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## Job quality in the shadow of informality: the mediating role of education. A regional analysis in Ecuador between 2014 to 2019

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### ABSTRACT:

This paper investigates the relationship between informality and job quality in Ecuador, emphasizing the role of education as a mediating factor. Utilizing data from the National Survey of Employment, Unemployment, and Underemployment from 2014 to 2019, the study employs an Employment Quality Index to assess job quality. Through a detailed empirical strategy incorporating pooled ordinary least squares regressions, panel data analyses, and spatial models, the research unveils a negative impact of informality in employment quality. However, the findings indicate that education does not significantly influence this relationship at the regional level. These results highlight the necessity for targeted policy interventions that address the structural issues in the labor market.

**KEYWORDS:** Employment quality index; informality; education; Ecuador.

**JEL CLASSIFICATION:** J46; R23.

## Calidad del empleo en la sombra de la informalidad: un análisis regional en Ecuador entre 2014 y 2019

### RESUMEN:

Este artículo examina la relación entre la informalidad y la calidad del empleo en Ecuador, destacando el papel de la educación como factor mediador. Utilizando datos de la Encuesta Nacional de Empleo, Desempleo y Subempleo de 2014 a 2020, el estudio emplea un Índice de Calidad de Empleo para evaluar la calidad del empleo. A través de una estrategia empírica detallada que incorpora regresiones de mínimos cuadrados ordinarios agrupados, análisis de datos de panel y modelos de rezago espacial, la investigación revela un impacto negativo de la informalidad en la calidad del empleo. Sin embargo, los resultados indican que la educación no influye en esta relación a nivel regional. Los hallazgos subrayan la necesidad de intervenciones de política específicas, que aborden los problemas estructurales del mercado laboral.

**PALABRAS CLAVE:** Índice de Calidad de empleo; informalidad; educación; Ecuador.

**CLASIFICACIÓN JEL:** J46; R23.

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## 1. INTRODUCTION

In developing countries, informality in labor markets has been widely studied. Among the most notable studies in this area are those that analyze the relationship between informality and development (La Porta and Shleifer, 2014; Loayza, 2016; Ulyssea, 2018; Ulyssea, 2020); the characteristics of informal workers (Portes et al., 1986; Maloney, 2004; Bernal, 2009); the effects on the productivity of companies (Chong et al., 2008; Benjamin and Mbaye, 2012; Ulyssea, 2018); and its social consequences (Saavedra and Tommasi, 2007; Kanbur, 2017).

Another area of study is the relationship between informality and the quality of employment. Studies show that informality decreases the quality of employment (Mahmood, 2018; Neog and Sahoo, 2021; Apablaza et al., 2023). However, there are nuances within this relationship. Given that for certain workers informality may be voluntary, this does not correspond in all cases to low quality of employment (Pagés and Madrigal, 2008). Additionally, there are other factors that can mediate the relationship between informality and employment quality, such as education. Workers with more education can benefit from better quality jobs (Conover et al., 2022).

The aim of this article is to analyze the regional effect of informality on employment quality and how regional educational attainment moderates this relationship, an area that has been little studied in the literature. This study is particularly valuable as it focuses on Ecuador, a country that has not yet been thoroughly analyzed in the context of informality and job quality. The lack of existing research on Ecuador presents a unique opportunity to explore these dynamics in a region where labor market conditions and economic structures differ significantly from other Latin American countries. By shedding light on Ecuador's specific context, this research contributes new insights to the broader discussion on employment quality and informality.

We chose to use aggregated regional data from the ENEMDU database to capture broader interactions and neighborhood effects to understand how higher educational attainment moderates the informality impact on overall job quality. The Employment Quality index (EQI) is constructed following the methodology proposed by Apablaza et al. (2023), which in turn uses the Alkire Foster method (Sehnbruch et al., 2020) to work on the different dimensions of worker deprivation. Taking the EQI as the dependent variable and among the explanatory variables the informality and education of the population, several econometric models are used to estimate the effect of informality on the EQI in the regions of Ecuador mediated through education, including spatial models.

Workers with higher education are generally expected to moderate the negative effects of informality on job quality because their skills and qualifications should lead to better employment opportunities. In the Ecuadorian context, a negative effect of the tertiary education rate on the informality rate is evident (Appendix 1), in line with works such as that of Ulyssea (2020). However, our empirical evidence from the Ecuadorian context suggests a more intricate scenario where higher education levels do not mitigate the negative effect of informality on job quality.

This can be attributed to a labor market mismatch, where highly skilled workers end up in lower-skilled positions within the informal sector due to a scarcity of high-skill job opportunities (Battu and Bender, 2020). In fact, Leuven and Oosterbeek (2011) estimate that the proportion of overeducated people in Latin America is higher than that of undereducated people. In Ecuador, overeducation was close to 30% in 2017, with higher rates in agricultural and elementary occupations (Castro et al., 2024).

Although the evidence on the relationship between informality and overeducation is limited (Battu and Bender, 2020), overeducation may positively correlate with informality as efforts to elevate educational levels in the population have not been matched by the labor market's ability to generate suitable jobs. Particularly in Ecuador, where the presence of multinational corporations is limited, and foreign direct investment (FDI) is low (Camacho and Bajaña, 2020).

Moreover, informal practices are deeply entrenched in the labor markets of many economies (Jones et al., 2006; Contreras et al., 2008), which may limit the potential of education to mediate the relationship between informality and job quality. Indeed, evidence from Peru suggests that the problem in reducing

the informal sector is not the lack of supply of better educated workers, but the shortage of educated entrepreneurs capable of managing productive businesses (La Porta and Shleifer, 2014).

Moving forward, the paper is structured as follows: section 2 synthesizes existing research on the dynamics of informality and job quality, section 3 outlines the methodological approach adopted for constructing the EQI and delineates the regression models used to analyze the impact of informality, section 4 provides an overview of the data source, section 5 presents the empirical findings, offering a comparative analysis of informality rates and EQI across different time periods and regions of Ecuador, supported by spatial analysis techniques, section 6 discusses the outcomes of the regression analyses and section 7 draws together the key insights from the study and implications for policy.

