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# Objectives of Sustainable Development and Youth Employment in Colombia

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**Abstract:** The sustainable development goals (SDGs) aim to raise quality employment, gender equity in access to employment and increase coverage in education. However, in Colombia, high unemployment rates and the informality of young people are risks of achieving these goals. The purpose of this research is to estimate the determinants of youth unemployment and its relationship with SDGs Objective 8, and linking it to the objectives of quality education and gender equity. Using the microdata of the Colombian household survey, DANE, this relationship is estimated with a methodology of age, period, and cohort, through a Probit/Logit Multinomial model. As a novel result for the Colombian case, it is shown that, although new generations of young people are more educated, education per se is not enough to guarantee them a quality insertion into the labor market, penalizing, above all, young women. Lack of work experience and segmentation of the labor market would help explain this outcome. Employment policies, therefore, to achieve the SDGs must not only invest in education, but also expand dual education programs, considering gender.

**Keywords:** sustainable development goals; human capital; youth unemployment; Probit model; multinomial logit model; cohort study

## 1. Introduction

The United Nations wants to overcome poverty and generate a sustainable path for economic growth through the strengthening of freedom and peace [1]. The document establishes a set of goals and schedules to achieve these objectives in a term up to the year 2030, with actions that must be followed by member countries. In Colombia, as in the rest of the world, these objectives have been applied above all with the increase in the influence of environmental movements and the concern with the generation of wealth in parallel in this regard and preservation of the environment [2,3].

Among the established goals, three of the objectives have a close relationship with the labor market. Objectives 4, 5, and 8 discuss, respectively, the quality of education, gender equality, and the generation of decent employment, forming a set of goals on access to employment and formalization of work, aimed at reducing the number of workers who live in poverty and extreme poverty. These aims include recurrent access to employment of vulnerable populations such as youth and the condition known as NEET, young people who do not work nor study.

In Colombia, the SDGs became a pattern politics, joining various plans national and local development in recent years, as shown by the study of the National Planning Department [4]. However, the report on the progress of the SDGs for Colombia shows that one of the main problems remains unemployment and the general structure of the labor market, especially for the younger labor force.

With an unemployment rate almost double the adult population, in addition to the high incidence of young people who do not work and do not study (also known as NEET generation). Although there has been a reduction in overall unemployment, unemployment rates remain higher among women and, especially, among younger groups, in addition to informality, which remains at levels above 60% [1]. These data allow observing the difficulty of Colombia to achieve the SDGs up to the deadline of Agenda 2030.

One of the ways to reduce the distances to these goals and the generation of better-quality jobs postulated by the economic literature is investment in human capital. However, there is evidence that, in developing countries, the components of human capital have distinct effects on employability. Research such as [5–7] shows that people with higher levels of education are less likely to be employed, while less educated workers remain in lower-quality positions. This highlights a problem in meeting the SDG target since these objectives are already defined as a roadmap in the socio-economic policy of the countries, which in this case will be affected by the lack of employability in a quality position determined by young unemployment. Thus, this article aims to find the determinants of the employment of Colombian youth, investigating the determinants of employment and the type of employment. Understanding these relationships can help to understand the extent to which the Colombian labor market can meet SDGs Objective 8.

The most novel finding of this research, for its contribution to the design of employment policies aimed at young people, so that the SDGs are achieved in terms of access to quality employment, is that work experience would be the key component in the employability of young people, so employment policies should not only focus on training and formal education (which are fundamental) but will strive more to generate the first job, and employment policies should not only focus on training and formal education (which are fundamental), but will strive more to generate the first job, involving the labor market, with programs such as apprenticeships and dual education models. At the same time, progress is needed in the schooling of the workforce, especially to lead the poorest to higher education, and thus increase the chances of formal jobs and long-term social mobility.

