

# 2. LABOUR FORCE PARTICIPATION AND SECTORAL DYNAMICS OVER THE BUSINESS CYCLE: REGIONAL EVIDENCE FOR ECUADOR

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## Abstract

Ecuador is a developing country characterised by a high degree of informality and has undergone significant economic transformations that have had an impact on the labour market. Despite the national trend of a slight decline in labour force participation, there are notable differences in development across the country, making it an interesting case study. This article examines the determinants of regional differences in labour force participation and the sectoral structure of employment. Using a regional panel data analysis, it identifies the cyclicity of labour force participation, formal and informal wage employment and self-employment for both sexes. The results of the decomposition highlight the significant influence of education, household conditions, age distribution and regional factors on regional labour force participation and employment composition. The results show that labour force participation has undergone significant changes over time and exhibits strong counter-cyclical behaviour. The analysis shows that formal employment is procyclical, while informal wage employment shows countercyclical fluctuations. Moreover, self-employment does not seem to be affected by the business cycle, except in recent years. Finally, it is concluded that women's participation in the labour force is more related to policies affecting the educational level of the population than to business cycle factors.

**Keywords:** labour participation rate, sectoral composition of employment, Ecuador, business cycle, employment.

**JEL:** J21, O17, E32

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## 1. Introduction

The Labour Force Participation Rate (LFPR) in Ecuador experienced three phases: a gradual decline from 2000 to 2012, a continuous rise from 2012 to 2017, and a subsequent decrease since 2017. This trend may be attributed to long-term shifts, the impact of age-related changes in labour participation, and the influence of the business cycle (Aaronson et al., 2014; Gasparini & Tornarolli, 2009).

This evolution of the LFPR in Ecuador may be the result of long-term changes, the effect of the life cycle as labour participation changes with age, and the influence of the business cycle. At the same time, a distinctive characteristic of labour markets in Latin American countries, including Ecuador, is labour informality, where informal jobs generally represent a significant proportion of work (Gasparini & Marchionni, 2017). It is estimated that more than 60% of workers is employed in informal salaried sector and self-employment in Ecuador. A basic analysis of the evolution of the sectoral composition of employment reveals a distinctive tendency. The increase in the rate of labour formality and the consequent reduction in labour informality is one of the most relevant changes experienced by the Ecuadorian labour market in recent years (Figure 2). To an important extent, this behaviour may be related to institutional and social factors that have produced long-term changes in sectoral composition of employment, as well as, the effect of the business cycle (Ontaneda et al., 2022).

While the national trend is towards a slight decrease in labour force participation, marked differences are observed in its evolution within the territory. Additionally, formal employment, informal employment, and self-employment are not equally distributed across the country. In the year 2018, the formal salaried employment rate in the province of Pichincha (49.52%) was approximately 4 times the formality rate of Chimborazo (12.43%). At the same time, self-employment in the province of Morona Santiago (74.67%) was double that of self-employment in Pichincha (34.60%) (INEC, 2018). Furthermore, it is determined that labour informality and self-employment in the provinces of Chimborazo, Morona Santiago, and Bolívar together represent 86%, while in the most economically dynamic province of the country of Pichincha, this rate does not exceed 50%.

Previous studies show the persistent geographical disparities in Ecuador, reflected in a heterogeneous economic and social geography (Mendieta & Pontarollo, 2016; Quintana-Romero et al., 2019; Răileanu-Szeles & Mendieta, 2016). The data highlights a regional economy marked by significant economic disparities, where regional economies display a high degree of polarization. Among Ecuador's 24 provinces, 3 (Pichincha, Guayas, and Azuay) generally enjoy a relatively better economic standing compared to the others. Several research findings also indicate the presence of a slow process of per capita income convergence process, accompanied by a significant degree of spatial segregation (Mendieta & Pontarollo, 2016; Quintana-Romero et al., 2019).

While various studies acknowledge the pronounced regional inequities in Ecuador, there is a scarcity of empirical research that addresses the distinct territorial dynamics of the Ecuadorian labour market. Analyses that incorporate the regional dimension are indispensable, as significant disparities between regions may persist. This paper analyses for the first time the business cycle patterns of LFPR and the sectoral composition of employment at the regional level in a developing country such as Ecuador. In particular, we focus on investigating which factors contribute to explaining the differences in labour force participation and the type of employment in the Ecuadorian regions. For this purpose, the paper conducts a Shapley-Shorrocks decomposition that allows calculating the average marginal contributions of each of the variables to the analysed labour indicator. Secondly, the article examines whether labour force participation and the sectoral composition of employment are related to the business cycle in the Ecuadorian labour market through a regional-level data analysis.

Ecuador turned out to be an interesting case to investigate the changes in labour participation and sectoral composition of employment. During the study period, labour market has been affected to both by economic growth as some changes in labour regulations that took place simultaneously. First, the period 2000-2006 is characterized by the recovery of country after the 1999 economic crisis, where the Ecuadorian economy grew in real terms at an average rate of 4.67% per year (BCE, 2023). The period 2007-2014 is characterized by rapid growth, except for 2009 due to the international crisis. The period 2014-2018 shows a marked contraction of the economy; in 2015 the economy grew by 0.10% and in 2016 it decreased by -1.23% (CEPAL, 2023). Secondly, various policies and changes in labour legislation have been implemented, including reforms that have eliminated forms of labour hiring related to precariousness and informality. The non-affiliation to the Ecuadorian Social Security Institute (IESS) of workers in a dependency relationship was classified as a criminal offense (Tinoco, 2014). Thus, the approach offers the unique opportunity to analyse LFPR and type of employment over a period that show diverse economic conditions and institutional changes. Therefore, this paper contributes to the literature on the determinants of LFPR and sectoral employment in developing countries, by providing new information about changes across business cycle. The findings are crucial for understanding the dynamics of the labour market, especially in a country like Ecuador, which is grappling with significant challenges related to informality and employment. This research not only provides a detailed insight into current labour dynamics but also makes a valuable contribution to the understanding of global economic patterns by considering regional diversity and the impacts of the economic cycle on labour force participation and sectoral composition of employment.

This paper is organized as follows: the next section describes related literature. Section 3 describes the data. Section 4 analyses the temporal evolution and regional trends of labour force participation and sectoral employment composition. Section 5 analyses provincial labour force participation and employment composition throughout the business cycle. Last, section 6 discusses and concludes.

## 2. Literature review

Studies that analysed long-term changes in labour supply patterns in Latin America documented how the labour force had increased at a considerable rate over several decades. The workforce in Latin America is becoming more gender balanced (Pagés et al., 2003). The gender gap in LFPR has partially declined as a result of the increase in the participation of women in the labour force, which may respond to the emergence of time-saving technologies in domestic production and changes in family composition, as well as the increase of women's educational achievement (Fitzenberger et al., 2004). Although, in the case of Latin America, Gasparini & Marchionni (2017) associate this behaviour with the lower and unstable economic growth, high inflation and crises experienced in the region, which prompted the entry of secondary workers, especially women. Thus, after an uninterrupted increase, the growth rate of female LFPR has slowed down in Latin America in the 2000s (Gasparini & Marchionni, 2017).

LFPR, particularly female, can be expected to be sensitive to the macroeconomic environment. This behaviour is known in the literature as the 'added worker effect': the labour participation decisions of household members are interdependent. Fluctuations in an individual's income not only affect their own labour supply but also that of other household members, such as a spouse or working-age children (Cahuc et al., 2014). This interdependence of decisions can motivate secondary workers to participate in the labour market when household income decreases in order to compensate for the loss of household income, which implies a countercyclical pattern of female labour participation (Gasparini & Marchionni, 2017; Lundberg, 1985; Parker & Skoufias, 2004).

