Interdisciplinary Scientific Journal Research and Knowledge
2025, Vol. 15, No. 2 e-ISSN: 1390-8146
Published by: Universidad Técnica Luis Vargas Torres

Fiscal decentralization and human development: an analysis for Latin America

Fiscal Decentralization And Human Development: An Analysis For Latin America

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Received 2025-01-12
Revised 2025-04-07
Published 2025-06-09
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Pages: 165 -192

Summary

This study examines the relationship between fiscal decentralization and human development in Latin America, using data from 15 countries between 1990 and 2020. The objective is to assess how subnational spending, alongside variables such as access to drinking water, education and health expenditures, and regulatory quality, influence the Human Development Index (HDI). Static and dynamic panel models were employed, including the Arellano-Bond method to control for endogeneity. Results indicate that fiscal decentralization and access to drinking water have a positive and significant impact on HDI, while education and health spending show variable effects. The study concludes that efficient public management and reducing inequalities are crucial for enhancing human development in the region.

How to cite this article (APA): Dominguez, P., Pinilla, D . (2025) Fiscal decentralization and human development: an analysis for Latin America, *Revista Científica Interdisciplinaria Investigación y Saberes,* 15 (2) 165-192

Keywords: Fiscal Decentralization, Human Development, Subnational Spending, Panel Data.

Resumen

Este estudio analiza la relación entre la descentralización fiscal y el desarrollo humano en América Latina, utilizando datos de 15 países entre 1990 y 2020. El objetivo es evaluar cómo el gasto subnacional, junto con variables como el acceso al agua potable, el gasto en educación y salud, y la calidad regulatoria, influyen en el Índice de Desarrollo Humano (IDH). Se emplearon modelos de panel estáticos y dinámicos, incluyendo el método de Arellano-Bond para controlar la endogeneidad. Los resultados muestran que la descentralización fiscal y el acceso al agua potable tienen un impacto positivo y significativo en el IDH, mientras que el gasto en educación y salud presenta efectos variables. Se concluye que la eficiencia en la gestión pública y la reducción de desigualdades son clave para mejorar el desarrollo humano en la región.

Palabras clave: Descentralización Fiscal, Desarrollo Humano, Gasto Subnacional, Datos De Panel.

Introduction

The relationship between fiscal decentralization and human development in Latin America has been the subject of extensive studies in the academic literature. It has been proposed that fiscal decentralization allows for a better distribution of resources and greater efficiency in the provision of public services, which could have a positive impact on human development.

From a theoretical approach, authors such as Oates (1972) and Smith (2013) have pointed out that decentralization allows for a more efficient allocation of public resources, by bringing decision-making

closer to citizens and facilitating a more accurate response to their needs. This logic is based on the assumption that subnational governments have better information on local demands, which should translate into improvements in public services, especially in health, education and drinking water, considered fundamental pillars of human development.

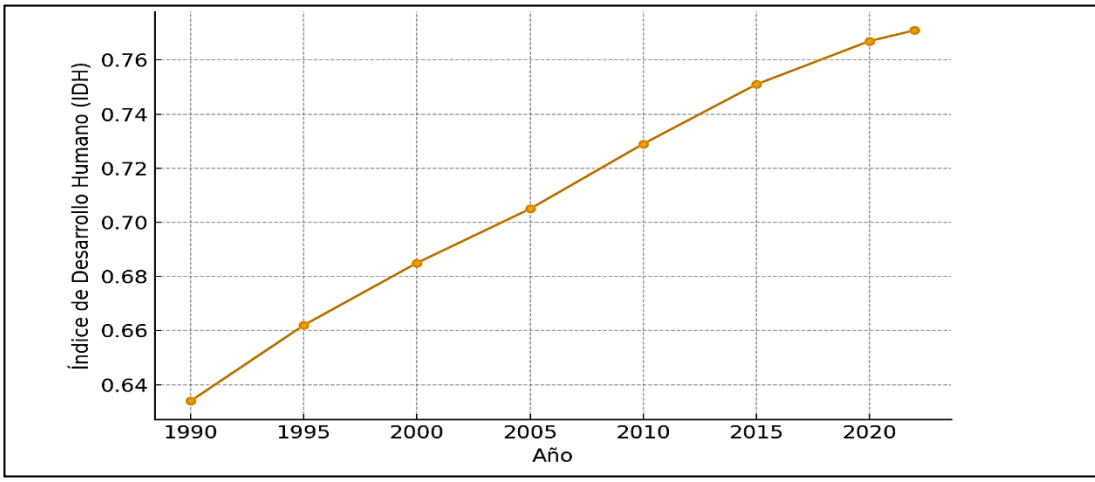
However, empirical evidence shows mixed results. In some countries, such as Brazil or Colombia, decentralization has generated positive impacts in terms of coverage of basic services and territorial equity. In contrast, in countries such as Mexico, Venezuela or Argentina, the effects have been limited or even negative, mainly due to structural failures such as the limited administrative capacity of local governments, excessive dependence on fiscal transfers and corruption (Mehmood & Sadiq, 2010; Miranda-Lescano et al., 2022).

