

Analysis of the Relationship Between Economic Factors and the Transition to Higher Education in Zacatecas

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Myriam⁴<https://doi.org/10.61117/ipsumtec.v9i1.467>

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Abstract—In various regions of Mexico, higher education institutions face significant challenges related to declining freshman enrollment, a phenomenon often associated with adverse household economic conditions. In the state of Zacatecas, this has raised concerns regarding the academic and financial sustainability of educational institutions, as well as young people's access to higher education. This implies that economic conditions may influence the decision to pursue university studies in different ways; therefore, it is important to analyze not only the general economic situation but also the specific factors that could be associated with the educational transition.

The objective of this research was to analyze the relationship between various economic factors and the transition to higher education in Zacatecas during the 2018–2024 period. The study employed a quantitative approach, with a non-experimental, longitudinal design and an exploratory-correlational scope, based on annual aggregate data from official sources. The dependent variable was the transition to higher education, defined as the proportion of students who continue their studies after completing high school. Economic indicators grouped into three analytical dimensions—economic capacity, vulnerability, and cost of living—were considered as explanatory variables.

Statistical analysis was performed using Spearman's correlations—both contemporaneous and with a one-year time lag—supplemented by partial correlations controlling for the time trend and a leave-one-out sensitivity analysis. The results show that the aggregate index of economic dimensions does not clearly capture the heterogeneity of the phenomenon; however, more consistent associations were observed at the level of specific indicators. In particular, household spending on transportation and

education were negatively correlated with the transition to college when the time lag was incorporated, while youth unemployment showed a positive association in the same analytical framework.

It is concluded that the relationship between household economics and the transition to higher education is not uniform and cannot be adequately summarized by a single composite indicator. The findings suggest that certain components of the cost of living and the youth labor market context may play a significant role in educational continuity, although their interpretation should be approached with caution due to the limited number of observations and the exploratory nature of the study.

Keywords—access to higher education, household economic conditions, cost of living, transition to college, Zacatecas.

Abstract—In several regions of Mexico, higher education institutions face significant challenges related to the decline in first-year enrollment, a phenomenon frequently associated with adverse household economic conditions. In the state of Zacatecas, this issue has raised concerns regarding the academic and financial sustainability of educational institutions, as well as young people's access to higher education. This implies that economic conditions may influence the decision to continue university studies in different ways, making it necessary to analyze not only the general economic situation but also the specific factors that may be associated with educational transition.

The objective of this research was to analyze the relationship between various economic factors and the transition to higher education in Zacatecas during the 2018–2024 period. The study was conducted using a quantitative approach, with a non-experimental, longitudinal design and an exploratory-correlational scope, based on aggregated annual data obtained from

official sources. The dependent variable was university

transition, defined as the proportion of students who continue on to higher education after completing upper secondary education. The explanatory variables included economic indicators grouped into three analytical dimensions: economic capacity, vulnerability, and cost of living.

The statistical analysis was performed using contemporaneous Spearman correlations and one-year lagged correlations, supplemented by partial correlations that controlled for the time trend and a leave-one-out sensitivity analysis. The results show that the aggregated index of economic dimensions does not clearly capture the heterogeneity of the phenomenon; however, at the level of specific indicators, more consistent associations were observed. In particular, household expenditure on transportation and education showed negative relationships with university transition when a one-year lag was incorporated, whereas youth unemployment showed a positive association under the same analytical framework.

It is concluded that the relationship between household economic conditions and the transition to higher education is neither uniform nor adequately summarized by a single composite indicator. The findings suggest that certain components of the cost of living and the youth labor market context may play a significant role in educational continuity, although their interpretation should be approached with caution due to the limited number of observations and the exploratory nature of the study.

Keywords—cost of living, household economic conditions, transition to higher education, transition to university, Zacatecas.

INTRODUCTION

Higher education is an essential component of economic and social development, as it contributes to the formation of skilled human capital, the strengthening of productivity, and the expansion of employment opportunities and social mobility. In this regard, universities not only generate knowledge but also help improve people's living conditions by providing access to greater opportunities for professional and social development [1]. This premise is particularly relevant in contexts where access to higher education is constrained by structural economic and social factors.

In Mexico, the higher education system is characterized by institutional diversity—in both the public and private sectors—as well as by differences in coverage, infrastructure, academic offerings, and student enrollment capacity [2, 3].

