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ORIGINAL ARTICLE

Determinants of Public Investment by District Governments in the Department of Ayacucho, 2008-2023

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ABSTRACT

This study analyzes the determinants of public investment by the district governments of Ayacucho in the period 2008-2023, using a fixed-effects balanced microeconomic data panel model with 1,600 observations. The financing items and the political cycle were considered as regressor variables. The financing items evaluated, according to the Ministry of Economy and Finance (MEF), include: i) Ordinary Resources, ii) Municipal Compensation Fund, iii) Canon (redistributed tax revenue from extractive industries) and Royalties, Customs Revenue and Participations, iv) Donations and Transfers, v) Resources from Official Credit Operations, vi) Municipal Taxes, and vii) Directly Collected Resources. The political cycle was defined by the first three years of local management. The results show that the following items: i) Ordinary Resources, ii) Municipal Compensation Fund, iii) Canon and Royalties, iv) Donations and Transfers, v) Resources from Official Credit Operations, and vi) Municipal Taxes are significant and positive for public investment, while Directly Collected Resources are not. The analysis of the political cycle shows that the first, second and third year of municipal management have a significant and negative effect on public investment. In conclusion, ordinary resources, donations and transfers, the municipal compensation fund and municipal taxes are positive determinants of investment. Canon and Royalties are positive when they exceed S/ 2,505.977 (percentile 75). However, directly collected resources are not determinants and the political cycle of the first three years has a negative impact on investment.

Keywords: public investment; local governments; subnational governments; public financing; political cycle.

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INTRODUCTION

This research studies the determinants that explain public investment made by the district governments of the department of Ayacucho and aims to respond to the problem of low public investment execution by the district governments of said department. The research hypothesis is contrasted with the econometric model results: the financing items and the political cycle explain the public investment of the district governments of the department of Ayacucho 2008-2023. This article provides valuable empirical evidence for future research that studies the determinants of public investment.

Importance of Public Investment

Public investment is important to close social gaps, improve quality of life and increase productivity and competitiveness.

In order to understand the extent of the lack of public investment, the low levels of competitiveness achieved by the department of Ayacucho are detailed below.

Competitiveness Ranking of the Department of Ayacucho

The Instituto Peruano de Economía (IPE, 2023) places the Ayacucho region in position 17 among the 25 Peruvian regions analyzed in the 2023 Regional Competitiveness Index. The Ayacucho region shows weaknesses in the price of electricity, ranked 21st, health, ranked 17th, education, ranked 17th, and fixed internet access, ranked 18th. In addition, Ayacucho public institutions execute approximately 69.6% of the annual budget allocated to public investment.

Peruvian Local Governments are the Main Actors in Public Investment

Table 1, which was prepared with data from the Banco Central de Reserva del Perú (BCRP), shows that local governments are primarily responsible for gross capital formation and public investment in Peru.

Table 1 shows that local, district and provincial governments in Peru developed on average 44.4% of gross capital formation, public

Table 1
Gross Capital Formation of the General Government, National Government, Regional Governments and Local Governments of Peru (Percentage of Gross Domestic Product [GDP]), 2008-2023

Gross Capital Formation	General Governmentl	National Government	Regional Governments	Local Governments
2008	4.1	1.2	0.8	2.1
2009	5.2	1.6	1.1	2.5
2010	5.4	1.9	1.2	2.4
2011	4.5	1.7	1.0	1.8
2012	5.2	1.5	1.3	2.4
2013	5.4	1.6	1.3	2.6
2014	5.2	1.7	1.1	2.4
2015	4.4	1.8	0.9	1.7
2016	4.1	1.5	0.9	1.8
2017	4.0	1.4	0.8	1.8
2018	4.2	1.5	0.8	1.9
2019	3.9	1.5	0.8	1.6
2020	3.8	1.4	0.8	1.6
2021	4.2	1.6	0.8	1.8
2022	4.7	1.5	1.0	2.2
2023	4.7	1.8	1.1	1.8
Average	4.56	1.58	0.98	2.03
%	**100.0%**	**34.5%**	**21.5%**	**44.4%**

Note. Prepared by the author, 2024.

investment, between 2008 and 2023, followed by the national government, which contributes approximately 34.5% of gross capital formation, while regional governments contribute 21.5%.

Analysis of the Problem under Study Using Descriptive Statistics

Table 2 includes all the data available from the Ministry of Economy and Finance (MEF) portal to show a descriptive summary, which allows us to have an idea of the low levels of public investment execution achieved by the district governments of the department of Ayacucho.

Since 2008, the MEF's Economic Transparency portal has made available information regarding the execution of public investment of 1,834 local governments. In 2007, the MEF shows information available for only 739 local governments nationwide (MEF, 2023). The above contributes to the definition of the time and cross-section dimension of this research. Table 2 considers the public investment of the study population, made up of approximately 1,808 observations from the 113 district governments of the department of Ayacucho.

Table 2 shows that district governments in the department of Ayacucho use 67.9% of the resources allocated to public investment. This result is in line with the findings of the World Bank, which indicate that subnational governments use two-thirds of the allocated budget (World Bank Group, 2017), while around 11 district governments, which belong to the 10th percentile, use 37.89% of public funds allocated to public investment.