In this sense, it is essential to understand what institutional conditions allow fiscal decentralization to effectively contribute to human development. For Pinilla-Rodríguez et al. (2015), the success of the decentralization model requires not only financial autonomy, but also clear rules of accountability, social control mechanisms, and technical capacities at subnational levels of government. Otherwise, decentralization may perpetuate or even deepen regional inequalities (The Problem of Corruption in Government Organizations, 2021).

Human development has been conceptualized by the United Nations Development Program (UNDP) as a process of expanding people's real freedoms, beyond mere economic growth. At its core, human development implies access to opportunities that improve the quality of life, such as education, health and a decent standard of living (UNDP, 2023). The main instrument for measuring this is the Human Development Index (HDI), which integrates three dimensions: life expectancy, years of schooling and adjusted GDP per capita.

In Latin America, the HDI has shown an increasing trend in recent decades, although with marked inequalities between countries and regions. The following graph illustrates the evolution of the HDI in the region between 1990 and 2022

Figure 1: Evolution of HDI in Latin America according to UNDP data (2023)



Source: UNDP (2023

In Latin America, the HDI has experienced an increasing trend in recent decades, rising from 0.634 in 1990 to 0.771 in 2022 (UNDP, 2023). However, these figures hide profound inequalities. While countries such as Chile and Uruguay exhibit high levels of human development, others such as Honduras and Nicaragua show significant lags. Economic crises, natural disasters and political instability have negatively affected human development at different historical moments, accentuating the fragility of social protection systems (Sofilda et al., 2023; Ginanjar et al., 2020).

Factors such as economic crises, political instability and natural disasters have negatively affected human development in the region. In addition, social inequality and labor informality continue to limit equitable access to basic public services (Sofilda et al., 2023; The Problem of Corruption in Government Organizations, 2021).

According to recent studies, investment in human capital has been one of the main drivers of growth in countries with a higher HDI. For example, in Uruguay, education policy and universal health coverage have reduced inequality gaps (Pinilla-Rodríguez et al., 2015).

Human development in Latin America has been a topic of wide academic and political debate, especially in recent decades. Authors such as Amartya Sen, Martha Nussbaum, and organizations such as the United Nations Development Program (UNDP) have contributed significantly to the understanding of the factors that influence human development in the region. This concept, which goes beyond economic growth, focuses on the expansion of people's capabilities and opportunities to lead lives they value. In this text, the main determinants of human development in Latin America are explored, based on actual authors and references.

One of the main obstacles to human development in Latin America is persistent economic and social inequality. According to the UNDP report (2020), the region continues to be one of the most unequal in the world, with a Gini coefficient that exceeds 0.45 in many countries. Authors such as Thomas Piketty (2014) have highlighted how the concentration of wealth in the hands of a minority limits access to basic services such as education, health and housing for broad sectors of the population. This inequality not only affects material well-being, but also opportunities for social mobility and the development of individual capabilities.

Education is a fundamental pillar for human development, as Amartya Sen has pointed out in his book "Development as Freedom" (1999). In Latin America, although there have been significant advances in educational coverage, challenges persist in quality and equity. According to the Economic Commission for Latin America and the Caribbean (ECLAC, 2018), educational gaps between urban and rural areas, as well as between different socioeconomic strata, remain significant. In addition, authors such as Heckman (2006) have emphasized the importance of early education

and its impact on the development of cognitive and non-cognitive skills, which is crucial to break cycles of poverty.

Health is another key determinant of human development. Martha Nussbaum, in her capabilities approach, highlights the importance of having a healthy life as one of the fundamental freedoms. In Latin America, although there have been improvements in indicators such as life expectancy and the reduction of infant mortality, inequalities persist in access to quality health services. According to the Pan American Health Organization (PAHO, 2019), rural populations and indigenous groups face significant barriers to access adequate health care. In addition, the COVID-19 pandemic has exacerbated these inequalities, evidencing the fragility of health systems in the region.