These differences impact young people's educational trajectories and the dynamics of new student enrollment

, particularly in states where economic constraints and regional inequalities persist. From this perspective, access to higher education does not depend exclusively on individual aspiration, but also on the material conditions and social environment surrounding students.

In recent years, various institutions of higher education have experienced a decline in new student enrollment, a situation that has raised concerns about its academic, financial, and institutional implications. The decline in enrollment can be interpreted as the result of the interaction of multiple social and economic factors, including family income, the cost of living, completion of high school, and the opportunities available to continue one's educational path [4,5,6]. Accordingly, decisions regarding whether or not to pursue higher education are closely linked to households' ability to cover the direct and indirect costs associated with studying.

Recent international literature reinforces the link between economic conditions and access to education. Some studies show that inequalities accumulated from the early stages of learning result in persistent disadvantages in access to higher education [7]. Similarly, other studies indicate that socioeconomic background and family environment continue to be determining factors in educational development and in social mobility associated with higher education [8].

Along the same lines, it has been documented that income inequality is associated with significant gaps in college enrollment and the attainment of academic degrees [9]. Furthermore, financial uncertainty particularly affects the preferences and decisions of low-income students regarding higher education options [10]. Similarly, there is evidence that education-related costs can influence enrollment behavior, making it essential to consider the economic component in the analysis of enrollment [11].

In Latin America, this issue takes on particular relevance due to persistent structural inequalities. Poverty, unemployment, and social inequality have been identified as factors that affect educational continuity [4]. In the university setting, it has also been noted that economic difficulties affect not only students but also institutions, due to the costs associated with dropout rates [12]. Similarly, adverse economic conditions are one of the main causes of university dropout in Central American contexts [13]. Taken together, these findings show that the analysis of enrollment cannot

be separated from the socioeconomic conditions that shape educational decisions.

In the specific case of Zacatecas, limited economic growth and persistent social disparities have hindered efforts to reduce income inequality, which can directly affect young people's ability to pursue higher education [14].

In this context, this research is significant in that it analyzes the relationship between economic factors and the transition to higher education in the state, considering not only an aggregate measure of economic conditions but also specific dimensions and indicators linked to household economic capacity, vulnerability, and cost of living. This approach stems from the need to examine whether these components are associated with educational continuity during the 2018–2024 period, both in real time and with a potential time lag.

The significance of this study lies in providing evidence, from a quantitative perspective, on how various factors associated with household economic conditions are linked to educational continuity during the transition from upper secondary to higher education. In this regard, the research contributes to a better understanding of the factors that influence academic continuity, offering an empirical foundation that can guide future research and the formulation of educational and social strategies.

METHODOLOGY

This research was conducted using a quantitative approach, focused on the analysis of aggregated numerical data to explore the relationship between various economic factors and the transition to higher education in the state of Zacatecas. This approach is particularly relevant for studying educational phenomena linked to household budget constraints, economic inequality, and decisions regarding educational continuity, especially when time series data derived from official sources are available.

The study followed a non-experimental, longitudinal design, as the variables were observed in their natural context, without direct manipulation, during the 2018–2024 period. Its scope was exploratory-correlational, as the aim was to identify the magnitude and direction of possible associations between economic indicators and the transition to college, without seeking to establish causal relationships.

The unit of analysis consisted of aggregated annual observations corresponding to the study period. Consequently, the analysis was not conducted at the individual student level, but rather based on

annual time series that integrate educational and socioeconomic data from the state of Zacatecas. This approach allows for an examination of general trends in the economic environment and their potential relationship with educational continuity at the regional level.

A statistical spreadsheet in Excel was used as a tool for systematization, compiled using secondary data from official sources, including the National Institute of Statistics and Geography (INEGI) [15], the National Council for the Evaluation of Social Development Policy (CONEVAL) [16], the Ministry of Public Education (SEP) [3] through Statistics 911, the National System of Statistical and Geographic Information (SNIEG) [17], and other complementary sources of socioeconomic information. These sources were selected based on criteria of reliability, temporal comparability, and relevance to the context under analysis.

The dependent variable was the transition to college, defined as the proportion of students who continue on to higher education after completing high school. Various economic indicators associated with households were considered as explanatory variables, organized into three analytical dimensions: economic capacity, vulnerability, and cost of living. Monetary indicators were deflated to express them in real terms and subsequently standardized using a min–max procedure in order to construct comparable dimensions on a common scale.