## **2. LITERATURE REVIEW**

The dynamics of the labor market, particularly in relation to informality, have long been a central focus of economic research, especially within the context of developing countries. A critical aspect emerging from this research is the relationship between informality and the quality of employment. Ulyssea (2020) points out that transitions into and out of informality often involve young, low-skilled workers and women, suggesting a pattern where vulnerable groups are more likely to engage in informal employment. This observation underscores the need to understand the pathways through which individuals enter and exit informal work, and how these transitions affect job quality.

Neog and Sahoo (2021) illustrates a high concurrence of informality rates with poor-quality jobs in India, particularly in the unorganized sector, highlighting the pervasiveness of informality and poor job quality. This overlap suggests that various criteria used to define informality consistently identify a similar group of workers who are often engaged in low-quality employment.

Among the studies that have been developed for developing countries is that of Mahmood (2018), in which a strong relationship is identified between the shift from informal to formal employment and improvements in job quality. This transition is often linked to increased productivity and higher per capita incomes, suggesting that structural changes in employment can lead to a significant reduction in vulnerability and an enhancement in the quality of jobs.

Pagés and Madrigal (2008) offer a nuanced perspective, suggesting that for some workers, informality might be a choice rather than a consequence of exclusion. Their analysis of job satisfaction data from three low-income countries reveals that job satisfaction varies significantly within different types of informal employment, indicating that informality does not uniformly equate to lower job quality across all contexts. The global review by Sethuraman (1998) emphasizes the varying quality of employment within the informal sector. They point out that while informal employment is generally of inferior quality compared to formal employment, there is considerable variation within the informal sector itself.

In the context of Latin American countries, Bertranou et al. (2013) explore the segmentation of the labor market in Argentina, highlighting the prevalence of precarious employment in various forms, including informal salaried employment and unskilled self-employment. Their analysis highlight that the most widespread factor affecting job quality in Argentina is informality, shaped by a complex interplay of economic, institutional, and regulatory factors.

The relationship between informality and job quality is further illuminated by the work of Apablaza et al. (2023), which provides a comprehensive analysis of this dynamic in Chile. This study utilizes a deprivation score to reflect the breadth of deprivations across various dimensions of job quality, offering a nuanced understanding of the factors contributing to poor quality of employment. One of the key findings of the study is that the most significant improvements in quality of employment deprivation across all regions are related to changes in working hours and income indicators. These improvements were largely driven by legal changes, particularly in working hours and minimum wage regulations, highlighting the profound impact of policy on employment quality. However, it is interesting to note that there are other factors that influence the quality of employment. Thus, regions with larger expansions in education showed stronger improvements in job quality, indicating a direct correlation between educational attainment and employment quality.

In this line of research, Chong et al. (2008) discovered in Peru that the training program for young workers (PROJOVEN) positively impacts the probability of securing high-quality employment. It is important to highlight that Peru, along with other Latin American countries like Ecuador, contends with labor markets characterized by high levels of informality and spatial inequality (Guevara-Rosero and Del Pozo, 2020). In Mexico, Conover et al. (2022) find evidence that workers with higher levels of education are more likely to start in the formal sector and remain in it, as well as to transition from the informal sector to the formal sector, benefiting from better salaries and higher job quality.

These studies support the hypothesis that education helps workers obtain higher quality jobs that are related to the formal sector, despite being in labor markets with high rates of informality. However, there is evidence that highly skilled workers end up in lower quality informal jobs, for which they are overeducated. Handel et al. (2016, 2017) find for low- and middle-income countries a positive relationship between informality and overeducation, arguing that this is due to the lack of job options.

This research further delves into this complex relationship, emphasizing education's role not just as a mediator but also as a potential exacerbator of the negative impacts of informality on job quality. While higher educational attainment is traditionally seen as a pathway to better employment opportunities, this study suggests a paradox where increased education levels may also lead to greater underemployment in informal sectors. This phenomenon points to a mismatch between the labor market's evolution and educational advancements, particularly in contexts like Ecuador, where the labor market is marked by high informality (Mendoza and Jara, 2020), limited multinational corporations, and low foreign direct investment (Camacho and Bajaña, 2020).

In line with this, La Porta and Shleifer (2014) indicate that in fact to reduce the informal sector and its practices it is necessary to have a supply of educated entrepreneurs and not only educated workers. This could be one of the factors why the level of education of workers does not counteract the effects of informality on the quality of employment. This scenario highlights the need for targeted policy interventions that not only enhance educational outcomes but also address the scarcity of educated entrepreneurs capable of creating competitive businesses. Policies should also aim to align educational achievements with labor market demands, particularly in regions where informal practices are deeply entrenched, to mitigate the adverse effects of informality on job quality."

### **3. EMPIRICAL STRATEGY**

#### **3.1. EMPLOYMENT QUALITY INDEX**

In OECD countries, the quality of employment is measured by three dimensions: income, security in the labor market and quality of the work environment; for which specific surveys that address these dimensions are required (Cazes et al., 2015). In the case of Ecuador, it is very difficult to obtain information on the quality of the work environment with the available surveys. Therefore, our approach follows the methodology established by Apablaza et al. (2023). This methodology, which adeptly captures the multifaceted nature of employment quality, is particularly well-suited for examining the Ecuadorian labor market in its diverse and nuanced forms.

In constructing an Employment Quality Index (EQI) for Ecuador, we adopt the Alkire-Foster method (Sehnbruch et al., 2020), a robust and versatile tool for measuring multidimensional deprivations. This method, known for its application in assessing poverty, lends itself remarkably well to the study of employment quality. It allows us to count multiple types of deprivations experienced by individuals simultaneously and to weigh these deprivations equally or differently depending on their relative importance. The flexibility of this method is key; it can be adapted to various contexts and thresholds, making it suitable for tracking changes over time and across different groups.

Following Apablaza et al. (2023), our application of the Alkire-Foster method revolves around three core dimensions of employment quality: labor income, employment stability, and working conditions. It should be noted that these dimensions have a certain relationship with those used in OECD countries and

in the case of the dimension of quality of the work environment, this is only measured based on the number of hours worked per week, which in the OECD framework is captured together with other indicators.