The quality of institutions and governance also play a crucial role in human development. Douglass North, in his work "Institutions, Institutional Change and Economic Performance" (1990), argues that institutions are fundamental to economic and social development. In Latin America, institutional weakness, corruption and lack of transparency have been persistent obstacles. According to Transparency International's Corruption Perceptions Index (2021), many countries in the region have low scores, which affects the efficiency of public policies and citizens' trust in the state.

Gender equity is another determinant of human development. Authors such as Naila Kabeer (2005) have highlighted how gender discrimination limits women's opportunities and, therefore, the development of their capabilities. . In Latin America, although there have been advances in women's political and labor participation, wage gaps and cultural barriers persist that limit their full development. According to the UNDP report (2019), gender violence and lack of access to reproductive health services are serious problems that affect the well-being of women in the region.

The environment and sustainability are also key determinants of human development. Authors such as Jeffrey Sachs, in his book "The

Age of Sustainable Development" (2015), have emphasized the importance of a sustainable approach to ensure the well-being of future generations. In Latin America, environmental degradation, deforestation and climate change are negatively affecting the quality of life of millions of people. According to the World Bank (2020), natural disasters and biodiversity loss are exacerbating poverty and inequality in the region.

Finally, culture and diversity are aspects that cannot be ignored when talking about human development. Authors such as Arjun Appadurai (1996) have highlighted how culture influences people's aspirations and capabilities. In Latin America, cultural and ethnic diversity is a fundamental characteristic, but also a challenge in terms of inclusion and recognition of rights. According to ECLAC (2020), indigenous and Afro-descendant peoples face higher levels of poverty and exclusion, which limits their human development.

Thus, economic and social inequality, education, health, institutional quality, gender equity, environment and culture are factors that interact dynamically to influence people's opportunities and capabilities. Authors such as Amartya Sen, Martha Nussbaum, and organizations such as UNDP and ECLAC have provided theoretical frameworks and empirical evidence to better understand these challenges. In order to move towards more inclusive and sustainable human development in the region, it is necessary to address these determinants in a comprehensive manner, with public policies that promote equity, social justice and respect for diversity.

Fiscal decentralization in Latin America has been promoted as a mechanism to improve the administration of public resources and strengthen citizen participation in decision-making. This process involves the transfer of competencies and funds from central governments to subnational governments (Oates, 1972; Pinilla-Rodríguez et al., 2015; Smith, 2013).

Decentralization models vary within the region. Brazil and Argentina have implemented federal systems with high autonomy for their local governments, while countries such as Peru and Colombia have adopted decentralized systems in which the central government retains considerable control over the distribution of resources (Hung & Thanh, 2022; Sofilda et al., 2023).

One of the main challenges of fiscal decentralization in the region is the unequal revenue-generating capacity of local governments. While some localities have a strong tax base, others depend almost exclusively on transfers from the central government, which perpetuates inequalities in access to goods and services (The Problem of Corruption in Government Organizations, 2021; Mehmood & Sadiq, 2010).

Studies on fiscal decentralization have found that, in some cases, the process has led to a better distribution of resources, but in others it has generated an increase in corruption and inefficient administration (Delgado et al., 2022).

The relationship between fiscal decentralization and human development has been widely discussed in the literature, with studies arguing both for and against its effects. In theoretical terms, argues that fiscal decentralization can improve human development by allowing a more efficient allocation of resources adjusted to local needs. However, empirical results have been mixed and depend largely on the institutional and economic context of each country (Ginanjar et al., 2020; Sofilda et al., 2023).

In some Latin American countries, decentralization has led to improvements in education and public health. In Brazil, for example, the strengthening of local governments has facilitated a better distribution of health services, increasing life expectancy and reducing infant mortality. However, in Mexico and Argentina, decentralization has been marked by problems of corruption and inequalities in the allocation of funds, resulting in heterogeneous

quality of public services across regions (Delgado et al., 2022; Mehmood & Sadiq, 2010; Miranda-Lescano et al., 2022).

Another relevant aspect is the capacity of local governments to manage decentralized resources. In cases where local administrations have a solid structure and an adequate level of fiscal autonomy, significant progress has been made in human development. However, in those regions where resources are captured by political elites or used inefficiently, decentralization has had a negative or no impact on the welfare of the population (The Problem of Corruption in Government Organizations, 2021; Sofilda et al., 2023).

In addition, recent studies suggest that fiscal decentralization should be accompanied by adequate oversight and transparency mechanisms to avoid mismanagement of funds. Lack of regulation and control can lead to decentralization generating more inequality, benefiting certain regions while leaving others without sufficient resources to improve their human development (Pinilla-Rodriguez et al., 2015; Hung & Thanh, 2022).