The grouping of indicators by dimensions served an analytical and descriptive purpose, as it allowed for the identification of general patterns without losing sight of the behavior of specific variables. Thus, in addition to the analysis by dimensions, individual indicators such as household spending on transportation, household spending on education, and youth unemployment were evaluated due to their potential relevance in explaining constraints or incentives associated with educational continuity.

Statistical processing was performed using custom code written in Python. In the first stage, descriptive statistics were obtained to characterize the evolution of the variables. Subsequently, Spearman's correlation coefficient was applied to estimate both contemporaneous and one-year lagged monotonic associations between the economic variables and the transition to college. Complementarily, partial correlations were estimated while controlling for the time trend, and a leave-one-out sensitivity analysis was conducted to assess the stability of the obtained coefficients.

Finally, tables and graphical representations were created to facilitate the interpretation of the results and visualize the general direction of the

observed associations. Taken together, this methodological strategy allowed us to integrate official educational and economic data to explore how different components of the socioeconomic environment may be related to the transition to higher education in Zacatecas.

Data, Variables, and Economic Dimensions Analyzed.

This study is based on the analysis of socioeconomic indicators associated with households in the state of Zacatecas, with the aim of exploring their possible relationship with the transition to higher education. To this end, an annual database was compiled that brings together economic and social indicators for the 2018–2024 period, selected for their potential relevance to households' educational decision-making.

The central variable of the study is the transition to college, defined as the proportion of students who continue on to higher education after completing high school. This variable is used as a proxy for effective access to college education within the regional context under analysis.

In addition to the university transition variable, economic indicators were collected that reflect households' material conditions and potential constraints associated with access to higher education. These indicators include variables related to income, household demographic characteristics, youth employment status, and household expenditure structure. The monetary indicators were deflated using the National Consumer Price Index (INPC) in order to express the values in real terms.

To facilitate the analysis, the economic indicators were grouped into three analytical dimensions that reflect different aspects of the

socioeconomic conditions of households: economic capacity, which includes variables associated with income and

availability of resources; vulnerability, which incorporates indicators related to conditions of economic or social precariousness; and cost of living, which includes household expenditure variables potentially associated with access to education or social mobility. Each dimension was calculated as the simple average of the indicators previously standardized using a min–max procedure, which allowed all variables to be brought to a common scale between 0 and 1.

The classification of indicators into these dimensions aims to organize the empirical analysis and facilitate the identification of general patterns in the data. The relationship between specific indicators and the economic dimensions considered in the study is

Table 1. *Dimensions analyzed and associated economic indicators.*

Dimension	Economic indicators
Economic capacity	Current household income, percentage of income from work, number of earners per household.
Vulnerability	Extreme poverty, youth unemployment rate, average household size.
Cost of Living	Household spending on food, household spending on education, household spending on transportation

Source: Author's own analysis (2026).

Methodology

The empirical analysis was conducted using an exploratory approach aimed at identifying possible associations between household economic conditions and the transition to higher education. Given the limited number of available observations, we opted to use nonparametric statistical methods that allow for the evaluation of relationships between variables without requiring strict assumptions about the data distribution.

In particular, we used Spearman's correlation coefficient, which measures the strength and direction of the monotonic association between two variables based on the ranking of the observed values. This coefficient is particularly suitable in contexts where the sample size is small or where the relationships between variables may not be strictly linear.

Spearman's correlation coefficient is calculated based on the differences between the ranks of the observations of the analyzed variables. Its general form is given in Equation (1).

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2-1)} \quad (1)$$

presented in Table 1.

where d_i represents the difference between the rang for each observation, and n is the total number of observations considered.

In addition to the contemporaneous correlations between economic indicators and the transition to college, the analysis also considers correlations with a one-year time lag. This procedure allows us to explore whether variations in certain economic indicators can be associated with subsequent changes in the transition to higher education, which is relevant from the perspective of the dynamics of educational and socioeconomic processes.

The analysis with a one-year time lag was conducted by comparing the values of the economic indicators in year t with the transition to college observed in year

$t+1$. This approach makes it possible to identify potential relationships that do not manifest immediately but may become apparent in subsequent periods.

Statistical Analysis

Based on the methodology described above, a correlation analysis was applied to the economic indicators considered in the study. First, the associations between the aggregate economic dimensions and university transition were evaluated to identify general patterns in the data.

The correlations between each economic dimension and university transition were estimated both contemporaneously and with a one-year time lag. These estimates allow us to identify which dimensions have the most significant associations with the educational variable under analysis. The corresponding coefficients are presented in Table 2.

