e	0.0552
rho	0.98068
F test all $u_i = 0$	516.46
Prob > F	0.0000

The fixed-effects model was jointly significant and explained a high proportion of the temporal changes occurring within departments. The value of $\rho=0.9806$ indicated that a substantial portion of the error variance was associated with persistent differences across territorial units. Likewise, the joint test of

departmental effects rejected the hypothesis that these components were equal to zero, indicating that the pooled estimation was insufficient.

As an alternative specification, a random-effects model was estimated under the assumption that unobserved departmental characteristics were uncorrelated with the explanatory variables.

Table 9. Random-effects model estimation

Explanatory variable	Coefficient	Standard error	t	p-value	Significance
ln(Mining concession fee transfers per capita)	0.1249	0.01331	9.39	<0.001	Significant at 1%
ln(Public investment per capita)	0.0619	0.0102	6.05	<0.001	Significant at 1%
Illiteracy	-0.0181	0.0030	-5.88	<0.001	Significant at 1%
Proportion of the economically active population (EAP)	0.3535	0.0792	4.46	<0.001	Significant at 1%
Electricity	0.0054	0.0007	7.08	<0.001	Significant at 1%
Poverty	-0.0038	0.00060	-6.47	<0.001	Significant at 1%
Constant	7.93590	0.14295	55.51	<0.001	Significant at 1%

Table 10. Goodness-of-fit statistics and variance components of the random-effects model

Indicator	Value
Number of observations	342
Number of groups	19
Observations per group	18
Within R-squared	0.8981
Between R-squared	0.3633
Overall R-squared	0.4113
Wald chi2(6)	2761.84
Prob > chi2	0.0000
sigma_u	0.34176
sigma_e	0.0552671
rho	0.97451

The estimated coefficients retained signs and levels of significance similar to those obtained with the fixed-effects model. However, the validity of the estimator depended on the assumption that the individual effects were uncorrelated with the regressors, a condition subsequently evaluated using the Hausman test.

3.5 Hausman test

The choice between fixed effects and random effects was made using the Hausman test.

Table 11. Results of the Hausman test

Variable	Fixed effects (FE)	Random effects (RE)	Difference (FE - RE)	Standard error
ln(Mining concession fee transfers per capita)	0.1302134	0.1249405	0.0052730	0.0022240
ln(Public investment per capita)	0.0635656	0.0619525	0.0014131	0.0006546
Illiteracy	-0.0167716	-0.0181411	0.0013695	0.0004720
Proportion of the economically active population (EAP)	0.3763240	0.3535585	0.0227655	0.0074549
Electricity	0.0055240	0.0054560	0.0000680	0.0000426
Poverty	-0.0037661	-0.0038922	0.0001261	0.0000457

The Hausman test yielded a statistic of $\chi^2(6) = 11.28$ and a p-value of 0.0302. Because the probability was below the 5% significance level, the null hypothesis was rejected. Consequently, the fixed-effects model

was selected, indicating that unobserved departmental characteristics were correlated with the explanatory variables.

3.6. Model diagnostic tests

3.6.1 Multicollinearity using VIF

The potential linear association among the explanatory variables was examined using the Variance Inflation Factor (VIF).

Table 12. Results of the multicollinearity test.

Variable	VIF	1/VIF	Decision
Poverty	3.87	0.2587	No severe multicollinearity
Electricity	3.60	0.2777	No severe multicollinearity
Illiteracy	2.45	0.4082	No severe multicollinearity
ln(Public investment per capita)	2.09	0.4781	No severe multicollinearity
ln(Mining concession fee transfers per capita)	1.71	0.5858	No severe multicollinearity
Proportion of the economically active population (EAP)	1.33	0.7539	No severe multicollinearity
Mean VIF	1.87	—	Acceptable

The results show that all VIF values were below five, while the mean VIF was 1.87. The highest values corresponded to poverty and electricity, although neither reached a level indicative of severe multicollinearity. Consequently, all explanatory variables were retained in the final specification.

3.6.2 Heteroskedasticity test

Equality of the error variance across departments was evaluated using the Modified Wald test.