Regarding the effect of the business cycle on labour participation, international evidence for developed countries shows that labour participation is procyclical. For example, Schweitzer & Tinsley (2004) analyse how LFPR in the UK was influenced by trend and business cycle factors. The study indicates that labour force participation exhibits a significant procyclical pattern. In the case of the United States, Shierholz (2012) argues that the reduction in the labour force participation since the beginning of the Great Recession is partially explained by the lack of job opportunities, that is, by cyclical factors.

Similarly, Van Zandweghe (2012) argue that both trend and cyclical factors played a role in reducing labour force participation in the recession of 2008, but the influence of these factors was different for men and women. Aaronson et al., (2014) conclude that cyclical weakness contributes to explaining part of the marked reduction in labour force participation since 2007 in the United States, although their results suggest that the contraction in participation is mainly due to ongoing structural influences related to demographic factors. In the case of Latin America, studies that analyse the cyclical behaviour of LFPR are rather scarce. Exceptions, such as Gasparini & Marchionni (2017), determine that the trend component of growth in Latin American countries is associated with an increase in female labour force participation, while short-term movements are countercyclical, especially among women with fewer years of formal education. A similar result is found by Duval-Hernández & Orraca-Romano (2011) when analysing Mexico, which determine that men's LFPR is procyclical and this trend is stronger the less formal studies, while in the case of women they find evidence of an increase in the labour supply during recessive periods. According to the authors, this is evidence in favour of the added worker effect among women with few studies.

A distinctive characteristic of Latin American labour markets is labour informality, where informal jobs generally represent a significant proportion of work (Gasparini & Tornarolli, 2009; La Porta & Shleifer, 2014; Maurizio, 2014). There are mainly two perspectives that seek to explain the existence of labour informality. The traditional view of labour market segmentation suggests that the informal sector arises as a result of the low capacity of the formal sector to absorb workers. Maloney (2004) and Perry et al., (2007), in contrast, suggest that certain workers, self-employed individuals and micro-entrepreneurs may voluntarily choose to enter labour informality, depending on the value they assign to the benefits of formality. The consensus suggests that the informal sector is a combination of segmented and self-selected workers (Perry et al., 2007). Thus, Maloney (2004) Bosch & Maloney (2008) find pro-cyclical transition patterns between the formal and informal sectors which suggest that an important part of the informal sector, particularly self-employment, corresponds to voluntary entry, although informal salaried work seems to correspond to the traditional view. According to the previously mentioned authors, a significant portion of the informal sector is considered voluntary, attributing this behaviour to comparative advantages that make this sector more attractive. However, they point out that another segment is in this market due to inefficiencies in the delivery of social benefits, promotion systems not based on merits, or the market's own segmentation.

Bosch & Esteban-Prete (2009) and Corseuil & Foguel (2012) propose a model to understand the way in which markets with large informal sectors respond to cyclical fluctuations. The authors argue that expansions promote the creation of vacancies, which increases the number of meetings between companies and workers (meeting effect), and companies increase the use of formal contracts that allow them to increase the productivity (offer effect). That produces an unequivocally positive impact on the job finding rate for formal jobs, but has an ambiguous impact on the finding rate for informal jobs. The impact on the share of formal employment depends on the strength of job creation in each sector.

### 3. Data

We use ENEMDU, which is a national survey with urban and rural representation that collects information about working conditions. The sample includes public sector employees, private wage earners, domestic workers, the self-employed and patrons. The sample weights provided by the survey are used in all analyses.

Individuals aged between 15-70 years are considered. The study period runs from 2000 to 2018, excluding 2002 because this year only includes an urban sample. The surveys correspond to the month of December. This implies that study period includes the recovery after the economic crisis of the late 1990s, the effects of the global financial crisis, the economic expansion registered up to 2014, the episode of economic contraction observed in 2015 and 2016, and slower growth until the end of the period analysed.

The labour participation rate is calculated as persons in the labour force expressed as a percentage of the working-age population. The analysis is carried out both by gender, and for the formal salaried, informal salaried and self-employment sectors. The study defines informal workers as those who are not affiliated with social security (Hussmanns, 2004).

First, the paper studies the evolution of the variables analysed throughout the period 2000-2018. Subsequently, a province-level panel data analysis is carried out to determine the cyclical behaviour of labour participation and the sectoral composition of employment.

## 4. Evolution of labour force participation and sectoral employment composition at the provincial level

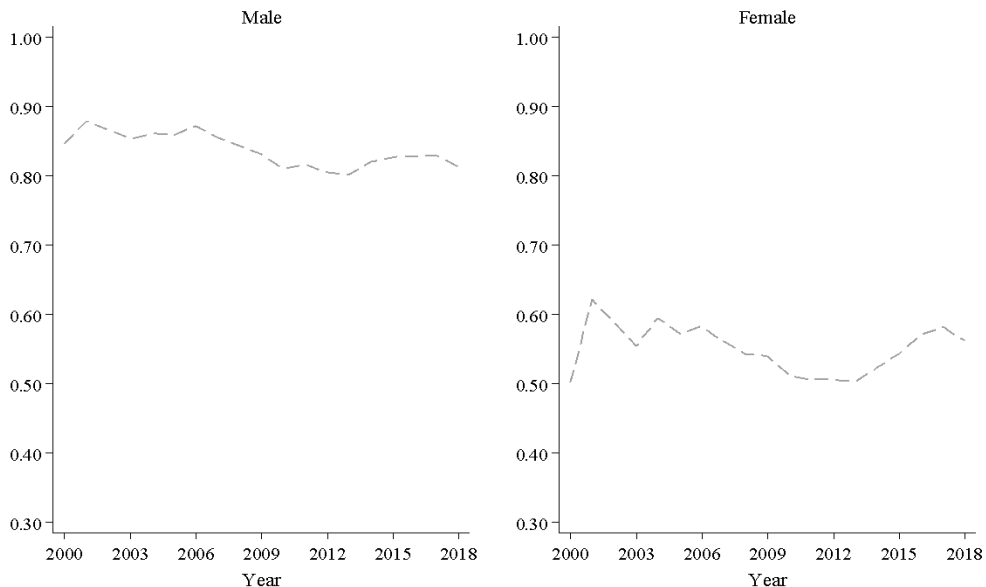
### 4.1. Descriptive analysis

First, the paper briefly describes the evolution of the variables throughout the period 2000-2018. In the Figure 1 presents LFPR for men and women. The marked gender difference is evident, where LFPR for men is always higher compared to women. In both cases, a decreasing trend is observed in their LFPR, with the exception of the latest years when labour participation has increased considerably. In fact, participation rate is clearly linked to economic conditions since LFPR is reduced considerably until 2012, which occurs within the framework of sustained economic growth. Also, labour participation increases between 2013 and 2017, to begin to decrease until the end of the period, which is in line with macroeconomic setting.

Figure 2 shows the evolution of formal employment, informal employment, and self-employment. The analysis shows that formal work is higher for men, while self-employment is higher for women. As mentioned, labour informality has been one of the main characteristics of the Ecuadorian labour market. The significant reduction in informality has been probably one of the main changes in the Ecuadorian labour market in recent years. The Figure shows that formal employment increased continuously between 2003 and 2014, while the rate of informal employment decreased, particularly for women.