Each dimension is accorded equal weight in the overall index, with each comprising a set of specific indicators (Table 1). Equal weights were assigned to ensure a balanced representation of the various dimensions of job quality. This approach facilitates meaningful comparisons across regions. However, while equal weighting avoids bias toward any particular dimension, it may also oversimplify the complex trade-offs that workers make between different aspects of employment, such as income versus job stability. This limitation, though common in multidimensional indices, highlights the potential value of exploring alternative weighting schemes in future research. Nonetheless, equal weighting remains consistent with established practices in the literature and serves as a foundational framework for understanding the multifaceted nature of job quality.

Labor income, for instance, is gauged through hourly income, benchmarked against the basic hourly wage. The rationale behind benchmarking this indicator against the basic hourly wage is deeply rooted in the national labor regulations of Ecuador, the State annually establishes the unified basic wage for private sector workers (Ministerio de Trabajo, 2022). This benchmark reflects a nationally recognized standard and ensures that our assessment of labor income in terms of employment quality is grounded in the economic realities and legal standards prevailing in the country.

Employment stability encompasses indicators such as occupational status and job tenure, distinguishing between contract workers and self-employed workers (Apablaza et al., 2023), and accounting for the duration of employment in years. The job tenure indicator uses a threshold of one year, reflecting significant milestones in an Ecuadorian worker's journey. After completing a year of service, employees not only become eligible for annual vacations but also receive their first payment of the thirteenth and fourteenth salaries, marking important financial benefits. Moreover, aligning with Article 196 of the Ecuadorian Labor Code this one-year milestone entitles workers to an accumulation in their reserve fund or capitalized labor, equivalent to a month's salary for each subsequent year of service (Registro Oficial, 2020).

Working conditions are assessed through indicators like social security contributions and working hours, set against thresholds for social security coverage and a standard 40-hour workweek, legally in force since 1997 (Zamora, 2013).

**TABLE 1.**  
**Dimensions and Indicators of the Employment Quality Index (EQI)**

Dimension	Indicator	Weight	Thresholds
Labor Income	Hourly Income	1/3	Less than basic hourly wage
Employment Stability	Occupational Status	1/6	No contract, self employed
	Job Tenure (years worked)	1/6	Less than 1 years
Working Conditions	Social Security	1/6	No affiliation to the pension system
	Working Hours	1/6	More than 40 hours per week

**Source:** Own elaboration

The Alkire-Foster method is then employed to calculate the index. This method first calculates the proportion of individuals who are deprived in multiple dimensions (incidence) and then assesses the average deprivation score among these individuals (intensity). This dual focus provides a more nuanced understanding of employment quality, as it captures not only how many workers are experiencing poor job quality but also the depth of their deprivation. It should be noted that this study differs from that of Orellana et al. (2020) as they use polychoric principal component analysis to construct a job quality index.

In the Alkire-Foster framework, let's consider a population  $N$  of individuals, each potentially experiencing deprivations in various dimensions of employment quality. We define  $D$  as the set of dimensions. For each individual  $i$  in the population, and each dimension  $d$  in  $D$ , we identify whether the individual is deprived in that dimension. If individual  $i$  is deprived in dimension  $d$ , we denote this as  $d_i = 1$ ; otherwise,  $d_i = 0$ . Each dimension  $d$  is assigned a weight  $w_d$ .

For each individual, we calculate a deprivation score,  $c_i$ , which is the sum of the weights of the dimensions in which the individual is deprived:  $c_i = \sum_{d \in D} d_i * w_d$ . This score represents the breadth of an individual's deprivations across all considered dimensions. A cutoff  $k$  is set, which is a threshold that determines when an individual is considered to have poor quality employment. This could be, for instance, being deprived in at least one of the key dimensions.

Finally, two key indices are calculated: i) the headcount ratio ( $H$ ), and ii) the average Intensity of deprivation ( $A$ ).  $H$  is the proportion of the population that is deprived in their quality of employment (i.e., those for whom  $c_i \geq k$ ).  $A$  is the average deprivation score among those who are considered to have poor quality employment.

The product between  $H$  and  $A$  (known as adjusted headcount ratio ( $M_0$ )) provides a comprehensive measure that reflects both the prevalence and the intensity of poor employment quality in the population. Finally, to calculate the EQI, the inverse of  $M_0$  is considered, in this way values close to 1 represent higher job quality.

### 3.2. INFORMALITY AND EMPLOYMENT QUALITY

Our primary objective is to estimate the regional impact of informality employment, understood as workers in companies or businesses that are not registered with the tax authority, and therefore do not pay taxes (Mendoza and Jara, 2020) on the quality of employment, as measured by the Employment Quality Index (EQI). To achieve this, we will employ a regression model that accounts for the panel structure of the data. The EQI serves as the dependent variable, aggregated at the regional level. Informality, measured as the proportion of the informal workforce in each region, serves as the primary independent variable. The panel data regression equation can be expressed as:

$$EQI_{it} = \alpha + \beta * Informality_{it} + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Where  $EQI_{it}$  is the Employment Quality Index for region  $i$  at time  $t$ .  $Informality_{it}$  is the informality rate,  $X_{it}$  is a vector of control variables.  $\alpha$  is the intercept,  $\beta$  is the coefficient measuring the impact of informality on EQI,  $\gamma$  is a vector of coefficients for the control variables,  $\mu_i$  represents region-specific fixed effects to control for unobservable characteristics that are constant over time for each region but vary across regions,  $\lambda_t$  represents time-specific fixed effects to control for factors that vary over time but are constant across all regions, such as national economic policies or global economic trends,  $\epsilon_{it}$  is the error term.

Incorporating insights from previous studies (Apablaza et al., 2023; Bertranou et al., 2013), the model includes several control variables at the regional level. Variables such as regional GDP per capita, educational and sectoral composition of the workforce in each region are considered. To thoroughly assess the influence of regional educational attainment on the relationship between informality and employment quality, we incorporate another specification that considers an interaction term between informality and education. This approach is particularly crucial in understanding how the regional disparities in education levels across Ecuador can impact the way in which informality affects employment quality.

This interaction term is designed to capture the differential effects of informality on employment quality based on the varying levels of educational attainment across regions. The coefficient of this interaction term is key to our analysis. It indicates the extent to which the impact of informality on employment quality is moderated by education. A significant value of this coefficient in our model would suggest that the level of education in a region can either amplify or mitigate the effects of informality on job quality. For instance, regions with higher educational attainment might exhibit a weaker negative relationship between informality and employment quality. This observation is supported by findings from

Conover et al. (2022), which indicates that better-educated workers tend to have a higher likelihood of securing formal and better-quality jobs, and also they are more inclined to start in formal employment, persist in these roles, and transition to them from informal jobs, also benefiting more significantly in terms of wages from such transitions.