Table 2. Spearman's Correlations between Economic Dimensions and University Enrollment

	Contemporary		Lag ($t \rightarrow t + 1$)	
	ρ	P_{val}	ρ	P_{val}
Economic capacity	0.54	0.22	-0.20	0.70
Vulnerability	-0.61	0.15	-0.49	0.33
Cost of living	0.04	0.94	0.71	0.11

Source: Author's own calculations (2026)

Subsequently, a more detailed analysis was conducted at the level of specific economic indicators, with the aim of identifying which individual variables show the most consistent associations with the transition to higher education. This analysis included both contemporaneous correlations and correlations with a time lag.

The corresponding correlation coefficients are presented in Table 3, which summarizes the observed associations between the main selected economic indicators and the transition to college, both contemporaneously and with a time lag.

Table 3. Spearman Correlations between Economic Indicators and University Transition

	ρ_{cont}	ρ_{rez}	ρ_{par}	$rango_{leave-one-out}$
Transportation spending	-0.07	-0.71	-0.20	-0.43
Education expenses	0.21	-0.77	-0.49	-0.43
Youth unemployment	0.14	0.66	0.71	0.14

Source: Author's own calculations (2026)

To verify the consistency of the identified associations, the following procedures were applied

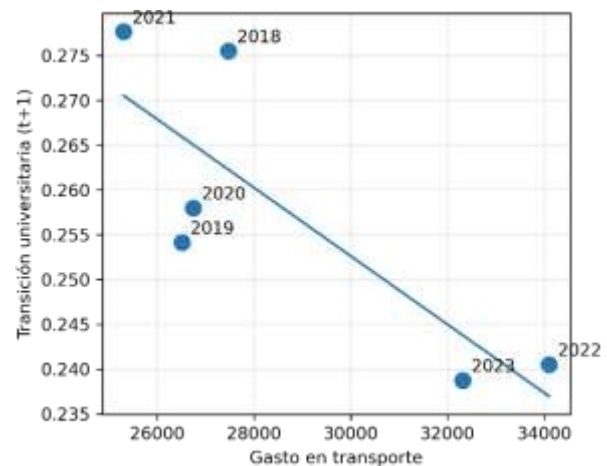
additional statistical analyses. First, partial correlations were estimated while controlling for the temporal trend, in order to assess whether the observed relationships between variables could be attributed simply to parallel changes over time. This procedure was implemented by first removing the linear component associated with the year from each variable and then calculating the correlation between the resulting residuals.

In addition, a leave-one-out sensitivity analysis was conducted, in which the correlations were recalculated by successively excluding each observation from the sample. This procedure allows us to assess whether the observed associations depend on a specific observation or whether they remain relatively stable when the dataset is slightly modified. The partial correlation coefficients and the range of the leave-one-out analysis are also shown in Table 3.

Finally, to complement the statistical analysis, graphical representations of the relationships between some of the economic indicators and the transition to college were created. These graphs allow for a direct visualization of the distribution of the observations and the general trends present in the analyzed data.

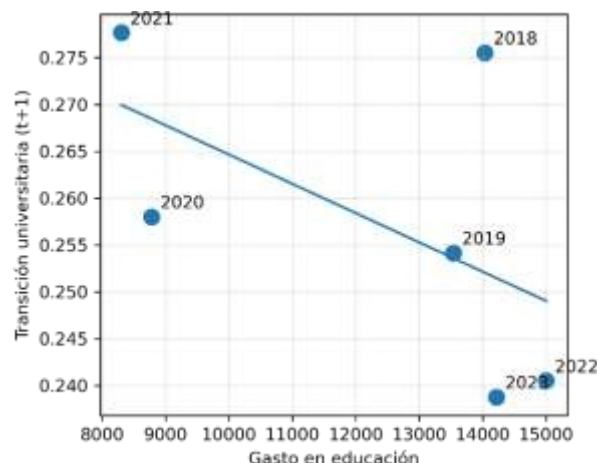
Figures 1, 2, and 3 present the relationship between three of the economic indicators considered—transportation spending, education spending, and youth unemployment—and the transition to college, with a one-year time lag, respectively.