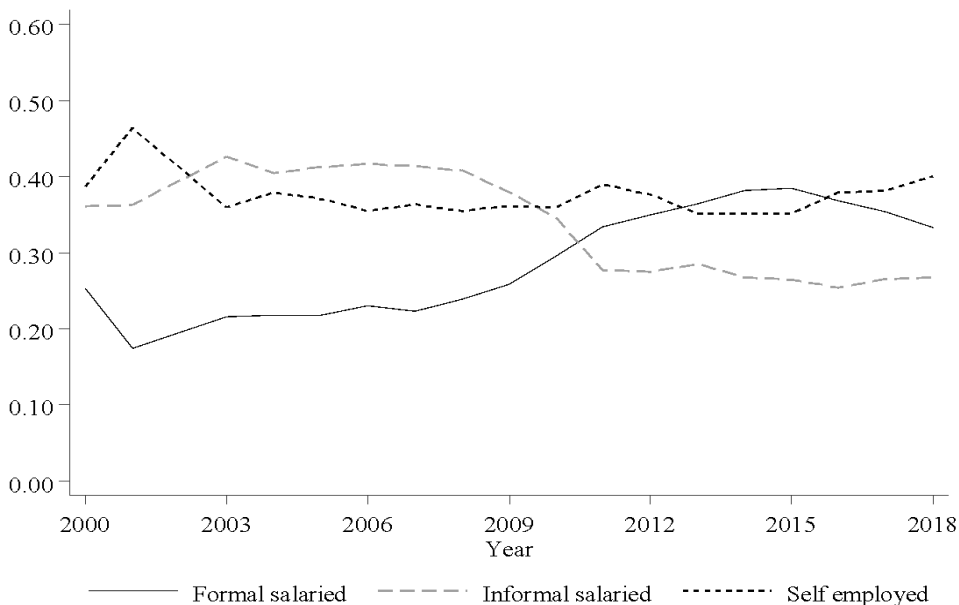
The reduction of informality can be associated with policies aimed to promote affiliation to social security, but it can also be related with the behaviour of the economy. The traditional view explains that informality sector can function as a refuge for workers who cannot be employed in the formal sector of the economy. As mentioned above, the years 2000-2014 represented an episode of economic recovery, so that, as jobs were created in the formal sector, workers moved to this sector and the percentage of informal workers decreased.

**Figure 1. Labour participation by gender**



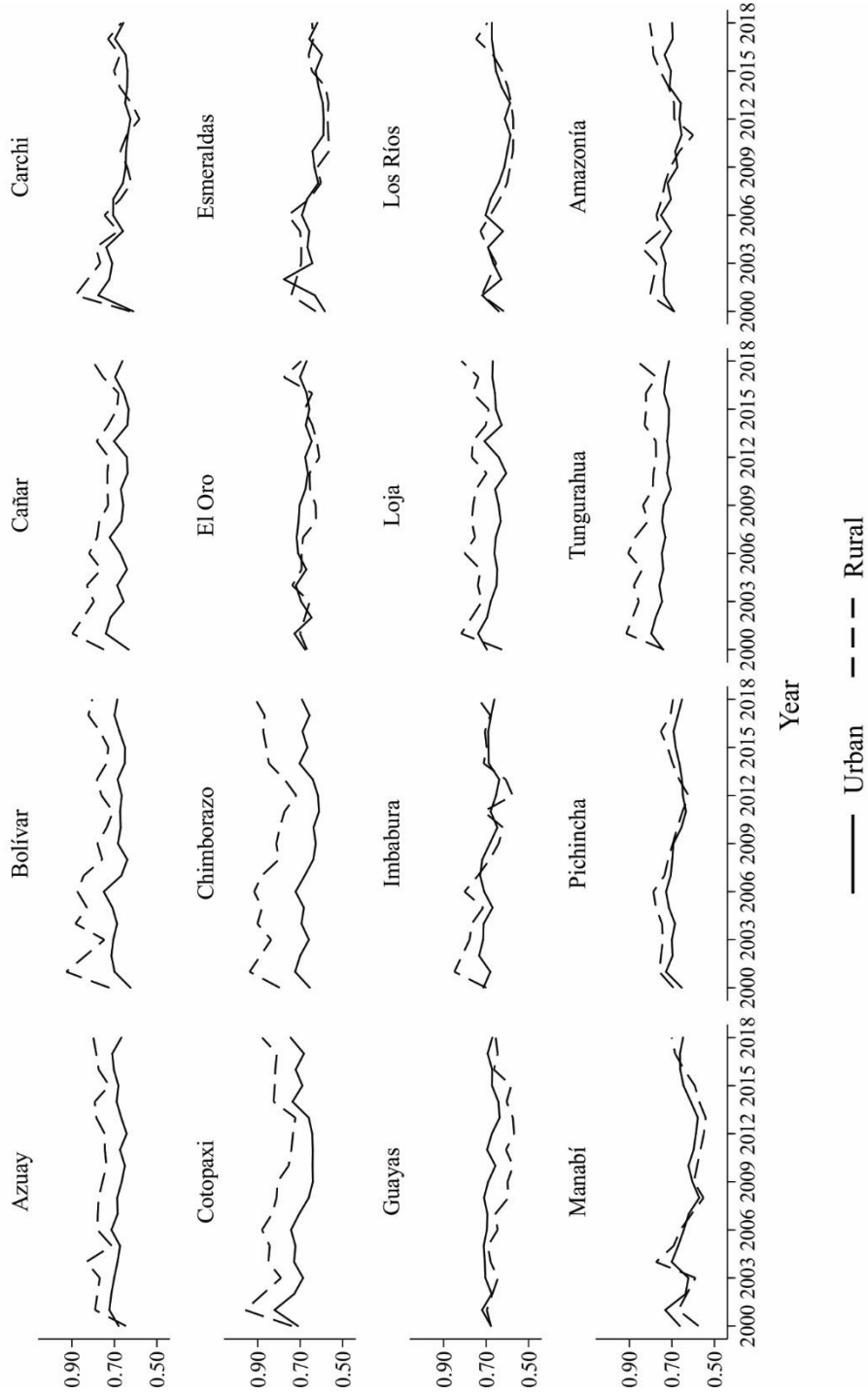
Source: Author's estimates using ENEMDU several years.

**Figure 2. Composition of employment**



Source: Author's estimates using ENEMDU several years.

Figure 3. Regional labour force participation



Source: Author's estimates using ENEMDU several years.

Informal employment and self-employment not only closely follow the performance of the economy during the initial period, but also seem to increase as of 2014, a period during which the country has experienced recession and economic contraction. For unemployed workers, labour informality became the only option; consequently, the workers in this sector increased. Figure 2 presents the evolution of employment composition. Formal and informal wage worker rates showed opposing trends during the study period. Formal employment saw consistent growth from the 2000s, with a significant rise in 2007, but a decline in 2016 due to economic challenges faced by economy. However, informal employment reached its peak in 2006, experiencing a slight decrease until 2011. Conversely, self-employment show a more constant trend, experiencing a significant decrease starting in 2001. This trend persisted until 2016, with a slight increase, possibly in response to the country's challenging economic situation.

#### ***4.2. Regional trends in labour force participation and sectorial composition of employment***

According to Figure 3, the national perspective on labour force participation is significantly influenced by the major provinces of Ecuador, Pichincha and Guayas, which represent 43.4% of the total population (INEC, 2018). In contrast, a subnational analysis allows for the identification of existing differences in regional Ecuadorian labour market. Additionally, the analysis below aims to visualize disparities in labour market structure between urban and rural areas.

In general terms, in most provinces, there is a recovery in LFPR following the financial crisis of 1999. This sustained growth continues until 2006, after which LFPR decreases slightly. However, starting in 2012, there has been a sustained increase in LFPR driven by the rise in female labour force participation in response to the economic deterioration observed during these years.