## 2. Literature Review

Human capital is one of the most discussed and empirically analyzed theories in the economic sciences, in particular, to investigate the relations of salary, productivity, and employment. According to the postulates of the classical vision, the productivity of the individual is a function of the level and form of accumulated human capital, that is, of the investment in training and qualification that favors the performance of the work. This would impact on salary levels and the form of occupational insertion, in which the workforce with the largest stock of human capital would have facilitated access to the best jobs [8,9].

However, later developments in the theory admit the existence of heterogeneity in the distribution of human capital among labor, both in its level and in the modality of investment made. This observation derives from the concern to explain the existence of a salary differentiation between workers of the same educational level. This heterogeneity originates in two types of investment, the specific and the general. The second is the type of human capital used in various activities or companies, with perfect or almost perfect factor mobility. From an empirical point of view, the level of formal education is one of the components that are most used to represent this type of investment. On the other hand, there is a form of human capital that cannot be completely transferred between occupations or companies, called specific human capital and that transforms the workforce into an almost fixed component of the firm's production function. It is traditionally represented by experience in the labor market. The two investment modalities second the theory of human capital, must increase productivity and, consequently, wages and employability of labor. However, the way companies combine these components with their characteristics is also a determinant of the allocation of labor between employment and unemployment and between occupational segments.

Following the postulates of human capital, a series of criticisms and complementary studies emerged that strengthen the analysis of the relationship between education and experience with the labor market. The theories of the filter and signaling [10–12] argue, for example, that education is not a reflection of productivity but serves as a signal for the labor market about the skills that a person could have. However, one of the problems detected in the so-called mismatch of education or of the skills demanded and offered, which reflects a disconnection from formal education with labor demand. In this way, phenomena such as over-education or under-education are observed more specifically, in which the first refers to the job for which the person has a higher educational level than the required and, the second case, occurs when people have a lower level of training than requested in vacancies.

In the Colombian case, [13,14] found that the most educated and younger people tend to be more vulnerable to unemployment. Likewise, the higher incidence of low-quality employment causes young workers to have low social protection, increasing the wage gap and, therefore, inequality. Likewise, it causes underestimation of unemployment because of hidden or informal employment, exhibiting a myopic vision of the labor market [15].

Analysis such as those presented by [16,17] reveals a strong labor segmentation in Colombia, which unequally distributes the active population in economic segments with different levels of formalization and quality of employment. In addition, as shown in [18], women have increased their labor participation, but especially in the informal activities of the economy. Finally, [19] they also found that experience favors labor participation and that education especially favors formality, so that human capital, including education to a greater extent, would help to enter higher-quality jobs achieving the objective 8 of the SDGs.

In this way, the literature shows a positive relationship between education and employability that affects the dynamics of young employment, nevertheless, it leaves aside a deeper analysis of the role of the experience that was addressed in this study in order to be able to establish the determinants of young employment that will allow or fail to meet the objective of increasing quality jobs, since if these variables that affect the employment insertion of young people are not identified, this objective may not be met. Thus, by identifying these barriers, economic policy solutions can be offered.

### 3. Materials and Methods

To meet the objectives, the data are used in the gran Encuesta Integrada de Hogares (GEIH), which takes the Departamento Administrativo Nacional de Estadísticas (DANE) in Colombia since 2008 and present the microdata about living conditions and labor market. People between the ages of 16 and 39 are selected from the 2008, 2012, and 2016 surveys, with complete information for the variables used in this research. Two models with the selected data are estimated, the first being a logit for the probability that an individual is employed, while the second is concerned with estimating the probability that a person is employed in a certain type of occupation, according to the quality of the job.

The GEIH is in a household survey and focuses on the structure of the workforce (occupied, unemployed and inactive) and its sociodemographic characteristics [20,21]. This feature allows sampling groups to be homogeneous, which is an advantage in the cohort method because it gives the possibility of having not-so-dissimilar age groups, with less biased samples by decreasing the variance of the estimators. In addition, GEIH is not a panel, for that reason requires the use of cohorts for analysis. In this sense, as the sampling unit is the home and the purpose of the sample homes and people, it is possible to characterize and compare the behavior of people within each household and between households because the rotating sample takes similar units of study each year. This advantage allows you to choose cohorts that share similar sociodemographic characteristics, probability distributions.

