4. COHORT ANALYSIS OF LABOR PARTICIPATION AND SECTORAL COMPOSITION OF EMPLOYMENT IN ECUADOR

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Abstract

The study assesses the contribution of cohort, age and business cycle effects to the evolution of labor participation rate and sectoral employment in Ecuador from 2000 to 2019. Being characterized by a large amount of informality, as well as by significant economic and institutional changes, Ecuador could provide new insights to the literature. The empirical analysis reveals that both female and male labor participation rate decreases for the younger generations. The life cycle profiles for sectoral employment show that formal employment rate has an inverted U-shaped form. In contrast, younger workers are found to be more likely to participate in the informal salaried sector, while self-employment notably increases with age. A sustained growth in formal employment rate is observed for the new generations, while the opposite occurs for the informal salaried and self-employment. Finally, the results suggest that female labor participation is strongly countercyclical, which correspond to the added worker effect hypothesis.

Keywords: age effects, period effects, cohort effects, labor participation, Ecuador, business cycle.
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1. Introduction

In Ecuador, the labor force participation rate (LFPR) has not experienced major changes in the last 20 years, ranging from 65.41% in 2000 to 64.26% in 2019. However, this result hides

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substantial heterogeneity in the evolution of labor participation among different population groups. In this regard, the evolution of the LFPR in Ecuador can be classified into three phases: (1) 2000-2012, a roughly stable reduction in the participation rate; (2) 2012-2017, a steadily rising labor force participation; (3) 2017- present, a declining LFPR. This dynamic could be the result of long-term changes, under the influence of age and business cycle. Understanding these effects help policymakers to better address the labor supply, unemployment, and the productive capacity of the economy in relation with LFPR. If the LFPR responds to cyclical factors, much of the decline in labor participation observed in recent years can be reversed by applying short-term economic policies. However, if the LFPR rather depends on structural factors, the reduction in the LFPR represents a different challenge for policymakers and implies the design of policies addressing structural causes.

A distinctive characteristic of labor markets in Latin American countries, including Ecuador, is labor informality, where informal jobs generally represent a significant proportion of work (Gasparini and Tornarolli, 2009). It is estimated that in Ecuador more than 60% of workers are either self-employed, or employed in the informal salaried sector. The increase in the rate of labor formality and the resulting reduction in labor informality are among the most relevant changes experienced by the Ecuadorian labor market in recent years. This behavior could be explained by institutional and social factors, as well as by the effect of the business cycle.

This paper analyzes the life cycle patterns and generational changes of LFPR, as well as the sectoral composition of employment in Ecuador. First, we investigate the life cycle patterns of labor participation and examine how the rates of formal, informal, and self-employment evolve over the life cycle. Second, we determine whether LFPR has changed across generations of workers. In particular, we focus on investigating whether those who are currently young (the new generations of workers) in Ecuador have informal employment rates lower than those of older cohorts at the same age. For this purpose, the paper carries out an age-period-cohort (APC) analysis based on Deaton (1985) and Deaton (2018), using a pseudo-panel data of 812,146 individuals, over a period of 20 years (2000-2019). The approach consists of observing over time, by successive surveys, representative groups of individuals who entered the workforce at a given point in time and to determine then the effects of age, cohort and period.

This paper contributes to the literature on the determinants of labor force participation and sectoral composition of employment in the developing countries, by providing new information about the changes occurring across generations, also about the life cycle dynamics. Most of the research on this topic in Ecuador has focused on the cyclical behavior based on short term panel data with a maximum temporary extension of one year (Goñi Pacchioni, 2013). However, the alternative approaches do not allow distinguishing generational changes (cohort effects) from life cycle evolution because the same individual is only observed for a maximum period of one year. The APC analysis has the advantage that allows to combine a large number of cross sections to observe, over a long period of time (20 years in this case), the evolution of the same cohort over time. To our knowledge, this paper is the first APC application of aggregate labor market indicators in Ecuador.

The paper is organized into five sections. The first section of Introduction is followed by section 2 of Literature review. Section 3 describes the methodology and data and Section 4 is the empirical analysis including the Age-Period-Cohort Decomposition and the explanation of age and cohort effects. The last section concludes and formulates policy recommendations.

2. Literature Review

This section briefly presents the most important contributions to the literature on labor participation, with a focus on the life cycle evolution and the long-term change in the LFPR.

The propensity to participate to the labor force generally evolves throughout the life cycle following an inverted U pattern, where the LFPR increases with age to a peak, remains constant between 30 and 55, and then begins to decline. This is a pattern that has been observed in several developing and developed countries, although gender differences in the life cycle profiles have been found *inter alia* by Fitzenberger *et al*., (2004) for West Germany, Duval Hernández & Orraca Romano (2011) for Mexico, Beaudry & Lemieux (1994) for Canada, and Balleer *et al*. (2009) for the Euro Area. The reason why the life cycle profile of labor participation between women and men differs is that the age-related participation of females is expected to be influenced by the birth of their children. A common hypothesis about female labor participation is that it develops into three steps, *i.e.* (1) women enter the labor market, (2) at a moment in time they interrupt their labor participation to have children, and (3) after a while, they reenter again (Contreras, Puentes and Bravo, 2005). Thus, the institutional framework matters for women participation since their employment depends on social institutions, such as the child care facilities and guarantees of maternity leave (Fitzenberger, Schnabel and Wunderlich, 2004).

According to the literature, the gender gap in labor force participation has declined in Latin America during the last decades (Pagés *et al*., 2003). On the one hand, this may respond to the increase in women labor participation due to the emergence of time-saving technologies in domestic production, changes in family composition, increase in the educational attainment of women (Fitzenberger, Schnabel and Wunderlich, 2004) as well as, cultural changes related to perception of the role of women in labor market (Contreras, Puentes and Bravo, 2005). On the other hand, this tendency is rooted in the unstable economic growth, high inflation and major economic crises which have forced more women to enter the labor market (Gasparini and Marchionni, 2017).