Table 13. Modified Wald test

Test	Null hypothesis	Statistic	p-value	Decision
Modified Wald test	Constant variance across all groups	Chi2(19) = 122.95	0.0000	Reject H_0

The test yielded a statistic of $\chi^2(19)=122.95$ and a probability below 0.001. This result rejected the hypothesis of constant variance and confirmed the presence of groupwise heteroskedasticity. Therefore, conventional standard errors were not appropriate for statistical inference.

3.6.3 Cross-sectional dependence test

The contemporaneous correlation of errors across departments was assessed using Pesaran's CD test.

Table 14. Pesaran cross-sectional dependence test

Test	Null hypothesis	Statistic	p-value	Decision
Pesaran CD test	No cross-sectional dependence	8.388	0.0000	Reject H_0

The mean absolute value of the off-diagonal correlations was 0.299, while the Pesaran CD statistic reached 8.388 ($p < 0.001$). Consequently, the null hypothesis of cross-sectional independence was rejected, providing evidence of cross-sectional dependence among departments. This relationship may have been associated with common shocks, national policies, or shared macroeconomic conditions simultaneously affecting the units analyzed. Taken together, the presence of heteroskedasticity and cross-sectional dependence justified the use of a robust correction in the final estimation in order to obtain standard errors consistent with these data characteristics.

3.7. Final model

The fixed-effects model was re-estimated using Driscoll–Kraay standard errors and a maximum lag of two periods. This correction enabled robust inference in the presence of heteroskedasticity and cross-sectional dependence without altering the coefficients estimated by the fixed-effects model.

Table 15. Fixed-effects model with Driscoll–Kraay standard errors

Explanatory variable	Coefficient	Driscoll–Kraay standard error	t	p-value	Significance
ln(Mining concession fee transfers per capita)	0.1302	0.0188	6.90	0.000	Significant at 1%
ln(Public investment per capita)	0.0633	0.0154	4.10	0.001	Significant at 1%
Illiteracy	-0.0167	0.0033	-4.98	0.000	Significant at 1%
Proportion of the economically active population (EAP)	0.3763	0.1523	2.47	0.024	Significant at 5%
Electricity	0.0055	0.0009	6.07	0.000	Significant at 1%
Poverty	-0.0037	0.0008	-4.50	0.000	Significant at 1%
Constant	7.8812	0.1737	46.03	0.000	Significant at 1%

The final model used 342 observations corresponding to 19 departments. The joint significance test was statistically significant ($F=230.22$; $p<0.001$), indicating that the included variables jointly explained the behavior of non-extractive GDP per capita. The within coefficient of determination was 0.8982, indicating that the model explained approximately 89.82% of the temporal variation observed within departments.

3.7.1 Economic interpretation of the results

Mining concession fee transfers per capita had a coefficient of 0.1302 and were statistically significant at the 1% level. Consequently, a 1% increase in transfers was associated, on average, with a 0.1302% increase in non-extractive GDP per capita, holding the other variables constant. This result was consistent with the existence of a favorable effect of mining-related resources on non-extractive economic activities.

Public investment per capita had a coefficient of 0.0633 and was also significant at the 1% level. Thus, a 1% increase in this variable was associated with an approximate 0.0633% increase in non-extractive GDP per capita. The positive magnitude indicated that the accumulation of infrastructure and public services was associated with better departmental productive performance.

The illiteracy coefficient was -0.0167 . Because the dependent variable was expressed in logarithms and illiteracy in percentage points, a one-percentage-point increase in the illiteracy rate was associated with an approximate 1.67% reduction in non-extractive GDP per capita. This result reflected the importance of human capital for regional productivity.

The proportion of the economically active population (EAP) had a coefficient of 0.3763 and was significant at the 5% level. Because this variable was expressed on a scale from zero to one, an increase of 0.01, equivalent to one percentage point, was associated with an approximate 0.376% increase in non-extractive GDP per capita.

Access to electricity had a coefficient of 0.0055. Therefore, a one-percentage-point increase in electricity coverage was associated with an approximate 0.55% increase in non-extractive GDP per capita. The positive relationship highlighted the role of energy infrastructure in supporting productive activities.