However, the cyclical evolution of provincial LFPR shows some notable differences. While in most provinces, an increase in LFPR is observed since 2015, several provinces exhibit little or no change in labour participation despite the deterioration of conditions, which is particularly noticeable in the provinces of Guayas, Imbabura and Esmeraldas.

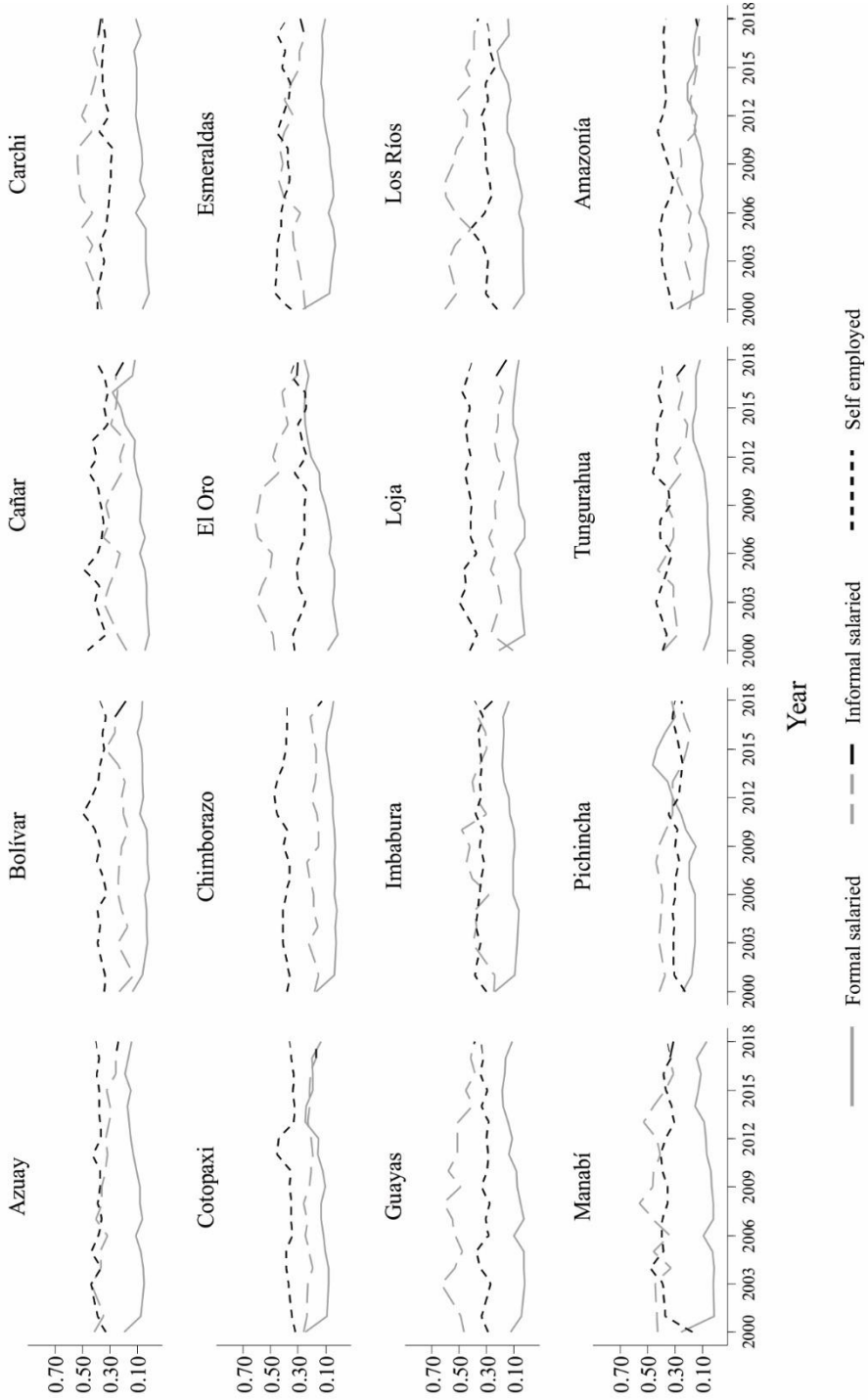
In the provinces specializing in agricultural activities such as Bolívar, Cañar, Cotopaxi, Chimborazo, and Tungurahua, the difference between rural and urban LFPR compared is remarkable. One aspect to consider is that starting from the year 2015, the urban-rural labour participation gap has narrowed in most provinces, a trend related to the economic deterioration in the country during these years. It is worth noting that Guayas is the only province in the country where urban labour force participation surpasses rural participation throughout the entire study period.

In provinces like Bolívar, Cañar, Cotopaxi, Chimborazo, rural LFPR consistently exceeds urban participation. Additionally, it is important to highlight the behaviour of provinces like Azuay, Guayas, Los Ríos, and Chimborazo, where LFPR has exhibited a growing trend over the past three years. In contrast to the national trend, the Amazonian regions experienced a continuous increase in labour force participation.

In summary, the data indicate that the national trend does not uniformly reflect all regions, and many provinces exhibit their unique dynamics that deviate from what is observed at the national level. These findings confirm the existence of notable regional variations among the provinces of Ecuador. This type of analysis highlights the valuable contribution of this research, as it allows for the observation of the heterogeneities present in each region, thereby providing a more comprehensive and accurate representation of the labour situation in the country.