Finally, the cultural and ethnic diversity that characterizes Latin America also constitutes an important challenge for the design of inclusive public policies. The historical marginalization of indigenous and Afro-descendant peoples has led to high levels of poverty and exclusion, which calls for an intercultural approach to human development (ECLAC, 2020).

In this complex and multidimensional framework, this research proposes to analyze the effect of subnational spending -as a proxy of fiscal decentralization- on human development in 15 Latin American countries during the period 1990-2020. Through the use of panel data models, we seek to understand whether greater autonomy in the use of public resources by local governments translates into an improvement in the living conditions of the population.

Methodology

In order to determine the effect of subnational spending on human development in Latin America, 15 countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru and Uruguay) were analyzed for the period 1990 to 2020.

For this purpose, the Human Development Index (HDI) was considered as the dependent variable, and subnational spending (expsub, decentralization variable), access to drinking water (water), primary education spending per student (eduexp), public spending on health (health) and regulatory quality (rolaw) as explanatory variables, as detailed in Table 1.

Table 1: Variables used in the study

Variable	Definition	Source
Human Development Index (HDI)	It is a composite statistical indicator that measures the level of development of countries according to three basic dimensions of human development. It ranges from 0 to 1, where this value indicates the highest level of human development.	UNDP (2025)
Access to drinking water	Percentage of people using at least basic water services. This indicator covers both people using basic water services and those using safely managed water services.	World Bank (2024)
Public health expenditure per capita expressed in dollars (eduexp)	Public expenditure per student is the average general government expenditure (current, capital and transfers) per student at a given level of education, expressed as a percentage of GDP per capita.	World Bank (2024)
Public spending on education (health)	Public expenditure to provide health services to the population, regardless of the entity that financed or managed it, expressed in per capita terms.	World Bank (2024)
Rule of Law (rolaw)	Captures perceptions of the extent to which agents trust and comply with societal norms, and in particular the quality of contract enforcement, property rights, police and courts, as well as the likelihood of crime and violence	World Bank (2024)
Subnational spending (expsub)	Ratio of own spending directly executed by subnational governments to total general government spending.	International Monetary Fund (2024).

The relationships of the explanatory variables with the HDI are expected to be positive and significant, as stated in the literature, contrasting them through the estimation of the following equation:

$$IDH_{it} = \beta_o + \beta_1 expsub_{it} + \beta_2 water_{it} + \beta_3 eduexp_{it} + \beta_4 health_{it} + \beta_5 rolaw_{it} + \varepsilon_{it}$$

Where:

Human Development Index (*HDI*): composite measure developed by the United Nations Development Programme (UNDP) that assesses the development of countries by considering three key dimensions : health (life expectancy at birth), education (expected years and average years of schooling) and standard of living (adjusted gross national income per capita). It aims to provide a more comprehensive view of human well-being, beyond mere economic growth (UNDP, (2023). Its values range from 0 to 1, where one is maximum human development. The data are taken from the United Nations Development Programme (UNDP, 2025).

Decentralization of subnational government spending (ratio of subnational own spending to general government spending) (*ExpSub*). Measures the proportion of spending directly executed by subnational governments in relation to total general government spending. It is expressed as the ratio of subnational governments' own spending (excluding transfers) to total public sector spending, reflecting the degree of financial autonomy and decentralized management capacity (OECD, 2019). Data are from the fiscal decentralization database of the International Monetary Fund (IMF, 2001).

People using at least one basic drinking water service (% of population) (*Water*). This indicator covers both people using basic water services and those using safely managed water services. Basic drinking water services are defined as drinking water from an improved source, provided that the collection time does not exceed 30 minutes for a round trip. Improved water sources include piped

water, drilled or tube wells, protected dug wells, protected springs, and packaged or home-delivered water. Data are from WHO/UNICEF Joint Monitoring Programme on Water Supply, Sanitation and Hygiene (WHO/UNICEF, 2023).

Access to safe drinking water is considered essential for human development. The lack of adequate water and sanitation services contributes to the spread of diseases, affecting health and reducing the productivity of populations. It has been estimated that 80% of all diseases and more than one third of deaths in developing countries were due to the consumption of contaminated water (Villena, 2018). Furthermore, the World Bank (2023) highlights that improved access to clean water drives economic development and is essential for achieving the Sustainable Development Goals. Therefore, ensuring universal access to clean water is crucial to improve the Human Development Index in nations.