Regarding the effect of business cycle on labor participation, evidence for the developed countries shows that labor participation is procyclical. For example, Schweitzer & Tinsley (2004) find that labor force participation exhibits a significant procyclical pattern in the UK. Similarly, Shierholz (2012) and Aaronson *et al.* (2014) find evidence of a procyclical behavior of labor participation in the United States. They find that reduction in the labor force participation during Great Recession is partially explained by cyclical weaknesses, although their results also suggest that the contraction in participation is mainly due to ongoing structural causes related to demographic factors. At the same time, Van Zandweghe (2012) argues that both trend and cyclical factors have reduced labor force participation during the 2008 recession, but the influence of these factors has been different for men and women. In the case of men, the reduction in labor force participation is mainly the continuation of long-term factors related to demographic trends, while the reduction in women's participation is fully explained by cyclical factors.

Labor participation, particularly the women's one, can be expected to be sensitive to the macroeconomic behavior. This is known as the effect of the added worker: labor participation decisions of household members are interdependent, and fluctuations in income and employment also affect that of other household members, such as the spouse and working-age children (Cahuc, Carcillo and Zylberberg, 2014). If household income decreases,

secondary workers can participate in labor market to compensate the household income loss. This implies a countercyclical pattern of female labor participation (Gasparini and Marchionni, 2017). This response to labor market shocks occurs especially in situations where uncertainty and credit restrictions prevail, and formal insurance mechanisms are weak (Lundberg, 1985; Parker and Skoufiasz, 2004). In this line, (Gasparini and Marchionni, 2017) find that female labor participation in Latin America in the 2000s is positively associated with long term economic growth, while short-term changes of female LFPR are countercyclical, particularly among women with less years of formal education. A similar result is found by Duval Hernández & Orraca Romano (2011) when analyzing Mexico.

As was previously mentioned, a distinctive characteristic of labor markets in Latin American countries is labor informality. There are two main perspectives that explain the existence of labor informality. First, there is the traditional view of labor market segmentation which suggests that the informal sector arises as result of the low capacity of the formal sector to absorb workers. Therefore, rather than being unemployed, individuals prefer to work in the informal sector. From this point of view, the existence of a large informal sector is the proof of labor market segmentation and also a reflection of entry barriers to the formal sector, which respond to salary rigidities and the presence of unions. Second, Maloney (2004) and Perry *et al.* (2010) suggest that certain workers, especially the self-employed and micro-entrepreneurs may voluntarily choose to leave the formal sector and to work in the informal sector, depending on the value assigned to the benefits of formality. The literature suggests that the informal sector is a combination of segmented and self-selected workers *(Perry et al.*, 2010), explaining which of the two views on labor informality stands out when studying the cyclical behavior of labor informality. For instance, Bosch & Maloney (2008), Bosch & Maloney (2010) and Maloney (2004) find pro-cyclical transition patterns between the formal and informal sectors. This suggests that an important part of the informal sector, particularly self-employment, corresponds to voluntary entry. According to the authors above, much of the informal sector represents a voluntary sector, and informality is explained by inefficiencies in the provision of social benefits, non-merit-based promotion systems, or comparative advantages that make informality more desirable. In the case of Ecuador, Goñi Pacchioni (2013) studies the cyclical correlation of entries into- and exits from different states of employment[5] and finds that outflows from formal to self-employment are countercyclical, while transitions from self-employment to formal employment are procyclical, which supports the existence of a segmented self-employment sector in the country. Nevertheless, this study does not capture the effects of rapid economic growth of the Ecuadorian economy since the financial crisis of 1999. The increase in the labor informality rate after 2012 was not examined either.

Only a restrained body of literature has focused on studying the life cycle behavior of labor informality in Latin American. Exceptions are Bosch & Maloney, (2010) for Argentina, Brazil and Mexico, who find evidence that self-employment becomes relatively more attractive or feasible as workers age. This indicates that self-employment does not represent an entry point to the labor market for young workers, and is consistent with an interaction of aversion to risk and the accumulation of human and physical capital necessary to carry out their own enterprise. The opposite is observed in the informal salaried sector, where the entry is heavily weighted towards young people.

[5] *The author carries out one-period-ahead Markov chains built upon a system of five states of employment during the period 2007Q1-2010Q3.*

3. Methodology and Data

The analysis is based on pseudo-panel data, which tracks groups of individuals born at the same time over successive surveys. Compared to cross-sectional data or short-term panel data, the pseudo panels provide the advantage of capturing the labor market behavior across time. However, the most important indicators of labor market have strong life cycle age-related components, as well as generational effects, that make life cycle profiles to also change over time. When life cycle profiles are generated with cross-sectional data, the results overlap life cycle effects with generational or long-term effects, because it is impossible to discern between them by a single observation over time (Deaton, 2018). Compared to panel data, pseudo-panel data have the disadvantage that they do not track the same individuals over time, but rather groups of individuals who share a characteristic of interest. Compared to panel data, the cohort data are constructed from new surveys each year and therefore cannot suffer from significant dropouts over time. Additionally, this methodology can be considered preferable to analyses based on short panels because it allows to extend the period of analysis, making it possible to visualize structural trends affecting the labor market.

Our methodology here consists of decomposing LFPR and sectoral composition of employment by age, cohort and period effects. The age effects represent the evolution of the variables throughout the life cycle. Cohort effects capture secular trends that lead to differences between cohorts. Period effects measure changes in variables as a result of macroeconomic effects that affect all cohorts simultaneously, and that cannot be attributed to age or cohort effects.

The study applies the linear decomposition proposed by Deaton (2018) and Deaton & Paxson (1994) . Suppose E is a matrix of dummy variables of age, C a matrix of cohort dummy variables, and P a matrix of dummy variables of year. The cohort data are organized in such a way that each observation represents a cohort in a particular year. Thus, the rows of E, C and P matrices are formed by pairs of cohort-year and the number of columns is the number of age, cohort and year, respectively. The decomposition of the dependent variable takes the following form:

$$y = \beta\iota_N + E\sigma + C\delta + P\theta + X\gamma + u \quad (1)$$

where: y denotes a vector of $N \times 1$ observations, ι_N is an $N \times 1$ vector of ones associated with the constant term parameter β, and u is a vector of disturbance terms. σ, δ and θ are the vectors of the age, cohort and year effects, and X includes a full set of additional explanatory variables.