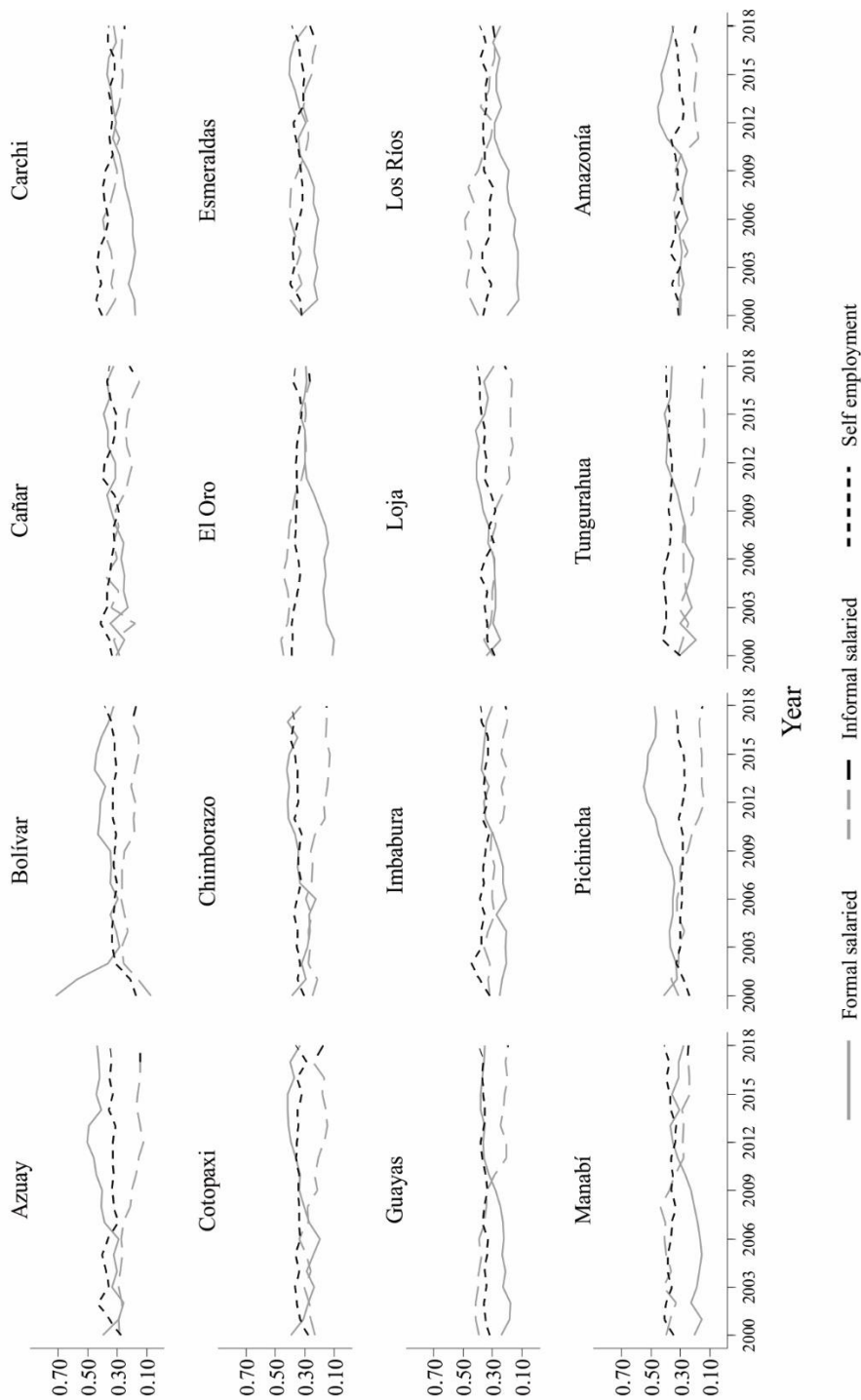


Figure 4a. Sectorial composition of employment (Rural)



Source: Author's estimates using ENEMDU several years.

Figure 4b. Sectorial composition of employment (Urban)



Source: Author's estimates using ENEMDU several years.

Most studies address this analysis at the national level, overlooking the variations present at the provincial level and the different trends observed in urban and rural areas. According to national data, most jobs in Ecuador are informal wage employment and self-employment. Regional data shows formal employment predominates in urban areas, while rural areas have a significant informal wage employment and self-employment sector. Additionally, the data shows that the composition of employment differs considerably between regions. In rural areas, provinces like Bolívar, Chimborazo, and Loja exhibit a prevalence of self-employment, while in provinces such as Carchi, Guayas, El Oro, Imbabura, Los Ríos, and Manabí, the informal sector predominates.

Similar to what was observed in the aggregated data, regional data also indicates a downward trend in the informal wage employment rate in most provinces. It is important to note that self-employment has remained constant during the study years, with the formal and informal employment rates evolving in opposite directions over the period.

Subnational analysis allows us to observe two worth noting situations that go unnoticed in national analysis. First, the sustained growth in formal employment (and the consequent reduction in informal employment) is primarily occurring in the urban areas of the country. Second, the achievements in increasing formal employment are not uniform across the country, and the noticeable growth in formality between 2009 and 2014 (and its subsequent decrease) is mainly concentrated in the most dynamic province of the country, Pichincha.

Figure 4b illustrates that urban sector shows a significant increase in the formal employment over the analysed period. The data also indicate that the increase in self-employment as a response to the macroeconomic deterioration observed from 2013 onwards primarily originated in the urban sector of the country.

There are significant disparities in the labour composition between urban and rural areas. While self-employment and the informal market predominate in the rural sector, in the urban sector, provinces like Azuay, Bolívar, and Pichincha exhibit a higher participation in the formal sector. Through this analysis, the document allows for a deeper understanding of the existing disparities, facilitating a more effective approach to addressing potential inequities in each region. It provides support for the formulation of strategies that align with the specific needs and challenges of each region.

### ***4.3. The relative importance of different determinants in explaining regional labour differences***

This section establishes the importance of different factors in determining regional LFPR and sectoral employment composition. The exercise allows us to determine how much of the observed disparity can be attributed to each of the analysed factors.

We propose a decomposition of inequality measures using the Shapley-Shorrocks decomposition method. This method allows for the decomposition of an aggregate statistical indicator  $I$  into a set of contributory factors  $X_1, X_2, \dots, X_n$ ,  $I = f(X_1, X_2, \dots, X_n)$ , where  $f(\cdot)$  describes the underlying model. The decomposition assigns contributions  $C_k$  to each of the factors  $X_k$ , in a way that  $I$  is expressed as the sum of the factor contributions. Thus, the outcome variable  $I$  is divided among a set of factors in an additive structure.

To compute the share of inequality attributed to each variable, the following procedure is applied: (1)  $I$  is calculated for all possible coalitions of the regressors (2) the Shapley value of each variable is calculated as the average of all its marginal contributions to  $I$ . The marginal contribution is calculated as the difference in  $I$  between a combination where the variable is included and this same coalition without it. Therefore, the contribution of a variable is calculated as the average marginal contribution in all possible combinations of the variables (Fourrey, 2023).

The Shapley-Shorrocks decomposition satisfies two important properties. First, it is symmetric in the sense that the contribution assigned to any given factor should not depend on the way in

which the factors are listed (Shorrocks, 2013). Secondly, decomposition should be exact and additive, such that  $C_k$  can be interpreted as the proportion of observed inequality attributable to factor  $k$  (Shorrocks, 2013).

In this task, we use variance as a measure of inequality. We start by estimating a log-linear equation and then calculate the labour rate variance. Taking advantage of the diversity of behaviours observed in the country's regions, the paper proposes a panel data regression model with regions as the unit of analysis. In this way, it captures the inter-regional and inter-temporal evolution of labour participation. The decomposition starts from the following model:

$$\log\left(\frac{y_{p,t}}{1-y_{p,t}}\right) = \alpha + \xi X_{p,t} + \eta_t + u_p + \varepsilon_{i,t} \quad (1)$$

Where  $p$  refers to the region, and  $t$  denotes the time dimension. The analysis takes advantage of the fact that the ENEMDU is representative at the provincial and urban-rural levels and divides each region into areas. Due to the considerable differences in the evolution between men and women, the analysis of labour participation is disaggregated by sex. In the estimation, we considered the averages for the years 2000-2002, 2003-2005, 2006-2008, 2009-2011, 2012-2014, and 2015-2018 to ensure maximum variability among regional variables. This process is useful for maintaining consistency in indicators. For this research, adjustments were made on a triennial basis, with the exception of the last one, which spans four years. According to Bond et al. (2001), this temporal adjustment aims to correct the inherent inertia in indicators and mitigate effects related to macroeconomic cycles. Consequently, each temporal unit reflects the three-year average for each indicator, resulting in a total of six temporal units. Participation rates ( $y$ ) are expressed using log-odds because this guarantees that the linear predictions remain confined between 0 and 1.  $X$  represents a matrix of determinants, including age groups 15-24, 25-34, 35-44, 45-54, 55-64, and over 65 years; the educational achievement of the population, which is measured as the percentage of people between 25 and 70 years in four education levels: none, primary, secondary, and higher. Additionally, we include a variable that measures the percentage of people belonging to a minority group and a household deprivation index, assessing the material conditions of the population<sup>5</sup>. Additionally, specific time-invariant factors characterizing the labour market structure of each province are considered  $u_i$ . We include time effects ( $\eta_t$ ), to account for global conditions that change over time and collectively affect all provinces. The last variable  $\varepsilon$  represents the i.i.d. error.

The first step in the decomposition analysis is to run the labour rate functions (1). The regression results appear in Annex 1. Table 1 established that the  $j$ 'th factor's percentage contribution to the level of regional disparities differ considerable between factors. The outcomes of the standard regression analysis could not have discerned these disparities in relative significance.