Finally, poverty had a coefficient of -0.0037 . A one-percentage-point increase in the poverty rate was associated with an approximate 0.37% decrease in non-extractive GDP per capita. This result indicated that income and consumption constraints were associated with lower dynamism in non-mining economic activities.

3.8. Discussion

Mining concession fee transfers showed a positive and statistically significant relationship with non-extractive GDP per capita. The estimated elasticity of 0.1302 indicated that their contribution was favorable, although moderate. This result suggested that the resources distributed to subnational governments may have supported the growth of activities other than mining extraction. However, the non-experimental design did not allow an exclusive causal relationship to be attributed to these transfers.

This finding was consistent with Aragón and Rud (2013) and Coulibaly et al. (2024), who identified local economic effects associated with mining activity. It was also compatible with Loayza and Rigolini (2016), Cruz-Lauracio and Garabito-Montegudo (2025), and Huacani Sucasaca et al. (2024), who indicated that the benefits derived from mining revenues depended on how these resources were managed. Therefore, the estimated coefficient represented an average effect and did not imply similar outcomes across all departments.

Public investment, labor force participation, and access to electricity showed positive associations, whereas illiteracy and poverty maintained negative relationships. These results demonstrated that departmental economic performance did not depend exclusively on mining-related transfers. The evidence was consistent with Zallé (2019) and Murillo et al. (2024), who emphasized the importance of human capital, infrastructure, and state capacity in enabling territories to benefit from natural resources.

Overall, mining concession fee transfers constituted a complementary source for non-extractive economic growth, but they did not replace infrastructure, education, and poverty-reduction policies. The study limitations included the use of aggregated information, coverage restricted to 19 departments, and the absence of direct indicators of expenditure efficiency and institutional quality.

CONCLUSIONS

The fixed-effects estimation with Driscoll–Kraay standard errors showed that mining concession fee transfers had a positive and statistically significant effect on non-extractive GDP per capita in Peruvian departments during the 2007–2024 period. On average, a 1% increase in per capita transfers was associated with an approximate 0.13% increase in non-extractive economic activity, holding the other variables constant. Public investment, labor force participation, and access to electricity also showed favorable effects, whereas poverty and illiteracy were associated with lower departmental economic performance. These results indicate that mining concession fee transfers may constitute a complementary source for promoting economic activities other than mining. However, their contribution should be accompanied by adequate public expenditure execution, improvements in infrastructure, and policies aimed at strengthening human capital. The evidence obtained may support the design of public decisions intended to improve the allocation of these resources. Future studies could extend the analysis to the provincial or district level and incorporate indicators of institutional quality, expenditure efficiency, and territorial governance.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to the subject matter of this study.

AUTHOR CONTRIBUTIONS

1. Conceptualization: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
2. Data curation: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
3. Formal analysis: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
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5. Investigation: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
6. Methodology: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
7. Project administration: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
8. Software: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
9. Writing – original draft: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.
10. Writing – review and editing: D. Condori-Sotacuro, V. Ramos-Kerhuayo, L. Zamora-Concha.