As usual, a cohort, age, and year dummy variable is eliminated to avoid the singularity problem in the regressor matrix. The exact relationship between the variables (cohort = year - age) generates an identification problem. To overcome it, an additional restriction is applied, stating that the year effect is orthogonal to a time trend and zero sum, as follows:

$$\kappa'\theta = 0 \quad (2)$$

$$\iota_T'\theta = 0$$

κ is a vector $(1,2,3,\dots,T)$ where: $\kappa = 1$ represents the starting year and $\kappa = T$ the final year. These restrictions are satisfied by defining the year dummy variables for $t = 3,\dots,T$ as follows:

$$d_t^* = d_t - [(t-1)d_2 - (t-2)d_1] \quad (3)$$

where: d_t is equal to 1 if the year is t and 0 any other case. This equation ensures that constraint 2 is met and that the year dummies add to zero. Therefore, the year effects capture common macroeconomic shock and can be interpreted as cyclical fluctuations or business cycle effects that average to zero over time[6]. We estimate equation 1 with the first age group and forty-sixth cohort omitted, so that the 15- year age group and workers who were 15 years old in 2000 (cohort 1985) are groups of reference. Due to the restriction of equation 3, the reference base year is a timeless average of all years (Deaton and Paxson, 1994).

When estimating equation 1, it should be considered that the cohort observations are averages of individuals included in each group, which are error ridden estimates of the true cohort means. For this, the paper uses errors in variables estimator for grouped data proposed by Deaton (1985). In this way, the model uses data at the individual level, which are used to compute estimates of variance of sampling errors necessary to correct the bias and obtain a consistent estimator. All estimates were obtained by applying the weights provided by the surveys. Additionally, to check the robustness of the results, the estimates were also obtained with the method proposed by Deaton (2018), and the results were similar.

The study uses data from the Employment, Unemployment and Underemployment Survey (ENEMDU in Spanish), running from 2000 to 2019, without the year 2002, when only an urban sample is included. Only individuals aged 15-70 years are considered, which results into a number of 56 cohorts (for those born between 1940 and 1995) and 812,146 individual observations. The variables to be analyzed are: the labor participation rate and the sectoral composition of employment. The analysis is carried out by gender, an important issue here that is omitted by previous studies.

4. Empirical Results

This section presents a cohort analysis conducted to decompose the change in LFPR to highlight the age, cohort and period effects in Ecuador during the period 2000-2019. The analysis develops into two steps, the first step being aimed to distinctively identifying the age, cohort and period effects on LFPR, and the second step being a regression analysis of additional determinants. The decomposition analysis, as well as all graphs presented in section 4.1, is based on equation 1 of the methodology. Since the empirical analysis uses 46 cohorts, 56 age groups and 19 years, a number of 121 coefficients were estimated. The large number of coefficients makes possible only the graphical representation.

4.1 Decomposition of Labor Force Participation Rate

We first report in Figure1 the LFPR for different groups upon gender. The charts provide insights into life cycle, generation effects and cyclical fluctuations. The age of individual is plotted on the horizontal axis, and the cohort's LFPR is shown on the vertical axis. The plotted points are connected when the same cohort is followed through time, but the distinct cohorts are left disconnected. For those who were 15 years old in 2000, the 2000 survey was used to calculate LFPR of those who were 15 years old, and the result is graphed as the first point of the first segment from the left in the figure. The 16 years old LFPR in 2001 is the second point on the same line, and the remaining points come from the other surveys,

[6] *Equation 3 gives the third to the final coefficients for the year dummies; the first and second year effect can be obtained from (2).*

following the cohort through the 19 years until it is last observed at the age of 34 in 2019. The chart shows the same process for 11 cohorts, born between 1930-1973 at five-year intervals, from the youngest to the oldest, and the segment is plotted until the members of the cohort were aged 70 or older.

According to Figure 1, both age and cohort effects occur in the labor participation process. In addition, it is possible to detect common macroeconomic patterns for all cohorts. The chart also shows shifts between segments, which indicate the existence of cohort effects for a given age. For example, at age 25, those born in 1985 have a LFPR lower by 5.72 pp. than the LFPR at the same age of the cohort born five years earlier, and by 7.10 pp. lower than the LFPR of the cohort born 10 years earlier. These differences in LFPR between generations are captured by the cohort effects.

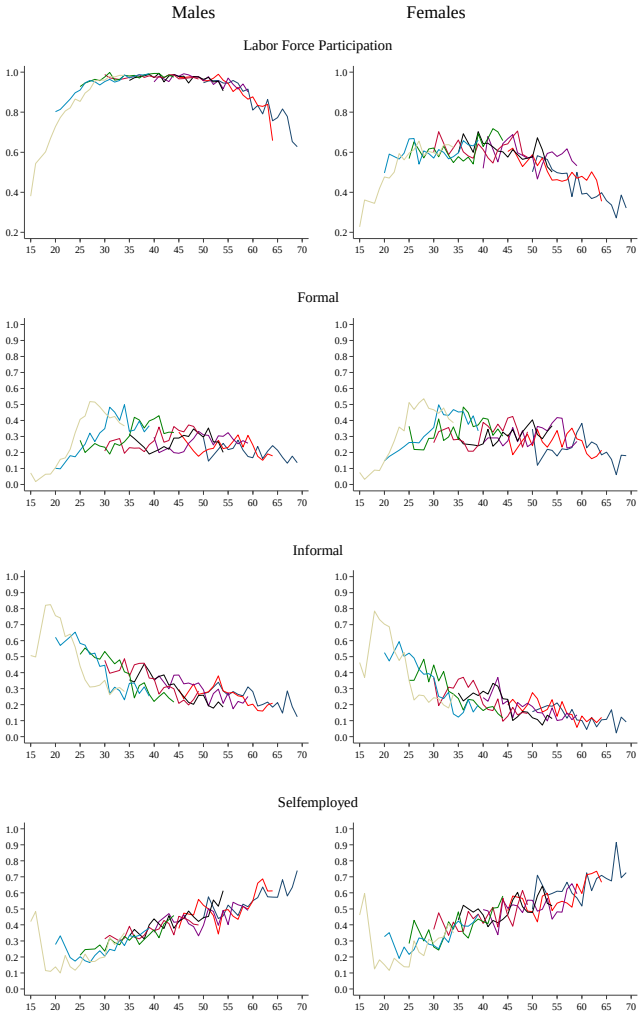
The labor participation profiles for men and women are different, and moreover they are inverted U-shaped, which is not surprising since LFPR is expected to grow much more rapidly in the early years of the working life that they do after the age of 50. As each connected line represents the same cohort over 19 years, the chart also reflects the impact of economic growth. As shown by charts, each cohort exhibits a rapid reduction in LFPR from 2001 to 2010, and then a rapid growth in the subsequent years.