This in-depth analysis is not just a statistical exercise but has profound policy implications. If educational attainment is found to significantly mediate the impact of informality, this would underscore the importance of educational policies in mitigating the negative aspects of informality. It could indicate that regions with higher education levels are better equipped to transform informal employment into more quality-driven job opportunities, or conversely, that regions with lower education levels might be more vulnerable to the negative effects of informality.

In the other hand, if higher education exacerbates informality's adverse effects, it signals a misalignment between the labor market's needs and the educational system's output. This knowledge is vital for designing educational policies that not only improve educational attainment but also ensure that the skills acquired are relevant and valued in the labor market.

#### **4. DATA DESCRIPTION**

The backbone of our empirical analysis is the data derived from the National Survey of Employment, Unemployment, and Underemployment (ENEMDU), conducted by Ecuador's National Institute of Statistics and Census (INEC) from 2014 to 2019. This dataset offers a comprehensive and granular view of the Ecuadorian workforce, encompassing a wide range of variables such as gender, age, household head status, social security coverage, marital status, ethnicity, educational level, working hours, years of employment, and occupational status. The richness of ENEMDU data, coupled with its longitudinal nature, provides an unprecedented opportunity to delve into the nuances of employment quality in Ecuador.

In our approach, we have strategically chosen to use the ENEMDU surveys from June and December of each year, as these tend to have a larger sample size, offering greater representativeness at the regional level. This decision enhances the robustness of our analysis, ensuring that the insights we derive are reflective of the diverse conditions across the various regions of Ecuador. Additionally, the starting point of our dataset, 2014, is significant as it marks the year when the surveys began to offer distinct representation for the regions of the Amazonia (MIES, 2017). Prior to this, the representation of these regions was aggregated, limiting the granularity of regional analysis.

It is important to note that all variables used in this analysis are sourced from the National Survey of Employment, Unemployment, and Underemployment (ENEMDU), except for the Gross Domestic Product (GDP), which is obtained from the Central Bank of Ecuador. Thus, following Apablaza et al. (2023) and Bertranou et al. (2013), some variables are incorporated into the model. The informality rate is measured as the ratio between the number of workers in informal companies or enterprises and the total number of workers in the regions. It should be noted that since 2015, the new methodology used to calculate informal employment considers companies with less than 100 workers that are not registered in the Single Registry of Taxpayers as informal; therefore, workers in these companies are considered informal (Vera et al., 2015). With this, an update and homologation were carried out in the ENEMDU databases, which provide a measure of informality since 2007 with the new methodology.

The gross employment rate is measured as the ratio of employed to the economically active population. The population with tertiary education is calculated as a dichotomous variable, which takes values of 1 when the rate of population with tertiary education is higher than the national rate. The rate of workers in microenterprises is measured as the ratio of the number of workers in microenterprises (enterprises with less than 10 workers) to the total number of workers<sup>1</sup>. The rate of workers in the tertiary

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<sup>1</sup> The definition of microenterprises is based on two dimensions: the number of workers and the sales volume. Thus, companies with less than 10 workers and sales that do not exceed \$100,000 per year are considered microenterprises (INEC, 2021). However, the ENEMDU does not have information on the sales volume of companies, which is why authors such as Guevara-Rosero (2021) only work with the criterion of the number of employees.

sector is calculated as the proportion of workers in the service sectors (branches from G to U of the International Standard Industrial Classification). The urban population rate is calculated as the proportion of the population residing in urban areas. Finally, GDP per capita is measured by dividing GDP by the total population in each region, assuming that the regions' share of total GDP remains the same between June and December of each year.

Additionally, meticulous processing of the ENEMDU data is carried out to align it with the dimensions and indicators of the EQI. The analysis is finely aggregated to the provincial level, allowing us to uncover regional variations in employment quality across Ecuador. Subsequently, control variables that influence the quality of employment are taken into account. Table 2 shows a detailed description and descriptive statistics of these variables.

Since 2012, Ecuador has comprised 24 provinces. Considering the analysis period from 2014 to 2019 (12 periods), the dataset includes a total of 288 observations. However, in June 2016 and 2017, and in December 2018, the databases do not contain information for the province of Galapagos, so the final database size is 285 observations. Thus, the panel dataset used in this study consists of 24 cross-sectional units corresponding to Ecuador's provinces, observed over 12 time periods. However, due to missing data for the Galápagos province in certain years, the dataset is classified as unbalanced.

To avoid multicollinearity, the correlation between these variables was calculated, showing that the rate of people employed in the tertiary sector and the rate of people living in urban areas showed the highest correlation (0.86). Additionally, the variance inflation factor was calculated where the rate of people employed in the tertiary sector showed the highest value (Appendix 2). With these considerations, this variable was excluded from the analysis.