Moreover, the failure to select in this household survey was dealt with the [20] method, in which the workforce was taken as a reference and if they attend any educational institution, this is how we work on the possible bias in which the results show that there are no changes in statistical significance or the trend of coefficients, in this sense in Colombia there would not be this bias, however, the marginal coefficients derived from the model are presented with the treatment of Heckman for greater statistical

accuracy. In this sense, the effect that in younger cohorts who have not completed their education does not generate a bias in determining the employability probability. Similarly, as Table 1 shows, cohorts are balanced, i.e., they are not underrepresented in each generation and each year in which the household survey was taken (2008, 2009, and 2012), given the target population of the household survey determined by housing, households, and individuals, as explained above.

**Table 1.** Cohort groups by survey year.

	2008	2012	2016
Generation 1—Cohort 1997–2000	-	-	16–19 Years (46,258)
Generation 2—Cohort 1992–1996	-	16–19 Years (51,246)	20–24 Years (49,132)
Generation 3—Cohort 1987–1991	16–19 Years (53,971)	20–24 Years (70,295)	25–29 Years (70,126)
Generation 4—Cohort 1982–1986	20–24 Years (75,761)	25–29 Years (70,537)	30–34 Years (62,730)
Generation 5—Cohort 1977–1981	25–29 Years (70,090)	30–34 Years (64,450)	35–39 Years (56,973)
Generation 6—Cohort 1974–1978	30–34 Years (63,205)	35–39 Years (58,485)	-
Generation 7—Cohort 1969–1973	35–39 Years (32,986)	-	-

Source: Own Elaboration.

For the first, the dependent variable is a dummy of value 1 if the individual is employed and of zero value if he is unemployed, as defined by the DANE. As explanatory variables, the theoretical aspects raised by the theory of human capital are taken as the basis, with education as the main explanatory variable. In addition, a set of variables is introduced to capture the so-called age-period-cohort effect. This method allows analyzing the probability of employment among individuals who were born in the same period of time and who have experienced basically the same socioeconomic changes [22]. This type of analysis has not yet been found in the case of the labor market in Colombia, but it has a long application in international literature, as in [22,23]. In addition, the method makes it possible to overcome the longitudinal non-observation of individuals in the GEIH, avoiding potential bias problems in the estimates because they do not consider the presence of unobservable factors and the evolution of the individuals over time.

In short, you want to estimate the model:

$$\Pr(y = 1) = f(\text{sex, head of household, marital status, Education, region, Age, cohort, period}) \quad (1)$$

When using the Heckman method for selection bias [24], a control is performed that is shown in the following equation:

$$\Pr(y = 1) = f(\text{sex, head of household, marital status, Education, region, Age, cohort, period}) \text{ select}(\text{Workforce—sex, head of household, school attendance}) \quad (2)$$

With this model is obtained the so-called Mills inverse reason that is added in the main probability equation

$$\lambda_i = \phi(-\theta - z'_i \delta) / \Theta(-\theta - z'_i \delta) \quad (3)$$

in which they  $\phi$   $y$   $\Theta$  represent respectively the density and cumulative functions of the normal distribution, while  $z$  and are the set of variables explanatory of the probability of participation in the labor market and their respective vector of coefficients  $\delta$ .