Public expenditure per student, primary education (% of GDP per capita) (*eduexp)*. Calculated by dividing total public expenditure on primary education by the number of students in primary education, expressed as a percentage of GDP per capita. The aggregate data are World Bank estimates. It is considered that there is a positive and direct relationship between public spending on education and the Human Development Index (HDI). Adequate investment in the education sector improves the quality of life and economic opportunities of the population, although such relationship may be mediated by the efficiency and equity that characterizes this expenditure (López et al., 2016; IDB, 2018).

General government health spending per capita (constant 2015 dollars) (*Health*). Public health spending usually includes outlays made to provide health services to the population (vaccination campaigns, dissemination of information on health and healthy lifestyles, occupational health, health services provided to individuals and collectives, etc.), regardless of the entity that financed or managed it. Included are internal transfers and subsidies, transfers

and subsidies to voluntary schemes, as well as health social security contributions. This indicator describes the role of internal government sources in financing health care compared to private and external sources. Data are from the World Bank.

In general, it has been observed that higher health spending tends to correlate positively with a higher HDI. This is because the HDI considers not only life expectancy, but also education and per capita income, all of which are affected by the quality of and access to health services. Countries that devote a higher percentage of their GDP to health generally have a higher HDI, showing a direct relationship between these variables" (UNDP, 2022).

Rule of Law (*Rolaw*). It captures the perception of the degree of trust and compliance with social norms by agents, in particular the quality of contract enforcement, property rights, police and courts, as well as the likelihood of crime and violence. The estimate provides the country's score on the aggregate indicator, in units of a standard normal distribution, i.e., with an approximate range of 1 to 6.

It is understood that a strong rule of law contributes significantly to social and economic development, which in turn is reflected in a higher HDI. Compliance with the rule of law ensures the protection of human rights and fundamental freedoms. For example, an effective and accessible justice system, or an environment of predictability that fosters investment and economic growth, are essential to ensure that all people can enjoy their basic rights, which directly impacts human development, (UNDP, 2016; Global Justice Foundation, 2021).

Given that the data correspond to time series and cross-section, panel data are estimated, both static, in which the past of the variable is not considered, and dynamic, given that the HDI is a non-stationary variable that depends on the behavior of its lags.

In the first case, heterogeneity is analyzed through fixed and random effects and the selection is performed using the Hausman test,

whose null hypothesis is the preference of random effects. In both cases, the presence of heterogeneity generates problems in the estimation because the error with this type of data is divided in the residual of the estimation and in the one linked to the unobservable heterogeneity, this part of the error is correlated with the explanatory variables which generates that the estimation is not the most efficient.

The fixed effects consider that the correlation between the residuals and the explanatory variables is different from zero and corrects the problem by subtracting the difference of each variable minus its mean, so that the heterogeneity lies in the differences between individuals. While random effects consider that the correlation is zero and the estimation is done by the difference of each variable with respect to a proportion of the mean, placing the burden of heterogeneity on chance.

While the estimation of random effects does not require any validation in terms of autocorrelation and heteroscedasticity, because it is a generalized least squares model, the estimation of fixed effects requires the validation of both assumptions and, if this model is chosen, its correction in the presence of any of the indicated problems.

If autocorrelation is evidenced, this problem may give an idea that the dependent variable is linked to its past behavior and would require dynamic estimation, which considers the lag of the dependent variable. For this purpose, the Arellano-Bond method is used, which can be analyzed in terms of long-term behavior influenced by the past.

The Arellano-Bond method is a technique based on the Generalized Moment Estimator (GMM) that allows dealing with endogeneity in dynamic panel data. In simple terms, this method transforms the original equation to eliminate unobserved fixed effects and then uses

past values of the dependent variable as instruments to estimate the model coefficients efficiently.

To achieve this, the method takes differences in the equations to eliminate time invariant factors that could be biasing the estimates; past values of the dependent variable are used as instruments, assuming they are correlated with the current dependent variable but not with the model errors; and GMM is applied to find the most accurate coefficients.

To ensure the validity of the instruments, the Sargan test is applied, which assesses whether the instruments used in the model are truly exogenous, that is, whether they are uncorrelated with model errors. If the Sargan test gave a high p-value, it meant that the instruments were adequate. But if the p-value was very low, it meant that the instruments might be poorly chosen and that the model still suffered from endogeneity problems.

Results

To understand the relationship between different socioeconomic variables and the Human Development Index (HDI), static and dynamic estimation models have been applied to evaluate the impact of variables such as subnational spending (expsub), access to drinking water (Water), primary education spending per student (Eduexp), government spending on health per capita (Health) and the rule of law (Rolaw).