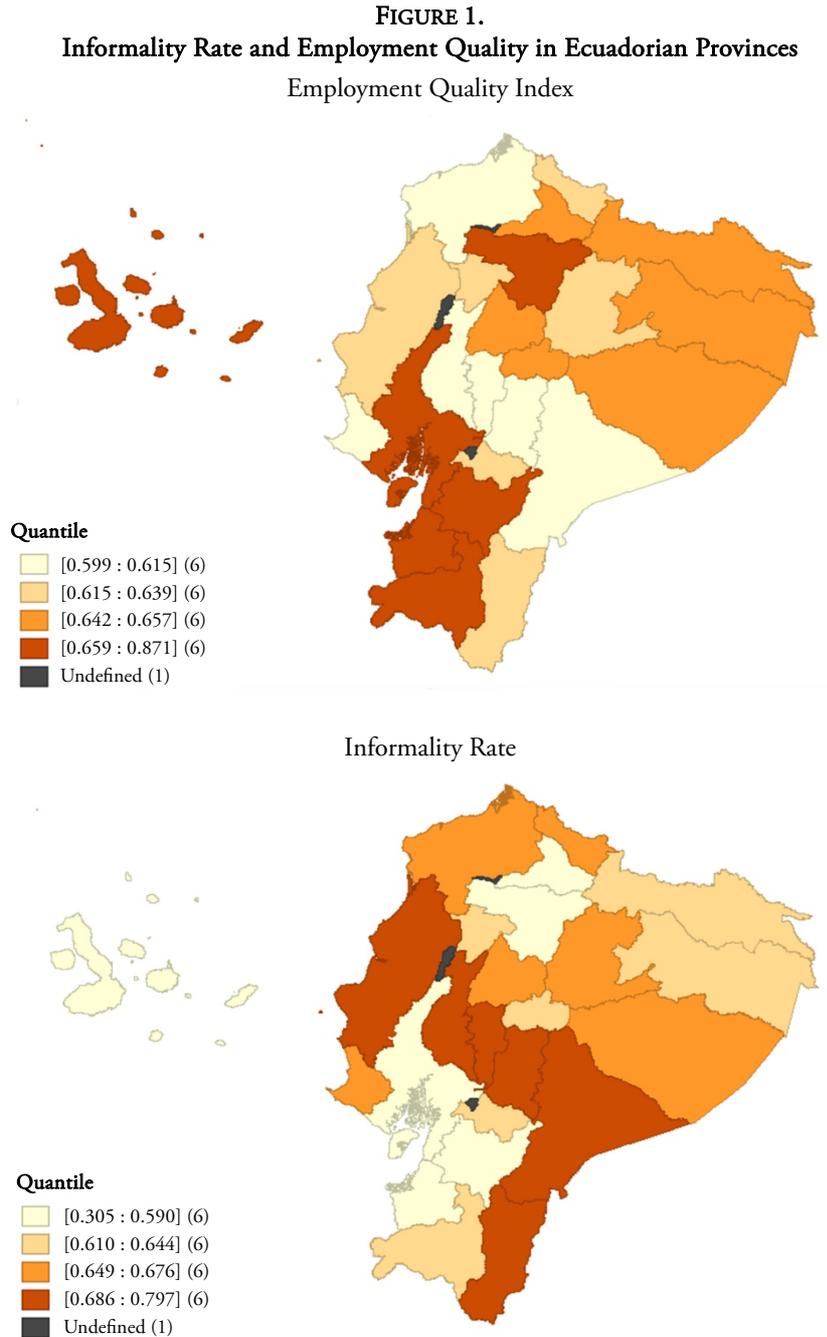
TABLE 2.  
Descriptive statistics of aggregated variables used in the estimates

Variable	Definition	Min	Max	Mean	Std. Dev	Obs
EQI	$1 - M_0$	0.5450	0.8990	0.6484	0.0581	285
Rate of informality	$\frac{\text{employees in informal sector}_{i,t}}{\text{employees}_{i,t}}$	0.1277	0.8580	0.4862	0.1254	285
GDP per capita	$\frac{GDP_{i,t}}{\text{population}_{i,t}}$	1.0555	27.7145	2.8356	2.8296	285
Gross employment rate	$\frac{\text{employees}_{i,t}}{\text{economically active population}_{i,t}}$	0.5053	0.8758	0.6674	0.0785	285
Population with tertiary education	1 if the rate of population with tertiary education is higher than national average	0	1	0.4175	0.4940	285
Rate of employees in microenterprises	$\frac{\text{employees in microenterprises}_{i,t}}{\text{employees}_{i,t}}$	0.7498	0.9899	0.9021	0.0546	285
Rate of employees in the tertiary sector	$\frac{\text{employees in the tertiary sector}_{i,t}}{\text{employees}_{i,t}}$	0.1430	0.8248	0.4640	0.1246	285
Urban population rate	$\frac{\text{urban population}_{i,t}}{\text{population}_{i,t}}$	0.1207	0.9652	0.5379	0.2113	285

Source: ENEMD

## 5. INFORMALITY AND EMPLOYMENT QUALITY INDEX IN ECUADOR

The comparative analysis of informality and job quality in Ecuador for 2014 and 2019 reveals profound regional disparities during the period. Provinces such as Pichincha, Galapagos, Guayas, Azuay and El Oro show lower informality rates and higher employment quality indices, potentially indicating more robust formal employment structures and better job conditions (Figure 1). Conversely, provinces like Bolívar, Los Ríos, Chimborazo and Morona Santiago exhibit higher informality rates, suggesting a prevalence of informal employment and potentially lower job quality.