Figure 1 shows a very interesting panorama in relation to the composition by age of formal, informal and self-employment in Ecuador. The formal employment rate by cohort is an inverted U-shaped curve and clearly shows differences between segments, which indicate the existence of cohort effects for a given age. For example, the formal employment rate for the 1985 cohort is by 14.33 pp. higher than the corresponding rate for workers born 10 years earlier. This indicates significant cohort effects in the formal employment rate in the Ecuadorian labor market. Figure 1 also shows that informal salaried employment rate declines steadily from younger to older age groups. For example, the informal salaried rate at age of 15 is, on average, 78.14% of employment, while the same rate is 14.26% at the age of 70. In addition, the informality rate of new generations appears to be lower than that of the previous ones.

As shown in Figure 1, the rate of self-employment is higher for the oldest than for the youngest. For example, the self-employment rate at age 70 is, on average, 77.80%, as compared to the self-employment rate at age 15, which is 19.90%. Again, this pattern is different as compared to the formal work.

Finally, Figure1 reflects the effects of common macroeconomic shock on sectoral employment rate of all cohorts. Thus, the time effects are certainly present in the evolution of sectoral composition of employment.

Figure 1. Labor Participation by Cohort and Gender



Source: Author´s estimates using ENEMDU for several years.

The charts presented in Figure 2 reflect the estimated coefficients of the decomposition based on 46 cohorts, 56 age groups and 19 years. The graphs also present the 95% confidence interval for each estimated coefficient. We also determine the overall significance of the estimated effects. For instance, the year effects of the male LFPR are globally significant, with an associated F-value of 13.36. The corresponding F-values for age and cohort effects are 356.05 and 15.71, respectively. The resulting age, cohort and year

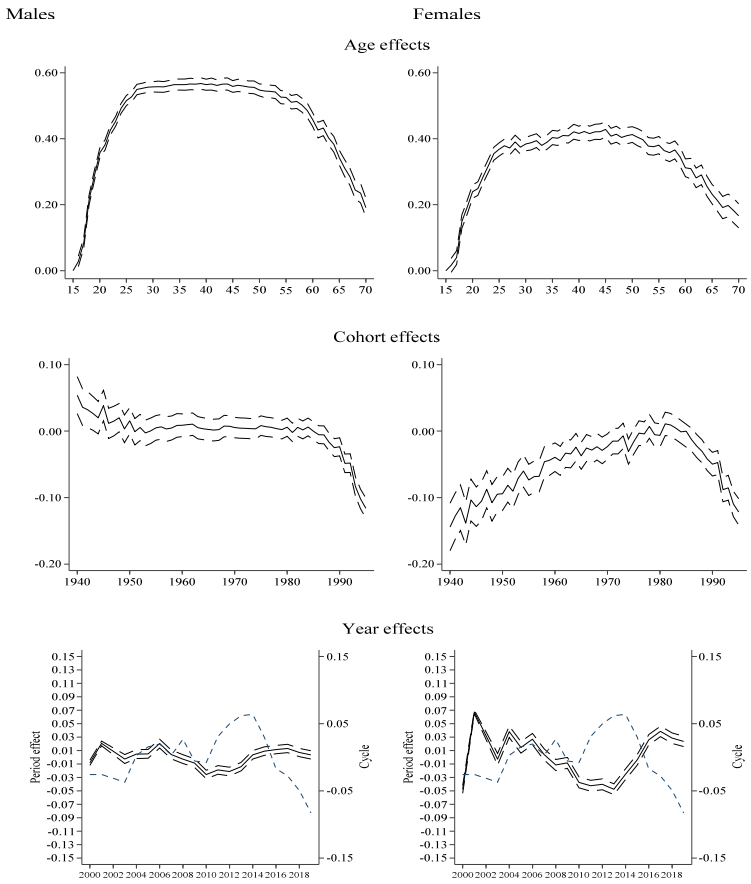
effects for female labor force participation and sectorial composition are also statistically significant.

The first panel of Figure 2 isolates the effects of age from generational variations and macroeconomic shocks. The life cycle profiles of LFPR are inverted U-shaped curves for both men and women. For men, LFPR grows rapidly until the age of 27, it remains stable until the age of 45, and then it starts to decrease. For women, LFPR is considerably lower than for men, which is consistent with the theory that men are the main income providers. In their case, the age effects shows that LFPR constantly grows until the age of 23, and from this age to 45 it remains constant. Finally, starting with the age of 45, the women LFPR decreases until the age of 70. This is consistent with the hypothesis that generally women interrupt paid work sooner than men, for family life.