Therefore, the public investment execution of district governments belonging to the 20th percentile and the 10th percentile have

Table 2

Annual Public Investment Execution, Percentage of the Modified Institutional Budget, of 113 District Governments of the Department of Ayacucho, Analyzed in Percentiles, 2008-2023

Year	Minimum	Maximum	P_{10}	P_{20}	P_{50}	P_{80}	P_{90}	Average	Standard deviation
2008	25.9	98.4	51.1	61.4	76.9	86.4	94.3	74.1	15.5
2009	18.8	96.9	50.1	60.9	76.4	87.6	92.4	73.6	16.6
2010	11.8	99.6	49.1	60.8	75.4	90.1	94.1	74.2	17.9
2011	31.9	99.3	41.9	53.2	72.0	83.3	88.1	69.0	16.4
2012	16.0	97.9	35.4	47.1	64.1	81.5	88.0	63.3	19.5
2013	14.2	96.4	37.3	49.5	63.7	78.9	87.0	62.9	18.2
2014	1.8	98.1	35.1	55.4	75.3	89.3	93.5	70.2	22.2
2015	23	99.4	33.1	48.5	73.1	90.5	94.1	68.8	23.8
2016	6.3	99.6	39.3	50.1	73.3	86.7	92.0	69.4	20.5
2017	7.3	99.9	37.1	46.5	73.5	87.3	92.3	68.0	21.7
2018	13.3	99.4	37.0	46.0	71.1	87.6	94.9	67.3	21.8
2019	3.8	98.8	38.5	52.0	72.3	88.4	92.1	68.4	21.1
2020	6.9	97.6	28.0	39.0	57.1	75.9	85.2	56.5	20.3
2021	4.2	97.2	33.9	48.4	70.2	85.7	91.3	66.6	21.1
2022	8.4	100.0	32.6	42.4	73.8	91.1	95.7	67.7	24.7
2023	3.4	98.7	26.8	45.2	73.3	88.0	92.1	67.0	24.0
Minimum	1.8	96.4	26.8	39.0	57.1	75.9	85.2	56.5	15.5
Maximum	31.9	100.0	51.1	61.4	76.9	91.1	95.7	74.2	24.7
Average	11.0	98.6	37.9	50.4	71.3	86.2	91.7	**67.9**	20.3
$\dot{P}_k - \dot{P}_{k-1}$				12.5			5.5		
Standard deviation	8.7	1.1	7.2	6.6	5.3	4.2	3.1	4.5	2.8

Note. Prepared by the author, 2024.

a significant difference of 12.5%. However, the difference between the 90th and 50th percentiles is smaller, approximately 5.5%. District governments decreased public investment in 2020; however, after the pandemic, these governments experienced a rebound effect; that is, they reached levels of public investment execution similar to the periods prior to 2020. The purpose of this research is to demonstrate that the district governments of the department of Ayacucho do not make sufficient public investments, despite having resources for this task.

Research Related to the Variables under Study

Below are the relevant studies related to the execution of public investment by local and subnational or district governments.

Public investment has a significant and positive relationship with public debt (Galván *et al.*, 2023) and net debt shows a direct relationship with public investment (Dhawan & Yadav, 1997). In other words, domestic and foreign debt are sources of financing for public investment (Bint-e-Ajaz & Ellahi, 2012). In this regard, the conditions for accessing external credit influence public investment (Vashakmadze *et al.*, 2017).

However, for Mehrotra and Välilä (2006) contradictory results show that increases in public debt lead to a decrease in public investment; likewise, unforeseen increases in public debt lead to a reduction in public investment (Jalles & Medas, 2024). Public investment shows an inverse relationship with debt, due to the commitment of public resources to meet interests (Haraldsvik *et al.*, 2023).

Public financing sources such as specific transfers for capital expenditure, transfers for free availability, public debt and own revenue show a positive and significant relationship with public investment (Capello *et al.*, 2019). In this regard, it is also stated that financing sources significantly and positively influence public investment by local governments (Jiménez *et al.*, 2020; Lastra, 2017).

In line with the public financing items, fiscal revenues or tax revenues show a positive relationship with public investment (Vashakmadze *et al.*, 2017); in this regard, tax collection turns out to be very important to promote public investment (Chand & Kumar, 2004, p. 5616). Municipalities show high dependence on the resources available to provide public infrastructure (Goeminne & Smolders, 2014).

As for the political cycle, public investment in small local governments decreases during the first and third year of management, and is not significant during the second year (Jiménez *et al.*, 2020); in addition, public investment is reduced in the year prior to elections (Capello *et al.*, 2019). However, an increase in investment is observed during the election year (Haraldsvik *et al.*, 2023). Investments increase as elections approach (Goeminne & Smolders, 2014).

The competition for public resources to shape current expenditure and public investment also affects the level of execution of public investment (Goldsmith, 2008).

Public investment is essential but not sufficient for economic growth; likewise, it is crucial to choose which projects to invest in (Somik, 1999). In this regard, it is stated that public projects are related to the priorities of the authorities (Reyes Cortez, 2023); on the other hand, the population growth rate has a positive impact on public investment (Hansen, 1965). Public investment promotes greater private investment and together they improve production levels (Abiad *et al.*, 2016).