**Note:** Average for the period 2014 to 2019.

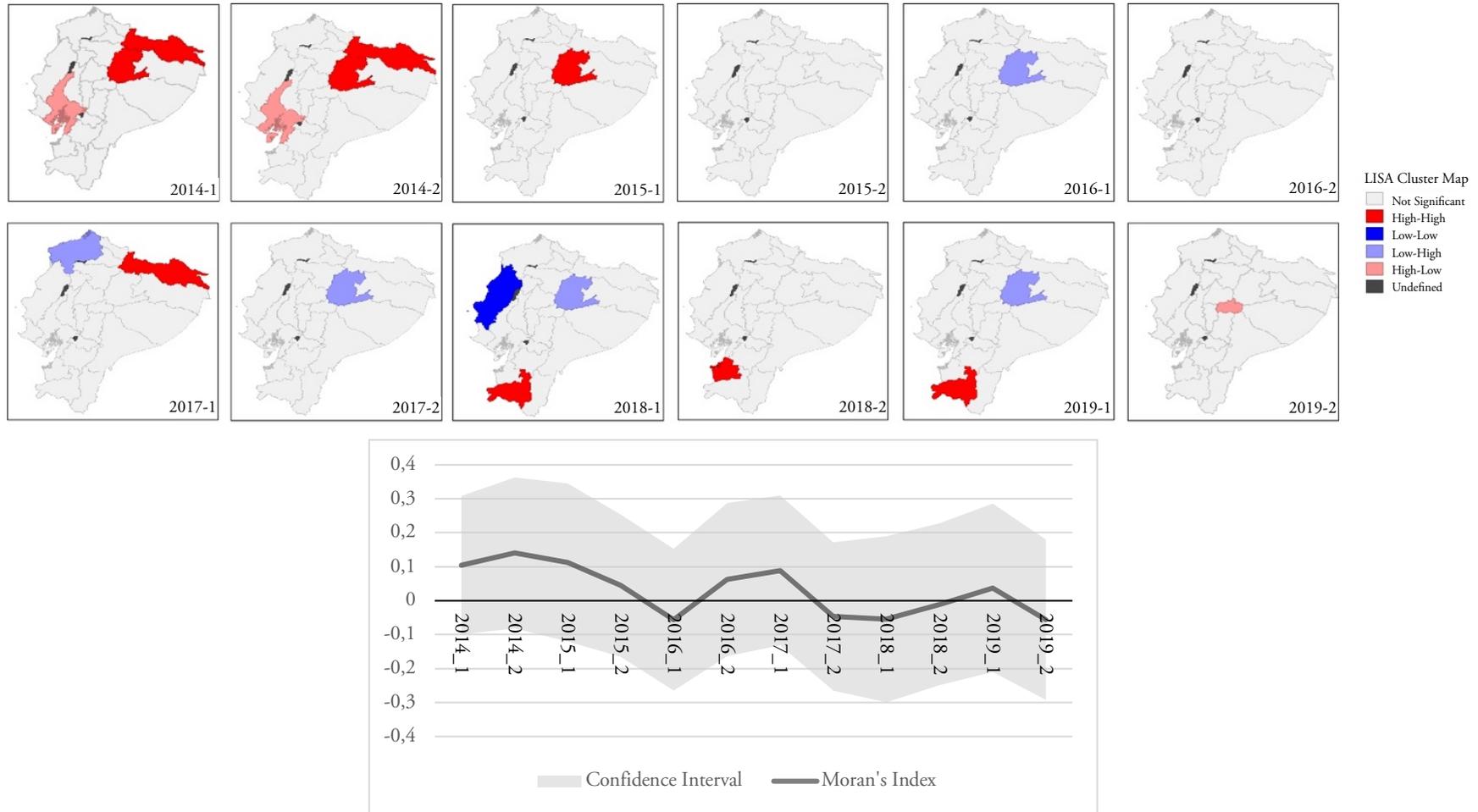
**Source:** ENEMDU.

The Local Indicators of Spatial Association (LISA) cluster maps and Moran's I statistics for the Employment Quality Index (EQI) provide a localized and global measure of spatial autocorrelation, respectively, for the years 2014 and 2019 (Figure 2). The LISA cluster map shows between 2014 and 2015 clusters with provinces in the north of the country where the EQI takes high values that are surrounded by provinces with similar values (red provinces on the map). During 2016 this pattern disappears and between 2017 and 2018 it is observed that in this area of the country there are provinces with low EQI values surrounded by provinces with equally low values (the case of Esmeraldas in the far north and Sucumbíos towards the northeast) or provinces with high EQI values (the case of Manabí in the northwest of the country). Finally, in 2018 and 2019, clusters of provinces with high EQI values surrounded by provinces with equal values appear again, but now in the southern part of the country. Despite these localized patterns in certain areas of the country, the Moran's I shows that there is no spatial autocorrelation for the EQI during the period analyzed. That is, it can be assumed that the distribution of EQI values is random between provinces.

The analysis of the spatial distribution of informality rates in Ecuador through LISA cluster maps and Moran's I statistics from 2014 to 2019 (Figure 3) shows clusters of provinces where the informality rate is low, in the northern part of the country. This contrasts with the fact that in these areas there are also clusters of provinces with high EQI values. However, this pattern fades in 2016, 2018 and 2019. Additionally, the Moran index shows that there is no spatial autocorrelation for this indicator, except for the second half of 2014 where a positive spatial correlation is shown.

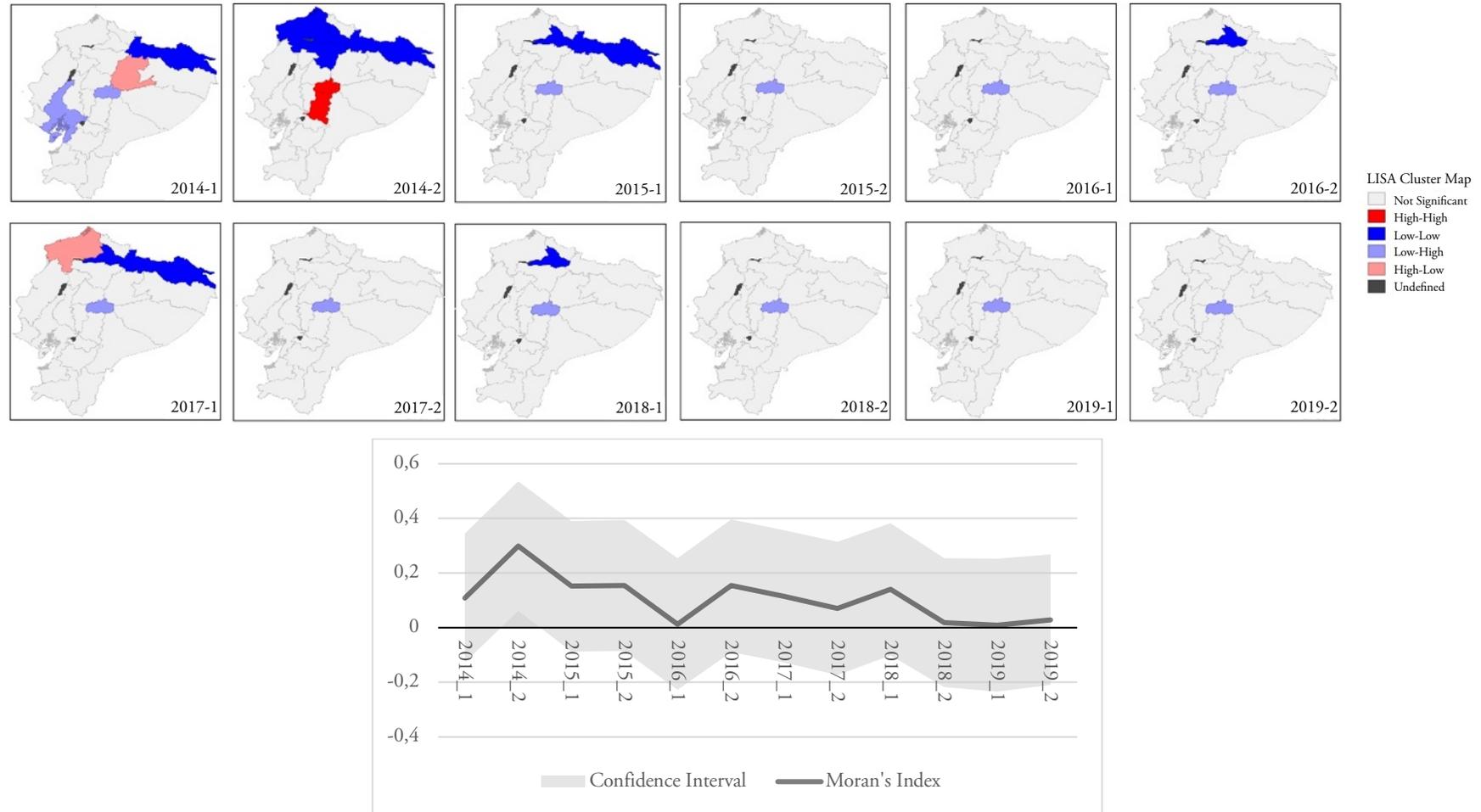
In the pursuit of understanding the broader interplay between informal employment and employment quality within Ecuadorian provinces, a bivariate LISA analysis was conducted. This analysis aimed to discern whether the informality rates of neighboring provinces exert an influence on the Employment Quality Index (EQI) within a given province. The results revealed that the relationship between a province's EQI and its neighbors' informality rates was not statistically significant. This suggests that the quality of employment within a province may not be directly affected by the informal employment rates in the adjoining regions. This finding indicates a level of independence in the factors determining the quality of employment, implying that local provincial conditions, policies, and economic dynamics may play a more substantial role than the influence of neighboring provinces' employment structures.