Table 1 shows that the most important factor in explaining regional disparities in male labour force participation is the educational achievement of the population. 30.9% of the regional differences in male labour participation are attributed to variations in the educational achievement of the population. The data also indicate that household material conditions explain a significant portion (21.8%) of regional differences in male labour force participation. This suggests a strong association between the decision to participate in the labour market and household economic conditions. In this case, the age structure of the region explains approximately 8.84% of male labour force participation.

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<sup>5</sup>Material wealth is a household wealth proxy calculated as an index of principal components analysis of the characteristics of the household's dwelling: main material of the dwelling's floor, sewage elimination systems, and water supply system. The higher the index, the lower the wealth of the household.

Table 1. The contribution of each explanatory factor to regional disparity (%)

Variable	Male				Female			
	Labour participation	Formal salaried	Informal salaried	Self employed	Labour participation	Formal salaried	Informal salaried	Self employed
Age group (25-34)	2.8	9.49	2.39	6.2	0.64	8.38	1.97	7.57
Age group (35-44)	0.58	9.65	2.19	4.3	1.07	7.54	1.32	6.11
Age group (45-54)	2.11	8.22	2.79	2.95	0.7	5.95	1.54	4.5
Age group (55-64)	1.09	4.02	3.74	1.51	0.54	2.12	6.03	2.01
Age group (65-70)	2.26	0.76	3.73	3.19	1.15	1.24	4.39	3.29
Primary	23.68	9.21	4.75	3.11	18.33	13.15	1.64	10.6
Secondary	5.04	8.86	2.92	3.16	21.83	10.3	1.8	9.27
University	2.18	8.58	6.76	3.18	20	11.83	1.99	9.76
Minority group	1	2.33	4.91	11.05	1.92	1.99	2.86	3.95
Poor material condition	21.8	9.43	2.22	5.71	2.89	9.46	1.75	8.51
Regional effects	27.24	22.65	52.58	53.07	28.09	23.76	54.87	29.82
Temporal effects	10.22	6.81	11.01	2.56	2.83	4.28	19.83	4.6

Source: Author's estimates using ENEMDU several years.

In the case of women, the data also emphasize the significant importance of the population's educational achievement in explaining regional differences in labour force participation. In fact, more than 60% of the differences in labour force participation are attributed to this variable. In this case, the age structure contributes to explaining a small portion of female labour force participation.

The estimated labour equations suggest that formal employment decreases for younger workers and those with lower levels of education (Annex 1). This was expected in light of previous studies that find significant differences in the formal employment rate across the life cycle in Ecuador (Balleer et al., 2009; Contreras et al., 2005; Ontaneda et al., 2022). Table 1 confirms that these factors are the most important in explaining regional differences in the formal employment rate. The results from Annex 1 also demonstrate a strong association between household economic conditions and the labour market status of its members. This indicates that household material conditions play a significant role in explaining regional differences in formal employment, with an inequality weight factor of 9.43% for men and 9.46% for women.

In the case of informal employment, regional-specific characteristics hold significant weight. For example, sectoral specialization and institutional differences in each province can represent an essential factor contributing to explaining the employment structure of each province. This result is important because it suggests that regional labour informality is not primarily explained by the level of educational achievement of the population or age structure but rather by specific regional characteristics. In the case of men, the age structure explains 14.84% of regional differences, and in women, it is 15.25%. Education remains in order of relevance, with a factor inequality weight of 14.43% and 5.43% in men and women, respectively.

In the case of self-employment, it is worth highlighting some relevant points. The data indicates that the factors contributing to explaining regional differences in self-employment vary between men and women. In the case of men, regional characteristics were the most important variable, with a factor inequality weight exceeding 50%. Following this is the age structure (18.15%) and membership in a minority group (11.05%).

In women, regional characteristics (29.82%), education level (29.63%), age structure (23.48%), and household material conditions (8.51%) are the most relevant factors. This highlights the differences in the determinants of self-employment between men and women, which aligns with previous studies (Ontaneda et al., 2022).

In sum, the most important factors in explaining regional differences in labour force participation and employment composition are the educational achievement of the population and age groups. However, in the case of informal wage employment and self-employment, specific regional characteristics stand out, as well as the economic conditions of the worker's household.

## **5. Provincial labour force participation and employment composition throughout the business cycle**

This section analyses the cyclicity of the labour force participation and sectorial composition of employment by exploiting regional disparities in labour market conditions. As shown in the Figure 4a and 4b, the evolution of labour force participation and sectorial composition of employment vary considerably across region, which can help to estimate business-cycle effects. The marked geographical heterogeneity in the evolution of labour force participation and the sectorial composition of employment is evident. There are regions with a marked increase in labour participation and some regions with moderate expansions and even contractions. Similarly,

Annex 2 shows that the unemployment rate, a proxy for the business cycle, shows different regional behaviours during the study period.

The article analyses the sectoral composition of employment for formal salaried, informal salaried and self-employment sectors. Following Aaronson et al. (2014), the paper estimates a provincial-level panel data regression model on annual data using the following specification:

$$\log\left(\frac{y_{p,t}}{1-y_{p,t}}\right) = \alpha_p + \delta_t + \gamma_p \text{time} + \sum_{i=0}^k \beta_i UR_{p,t-i} + \phi X_{p,t} + \varepsilon_{p,t} \quad (2)$$

Where  $\alpha_p$  represents province and area fixed effects,  $\delta_t$  are time fixed effects,  $\gamma_p$  are specific time trends for each province and area, and  $X_p$  is a vector of covariates related to demographic characteristics<sup>1</sup>. Due to the short period available, the analysis limit to two the number of lags included in the model. As mentioned earlier, the microdata is aggregated across provinces, area and years in order to construct the cross-sectional/time series panel, where the number of regions  $N = 32^2$  and the number of years  $T = 19$  for the period 2000-2018.

The results of the estimation of equation 2 for labour force participation are presented in Table 2. Columns 1 and 4 present the results when only the contemporary unemployment rate is included in the specification. Then a lag of the unemployment rate is added to the regression specification in order to determine whether participation rate responds to the labour market shocks with delay. As shown in column 1 of Table 2, the cyclical parameter is positive when only the contemporary unemployment rate is included in the specification, suggesting that men's labour participation is contra cyclical. The high correlation of the unemployment rate results in the multicollinearity problem, so caution should be exercised when interpreting lags individually. The Total cyclical effect (TCE), which is calculated as the effect of a unit change of the unemployment rate on labour participation in the long-run static equilibrium (Baltagui, 2011), indicates a counter-cyclical behaviour of male labour participation. This agrees does not agree with what was found by Puigvert & Juárez-Torres (2019) and Duval-Hernández & Orraca-Romano (2011), who determine that men's labour force participation is procyclical in the case of Mexico. The results for the labour participation of women presents a clear picture for this relationship. The results indicate that female labour force participation is affected by the business cycle during the research period, as shown by the statistically significant coefficient of TCE. These results align with the findings of (Gasparini & Marchionni, 2017) who observe an increase in female participation in the labour market, though they note that this trend is only sustainable in the short term. The latter provides evidence in favor of the added worker hypothesis, which suggests that labour force participation, especially among women, exhibits counter-cyclical behaviour.

Table 2a and 2b presents the results of how the business cycle affects the sectoral composition of employment. The TCE shows that formal employment follows the business cycle in the 2000-2018 period. When unemployment decreases due to higher economic activity, formal employment increases, and vice versa. This result is observed in both the case of formal employment for men and women.

The results support a pronounced counter-cyclical behaviour of the labour informality rate, as the TCE is positive and statistically significant in all specifications. This analysis provides evidence in favour of the traditional view that labour informality in Ecuador arises due to the limited capacity

<sup>1</sup> The covariates included in the vector  $X_p$  are the proportion, by province, area and year, of educational groups of people with no more than primary education, people with secondary education and people with tertiary education and four age groups, 15-24, 25-34, 35-54, 55-64, over 65 years old.