Problem, Objective and Hypothesis of the Research

In this line, the following research problem is raised: How do financing items and the political cycle influence public investment of the district governments of the department of Ayacucho 2008-2023? The objective is to analyze financing items and the political cycle as determinants of public investment of the district governments of the department of Ayacucho 2008-2023. The research hypothesis is: financing items and the political cycle explain public investment of the district governments of the department of Ayacucho 2008-2023.

Limitations of the Research

The main limitation of the research is that the results obtained are limited by the 2008-2023

time horizon. The relationship between the variables under study is evident in the study period.

The second limitation of this paper is that 13 recently created district governments in the department of Ayacucho do not meet the data requirements of the research method. Consequently, of the 113 district governments that make up the population, a sample of 100 district governments was obtained.

METHODS

The focus of this research is quantitative and the type of research is explanatory; in addition, the design is non-experimental. In this regard, a fixed-effects static balanced microeconomic data panel is applied.

The population is made up of 113 Ayacucho district governments, cross-section axis, with 100 district governments as a sample. The sampling criterion is non-probabilistic; that is, the sample is made up of all the district governments of the population under study that have data available for the panel type analysis in the period 2008-2023. In this context, the balanced sample is made up of 1,600 observations, where the cross-section axis is made up of 100 district governments and the time axis considers 16 years. The 13 district governments not considered in the study are Anchihuay, Andrés Avelino Cáceres Dorregaray, Canayre, Chaca, Magdalena, Ninabamba, Oronccoy, Patibamba, Pucacolpa, Putis, Río Unión Progreso, Samugari, and Uchuraccay. It is worthy to detail the typology of this research in order to explain the procedure used. In this regard, the research proposes an econometric model; that is, the relationship between the quantitative approach and mathematical methods is evident according to Hernández-Sampieri and Mendoza (2019). Systematization and analysis of the data on annual execution of public investment, financing items and political cycle correspond to the period 2008-2023. For this purpose, the StataSE-64 software version 16 is used, in agreement with what was indicated by Baena (2017), Niño (2011), Tamayo and Tamayo (2003), and Monje (2011) regarding research with a quantitative approach.

This work is explanatory in accordance with the provisions of Rivas (2017), and its objective is to determine the causal relationships (Pino, 2019; Sánchez *et al.*, 2018). To determine the causal relationships of local public investment, the significance levels, signs and values of the regressor variables parameter, such as financing items and political cycles, were analyzed. In addition, the research does not consider experimentation for data generation, coinciding with the arguments of Silvestre and Huamán (2019).

This research considers a longitudinal design of the microeconomic panel because the same 100 district governments are analyzed during the period 2008-2023, adjusting to what was pointed out by Díaz (2019) and Rosales (2010). On the other hand, a fixed effects panel is chosen because it captures the individual heterogeneity of the district governments (Wooldrige, 2010).

Description of Data Collection and Analysis

For data collection, a panel matrix was created using Excel software, entering the annual amounts in soles of the accrued public investment, the dependent variable, which appears on the transparency portal of the Ministry of Economy and Finance, Consulta Amigable, for each of the districts and study period. Then, for each of the seven financing items, the annual amounts in soles corresponding to the Modified Institutional Budget (PIM) were entered. Each of the values entered in the panel matrix, in current soles, were deflated using the Consumer Price Index (CPI), which allows current prices to be brought to constant prices, taking 2008 as the base year.

This procedure was developed to eliminate the influence and/or distortion of inflation on the results of this research. Each of the annual amounts at constant prices was then expressed in terms of natural logarithms.

After developing the VIF test in the general model, it was evident that the financing item related to *Canon* and *Sobrecanon* (additional redistributed tax revenue from extractive industries), Royalties, Customs Revenue, and Participations show severe multi-collinearity. After developing a set of VIF tests, it was determined that it is convenient to express this va-

riable as the 75th percentile of the respective real annual amounts; that is, canon2, by which the district government receives revenue equal to and/or greater than S/ 2 505.977. Therefore, the financing item *Canon* and *Sobrecanon*, Royalties, Customs Revenue and Participations is not expressed in terms of a natural logarithm; that is, it is expressed in terms of real monetary units.

Dummy data collected for the political cycle is assigned as follows: the value of 1 is for the first year of management and 0 otherwise; the value of 1 is for the second year of management and 0 otherwise; the value of 1 is for the third year of management and 0 otherwise, and the value of 1 is for the fourth year of management and 0 otherwise.

At the end of the data collection process, the panel matrix consisted of 11,200 data items related to financing; 6,400 data items related to the political cycle, making a total of 17,600 data items related to the independent variables. In addition, there are 1,600 data items corresponding to the dependent variable, which is public investment. The panel matrix enables the analysis of 19,200 data items related to both the dependent and independent variables of the econometric model.

The panel matrix was imported from Excel using the StataSE-64 software version 16 to analyze the collected data. Next, a set of econometric tests were developed to validate the final model. The tests developed are: i) normality test: bias test – Kurtosis; ii) normality test: Shapiro Wilk; iii) normality test: Kernel density estimate; iv) multi-collinearity test: VIF; v) heteroscedasticity test: residual plot; vi) heteroscedasticity test: Breusch – Pagan; vii) heterogeneity test: Breusch –Pagan; and viii) Hausman test to select the model between a fixed effects panel and a random effects panel. According to the results of each of the indicated tests, it was concluded that the hypothesis contrast of this research will be carried out using a fixed-effects static balanced microeconomic panel model with normal distribution.