The second panel of Figure 2 presents the cohort effects of LFPR. In the case of men, conditional on age and year effects, LFPR remains constant across generations, except the generations born after 1980, which have significantly lower LFPR. In contrast, the women LFPR cohort effect is an inverted U-shaped curve, increasing for generations born 1958-1980, and decreasing for younger generations born after 1981. For example, the woman LFPR cohort effect shows a difference of -0.1086 in y_{ct} between the cohort aged 25 in 2000 (cohort 1975) and the cohort 19 years younger, aged 25 in 2019 (cohort 1994). The average value of y_{ct} in 2000 for workers aged 25 was 0.6168, so the model estimates a LFPR of 0.5082 for the younger cohort at the same age in 2019. The decline in LFPR for generations born after 1980 can be explained by the significant increase in higher education enrollment observed from 2000 onwards. In Ecuador, the higher education attendance rates were 11% in 1990, 13% in 2001 and 22% in 2010 (SNI, 2022). This reflects the importance of considering the cohort effects in explaining changes in LFPR. Omitting them could lead to wrong conclusions by overlapping the effect of the demographic transition and the generational changes.

The third panel of Figure 2 suggests that LFPR is countercyclical for both women and men. This is especially evident during the 2008-2019 period, when the improvement in macroeconomic conditions is linked to the LFPR reduction. The latter finding is in line with Serrano *et al.* (2019) who found that in Latin America the female LFPR follows a countercyclical pattern in the sense that the worsening of economic conditions can affect the entry of woman to labor market in two opposite directions. On the one hand, an economic bust may discourage the entry of women to labor market as they face lower wages and less favorable conditions. On other hand, an economic contraction may lead to lower employment and earnings for men, so that women´s participation in labor market must increase, as to support the family life. This latter effect seems to prevail in Latin America and Ecuador as well.

Figure 2. LFPR Decomposition by Gender



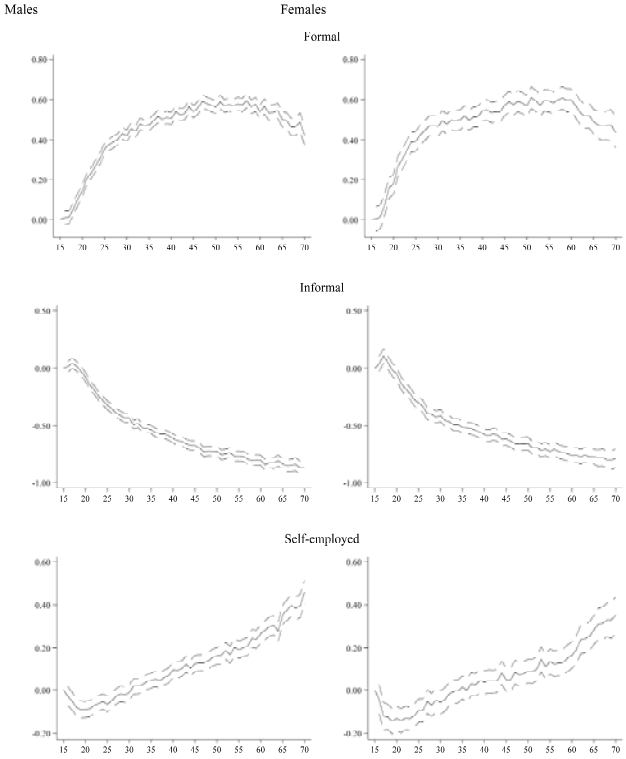
Source: Author´s estimates using ENEMDU for several years. The navy short dash (right axis) is HP-filtered real GDP. The dashed lines are the 95% confidence interval for the year, period and cohort effects.

Figure 3 presents the age effects of the rates of formal employment (first panel), informal employment (second panel) and self-employment (third panel). The formal employment age profile is an inverted U-shaped curve, which is consistent with the life-cycle interpretation. Conditional on cohort and year effects, the age effects of formal employment rate grow until reaching its maximum at the age of 47, and falls thereafter. However, this life cycle profile is only observed in the formal sector of the Ecuadorian labor market.

The analysis of the age profiles of informal salaried work and self-employment provides the most interesting results. As introduced above, labor informality and self-employment are important characteristics of the Ecuadorian labor market. The age profile of informal salaried

employment and self-employment appears here to be different from that observed in the formal sector. According to our results, the life cycle profile of informal salaried employment is the highest among the youngest. For example, the age effect indicates a difference of 0.43 in informal employment rate of men between the age group of 15 and the age group of 30. The y_{ct} of the informal employment rate for 30-year-aged aged workers is 42.53%, so that y_{ct} is estimated to be 85.68% for the 15-year-aged aged workers, conditional on cohort effect and period. For women, the model predicts an informal employment rate of 71.20% for the 15-year-old age group, compared to a rate of 30.22% for the 30-year-old age group. Conditional on cohort and year effects, the age effects are increasing with time, and starting with the age of 58 the rate of self-employment is increasing. Additionally, there is no clear turning down of the age profile for self-employment.

Figure 3. Age Effects of Sectoral Employment Rate



Source: Author´s estimates using ENEMDU for several years. The navy short dash is the unemployment rate which corresponds to the number of unemployed workers over the total labor force. The dashed lines are the 95% confidence interval for the year, period and cohort effects. Table 2 presents the F Tests for joint significance of the age, period and cohort effects.

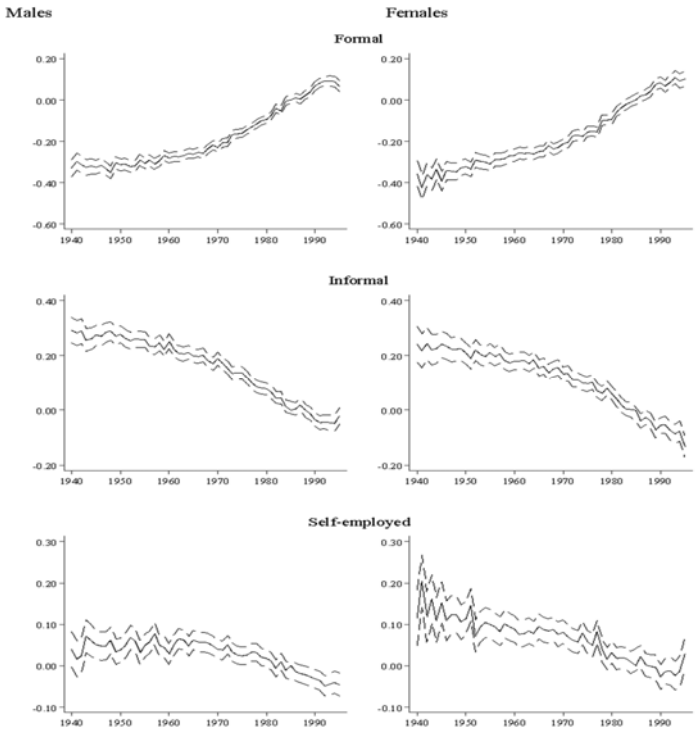
The high rate of labor informality among young workers could give insights into the lack of sufficient job opportunities for this group of the population that finds an option in informality. Also, these results may imply that young workers choose informality to acquire enough