FIGURE 2.  
LISA cluster map and Moran's I for Employment Quality Index



Source: ENEMDU.

FIGURE 3.  
LISA cluster map and Moran's I for Informality



Source: ENEMDU

## 6. RESULTS

We present an examination of the determinants of the Employment Quality Index (EQI) across Ecuadorian provinces, utilizing pooled ordinary least squares (OLS) regressions and panel data techniques. Our empirical strategy progressively incorporates additional complexities to elucidate the nuanced effects of informality on employment quality, especially considering the interaction with tertiary education levels relative to the national context.

Pooled OLS regression (Model 1) in Table 3, reveals a statistically significant negative relationship between the rate of informality and EQI. This negative coefficient suggests that an elevation in informality is associated with a detraction in employment quality, holding other factors constant.

Enhancing the robustness of our findings, we introduced fixed effects for both year and region in Model 2, adjusting for unobserved heterogeneity that could confound our estimates. In this specification, the coefficient for informality marginally attenuates to -0.2051, yet remains negatively significant, thereby affirming the adverse impact of informality on employment quality within fixed regional contexts.

In Model 3, we enriched our analysis by including an interaction term between informality rates and a binary indicator of tertiary education, which is set to 1 for provinces with a proportion of tertiary-educated population exceeding the national average. The interaction term emerged as significantly negative. This outcome indicates that the detrimental effect of informality on employment quality is more pronounced in provinces with higher levels of tertiary education.

Since the data we are working with follow a panel data specification, the Breusch Pagan test is applied to determine whether the random effects estimator with panel data is better than using the OLS estimator in pooled data. Then, the Hausman test is applied to decide the best panel data model between fixed and random effects (Appendix 3). After these tests, it is determined that the best model is the fixed effects model, which is shown in specification 4 of Table 3. In this model it is observed that the informality rate maintains its negative effect on the quality of employment, however the education and the interaction between education and informality are not significant.

Since there is some evidence of spatial autocorrelation in the informality rate and of localized spatial autocorrelation in both the employment quality index and the informality rate, it was decided to additionally estimate the spatial error and spatial lag model (SAC model) with fixed effects to panel data. Across all models in Table 4, the rate of informality consistently exerts a negative impact on EQI, underscoring the detrimental effects of informal employment on job quality, even when accounting for spatial dependencies. In fact, the significance of both the lambda ( $\lambda$ ) and the rho ( $\rho$ ) in the SAC model suggests that spatial dependencies are crucial in understanding the relationship between informality and job quality in Ecuador. These findings indicate that not only do local factors within a region influence employment quality, but there are also significant spillover effects from neighboring regions.

However, even considering these relationships of the regions in space, it is evident that education is not influencing the relationship between informality and the quality of employment. These results could be due to structural factors, such as the lack of formal employment opportunities and the widespread informal practices that dominate the labor market, leading to a scenario in which education does not translate into better quality of employment. As a result, even highly educated individuals might not achieve better employment outcomes due to the entrenched nature of informal work.

TABLE 3.  
OLS and Random Effects Panel Data Estimation Results

Dependent variable: <i>EQI<sub>it</sub></i>	Pooled OLS (1)		Pooled OLS with time-region effects (2)		Pooled OLS with time-region effects and interaction (3)		Panel fixed effects with interaction (4)	
	Coefficient ( <i>Std. Dev.</i> )		Coefficient ( <i>Std. Dev.</i> )		Coefficient ( <i>Std. Dev.</i> )		Coefficient ( <i>Std. Dev.</i> )	
Rate of informality	-0.4309 (0.0292)	***	-0.2051 (0.0328)	***	-0.1338 (0.0322)	***	-0.1485 (0.0385)	***
Population with tertiary education	0.0160 (0.0049)	***	0.0241 (0.0043)	***	0.1349 (0.0170)	***	0.0103 (0.0237)	
Interaction between informality and tertiary education					-0.2371 (0.0354)	***	-0.0124 (0.0488)	
GDP per capita	0.0008 (0.0007)		0.0010 (0.0006)		0.0012 (0.0006)	**	-0.0002 (0.0009)	
Gross employment rate	0.1873 (0.0317)	***	0.0166 (0.0349)		-0.0245 (0.0329)		-0.1255 (0.0400)	***
Rate of employees in microenterprises	0.0197 (0.0655)		-0.1106 (0.0644)	*	0.0044 (0.0621)		-0.2096 (0.0671)	***
Urban population rate	-0.0647 (0.0157)	***	-0.0265 (0.0152)	*	-0.0237 (0.0141)	*	0.0197 (0.0243)	
Constant	0.7411 (0.0596)	***	0.8440 (0.0590)	***	0.7243 (0.0575)	***	0.9776 (0.0632)	***
Time fixed effects			<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	
Region fixed effects			<i>Yes</i>		<i>Yes</i>		-	
# observations	285		285		285		285	
Adj. R squared	0.7035		0.7985		0.8272		-	
Root MSE	0.0317		0.0261		0.0242		-	

Source: Own elaboration.