Figure 1. Relationship between transportation spending and the transition to college



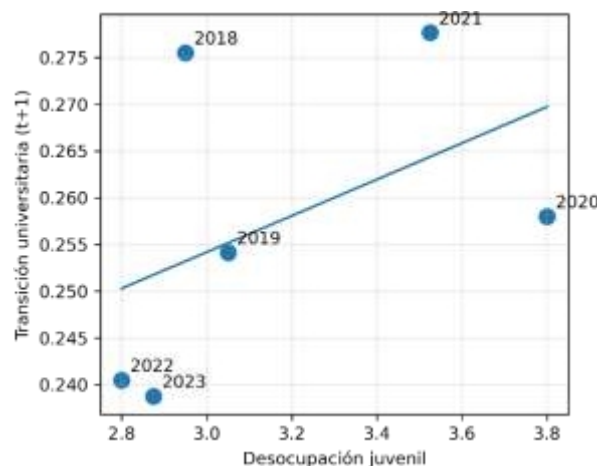
Source: Author's own work (2026)

Figure 2. Relationship between education spending and the transition to college



Source: Author's own work (2026)

Figure 3. Relationship between youth unemployment and the transition to college



Source: Author's own work (2026)

DISCUSSION AND ANALYSIS OF RESULTS.

The results suggest that household economic conditions may be associated with the transition to higher education in different ways. Analysis by economic dimensions revealed that the effects are not uniform across the various components of socioeconomic conditions.

In particular, the dimension associated with the cost of living shows the most consistent associations with the transition to college when considering time lags. Within this dimension, indicators related to household spending on transportation and education show negative correlations with the proportion of students who continue on to higher education in the following year. This pattern suggests that increases in household expenses

related to transportation or educational services may represent an additional financial burden for households, which potentially limits educational continuity beyond high school.

The results obtained in this study are consistent with those reported by [11], who notes that the costs associated with education can alter university enrollment behavior and affect decisions regarding academic continuity. In the present study, household spending on transportation and education showed negative associations with the transition to college when a time lag was considered, suggesting that both direct and indirect costs related to education can become barriers to access to higher education in regional contexts such as Zacatecas.

Similarly, the findings are consistent with those presented by [10], who found that financial uncertainty significantly influences the educational preferences of students from lower-income households. In both cases, budget constraints appear to limit opportunities for continuing education, particularly when households face increases in essential expenses related to transportation or academic training.

Furthermore, the results are consistent with the findings of [13], who identifies economic factors as one of the main causes of university dropout rates in Latin American contexts. Although the present study focuses specifically on the transition to higher education rather than on university retention, both studies suggest that economic constraints continue to play a significant role in young people's educational trajectories.

In regional contexts such as the state of Zacatecas, where territorial dispersion and distance to educational institutions can be significant factors, transportation costs can become a major barrier to continuing one's studies. The negative association observed between transportation expenses and the transition to college may reflect precisely this type of economic constraint related to geographic accessibility to institutions of higher education.

Similarly, household spending on education also shows a negative relationship with the transition to college. Although at first glance one might expect higher educational spending to be associated with higher levels of academic continuity, in this case the result may reflect that households facing higher educational costs in earlier stages of the educational process experience greater budgetary pressures

, which could limit their ability to finance college studies in the short term.

The findings also align with research highlighting the influence of socioeconomic context on access to higher education. In this regard, [7] note that inequalities accumulated from early stages of learning lead to persistent disadvantages in access to higher levels of education. In the case of Zacatecas, the results suggest that certain components of the cost of living and economic vulnerability could contribute to deepening these inequalities in educational continuity.

Similarly, the results are consistent with those reported by [9], who found that income inequality is associated with significant gaps in college enrollment and the attainment of academic degrees. Although the present study does not directly analyze income inequality, the observed correlations between household expenses and the transition to college suggest that economic constraints continue to affect educational access opportunities.

Furthermore, the results also partially support the findings of [5], who identified that socioeconomic factors influence access to higher education in rural contexts. This relationship is particularly relevant for Zacatecas due to its territorial characteristics and the geographic dispersion of part of its student population.

Furthermore, the youth unemployment indicator shows a positive association with the transition to college when a time lag is taken into account. This result can be interpreted as a possible relationship between conditions in the youth labor market and educational decisions. In contexts where employment opportunities for young people are more limited, pursuing higher education can become an alternative strategy for improving future employment prospects. This behavior has been documented in various studies on educational decisions in contexts of labor market uncertainty.

The positive association observed between youth unemployment and the transition to college can be interpreted as a possible substitution effect between employment and education. This pattern is consistent with the findings of [4], who argues that economic and labor market conditions significantly influence the educational trajectories of young people in Latin America. When job opportunities are limited, continuing one's studies may be perceived as a

more favorable alternative for improving future employment prospects.