experience to then enroll in the formal sector. In other words, informal jobs can represent the door to the labor market for young people (Duval Hernández and Orraca Romano, 2011). The significant participation of elderly in self-employment suggests that many workers cannot afford to retire and must continue to be self-employed after the retirement age. The low coverage of the contributory pension system in Ecuador and other countries explains why these workers have to continue working even after they reach the retirement age (De la Torre and Rudolph, 2018). Another explanation could be that workers voluntarily choose to work in informal positions and to be self-employed because, for example, older adults can voluntarily choose self-employment, once they have accumulated the necessary human and physical capital to start their own business (Bosch and Maloney, 2010).

The generational evolution of sectoral participation is presented in Figure 4. For formal salaried workers, the cohort effects are larger the younger the cohort, so that, at the same age, those born later have a higher rate of labor formality. This is expected to happen in a country that has experienced considerable growth. The opposite behavior is observed for informal employment, that is, the cohort effects are smaller the younger the cohort. Note that the cohort effects are significant and large in magnitude, revealing a distinctive pattern of an increasingly formal Ecuadorian labor market. To illustrate the results, let us consider the case of a difference in y_{ct} of 0.2478 between the generation born in 1975 (aged 25 in 2000) and the generation born in 1994 (aged 25 in 2019) for the men formal employment rate, and -0.1834 for the men informal employment rate. The y_{ct} for the 1975 cohort is 0.2412 for formal employment and 0.5152 for informal employment, so that, the model predicts a formal employment rate of 0.4890 and an informal employment rate of 0.3319 for the 1994 cohort at the age of 25. Similar results can be derived for the women model. Figure 4 shows that the cohort effects for participation in self-employment decreases for the younger generations. The cohort effect is positive and statistically significant for older cohorts, so that, at the same age, those born later have a lower rate of self-employment as compared to the older generations.

However, when comparing the magnitude of the cohort effects between informal salaried employment and self-employment, it is obvious that the increase in labor formality among the younger cohorts is mainly due to the reduction in informal salaried employment than self-employment. To sum up, from the point of view of the generational evolution of sectoral employment in Ecuador, the increase in labor formality and the consequent decrease in informality and self-employment for the new generations are significant trends.

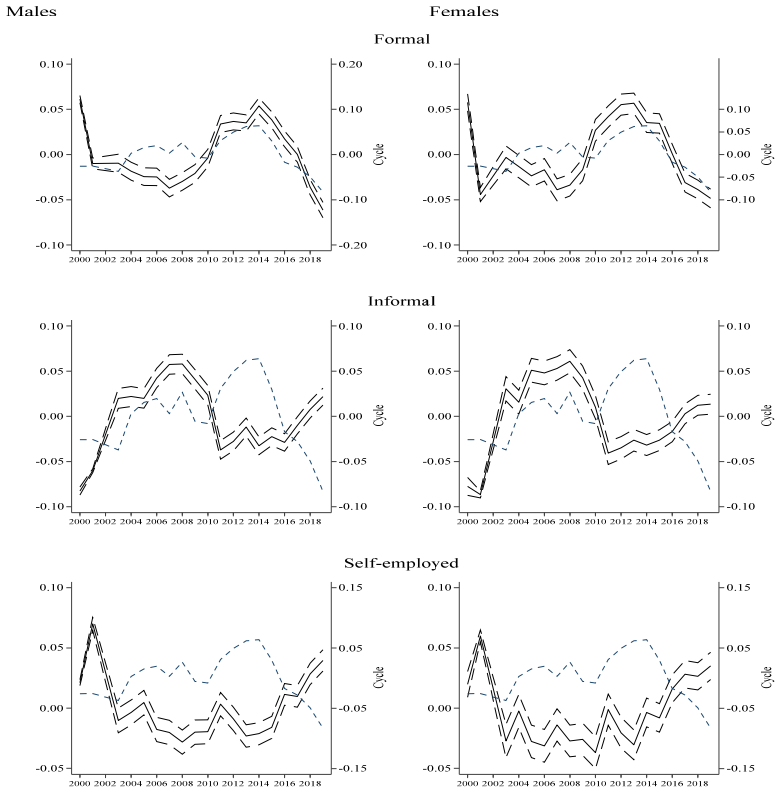
Figure 4. Cohort Effects of the Sectoral Employment Rate



Source: Author´s estimates using ENEMDU for several years. The dashed lines are the 95% confidence interval for the year, period and cohort effects. Table 2 presents the F Tests for joint significance of the age, period and cohort effects.

As shown in Figure 5, conditional on cohort and age effects, formal employment is strongly pro-cyclically: it grows during periods of economic expansion and contracts during the slowdown. The informal employment rate is counter-cyclically, but is less correlated to the cycle as compared to other sectors. The results also suggest a countercyclical pattern of self-employment, particularly in 2012-2019, when self-employment has grown considerably, together with the worsening of economic conditions. The latter is in line with Goñi Pacchioni (2013) who also finds a countercyclical behavior of self-employment in Ecuador.

Figure 5. Time Effects of Sectoral Employment Rate



Source: Author´s estimates using ENEMDU for several years. The navy short dash (right axis) is HP-filtered real GDP. The dashed lines are the 95% confidence interval for the year, period and cohort effects. Table 2 presents the F Tests for joint significance of the age, period and cohort effects.