In Equation (1), the sex variable is dichotomous of value 1 for men and zero for women; head of household is a dummy that identifies the reference person in households; marital status a dummy to identify people living as a couple (married or in free union); education is a set of dummies to capture at the maximum level of formal education of the individual, divided into Bachelor, Technician/Technologist, University and Postgraduate. The region is composed as categorical for the demographic zones of Colombia (Atlantic, Eastern, Central, Pacific, and Bogotá). Finally, binaries are

added to capture the age-period-cohort effect, organized according to the scheme in Table 1. That is, dummies variables that capture the age of the person in each year of the sample, organized in groups of five years (16–19 years; 20–24 years . . . ; 35–39 years), with the exception of the youngest group, which has four years, increased dummies for the year of birth, or generation of five years and dummies variables for the selected years of the survey.

On the other hand, in the confirmation of the cohorts, it can be observed that the changes in the levels of schooling between generations over time do not follow a monotonous pattern, because of which the selection and analysis of younger people are prioritized, from 16 to 39 years. This implies an average behavior different from that expected for a traditional sample of the labor market (18/65 years), once the probability that people continue in education (frequenting school or another form of education) is higher in this group. Likewise, technical and postgraduate studies increased in the country in the years studied, so high school students who did not previously enter technical education or technology began to be trained, regardless of their age, in addition, people university students they increased their admission to postgraduate studies in these years, so they increased the average level of schooling.

However, these effects on the cohorts do not compromise the results since being pseudo-panels does not follow the same individual but people who represent a certain generation, so they are exposed to structural changes that can alter the composition of the cohort between years, (such as greater departures to unemployment or inactivity and changes in incentives for educational training). In this case, Heckman's selection bias control methodology helps minimize related problems, as shown [25–27].

Among the employed, it is estimated a second model for the probability of being employed and n given occupancy group, defined according to the quality of the employment position. For this, the classification of [28] is used, which defines the jobs for Colombia taking as reference the income of the workers, access to social security, and the modality of the employment contract. This methodology is close to the definition of most relevant aspects of the use of SDGs. Besides, it has been used by other studies of employment quality in the country such as [29–31]. Three categories of employment are defined: low quality, medium quality, and high quality, whose main references are in Table 2.

**Table 2.** Occupations by quality of employment.

Type of Occupation		
Low Quality	Average Quality	High Quality
Management and management occupations	Health occupations	Primary and extractive exploitation occupations
Occupations in finance and administration	Occupations in social sciences, education, government services and religion	Occupations in equipment operation, transport and trades
Occupations in natural, applied and related sciences	Occupations in art, culture, recreation and sports	Occupations in processing, manufacturing and assembly
	Occupations in sales and services	

Source: Own Elaboration.

To verify the probability of occupation in each category, a multinomial logit model is estimated, an expansion of the traditional logit models for the case of more than two categories in the dependent variable. The equation to be estimated is the one defined in (2):

$$\Pr (y = j) = f (\text{sex, head of household, marital status, Education, region, sector, Age, cohort, period}) \quad (4)$$

In this equation, sex, head of household, marital status, education, region and the dummies of age, period, and cohort are defined as before. The sector is a set of binaries for the sectors of economic

activity (commerce, services, and industry). This model has been used to determine labor market participation, labor segmentation and to determine the probability of being employed, for example, in [32–37].

The models are estimated in their versions with a standard robust error or with the help of the Stata software and with results presented in the form of marginal effects. These results are presented and discussed below.

#### 4. Results

Table 3 shows the proportions of the unemployed and the average education by gender in each generation and cohort. It can be observed that women have a higher proportion of unemployment than men in all generations and years analyzed, so the goal of gender equity in the SDGs is not met. On the other hand, this employment gap is widened in the most current generations, that is to say, the youngest (generations 1 and 2), the gap in generations 3 and 4 is reduced, and it increases again in generations 5, 6, and 7; therefore, gender inequality in access to employment is broader in older and younger generations.