Likewise, the results are consistent with the findings of [8], who maintain that the socioeconomic and family environment continues to be a determining factor in educational development and social mobility. In this sense, continuing on to higher education may represent a strategy for socioeconomic advancement in the face of unfavorable labor market conditions.

However, unlike some studies that identify more direct effects between unemployment and dropping out of school, the relationship observed in this research should be interpreted with caution due to the exploratory nature of the study and the small sample size. This suggests the need for future research using individual-level data to more accurately understand the interaction between youth employment and educational decisions.

However, the statistical analysis also shows that some of the identified associations vary when additional controls or sensitivity analyses are applied. In particular, partial correlations that control for time trends suggest that some of the observed relationships may be influenced by general changes in the variables over the analyzed period. Likewise, the *leave-one-out* sensitivity analysis indicates that, while the signs of the correlations remain relatively stable in several cases, the magnitude of the coefficients may vary depending on the observations included in the analysis.

These results partly reflect the limitations inherent in the small size of the available sample, which necessitates interpreting the findings with caution. In this regard, the analysis presented should be understood primarily as an exploratory exercise aimed at identifying possible relationships between economic indicators and the transition to higher education in the regional context under study.

Finally, the results also show that constructing aggregate indicators based on multiple economic dimensions can obscure important patterns present in individual variables. In the case analyzed, combining different dimensions into a composite index tended to cancel out effects observed at the level of specific variables, reinforcing the importance of analyzing different components of households' socioeconomic conditions separately.

Taken together, the findings suggest that certain economic factors associated with the cost of living and the

youth employment may play a significant role in the transition to higher education in the state of Zacatecas. These results open the door to exploring in greater depth, in future studies, the interaction between regional economic conditions, educational costs, and decisions regarding academic continuity in similar contexts

CONCLUSIONS

This study explored the relationship between various economic indicators and the transition to higher education in the state of Zacatecas during the period analyzed. Using an approach based on nonparametric correlations and time-lag analysis, several relevant associations were identified between certain components of household economic conditions and educational continuity beyond high school.

The results suggest that indicators associated with the cost of living—particularly transportation and education expenditures—exhibit negative relationships with the transition to college when time lags are taken into account. This pattern may indicate that economic costs related to mobility or prior educational expenses represent a significant burden for households and can influence decisions to pursue higher education. In regions such as the state of Zacatecas, where commuting to institutions of higher education may involve considerable distances, transportation costs can be a significant factor in actual access to university education.

Furthermore, the analysis also suggests a positive association between youth unemployment and the transition to higher education. This result could be interpreted as a possible substitution effect between employment and education, in which contexts with fewer job opportunities for young people encourage them to remain in the education system as a strategy to improve their future employment prospects.

Furthermore, the results show that analyzing individual economic variables allows for the identification of patterns that may be obscured when using aggregate indicators that combine multiple socioeconomic dimensions. In this regard, the study highlights the importance of examining the various components of household economic conditions separately when analyzing processes of access to higher education in regional contexts.

Finally, it is important to note that the results should be interpreted with caution due to the limited number of available observations, which restricts the inferential scope of the analysis. Consequently, the findings presented should be considered

exploratory evidence that can serve as a starting point for future research using more extensive databases or information at the municipal or individual level. Despite these limitations, the study provides initial insights into how certain economic factors may influence decisions regarding educational continuity within the socioeconomic context of the state of Zacatecas.

As future lines of research, we propose, first, to expand the analysis using databases with greater territorial disaggregation—particularly at the municipal or institutional level—in order to identify regional differences in the relationship between household economic conditions and the transition to higher education. This would allow for a more precise assessment of whether factors such as transportation, family income, and educational spending affect young people differently depending on their place of residence and proximity to educational institutions. Second, it is suggested that the quantitative approach be complemented with qualitative or mixed-methods studies that incorporate the perspectives of students, families, and educational authorities, in order to delve deeper into the economic, social, and personal factors that influence the decision to pursue higher education or not. These approaches would strengthen our understanding of the phenomenon and provide broader evidence for designing strategies aimed at promoting access to and retention in higher education in regional contexts such as Zacatecas.

ACKNOWLEDGMENTS

The authors thank students Pablo Berumen Fernández and Gerardo Vázquez de la Torre for their collaboration in creating and managing the database used in this study. The authors also thank the National Technological Institute of Mexico for the funding granted to the ITSJ-CA-3 Academic Body through the 2025 Program to Strengthen Academic Bodies. LJFS also thanks SNII-SECIHTI.

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