<sup>2</sup> Ecuador currently consists of 24 provinces, however, until 2014 the Amazon was representative only at the aggregate level and the province of Galapagos is included only from 2014 so it is not included in the analysis.

of the formal sector to absorb workers, which is expressed as counter-cyclical informal wage employment.

In regard to the results for self-employment, although they support a counter-cyclical behaviour, since the positive coefficients are not significant or they are overshadowed by larger negative effects, it is found that self-employment is impervious to the business cycle. This result goes against the countercyclical behaviour that self-employment exhibits at the national level. This finding is important because it indicates that the role of self-employment as a refuge sector in times of economic contraction is not fulfilled for all regions of the country.

In summary, the results found highlight the strong relationship between formal and informal wage employment and the business cycle. In particular, the behaviour of informal wage employment is in line with findings in other developing countries by Maloney (2004), Bosch & Maloney (2008) and Bosch & Maloney (2010), which suggest that a significant portion of the informal sector appears to correspond to the traditional view of a segmented labour market.

**Table 2: Results from State Panel Regressions**  
**Labour participation rate**

	Model					
	(1)	(2)	(3)	(4)	(5)	(6)
	Males			Females		
<b>Cyclical components</b>						
<b>Unemployment rate</b>	0.258*** (0.057)	0.284*** (0.064)	0.282*** (0.066)	0.603*** (0.106)	0.703*** (0.117)	0.710*** (0.115)
<b>Unemployment rate (-1)</b>		0.081 (0.061)	0.107 (0.069)		0.180 (0.112)	0.190 (0.121)
<b>Unemployment rate (-2)</b>			0.064 (0.061)			-0.172 (0.107)
<b>Total cyclical effect</b>	0.258*** (0.057)	0.365*** (0.085)	0.452*** (0.109)	0.603*** (0.106)	0.883*** (0.156)	0.728*** (0.192)
<b>N°. of observations</b>	512	480	448	512	480	448
<b>Adj. R-sq</b>	0.709	0.704	0.677	0.721	0.736	0.734

Source: Author's estimates using ENEMDU several years.

Statistical significance indicated at the \*\*\* 1 percent, \*\* 5 percent and \* 10 percent level. Standard errors clustered at the region level are in parenthesis.



**Table 2a. Results from State Panel Regressions  
Share of employment: Male**

	Model								
	(1)	(2)	(3)	(1)	(2)	(3)			
	Formal			Informal					
	Self employment			Self employment					
<b>Cyclical components</b>									
<b>Unemployment rate</b>	-0.286** (0.123)	-0.300** (0.135)	-0.381*** (0.136)	0.348** (0.137)	0.420*** (0.148)	0.410*** (0.147)	-0.062 (0.141)	-0.120 (0.153)	-0.029 (0.153)
<b>Unemployment rate (-1)</b>		-0.537*** (0.130)	-0.587*** (0.140)		0.285** (0.142)	0.426*** (0.151)		0.252* (0.147)	0.161 (0.157)
<b>Unemployment rate (-2)</b>			-0.784*** (0.127)			0.272** (0.138)			0.512*** (0.143)
<b>Total cyclical effect</b>	-0.286** (0.123)	-0.837*** (0.185)	-1.752*** (0.231)	0.348** (0.137)	0.420*** (0.148)	0.410*** (0.147)	-0.062 (0.141)	0.131 (0.209)	0.644** (0.26)
<b>N° of observations</b>	512	480	448	512	480	448	512	480	448
<b>Adj. R-sq</b>	0.736	0.723	0.724	0.636	0.632	0.654	0.200	0.210	0.241

Source: Author's estimates using ENEMDU several years.

Statistical significance indicated at the \*\*\* 1 percent, \*\* 5 percent and \* 10 percent level. Standard errors clustered at the region level are in parenthesis.

Table 2b: Results from State Panel Regressions  
Share of employment: Female

	Model					
	(1)	(2)	(3)	(1)	(2)	(3)
	Formal			Informal		
	(1)	(2)	(3)	(1)	(2)	(3)
<b>Unemployment rate</b>	-0.283** (0.121)	-0.379*** (0.134)	-0.439*** (0.138)	0.676*** (0.137)	0.719*** (0.151)	0.740*** (0.151)
<b>Unemployment rate (-1)</b>			-0.510*** (0.129)		0.096 (0.145)	0.258* (0.155)
<b>Unemployment rate (-2)</b>			-0.538*** (0.129)		0.367*** (0.141)	0.171 (0.163)
<b>Total cyclical effect</b>	-0.283** (0.121)	-0.818*** (0.182)	-1.486*** (0.234)	0.676*** (0.137)	0.815*** (0.206)	1.365*** (0.256)
<b>N° of observations</b>	512	480	448	512	480	448
<b>Adj. R-sq</b>	0.658	0.641	0.621	0.545	0.518	0.563
				0.244	0.255	0.256
				-0.393**	-0.340**	-
						0.301*
						(0.175)
						0.344**
						(0.166)
						0.171
						(0.163)
						0.004
						(0.236)
						480
						448
						0.256

Source: Author's estimates using ENEMDU several years.

Statistical significance indicated at the \*\*\* 1 percent, \*\* 5 percent and \* 10 percent level. Standard errors clustered at the region level are in parenthesis.

## 6. Conclusions

The document analyses labour participation and the sectoral composition of employment in Ecuador during the period 2000-2018. In the analysis of labour force participation, we have divided the sample by gender to observe specific characteristics within these subgroups, as emphasized in the literature. Employment is examined across formal salaried, informal salaried and self-employment sectors.

We conduct a decomposition analysis to identify the factors contributing to the explanation of regional disparities in labour indicators. The results of the decomposition emphasize the critical role of educational achievement, household material conditions, age structure, and regional-specific factors in shaping labour force participation and employment composition. It also underscores the gender disparities in these determinants, shedding light on the complex interplay of factors affecting men's and women's participation in the labour market and their choices regarding formal, informal and self-employment.

To understand how the fluctuations of the labour force participation rate and the sectoral composition of employment are related to macroeconomic shocks in the economy, the paper also explores the effects of the business cycle using a provincial-level panel data analysis. Our paper contributes by being one of the few that analyses the role of the business cycle in labour participation and the composition of employment for a developing country like Ecuador. Estimations using a panel data regression model suggest that the female labour participation rate is counter-cyclical. However, unlike previous papers, our results suggest that the business cycle affects male labour participation inversely. This becomes a characteristic phenomenon of the Ecuadorian economy.

When analysing the sectoral composition of employment, the results indicate a strong and significant effect of the business cycle. Our estimations suggest that formal salaried employment is significantly pro-cyclical. In the case of informal salaried employment, we find support for a countercyclical behaviour. This result is consistent with previous studies focusing on developing countries.

We do not find significant support for the impact of the business cycle on self-employment in either men or women. Although the coefficients measuring the effects of the business cycle on the share of self-employment are positive, they are not statistically significant. In terms of policies, our results show that economic expansion is associated with an increase in male labour force participation. The results indicate that female labour participation responds to policies that affect the educational attainment of the population, rather than cyclical factors. The results also highlight that the business-cycle has non-neutral effects on the allocation of workers among employment sectors.