First, Table 2 provides a statistical summary of the variables used in the models. It can be seen that the HDI has a minimum value of 0.49 and a maximum of 0.859, with a mean of 0.6972 and a standard deviation of 0.0814. This suggests a moderate variability in human development within the analyzed sample of Latin American countries.

Table 2: Descriptive statistics of the variables

Variable	N	Period		Minimum value	Maximum value
		Media	DE		
IDH	465	0,6972	0,0814	0,49	0,859
expsub	306	0,2282	0,1438	0,011	0,467
Water	311	0,9286	0,0533	0,762	1,000
Eduexp	204	0,1278	0,0427	0,029	0,267
Health	315	265,56	242,03	13,94	1172,97
Rolaw	330	3,1375	0,6471	2,255	4,849

- Of the participants, 68.3% stated that they had in-depth knowledge of the chain of custody, while 21.7% indicated that they had partial knowledge, and 10.0% acknowledged that they did not fully understand the protocols.
- The mean self-perceived knowledge (rated on a scale of 1 to 5) was 4.0, with a standard error of 0.25.

Subnational spending (expsub) shows a minimum value of 0.011 and a maximum of 0.467, with a mean of 0.2282, indicating significant differences in the decentralization of public spending. Access to drinking water (Water) shows a mean of 0.9286 with a standard deviation of 0.0533, reflecting high and relatively homogeneous coverage within the sample.

On the other hand, primary education expenditure per student (Eduexp) has a mean of 0.1278 with a deviation of 0.0427, suggesting that there are differences in educational investment relative to GDP per capita in each country. As for health expenditure per capita (Health), a wide dispersion is observed, with values ranging from 13.94 to 1172.97, reflecting disparities in public health investment. Finally, the variable that measures the rule of law (Rolaw) presents a range of 2.255 to 4.849, with a mean of 3.1375, indicating that Latin American countries have different levels of confidence in the legal and institutional system.

Table 3 presents the HDI estimation under a static model, using fixed and random effects. It is observed that access to drinking water

(Water) has a positive and highly significant coefficient (0.3511 in fixed effects and 0.3513 in random effects, both with a significance of 1%). This suggests that a higher proportion of the population with access to potable water is associated with an increase in human development.

Table 3: Static HDI estimation

Received specific training	**Frequency**	**Percentage**
Yes	33	55.0%
No	27	45.0%
Total	60	100%

Note: Values in parentheses are standard errors. Significance: 1% (***), 5% (**), 10%(*)

Primary education expenditure per student (Eduexp) shows a positive and significant coefficient at 5% in the fixed effects model (0.1392), but is not significant in the random effects model. This indicates that investment in education contributes to the HDI, although its impact may depend on country-specific characteristics.

Health spending per capita (Health) also has a positive and highly significant effect in both models (coefficients of 0.0007 and 0.00008 at 1% significance). Although the coefficient is small, it suggests that higher health spending is correlated with improvements in HDI.

The rule of law (Rolaw) also has a positive and significant impact in both model specifications (0.0133 in fixed effects and 0.0172 in random effects, with significance at 1%). This indicates that trust in

the legal system and protection of rights are key factors for human development.

As for subnational spending (expsub), its effect is not significant in the fixed effects model (0.0412), but it is significant in the random effects model (0.0572 at 10% significance). This suggests that decentralization of public spending could have a positive impact on human development, although its effect varies according to the methodological approach employed.

The goodness-of-fit indicators of the model show that the explained variance (R^2) is high, with values of 0.6405 in the fixed effects model and 0.6669 in the random effects model. In addition, the Hausman test suggests that the random effects model is the most efficient.

Finally, the presence of autocorrelation and heteroscedasticity in the data is observed, as indicated by the Wooldridge and heteroscedasticity tests. This reinforces the need to use dynamic methods to correct these problems.

To address the dynamics of the HDI and control for possible endogeneity problems, the Arellano-Bond method is applied in Table 4. In this model, the lagged HDI in a period (HDI (-1)) has a positive and significant coefficient (0.6035, with significance of 1%), indicating a high persistence in human development over time. That is, countries with a high HDI in the past tend to maintain high levels of development in the present.