4.2 Additional Socioeconomic Determinants

Our empirical results suggest that LFPR and the sectoral composition of employment change over the life cycle and also across generations of workers. In the second step of our empirical analysis, based on equation (1), we explore a set of potential determinants which are traditionally indicated as determinants of labor participation: education, marital status, number of children in household aged under 6, additional earners of labor income in household, non-labor income, and household deprivation index. These variables are expected to affect labor participation throughout the life cycle, as well as between generations.

The analysis is restricted to individuals older than 23, when most people have already completed their education. It should be emphasized that these models are only illustrative and cannot detect causal relationships due to potential endogeneity.

As shown in Table 1, even with additional control variables, the LFPR effects are robust in sign and significance.

Since earnings tend to increase with education, labor force participation is expected to be higher for persons with a better educational background (Fitzenberger, Schnabel and Wunderlich, 2004). However, education is found to be a significant correlate of LFPR only for women, but not for men. This can be explained by the fact that men are the main household income providers, which push them to participate in the labor market regardless of their level of education. In the case of women, the results show that the participation decisions are strongly affected by their level of education, as cohorts with a higher level of education have higher labor participation than other cohorts.

Table 1. Labor Participation Rate: Additional Socioeconomic Determinants

Effects	(1)	(2)	(3)	(4)
	Male		Female	
Age effects	356.05***	86.85***	108.02***	17.75***
Cohort effects	15.71***	6.11***	60.14***	20.57***
Period effects	13.36***	2.06*	12.1***	4.29***
Additional regressors				
Education years		0.01		0.03**
No. of children under 6 years		0.04		0.04
Additional earners in household		0.08***		0.05
Non-work income (logs)		-0.05***		-0.02*
Married		0.04		-0.16*
Household deprivation index		-0.003		0.06

*Source: Author´s estimates using ENEMDU; Statistical significance indicated at the *** 1 percent, ** 5 percent and * 10 percent level.*

Table 2 shows that educated persons are more likely to work as formal employees, while less educated people are more likely to either work as informal employees, or to be self-employed. The results also imply that women with higher levels of education are more likely to participate in the formal labor market and less likely to engage in informal work, as argue by Novta & Wong (2017). According to our results, an increase in one year of education is correlated with an increase close to 4 pp. in the formal employment rate, and a decrease by around 3 pp. and 2 pp. in informal employment rate and self-employment, respectively.

The number of children aged under 6 is not significantly related to LFPR (Model 2). When taking into account the sectoral composition, the results show that for both men and women, the number of children in household aged below 6 is not correlated with the type of employment. This is according to Contreras *et al.* (2005), who also finds that the number of children under 6 is not significantly correlated with the female participation. In fact this variable is strongly related to the life cycle, which is already incorporated into the life cycle effect. Besides, our estimation of the LFPR life cycle profile suggests that women interrupt paid work for family life (Section 4.1).

The results indicate that marital status especially affects the women labor participation, so that married women have a lower rate of labor participation (Table 1). When considering the sectoral composition of employment, Table 2 indicate that married women have a lower rate of formal employment and a higher rate of self-employment.

Table 2. Share of Employment: Additional Socioeconomic Determinants

Effects	Formal salaried				Informal salaried				Self-employed			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Male		Female		Male		Female		Male		Female	
Age effects	114.85***	15.23***	56.76***	7.15***	177.13***	0.59	114.54***	19.35***	54.68***	12.90***	32.31***	7.01***
Cohort effects	60.58***	7.68***	51.19***	242.49***	42.68***	98.19***	23.02***	12.31***	20.85***	5.08***	26.47***	23.97***
Period effects	50.47***	36.70***	25.14***	430.76***	46.82***	114.41***	32.06***	91.54***	3.07***	4.76***	3.16***	387.64***
Additional regressors												
Education years		0.04***		0.04***		-0.03***		-0.02***		-0.01		-0.02**
No. of children under 6 years		0.08		0.09		-0.07		-0.04		-0.01		-0.06
Additional earners in household		0.03		-0.002		-0.03		0.004		0.007		-0.002
Non-work income (logs)		-0.03**		-0.006		-0.03***		-0.01		0.06***		0.02
Married		-0.03		-0.29***		-0.12*		-0.01		0.15*		0.30***
Household deprivation index		0.01		-0.15***		-0.03		0.005		0.02		0.15**

Source: Author´s estimates using ENEMDU for several years; Statistical significance indicated at the *** 1 percent, ** 5 percent and * 10 percent level.

Non-work income is inversely correlated with both men and women LFPR. This is an expected result since people who have alternative sources of income have fewer incentives to participate in the labor market. Table 2 indicates that for men, non-work income is strongly correlated with the type of employment. While male workers with higher non-work income are less likely to work as salaried workers, formal or informal, they are more likely to be self-employed. We also find that additional earners in household have no significant effect, except for male LFPR. This result suggests that the presence of additional income earners in the household is associated with an increase in male labor participation.

Finally, the results show that household deprivation index[1] just partially explains LFPR. Women in poor household have a lower rate of formal employment and are more likely to be self-employment. This result is particularly important for Ecuador because it suggests that self-employment has different drivers for men and women. Bosch & Maloney (2010) argue that self-employment is not a refuge for discarded older workers, but rather a desirable sector that can be accessed once sufficient resources have been acquired. In Ecuador, however, our results indicate that self-employment is higher among women with lower levels of education, living in poor households. This suggests the role of self-employment as a refuge for women from vulnerable households.

4.3 Forecasting Labor Force Participation Rates

To illustrate the policy relevance of our analysis, we use the model results to forecast the LFPR and sectoral employment rates until 2024. To do that, we assume that the age and cohort effects remain constant over the forecasting period. For the cohorts entering the labor force after 2019, we fix the cohort effect at the level of the last observed cohort. In addition, since the age distribution of population is expected to remain constant over a 5-year period, the cohort size for the young cohorts is assumed to be the same as the last cohort observed. The forecasting exercise is based on the generational and life cycle effects. Figure 6 shows that the projected LFPR decreases for both men and women throughout the period, as resulted from the large negative cohort effects of the younger generations. They make LFPR to decrease as new cohorts enter the labor market. Noteworthy, it is obvious that the large increases in the LFPR between 2014 and 2018 are caused by the business cycle; if we consider only the generational and life cycle effects, LFPR are expected to continuously decrease in future as well. In addition, the gap between men and women LFPR is expected to stay relatively stable in the future. The estimated men LFPR is projected to be by 26.86 pp. above the women LFPR by 2024.