Due to the presence of collinearity in the dummy variables of the political cycle, it was decided to eliminate the fourth year of local management from the econometric model. Finally, using the StataSE-64 commands for panel models, the results shown in Table 3 were obtained.

For results interpretation purposes, the model variables that are expressed in terms of natural logarithms have the advantage of interpreting the results as elasticities, understood as percentage variation. On the other hand, variable canon2 retains the real monetary units; that is, soles at a constant price with 2008 as the base year. Interpretation of the political cycle's first, second and third years of management results derive from the comparison with the public investment level achieved in the fourth year of municipal management.

Econometric Model

The econometric model of this research is proposed taking into consideration previous studies where explanatory variables and determinants of public investment are analyzed.

$$Ln\_ip_{it} = \beta_0 + \beta_1 ln\_rdr_{it} + \beta_2 ln\_ro_{it} + \beta_3 ln\_fcm_{it} + \beta_4 canon2_{it} + \beta_5 ln\_dna_{it} + \beta_6 ln\_cre_{it} + \beta_7 ln\_im_{it} + \beta_8 A1_{it} + \beta_9 A2_{it} + \beta_{10} A3_{it} + uit$$

The dependent and explanatory variables of the econometric model are detailed below.

Cross-section Dimension

i: 100 district governments under study in the department of Ayacucho.

Time Dimension

t: the period, 16 years of study, 2008-2023.

Dependent Variable or Response

ln_ip_{it} is the natural logarithm of the public investment accrued by district government i in year t, 2008 as the base year.

Explanatory Variables or Stimuli

a) Public Financing Items

ln_rdr_{it} is the natural logarithm of financing item Directly Collected Resources of district government i in year t, 2008 as the base year.

ln_ro_{it} is the natural logarithm of financing item Ordinary Resources of district government i in year t, 2008 as the base year.

ln_fcm_{it} is the natural logarithm of the Municipal Compensation Fund financing item of district government i in year t, 2008 as the base year.

$canon2_{it}$ is assigned the value of 1 when district government i, in at least one period, receives equal to or greater than the 75th percentile of financing item *Canon, Sobrecanon*, Royalties, Customs Revenue and Participations; that is, S/ 2,505,977, 2008 as the base year.

ln_dna_{it} is the natural logarithm of financing item Donations and Transfers of district government i in year t, 2008 as the base year.

ln_cre_{it} is the natural logarithm of financing item Resources from Official Credit Operations of district government i in year t, 2008 as the base year.

ln_im_{it} is the natural logarithm of financing item Municipal Taxes of district government i in year t, 2008 as the base year.

b) Political Cycle

$A1_{it}$ first year of district government management i in year t; value 1 is assigned to the first year of district government management, and 0 otherwise.

$A2_{it}$ second year of district government management i in year t; value 1 is assigned to the second year of district government management, and 0 otherwise.

$A3_{it}$ first year of district government management i in year t; value 1 is assigned to the first year of district government management, and 0 otherwise.

c) In addition

u_{it}: are the disturbances that affect the dependent variable that are not estimated in the model.

β: represents the parameter of each of the explanatory variables, which are estimated using the econometric model.

RESULTS

Table 3 shows the results consistent with the objective of the paper: to analyze the financing items and the political cycle as determinants of public investment by the district governments of the department of Ayacucho 2008-2023.

Table 3 shows the econometric model results analyzing financing items Ordinary Resources, Municipal Compensation Fund, canon2, Donations and Transfers, Resources from Official Credit Operations and Municipal Taxes. It also analyzes the political cycle, such as the first year of management, second year of management and third year of management, which corroborate the following hypothesis: the financing items and the political cycle explain public investment of the district governments of the department of Ayacucho 2008-2023. The variable Directly Collected Resources is the exception because it is not significant as a determinant of district public investment.

The main findings for each of the variables in the areas of financing and political cycle are described and explained below, taking into account the level of significance, sign and value of the results shown in Table 3; in addition, they are compared with the research hypothesis.

Financing Items Results

The financing items are made up of 7 variables, the results of which are detailed below.

a) Directly Collected Resources (ln_rdr)

The natural logarithm of Directly Collected Resources is not significant to explain public investment for a confidence level of 99%, 95% and 90%; that is, the resources corresponding to this item do not cause any effect on public investment. Therefore, there is not enough statistical evidence to reject the research hypothesis. The results of Table 3 show that the district governments of the department of Ayacucho collect insufficient revenue in terms of Directly Collected Resources, which end up being neutral to boosting local public investment.

b) Ordinary Resources (ln_ro)

The natural logarithm of Ordinary Resources is significant at a confidence level of 99%; therefore, there is sufficient statistical evidence to accept the research hypothesis. By showing a positive sign, it can be stated in terms of elasticity that a 1% increase in Ordinary Resources by the Ministry of Economy and Finance would

Table 3
Public Investment Results of the District Governments of the Department of Ayacucho, 2008-2023