This research provides valuable guidance for policy formulation, particularly in the area of employment, highlighting the need for specific initiatives to address the heterogeneities that exist between regions. With regard to the cyclicity of employment types, the results underline the importance of designing flexible labour market policies tailored to the country's conditions, including measures to stimulate employment during economic downturns, thereby contributing to the development of effective policies. The findings underline the need to implement policies that promote the transition from the informal to the formal sector through fiscal incentives, training programmes and improvements in working conditions. Addressing the obstacles and challenges with specific strategies is essential to overcome this problem affecting the Ecuadorian labour market. In summary, the results of this research provide a comprehensive guide for policy making, identifying priority regions and serving as a starting point for future studies that focus on specific aspects or evaluate the effectiveness of implemented policies. Their application has the potential to improve the effectiveness of interventions and promote a more equitable and efficient labour market in Ecuador.

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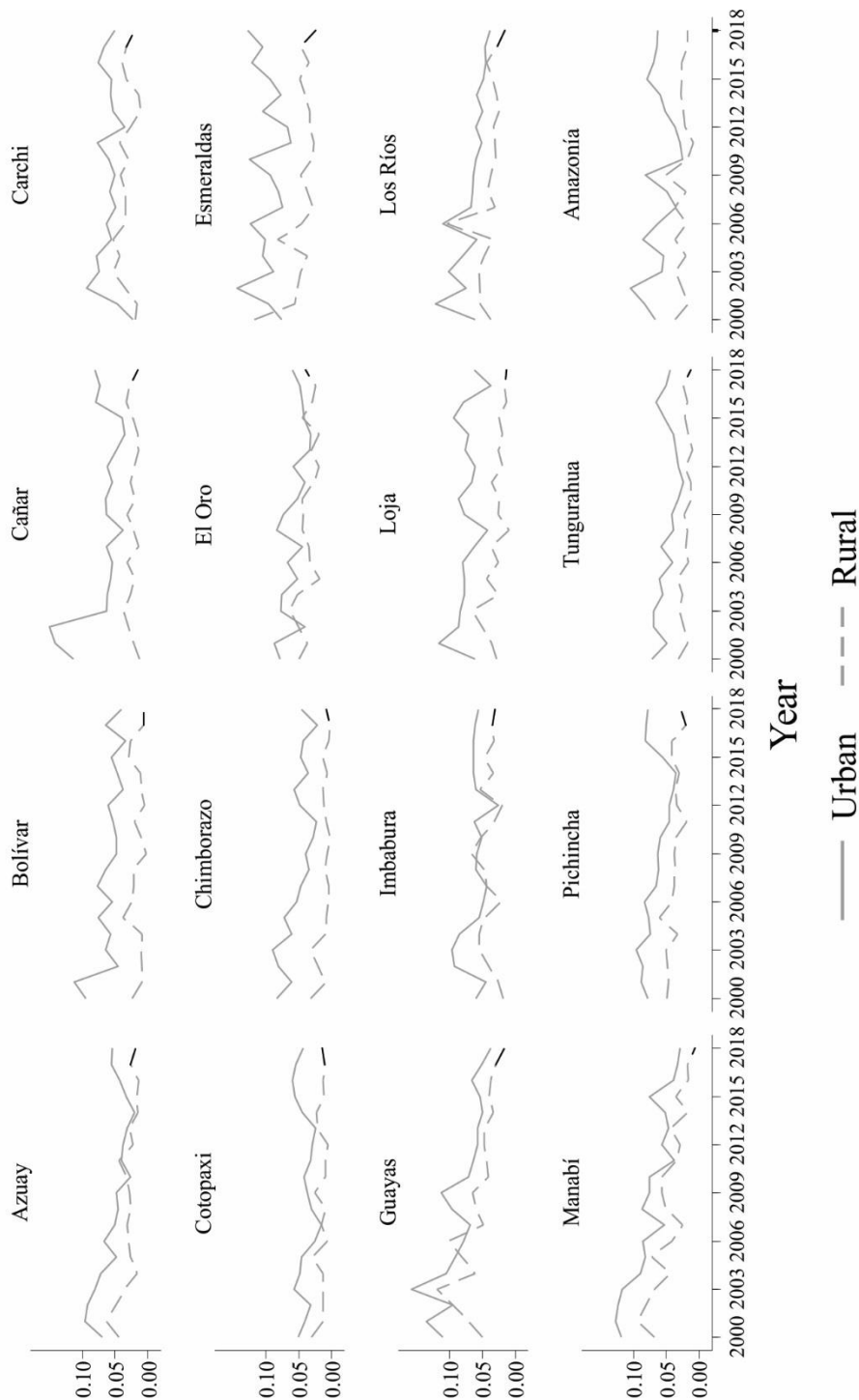
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Annex 1. Labour equation results

	Male				Female			
	Labor participation	Formal salaried	Informal salaried	Self employed	Labor participation	Formal salaried	Informal salaried	Self employed
Age group (25-34)	0.297***	-0.382**	0.094	-0.061	0.228	-0.23	0.031	0.017
	-0.087	-0.188	-0.115	-0.106	-0.151	-0.195	-0.174	-0.148
Age group (35-44)	0.073	0.501**	-0.025	-0.235*	0.009	0.308	0.079	-0.221*
	-0.102	-0.198	-0.163	-0.135	-0.188	-0.187	-0.17	-0.113
Age group (45-54)	-0.092	0.314	0.014	0.084	0.1	0.484*	0.029	-0.154
	-0.127	-0.207	-0.124	-0.119	-0.128	-0.245	-0.168	-0.16
Age group (55-64)	0.217**	0.256	-0.16	-0.031	0.240**	0.232*	-0.451***	0.131
	-0.088	-0.169	-0.098	-0.094	-0.11	-0.137	-0.145	-0.119
Age group (65-70)	-0.081	-0.09	-0.121*	0.037	-0.171**	-0.085	-0.01	0.044
	-0.06	-0.113	-0.072	-0.066	-0.079	-0.091	-0.05	-0.055
Primary	0.661	-2.023	2.124***	-0.62	2.660***	-2.331**	1.728**	-0.652
	-0.479	-1.298	-0.63	-0.595	-0.819	-0.949	-0.847	-0.759
Secondary	1.306**	1	0.42	-1.158	0.778	0.766	1.125	-1.303
	-0.624	-1.624	-0.808	-0.775	-0.737	-1.076	-0.916	-0.833
University	1.071	0.933	-2.487*	-1.253	0.268	0.149	1.681*	-3.012***
	-0.729	-2.023	-1.267	-1.077	-0.8	-0.981	-0.939	-0.75
Minority group	0.255	-1.727***	0.780*	0.338	0.096	-0.733	0.236	0.387
	-0.317	-0.602	-0.436	-0.439	-0.393	-0.652	-0.596	-0.49
Poor material condition	0.373***	-0.559**	-0.152*	0.253***	0.038	-0.578***	-0.111	0.143
	-0.071	-0.23	-0.089	-0.089	-0.077	-0.158	-0.119	-0.092
Constant	0.847***	-0.489	-1.701***	0.567	-0.212	-0.025	-3.321***	1.274***
	-0.286	-1.137	-0.561	-0.526	-0.241	-0.587	-0.55	-0.478
F test that all regional effects=0 (Prob >F)	2.41 (0.00)	12 (0.00)	33.02 (0.00)	23.46 (0.00)	4.60 (0.00)	15.93 (0.00)	19.54 (0.00)	19.73 (0.00)
N	192	192	192	192	192	192	192	192
Adj. R-sq	0.929	0.903	0.903	0.916	0.951	0.944	0.84	0.942

Statistical significance indicated at the \*\*\* 1 percent, \*\* 5 percent and \* 10 percent level. Standard errors clustered at the region level are in parenthesis. Source: Author's estimates using ENEMDU several years.

Annex 2. Provincial Unemployment Rate



Source: Author's estimates using ENEMDU several years.