Figure 6 shows a distinctive pattern in the sectoral composition of employment. In the future, it might be expected the formal employment rate to increase because: (1) new generations with large positive cohort effects will enter the labor market, and (2) age groups with higher rates of formal employment will prevail. The opposite is observed in the forecasted informal employment rate, which is expected to decrease because of the negative impact generated by the entry of new generations on the labor market, and by population aging. Finally, towards the end of the period, the self-employment rate is expected to increase as a large proportion of population ages and moves towards older age groups with higher self-employment.

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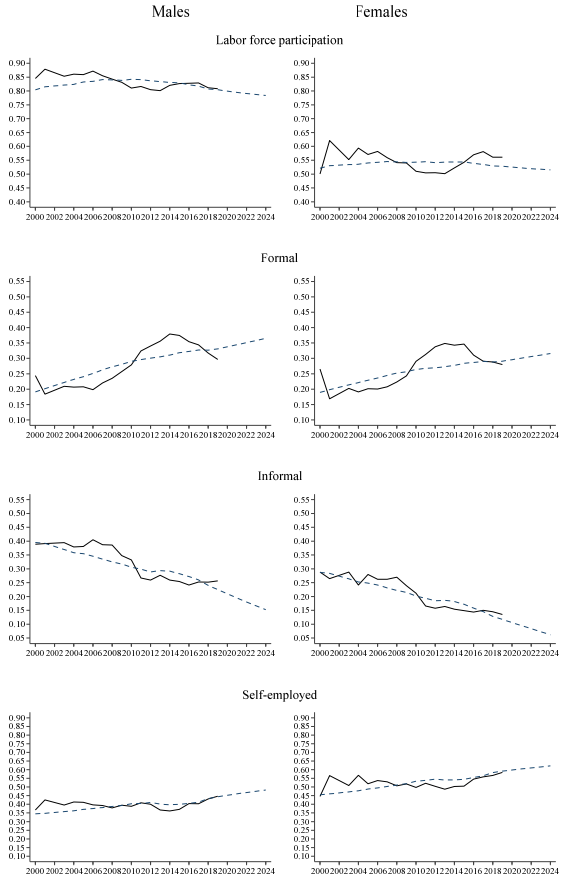
[1] *Household deprivation index is a proxy calculated here, by the principal components analysis, as an index of the main characteristics of the household's dwelling: main material of the dwelling's floor, sewage elimination systems, and water supply system. The higher the index, the lower the wealth of the household.*

Figure 6. Projection of Labor Force Participation Rate and Sectoral Employment Rate



Source: Author´s estimates using ENEMDU for several years.

5. Conclusions

This paper aims to provide a more comprehensive explanation of the Ecuadorian labor market, which has recently experienced important economic and institutional changes. To unveil the specific peculiarities of this country, the labor force participation has been analyzed upon gender and employment composition (formal and informal salaried employment, as well as self-employment). The cohort analysis developed in this paper allows to construct and compare gender specific life cycle participation profiles. The overall results firstly confirm a gender difference in life cycle profiles in the Ecuadorian labor market. The life cycle of labor participation exhibits an inverted U-shape. The women LFPR are found to be much lower as compared to men, which suggests that in Ecuador, according to the

traditional family principles, men are the economic provider to families and women mostly do housework.

The LFPR is different across subsequent cohorts, revealing a decreasing trend for the younger cohorts. This can be explained by the increased college attendance as a result of policies aimed to facilitate access to high education. The removal of user-fees in tertiary public education has significantly increased the access to education (Ponce & Loayza, 2012), which in turn partially explains the reduction in the LFPR.

Formal salaried workers have an inverted u-shaped life cycle LFPR. In contrast, informal salaried workers have the highest LFPR among the youngest, while it sharply decreases with the increase in age. These results are in line with Bosch & Maloney (2010) who find that entry to the informal salaried sector is strongly biased towards young people. For the self-employed workers, the LFPR life cycle profile increases with age, which has two explanations. One explanation is that the low coverage of the contributory pension system forces them to stay in work even after reaching the retirement age. Even the elderly self-employed workers who want a formal job find it difficult because most of them are viewed as less attractive than younger workers on the labor market. Another explanation is that older adults can freely choose self-employment, once they have accumulated the necessary capital to afford it. The results also show that the incidence of self-employment in Ecuador is higher among women with less education from poor households. This suggests that self-employment has different characteristics for men and women. For women from vulnerable households self-employment is more attractive due to its flexibility.

LFPR are found to considerably change across generations. While formal employment LFPR is higher for younger generations, the informal salaried employment has steadily declined across generations. Participation in self-employment also has decreased for the newest generations.

The estimated time effects, controlling for age and cohort effects, indicate that both male and female LFPR are countercyclical. The countercyclical behavior of female labor participation is notable and it is consistent with that predicted by the added worker hypothesis. Our estimations suggest that formal employment is pro-cyclical in a significant way. In the case of informal employed, we find support for a countercyclical behavior, but this response seems to be weaker than the one observed in the other sectors. We also find a counter-cyclical response of self-employment rate to the business cycle.

For policy purposes, our results show that LFPR is strongly associated with the economic cycle, which is indicative for the need to implement policies to prevent the loss of formal jobs during economic contractions. Given the low formal employment rate of younger workers and elderly workers, to facilitate their entry on the labor market, the government could design tax incentives for companies, training programs, and alternative contracting forms. Additionally, to make the hiring of young people more attractive, an alternative is to set up differentiated minimum wages. Similarly, incentives such as tax reductions or subsidies of employer´s contribution to the social security system, could stimulate the hiring of elderly workers in the formal sector.

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