	Regressor Variables	
Financing items	ln_rdr	0.00216
		(0.00385)
	ln_ro	0.0516***
		(0.00284)
	ln_fcm	0.0312***
		(0.00741)
	canon2	1.004***
		(0.0474)
	ln_dna	0.0400***
		(0.00372)
	ln_cre	0.0511***
		(0.00314)
	ln_im	0.0185**
		(0.00943)
Political Cycle	A1	-0.132***
		(0.0440)
	A2	-0.229***
		(0.0484)
	A3	-0.199***
		(0.0446)
Constant		12.78***
		(0.107)
Observations		1,600
Number of local governments		100

Note. Standard errors are in parentheses and significance levels are: *** p<0.01, ** p<0.05, * p<0.1. Prepared by the author, 2024.

produce an increase in public investment of 5.16% in district governments. The Ordinary Resources received by district governments come from Income Tax, General Sales Tax (IGV), Selective Consumption Tax (ISC) and Financial Transaction Tax (ITF).

c) Municipal Compensation Fund (ln_fcm)

The natural logarithm of the Municipal Compensation Fund is significant at a confidence level of 99%; therefore, there is sufficient statistical evidence to accept the research hypothesis. Since it shows a positive sign, in terms of elasticity it can be stated that a 1% increase in the Municipal Compensation Fund by the MEF would cause an increase in public investment of 3.12% in district governments. The Municipal Compensation Fund received by district governments depends mainly on the General Sales Tax (IGV).

d) Canon, Sobrecanon, Royalties, Customs Revenue and Participations (canon2)

When *Canon*, *Sobrecanon*, Royalties, Customs Revenue and Participations are equal to and/or higher than S/ 2,505,977 at constant prices with 2008 as the base year, it is significant for a confidence level of 99%; therefore, there is sufficient statistical evidence to accept the research hypothesis. By showing a positive sign, it can be stated that the district government that receives revenue equal to and/or higher than S/ 2,505,977 at constant prices of base year 2008, would increase public investment by 100.4%. That is, when *Canon*, *Sobrecanon*, Royalties, Customs Revenue and Participations represent a high revenue for the district gover-

nment, it produces an increase in public investment of more than 100%. This financing item is the main determinant with a positive effect on public investment.

e) Donations and Transfers (ln_dna)

The natural logarithm of Donations and Transfers is significant for a confidence level of 99%; therefore, there is sufficient statistical evidence to accept the research hypothesis. By showing a positive sign, in terms of elasticity, it can be stated that a 1% increase in donations and transfers by the MEF would lead to a 4% increase in public investment in district governments. The results in Table 3 show that donations and transfers have a positive influence on public investment.

f) Resources from Official Credit Operations (ln_cre)

The natural logarithm of the Resources from Official Credit Operations is significant at a confidence level of 99%; therefore, there is sufficient statistical evidence to accept the research hypothesis. Since it shows a positive sign, in terms of elasticity, it can be stated that a 1% increase in the Resources from Official Credit Operations by the MEF would produce an increase in public investment of 5.11% in district governments. The Ministry uses Official Credit Operations when there is a fiscal deficit; that is, when public spending is greater than public revenue.

g) Municipal Taxes (ln_im)

The natural logarithm of Municipal Taxes is significant at a confidence level of 99%; therefore, there is sufficient statistical evidence to accept the research hypothesis. Since it shows a positive sign, in terms of elasticity, it can be stated that a 1% increase in municipal taxes by the district municipality would produce an increase in public investment of 1.85%. The revenue collected by district governments as municipal taxes shows a lower impact on public investment when taking into account the other financing items.

Political Cycle Results

The political cycle is made up of the first, second and third years of municipal management.

a) First Year of Management

The first year of local management is significant for a confidence level of 99%; therefore, there are sufficient statistical indications to accept the research hypothesis. Table 3 shows a negative sign for this variable; therefore, it can be indicated that during the municipal authority's first year of management, public investment is reduced by 13.2%. This result shows that the new municipal administration has weaknesses to develop public investment in its district.

b) Second Year of Management

The second year of local management is significant for a confidence level of 99%; therefore, there are sufficient statistical indications to accept the research hypothesis. Table 3 shows a negative sign for the second year; therefore, it can be indicated that during the municipal authority's second year of management, public investment is reduced by 22.9%, that is, during the second year the fall in public investment is accentuated.

c) Third Year of Management

The third year of local management is significant for a confidence level of 99%; therefore, there are sufficient statistical indications to accept the research hypothesis. Table 3 shows a negative sign for the third year; therefore, it can be indicated that during the municipal authority's third year of management, public investment is reduced by 19.9%. In other words, until the third year of the government period, the weaknesses of municipal management linked to the execution of local public investment are sustained.

It is in the fourth year of municipal management that investment levels increase; that is, of the four years of local government term, in the first three years public investment reduces significantly, and it is in the last year of management that public investment grows.

DISCUSSION

According to the results of the research, of the 7 variables that make up the financing items, 6 of them corroborate that they are determinants of public investment, and the 3 years of

public management that make up the political cycle are shown to be determinants of public investment.