REFERENCES

- Aragón, F. M., & Rud, J. P. (2013). Natural resources and local communities: Evidence from a Peruvian gold mine. *American Economic Journal: Economic Policy*. <https://doi.org/10.1257/pol.5.2.1>
- Bahlburg, F. (2023). The local impact of mining in Peruvian districts: Evidence of a subnational resource curse? *International Journal of Energy Economics and Policy*. <https://doi.org/10.32479/ijeep.14319>
- Bai, R., & Liu, Y. (2023). Natural resources as a source of financing energy poverty reduction? Resources extraction perspective. *Resources Policy*. <https://doi.org/10.1016/j.resourpol.2023.103496>
- Coulibaly, M., Foltz, J., Parker, D., Olurotimi, O., & Traoré, N. (2024). The effects of mining on local poverty in developing countries: Evidence from Mali. *World Development*. <https://doi.org/10.1016/j.worlddev.2024.106605>
- Cruz-Lauracio, J., & Garabito-Monteagudo, E. (2025). El canon minero y el desarrollo socioeconómico en las regiones del Perú. *Gestionar: Revista de Empresa y Gobierno*. <https://doi.org/10.35622/j.rg.2025.02.002>
- Henriquez-Sánchez, M., et al. (2022). Mining as a driving force in the economic development of Peru. LACCEI. https://laccei.org/LEIRD2022-VirtualEdition/full-papers/FP49.pdf?utm_source=
- Huacani Sucasaca, Y., De La Cruz Huanca, N. R., Gutiérrez Mayta, D. J., & Velásquez Vilca, E. (2024). Efectos del canon y las regalías en la pobreza extrema por regiones en el Perú. *Impulso: Revista en Administración*. <http://doi.org/10.59659/impulso.v.4i7.33>
- Huamanga-Chumbes, N., & Pérez-Rojas, E. (2025). Canon y regalías mineras en gobiernos locales: Gestión de proyectos sostenibles y desarrollo territorial. *Revista Venezolana de Gerencia*, 30(Especial). Disponible en Redalyc. https://www.redalyc.org/journal/5860/586084466003/html/?utm_source=
- Kotsadam, A., Tolonen, A., & Villanger, E. (2023). The local impacts of mining revisited: Evidence from developing countries. *World Development*. <https://doi.org/10.1016/j.worlddev.2023.106177>
- Lapeyronie, H., & Szedlacsek, E. (2025). Mining in Africa and the resource curse. *The Extractive Industries and Society*. <https://doi.org/10.1016/j.exis.2024.101565>
- Liu, Y., Zhang, Y., & Wang, X. (2024). Natural resource dependence, institutional quality and regional economic growth. *Resources Policy*. <https://doi.org/10.1016/j.resourpol.2024.104738>
- Li, J., Chen, Z., & Sun, H. (2023). Fiscal decentralization, natural resources and sustainable economic growth. *Resources Policy*. <https://doi.org/10.1016/j.resourpol.2023.103834>
- Loayza, N., & Rigolini, J. (2016). The local impact of mining on poverty and inequality: Evidence from the commodity boom in Peru. *World Development*. <https://doi.org/10.1016/j.worlddev.2016.03.005>
- Martínez, G. (2021). Formalization Is Just the Beginning: Analyzing Post-Formalization Successes and Challenges in Peru's Small-Scale Gold Mining Sector. *Resources Policy*. <https://www.sciencedirect.com/science/article/pii/S0301420721003998>

- Medrano-Sánchez, E. J., et al. (2026). Extractive fiscal governance and subnational SDG progress: Evidence from mining canon and royalty transfers in Peru. *Frontiers in Political Science*.
https://www.frontiersin.org/journals/political-science/articles/10.3389/fpos.2026.1863029/full?utm_source
- Murillo, D., Maldonado, S., & Sardon, S. (2024). Commodity Booms, Local State Capacity, and Development. Columbia University / Northwestern University
https://www.researchgate.net/publication/385822605_Commodity_Booms_Local_State_Capacity_and_Development
- Rojas Victorio, R. A. (2025). Transferencia e impacto del canon minero en el desarrollo de las regiones del Perú. https://revistaimpulso.org/index.php/impulso/article/view/449?utm_source=
- Singh, S., Sharma, G. D., Radulescu, M., Balsalobre-Lorente, D., & Bansal, P. (2024). Do natural resources impact economic growth: An investigation of P5 + 1 countries under sustainable management. *Geoscience Frontiers*. <https://doi.org/10.1016/j.gsf.2023.101595>
- Wang, S., Li, Y., & Zhao, X. (2023). Natural resource rents, institutional quality and sustainable development: Evidence from emerging economies. *Journal of Cleaner Production*.
<https://doi.org/10.1016/j.jclepro.2023.136870>
- Yujra Capquequi, S., & Blanco Espezúa, M. P. (2019). Impacto del canon minero en el crecimiento económico y la pobreza en las regiones mineras del Perú, 2004-2015. *Semestre Económico*.
<http://dx.doi.org/10.26867/se.2019.v08i1.85>
- Zallé, O. (2019). Natural resources and economic growth in Africa: The role of institutional quality and human capital. *Resources Policy*. <https://doi.org/10.1016/j.resourpol.2018.11.009>