Table 4: Dynamic HDI estimation

	Coefficient / Standard error
HDI (-1)	0,6035***
	(0,0928)
HDI(-2)	0,2140**
	(0,0929)
expsub	0,0375**
	(0,0167)
Water	0,1129***
	(0,0436)
Eduexp	-0,0219
	(0,0253)
Health	0,00001**
	(4,45e-6)
Rolaw	0,0002
	(0,0036)
Constant	0,0241
	(0,0265)
Wald / F	2927,28***
Sargan Test	106,028

Note: Values in parentheses are standard errors. Significance: 1% (***), 5% (**), 10% (*)

The two-period lagged HDI (HDI (-2)) is also significant at 5%, with a coefficient of 0.2140, suggesting that human development does not only depend on the immediately preceding period, but has a long-term trajectory.

Subnational spending (expsub) has a positive and significant coefficient (0.0375 at 5%), which reinforces the idea that decentralization of public spending favors human development when dynamic effects and endogeneity problems are controlled for.

Access to drinking water (Water) maintains a positive and significant effect (0.1129 at 1%), although its magnitude is smaller than in the static estimate, which could indicate that its impact is more immediate and less persistent over time.

Primary education expenditure per student (Eduexp), unlike the static model, is not significant in the dynamic estimation. This suggests that

the effects of educational investment on human development may require a longer period to materialize.

Health expenditure per capita (Health) remains significant at 5%, although with a very low coefficient (0.00001), indicating that its impact on human development is positive, but marginal.

On the other hand, the rule of law (Rolaw) is not significant in this model, suggesting that its effect on the HDI could be better captured in a static specification or in interactions with other institutional variables.

The quality of the model is verified by the Wald test, which indicates a strong overall significance of the model. The Sargan test shows a value of 106.028, suggesting that the over-identification restrictions are valid and that the instruments used in the estimation are appropriate.

These results highlight the importance of applying dynamic models to understand human development, as they allow us to capture not only the contemporaneous effects of socioeconomic variables, but also the persistent influence of historical performance. The significance of the HDI in its two lags is evidence that human progress does not restart every year, but accumulates positive (or negative) effects over time. Likewise, the instrumental validation by means of the Sargan test guarantees the consistency of the estimated model.

At the empirical level, the impact of subnational spending reinforces the hypothesis that greater financial autonomy of local governments can improve human welfare, provided it is accompanied by efficient public management. The Water variable, with highly significant effects, is positioned as one of the most determinant variables, highlighting the urgency of policies for universal access to drinking water . In contrast, the variable Eduexp, although significant in static models, loses strength in the dynamic model, which could reflect that its benefits require long-term horizons to consolidate.

Finally, the non-significant behavior of Rolaw in the dynamic model suggests that institutional impact operates through more structural channels or requires interactions with other variables -such as public investment or citizen trust- to become evident. These differences in significance between models reinforce the need to employ multiple methodological strategies to capture the complexity of human development in Latin America.

Conclusions

The analysis of the determinants of the Human Development Index (HDI) using static and dynamic models provides robust empirical evidence on the factors that affect the quality of life of the population in Latin America. The region presents deep structural inequalities, institutional weaknesses and territorial fragmentation, which condition the results obtained. In this context, it is essential to interpret the findings not only from their statistical significance, but also from their practical relevance and their interaction with the institutional, social and economic conditions of each country.

One of the key findings is the positive relationship between subnational spending (expsub) and HDI, particularly significant in the dynamic model. This result confirms the hypothesis that fiscal decentralization can be a driver of human development, by allowing local governments to design policies that are better adjusted to the needs of their territories. However, its impact is conditional: in countries such as Brazil or Colombia, where subnational governments have administrative autonomy and technical capacities, the benefits are more visible. In contrast, in contexts such as Venezuela or Honduras, where political centralization and institutional weakness prevail, decentralization does not translate into effective improvements in welfare (Hung & Thanh, 2022; Sofilda et al., 2023).

Economic theory supports this evidence by pointing out that decentralization improves the allocation of resources and the efficiency of public services. However, the expsub effect is only statistically significant in certain models, suggesting that its effectiveness depends largely on institutional quality, local administrative capacity and the existence of accountability mechanisms (Pinilla-Rodríguez et al., 2015; Delgado et al., 2022). Indeed, decentralization without governance can lead to clientelism or local capture of resources (Berçintürk & Yereli, 2022).

Another relevant finding is the strong correlation between access to drinking water and the HDI. Its significance in all models shows that the coverage of basic services continues to be a structural factor of development. However, beyond statistics, drinking water should be conceived as a fundamental human right (United Nations, 2010). Severe inequalities persist in the region, particularly in rural and indigenous areas, where coverage has not translated into regular, safe and quality access. In countries such as Bolivia and Peru, expansion programs have had positive effects, but in others, such as Haiti and Nicaragua, water infrastructure remains precarious. Moreover, when coverage is high - as in Chile or Uruguay - the marginal effect may be reduced, showing diminishing returns and suggesting that policies should also focus on quality, sustainability and governance of the resource.