Discussion of Financing Items

The public resources that district governments use to finance public investment come mainly from transfers from the MEF and from resources generated in the district itself.

a) Directly Collected Resources (ln_rdr)

The increase by 1% in Directly Collected Resources of the district governments of the department of Ayacucho is statistically not significant in boosting public investment by such district governments.

The current findings of this research differ from the findings of Jiménez *et al.* (2020), who concluded that small local governments in Peru increase public investment by 5.76% in response to a 1% increase in directly collected resources. In addition, Lastra (2017) points out that small and micro local governments increased their investments by 3.66% and 3.62%, respectively, as a result of a 1% increase in own resources, which are the sum of two revenues: municipal taxes and directly collected resources. We agree with the results of Jiménez *et al.* (2020), who point out that directly collected resources are not significant in explaining the public investment of medium-sized local governments.

The district governments of the department of Ayacucho have the power to collect their own revenues, including directly collected resources, but the annual amount is insufficient to influence local public investment.

In a context where the population shows resistance to paying for municipal services and/or where the district municipality collects less revenue than the cost of providing the municipal service, favorable conditions are created for the disinterest of the local population in carrying out citizen control of municipal government expenses. That is, the population expresses little commitment to follow up on investment decisions made by the municipal government. To reverse such a context, the district municipality should build a culture of payment among the population for the municipal services provided, with the limitations that come with setting implementation measures; some of them being probably unpopular for the municipal government in office.

b) Ordinary Resources (ln_ro)

The increase in Ordinary Resources by 1% of the district governments of the department of Ayacucho increases public investment by 5.16%. In terms of financing items, ordinary resources are the second most influential factor in public investment of the district governments of the department of Ayacucho. This is mainly due to the capacity of the Central Government, under the Public Sector Budget Act, to transfer Ordinary Resources from the ministries to the local district governments, subject to institutional approval.

The current research confirms the conclusions of Lastra (2017) and Jiménez *et al.* (2020) regarding ordinary resources: district governments show a positive and significant relationship with public investment.

Jiménez *et al.* (2020) find that 5.38% of small local governments increase their public investment with a 1% increase in ordinary resources. Lastra (2017) points out that small and micro local governments increase their investment by 14.4% and 14.5%, respectively, with a 1% increase in ordinary resources. The value of the current study is similar to that of Jiménez *et al.* (2020).

This is consistent with Vashakmadze's *et al.* (2017) finding, Chand and Kumar (2004) and Goeminne and Smolders (2014) findings, in the sense that ordinary resources come from tax collection such as Income Tax, General Sales Tax, Selective Consumption Tax, Financial Transactions Tax and other tax sources. In other words, in this research the significant and positive relationship between tax collection and public investment is evident, and the dependence on available public resources to develop public investment is shown.

This implies that the MEF, responsible for fiscal policy, with the purpose of boosting public investment in district governments, should gradually promote the formalization and expansion of the tax base. This measure would

have as one of its consequences greater public investment due to greater collection of Income Tax (IR), General Sales Tax (IGV), Selective Consumption Tax (ISC), and Tax on Financial Transactions (ITF), as said taxes contribute to the formation of the Ordinary Resources item. In order to develop tax policies, the limitation faced by the MEF is that the Peruvian economy has been recovering from a recent economic recession that occurred during the year 2023 (BCRP, 2023). In this context, on August 8, 2024, the BCRP, responsible for monetary policy, with the aim of promoting economic recovery, decided to lower the reference interest rate from 5.75% to 5.50% (BCRP, 2024).

c) Municipal Compensation Fund, ln_fcm

Public investment increases by 3.12% thanks to the increase of the Municipal Compensation Fund by 1% in the district governments of the department of Ayacucho.

This research agrees with the conclusions of Lastra (2017): the Municipal Compensation Fund has a positive effect on public investment. The author points out that small and micro local governments increase their investment by 4.65% and 3.08%, respectively, with a 1% increase in the Municipal Compensation Fund.

This research also agrees with Vashakmadze's *et al.* (2017), Chand and Kumar (2004) and Goeminne and Smolders (2014) findings, since the revenue from the Municipal Compensation Fund come from the Municipal Promotion Tax, which is 2% of the General Sales Tax. In other words, tax collection has a significant and positive influence on the public investment of district governments. This implies that the MEF promotes measures that stimulate the economy and the labor market; in this way, consumption is stimulated and, consequently, the collection of the IGV increases. Such higher revenues would increase public investment financing of the district governments through the Municipal Compensation Fund, defined as 2% of the operations affected by the IGV. The limitation faced by the MEF is tax evasion.

d) *Canon, Sobrecanon*, Royalties, Customs Revenue and Participations (Canon2)

Public investment increases by 100.4% for district governments of the department of Ayacucho that receive an amount equal to or greater than S/ 2,505,977 in 2008 as the base year, corresponding to *Canon, Sobrecanon*, Royalties, Customs Revenue and Participations.

Revenue from *Canon, Sobrecanon*, Royalties, Customs Revenue and Participations exceeding S/ 2,505,977 in base year 2008 represent the first and most important driver of public investment. This is because these resources are limited to financing only public investment and do not allow the financing of current expenditure.

This research corroborates the results of Jiménez *et al.* (2020) and Lastra (2017). A positive and significant relationship is shown between the allocation of resources from the exploitation of natural resources and the public investment of district governments.