TABLE 4.  
SAC Model Estimation Results

Dependent variable: <i>EQI<sub>it</sub></i>	SAC Model with fixed effects (1)		SAC Model with fixed effects and interaction (2)	
	Coefficient ( <i>Std. Dev.</i> )		Coefficient ( <i>Std. Dev.</i> )	
Rate of informality	-0.1140 (0.0342)	***	-0.1141 (0.0350)	***
Population with tertiary education	0.0052 (0.0039)		0.0051 (0.0213)	
Interaction between informality and tertiary education			0.0002 (0.0441)	
GDP per capita	-0.0004 (0.0008)		-0.0004 (0.0008)	
Gross employment rate	-0.1517 (0.0356)	***	-0.1517 (0.0358)	***
Rate of employees in microenterprises	-0.2271 (0.0605)	***	-0.2271 (0.0606)	***
Urban population rate	0.0323 (0.0232)		0.0323 (0.0233)	
Time Fixed Effects	Yes		Yes	
# observations	276		276	
Overall R squared	0.1848		0.1847	
Rho	0.3526 (0.1706)	**	0.3528 (0.1757)	**
Lambda	-0.4142 (0.2393)	*	-0.4146 (0.2489)	*

Source: Own elaboration

## 7. CONCLUSIONS

In light of the findings from this research on the Ecuadorian labor market, we understand that the presence of informality significantly impacts the Employment Quality Index (EQI). Contrary to the expectation that higher education would mitigate the negative effects of informality on job quality, the study reveals that the presence of a more educated population does not appear to counterbalance the detrimental effects of informality on job quality.

A reason for this result could be the mismatch in the labor markets, if tertiary education is not aligned with industry needs, even a well-educated workforce may find themselves in informal sectors (Battu and Bender, 2020). Alternatively, the existence of deeply entrenched informal work practices might distort labor markets, suppressing wages and job quality even for those with advanced skills. Another reason for this result is that it would be educated entrepreneurs who can establish productive businesses against which informal businesses would not be able to compete, leading to a reduction in informality (La Porta and Shleifer, 2014) and thus improving the quality of work.

For policymakers, these findings highlight the critical need for strategies that align educational outcomes with labor market demands. This involves not just enhancing access to education but ensuring that education is directly linked to the needs of the economy. There is also a pressing need to foster entrepreneurship and support the development of businesses that can offer high-quality, formal employment opportunities.

Governments should address the issue of informal employment through a combination of strategies. While stricter enforcement of labor regulations and adjustments to minimum wage policies might be necessary, these should be complemented by efforts to expand formal job opportunities and improve the relevance of educational programs. The disconnect between education and employment outcomes in Ecuador and the fact that more education does not necessarily translate into more skills (Castro et al., 2024) indicates that reforms in the university system may be required, potentially focusing on practical skills, entrepreneurship, and stronger collaboration with industries to ensure graduates are prepared for the realities of the labor market.

The failure to tackle these issues could lead to significant consequences, including a 'brain drain' where highly educated individuals migrate to regions with better employment prospects, exacerbating regional inequalities. Furthermore, the persistence of underemployment could result in increased social dissatisfaction, as individuals find themselves in jobs that do not fully utilize their skills and education.

Recognizing the limitations of this study, particularly regarding data scope and potential confounding factors, future research should explore the causal pathways between education, informality, and job quality. Longitudinal studies, as well as comparative analyses across different regions or countries, could provide deeper insights into these complex dynamics, informing more effective policy interventions that can better address the challenges identified in this research.

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## APPENDIXES

### APPENDIX I

Dependent variable: Rate of informality <sub>it</sub>	Pooled OLS	
	Coefficient (Std. Dev.)	
Rate of population with tertiary education	-0.3258 (0.0904)	***
Rate of employees in the tertiary sector	-0.4607 (0.0761)	***
Urban population rate	-0.0967 (0.0405)	**
Rate of employees in microenterprises	0.5856 (0.0947)	***
Gross employment rate	0.0926 (0.0573)	
GDP per capita	-0.0031 (0.0013)	**
Constant	0.1780 (0.0954)	*
Time fixed effects	Yes	
Region fixed effects	Yes	
# observations	285	
Adj. R squared	0.9476	
Root MSE	0.0287	

## APPENDIX II

## Variance inflation factor (VIF) after regression

Variable	VIF	1/VIF
Rate of employees in the tertiary sector	9.69	0.103226
Rate of informality	7.01	0.142598
Urban population rate	6.89	0.145078
Rate of employees in microenterprises	3.80	0.263328
Gross employment rate	1.84	0.544365
Population with tertiary education	1.70	0.589475
GDP per capita	1.11	0.899874

## APPENDIX III

## Breusch and Pagan Lagrangian multiplier test

$$EQI[prov, t] = Xb + u[prov] + e[prov, t]$$

	Var	Sd=sqrt(Var)
EQI	0.0033794	0.0581323
e	0.0003487	0.0186726
u	0.0002179	0.0147626
Test: Var(u)=0		
chibar2(01)	99.70	
Prob > chibar2	0.0000	

## Hausman Test

	Coefficients		(b-B) Difference	Standar error
	(b) Fixed	(B) Random		
Rate of informality	-0.1929	-0.2667	0.0738	0.0189
Population with tertiary education	0.0102	0.0800	-0.0698	0.0148
Interaction between informality and tertiary education	-0.0086	-0.1469	0.1383	0.0307
GDP per capita	-0.0004	0.0004	-0.0008	0.0005
Gross employment rate	-0.1106	-0.0080	-0.1027	0.0185
Rate of employees in microenterprises	-0.2366	-0.1100	-0.1266	0.0306
Urban population rate	0.0138	-0.0554	0.0692	0.0191
Test: H0: difference in coefficients not systematic				
chi2(7)	62.86			
Prob>chi2	0.0000			