Expenditure on primary education per student (Eduexp) was significant in the static model but not in the dynamic model, which can be interpreted as a temporary lag in the educational effect on human development. Education has a greater impact in the medium and long term, and its effect depends not only on the amount invested, but also on its efficiency, equity and orientation. In Latin America, education systems, although they have improved in coverage, continue to reproduce inequalities: there are significant gaps between urban and rural areas, and between public and private education (ECLAC, 2018). Countries such as Argentina and Chile, with high levels of investment, still show unequal results due to

structural flaws in the quality of the system, which would explain the inconsistency of the effect of Eduexp on the HDI.

With respect to per capita health expenditure (Health), its positive but low magnitude effect suggests that, although health investment is important, its direct impact on the HDI is limited when it is not accompanied by an improvement in the efficiency of spending. In countries such as Uruguay and Costa Rica, where there are strong universal systems, the impact is more tangible. However, in Guatemala, Paraguay and El Salvador, the fragmentation of the health system, low investment and corruption limit its effectiveness. Hence, it is necessary not only to increase spending, but also to strengthen the governance of the health system (PAHO, 2019).

The rule of law (Rolaw) presents an interesting result: significant in the static model, but not in the dynamic model. This behavior suggests that legal institutions and confidence in the legal system have a structural, but not immediate, impact on human development. In Latin America, the weakness of the rule of law - manifested in corruption, impunity and the absence of efficient justice - has been a persistent obstacle. However, its effect could operate through indirect mechanisms, such as economic stability, investment attraction or the efficiency of social spending. This implies that institutional strengthening should accompany any decentralization or public investment policy, even if its effects on the HDI are manifested in the long term.

In addition, it should be noted that the effects of the variables analyzed are not homogeneous across all social groups. Women, indigenous peoples, people with disabilities and rural populations often face multiple barriers that prevent them from making equitable use of public services, even when these are expanded or better financed. In this sense, it is essential to incorporate a focus on intersectionality and territoriality in the formulation of public policies so that decentralization and social investment generate effective improvements in human development.

Finally, the results of the dynamic model where the HDI of previous years largely explains the current HDI reinforce the idea that human development is a cumulative and structural process. This requires governments to maintain sustained, coherent and long-term policies, especially in areas such as education, health, democratic governance and water management. Political volatility and frequent changes in investment priorities can break the virtuous cycle required to improve human well-being on a sustained basis.

In conclusion, improving human development in Latin America requires solid multilevel governance, in which the central, regional and local levels act in an articulated manner, with clear rules, strengthened technical capacities and a rights-based approach. Fiscal decentralization should be understood not as an end in itself, but as a means to democratize access to services, reduce inequality gaps and empower territories in their development process.

The empirical analysis using static and dynamic models leads to the conclusion that access to drinking water and decentralization of public spending are determining factors in the improvement of the Human Development Index (HDI) in Latin America. These variables have a direct impact on the provision of basic services and on the responsiveness of subnational governments to local needs . Investment in health and education also play a relevant role, although their impact varies according to the methodological approach: while education shows a significant effect only in the static model, health spending maintains a positive but marginal coefficient in both models. This shows that it is not enough to increase the resources allocated to these sectors; it is also necessary to improve efficiency and equity in their management, as well as to consider the time lags that characterize human capital outcomes.

As for the rule of law, its significance in the static model, but not in the dynamic model, suggests that its effect on human development operates through structural and long-term mechanisms, such as institutional stability, citizen confidence and legal security. For its

part, the persistence of the HDI over time confirms that human development is not achieved through specific interventions, but through sustained processes that require continuity of public policies, stable technical capacities and favorable institutional environments. This cumulative trajectory reinforces the need to adopt comprehensive development strategies, with a territorial approach, that articulate social investment, institutional strengthening and social cohesion.

Consequently, the results obtained allow us to affirm that human development in Latin America is conditioned by both the quantity and quality of public spending, as well as by the management capacities of governments at different levels. Moving towards a more inclusive and sustainable development model requires strengthening multilevel governance with effective decentralization criteria, expanding the coverage of essential services such as water, health and education, and designing long-term public policies with a structural vision. Only through profound institutional reforms and strategies focused on human rights will it be possible to guarantee the sustainability of advances in human well-being and close the persistent gaps between countries and territories in the region.

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