Jiménez *et al.* (2020) find an increase in public investment of 6.73% in small local governments when the 1% increase in the transfer of public resources associated with natural resources is added. On the other hand, Lastra (2017) points out that a 1% increase in *Canon* and other items increases investment in 24.6% of small local governments and in 15.4% of micro local governments. According to Capello *et al.* (2019), this determines that investment increases by 238.06% with a 1% increase in public resource transfers for specific public investment.

In this research, variable ln_canon is recoded due to its multi-collinearity, and variable canon2 is used as a dummy variable. The aforementioned explains the difference in the values obtained by Jiménez *et al.* (2020) and Lastra (2017). The recoding carried out shows that district governments with high revenues in the Canon category achieve high levels of public investment execution.

This variable implies that only district governments that receive revenue equal to and/or greater than S/ 2,505,977 from *Canon, Sobrecanon*, Royalties, Customs Revenue and Participations will be able to increase public investment by more than 100%. *Canon* is understood as 50% of the Income Tax from the extractive activity carried out in the district. On the other hand, the mining royalty is an

effective rate paid by companies in the sector to the government (MEF, 2023). The limitation that the National Government faces to increase revenue from this financing item is to unblock the operations of mining activities, resolve socio-environmental conflicts, and promote the formalization of mining activities.

For the purposes of exemplifying the description in the previous paragraph, on August 5, 2024, a socio-environmental conflict began in the province of Huanta, department of Ayacucho, due to the population's rejection of the continuation of the mining operation in the headwaters of the Razuhuillca mountain range, where the population's water source comes from (Defensoría del Pueblo, 2024). On the other hand, on April 3, 2024, Bill 7462/2023-CR was submitted to the Congress of the Republic, which considers in section 1 to change article 6 of Legislative Decree 1293; that is, to extend the term of validity of the mining formalization process until December 31, 2027.

e) Donations and Transfers (ln_dna)

Public investment increases by 4.0% thanks to the increase in donations and transfers of 1% of the district governments of the department of Ayacucho. In terms of financing items, donations and transfers, understood as non-reimbursable funds received by the government and for which there is no compensation, are the fourth most important driver of district public investment. This shows that public revenue from tax collection is complemented with donations and transfers to boost public investment of district governments.

This variable implies that the National Government and the Ministry of Economy and Finance are dependent on donations and transfers made by international and/or national institutions to promote public investment by district governments. Both face the limitation of generating sufficient public revenue to finance public investment; that is, the MEF has scarce resources to steadily increase public investment by district governments.

f) Resources from Official Credit Operations (ln_cre)

Public investment increases by 5.11% thanks to a 1% increase in the Resources from Official Credit Operations of the district local governments of the department of Ayacucho. The third most influential factor in the public investment of the district governments of the department of Ayacucho is the financing through Resources from Official Credit Operations. The Central Government has the power to transfer funds, prior agreement, from Resources from Official Credit Operations to the district governments; resources that were initially destined for public investment in ministries.

The research shows a positive and significant relationship between Resources from Official Credit Operations and the public investment of the district governments of the department of Ayacucho, which is consistent with the findings of Galván *et al.* (2023), Dhawan and Yadav (1997), Bint-e-Ajaz and Ellahi (2012), Capello *et al.* (2019), and Jiménez *et al.* (2020).

Galván *et al.* (2023) demonstrate the importance of debt as a source of financing for public investment, which shows positive effects on economic and social growth and development in the medium and long term. For their part, Jiménez *et al.* (2020) find that small local governments receive a 1.17% increase in public investment as a result of the 1% increase in resources from official credit operations.

In turn, Capello *et al.* (2019) state that a 1% increase in Public Debt increases public investment in 6.01% of subnational governments. While Bint-e-Ajaz and Ellahi (2012) point out that, given the lower tax collection by the government, government debt is a relevant means to boost public investment. For their part, Dhawan and Yadav (1997) show that debt positively influences public investment; in this regard, they allocate two-fifths of debt revenues to finance public investment.

However, the results found disagree with the claims made by Mehrotra and Välilä (2006), Jalles and Medas (2024), and Haraldsvik *et al.* (2023), which implies that the Ministry of Economy and Finance uses Resources from Official Credit Operations to cover the public investment needs of district governments. The limitation faced by the MEF is that on April 24, 2024, rating agency Standard & Poor's (S&P) lowered Peru's long-term sovereign rating in foreign currency from BBB to BBB- and in local

currency from BBB+ to BBB (S&P, 2024), which results in an increase on the interest rate on loans that Peru requests from international and/or national institutions.

g) Municipal Taxes, ln_im

Public investment increases by 1.85% due to the increase in the Municipal Tax by 1% in the district governments of the department of Ayacucho. The revenue generated in the district itself is relatively small to boost public investment in the district.

This research corroborates the results of Lastra (2017) and demonstrates a positive relationship between municipal taxes and public investment. The author points out that small and micro local governments would increase their investment by 3.66% and 3.62%, respectively, as a result of a 1% increase in own resources, which are the sum of municipal taxes and directly collected resources.

This variable implies that district governments collect insufficient municipal taxes from their district to significantly boost public investment in the district itself, a reality that justifies the lack of commitment from the organized civil population to commit to the control of public resources used by municipal management in terms of local public investment. The municipal government once again faces the limitation of developing probably unpopular measures to create a culture of payment of municipal taxes, understood as the sum of revenue from Property Tax, Real Estate Transfer Tax, Vehicle Property Tax, Betting Tax, Gambling Tax, Non-Sporting Public Shows Tax, Casino Games Tax, and Slot Machine Games Tax.

Discussion of the Political Cycle

a) First Year of Management

According to the research, in the department of Ayacucho, district governments experienced a 13.2% decrease in public investment during the first year of management compared to the fourth year of management.

The new local government begins its mandate by changing the people in charge of positions of trust, which extends to other related areas. This affects operational planning of the first year of management and contributes to the decrease in public investment.

This research corroborates the results of Jiménez *et al.* (2020), which indicate that public investment in district governments decreases at the end of the first year of management. These authors found that small local governments experienced a 30.4% decrease in public investment during the first year of management compared to the fourth year of management. This variable implies that the new and/or incoming municipal administration reflects notable weaknesses in executing public investment, because the new authority has the power to change those responsible for positions of trust, generally occupied by the closest environment of the new elected authorities. The limitation that the municipal authority faces in reversing this reality is the lack of will to implement meritocratic processes in the hiring of personnel.

b) Second Year of Management

According to the research, in the department of Ayacucho, district governments experienced a 22.9% decrease in public investment during the second year of management compared to the fourth year of management.

During the first year, changes in positions of trust had a negative impact on the strategic planning of the second year of management, resulting in a reduction in public investment. On the other hand, staff changes during the second year have an impact on the operational planning of the current year. Local public investment decreases as a result of the sum of the above-mentioned changes.

This research differs from the results of Jiménez *et al.* (2020) in that they conclude that the variation in public investment by small local governments during the second year of management is not significant compared to the fourth year of management. This variable implies that management weaknesses end up becoming more pronounced during the second year of municipal management. The limitation that the municipal authority faces in implementing meritocratic processes in the hiring of personnel is the constant pressure exerted by the allies who supported and/or financed the

electoral campaign, which concluded with the election of the new district authorities.

c) Third Year of Management

According to the research, in the department of Ayacucho, district governments experienced a 19.9% decrease in public investment during the third year of management compared to the fourth year of management.

This research corroborates the results of Jiménez *et al.* (2020), which indicate that public investment in district governments decreases at the end of the third year of management. These authors find a 13.6% decrease in public investment in small local governments during the third year of management compared to the fourth year of management. This is consistent with the findings of Capello *et al.* (2019), which indicate a decrease in investment in the year prior to elections.

On the other hand, with regards to the fourth year of municipal management, we agree with the results of Haraldsvik *et al.* (2023) and Goeminne and Smolders (2014), who observe the increase in public investment in this period. This variable implies that management generates staff turnover working in the district municipality, making it impossible for them to specialize and accumulate experience, which negatively affects the execution of public investment. Once again, it faces the limitation of developing meritocratic selection processes of personnel working in the district municipality.

The quantitative analysis of the implications and limitations mentioned in the discussion of this research are outside the research objectives and hypotheses; therefore, it is recommended to develop complementary studies that address these aspects.

CONCLUSIONS

According to the results obtained, it can be concluded that the financing items comprised by i) Ordinary Resources, ii) Municipal Compensation Fund, iii) Donations and Transfers, iv) Resources for Official Credit Operations, and v) Municipal Taxes are significant and positive determinants of public investment of the district governments of the department of Ayacucho in the study period, for a confidence level of 99%. *Canon* and *Sobrecanon*, Royalties, Customs Revenue and Participations received by the local government that are equal to or greater than S/ 2,505,977, 75th percentile, are significant and positive determinants of local public investment, with a confidence level of 99%. Directly Collected Resources are not determinants of public investment, for a confidence level of 99%, 95% and 90%. Regarding the political cycle, the local management results of the first, second and third years are significant and negative determinants of public investment by district governments, for a confidence level of 99%.

The degree of importance of the determinants of public investment by the district governments of the department of Ayacucho is expressed based on the value of the parameter of the econometric model determined in this research (see Table 3). Here are the public financing items from highest to lowest value in absolute terms: i) *Canon* and *Sobrecanon*, Royalties, Customs Revenue and Participations; ii) Ordinary Resources; iii) Resources for Official Credit Operations; iv) Donations and Transfers; v) Municipal Compensation Fund; and vi) Municipal Taxes. In the political cycle, the results of local management are the following from highest to lowest value in absolute terms: i) second, ii) third, and iii) first year. Directly Collected Resources are not significant for public investment.

In this regard, the results of this study provide reliable empirical evidence on the determinants of public investment by local governments. Furthermore, this paper seeks to contribute to the study and understanding of the determinants of public investment and, in this way, support the solution to the problem that local governments suffer from, related to the low levels of execution of annual public investment.

It is recommended that future empirical research be carried out to expand knowledge regarding the determinants of public investment in local or subnational governments.

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Conflict of Interest

The author has no conflicts of interest to declare.

Author Contribution

Marco Antonio Palomino Moisés (lead author): conceptualization, data curation, formal analysis, investigation, methodology, software, writing (original draft, review and editing).