**Table 3.** Unemployment rates by sex and generation and average school years by sex and generation.

Unemployment	Women			Men		
	2008	2012	2016	2008	2012	2016
Generation 1—Cohort 1997–2000			63.24			36.76
Generation 2—Cohort 1992–1996		65.25	53.73		34.75	46.27
Generation 3—Cohort 1987–1991	47.43	54.58	56.98	52.57	45.42	43.02
Generation 4—Cohort 1982–1986	52.13	58.64	62.20	47.87	41.36	37.80
Generation 5—Cohort 1977–1981	56.80	62.84	64.41	43.20	37.16	35.59
Generation 6—Cohort 1974–1978	61.43	65.96		38.57	34.04	
Generation 7—Cohort 1969–1973	62.11			37.89		
Education	Women			Men		
	2008	2012	2016	2008	2012	2016
Generation 1—Cohort 1997–2000			9.35			9.16
Generation 2—Cohort 1992–1996		10.55	9.84		9.06	9.22
Generation 3—Cohort 1987–1991	8.64	9.96	11.64	8.15	9.31	11.01
Generation 4—Cohort 1982–1986	10.14	11.20	11.82	9.70	10.61	11.16
Generation 5—Cohort 1977–1981	10.87	11.11	11.45	10.49	10.56	10.80
Generation 6—Cohort 1974–1978	10.56	10.63		10.16	10.14	
Generation 7—Cohort 1969–1973	10.05			9.52		

Source: Own Elaboration.

On the other hand, in all generations, women have on average more years of schooling than men, and it is observed that young people have a higher average education than adults, fewer people of generation 1 who still have to accumulate schooling because they have maximum 16 years. This scenario reflects two things, the first one that has advanced in terms of educational coverage (objective 5 of the SDGs), but it is being wasted in terms of objective 8, since women are the ones who are most educated, but less employed than men, so the country does not take advantage of this human capital to increase the economic growth and quality jobs, so it could not meet this goal on the 2030 agenda.

On the other hand, Table 4 presents the marginal effects of the variables used on the probability of an individual being employed in Colombia in the years investigated, using the Heckman method [38] 38 as statistical control of selection bias, for probabilistic models, in this case, it is estimated with an equation of participation in the labor force, determined by the variable sex, head of household, and school attendance. It was found that the estimators do not change in sign or trend, only in magnitude, so the possible bias does not alter the results of the model presented below.

**Table 4.** Marginal effects model Probit analysis by employment cohorts.

	dy/dx	Std. Err.	P > z
Gender	0.1127115	0.0017085	0.000
Estado civil	0.0437477	0.0016303	0.000
EDUCATION			
Bachelor	−0.0153454	0.0015101	0.000
Technician/Technologist	−0.0097736	0.0020629	0.000
University	−0.015424	0.0022579	0.000
Graduate	0.0637705	0.0048961	0.000
REGION			
Eastern	0.0115719	0.0018841	0.000
Central	−0.0139544	0.0015668	0.000
Pacific	−0.0421918	0.0019159	0.000
Bogotá	0.0388791	0.003067	0.000
AGE			
16–19 Years	−0.0775636	0.0050746	0.000
20–24 Years	−0.0632977	0.003971	0.000
25–29 Years	−0.0146618	0.0027648	0.000
COHORTE			
Born 1997–2000	−0.09351	0.0081568	0.000
Born 1992–1996	−0.0794912	0.005339	0.000
Born 1987–1991	−0.068432	0.004335	0.000
Born 1982–1986	−0.0460932	0.0033362	0.000
Born 1977–1981	−0.0267432	0.0023451	0.000
Born 1974–1978	−0.0096444	0.0026283	0.000
PERIOD			
Year 2012	0.0355448	0.0016936	0.000
Year 2016	0.0719632	0.0028942	0.000
Number of obs		1,099,737	
Wald chi <sup>2</sup> (22) <sup>1</sup>		5119.05	
Prob > chi <sup>2</sup>		0.0000	
Pseudo R <sup>2</sup>		0.0721	
/athrho	1.251.911	0.0284328	0.000
rho	0.8488187	0.0079472	

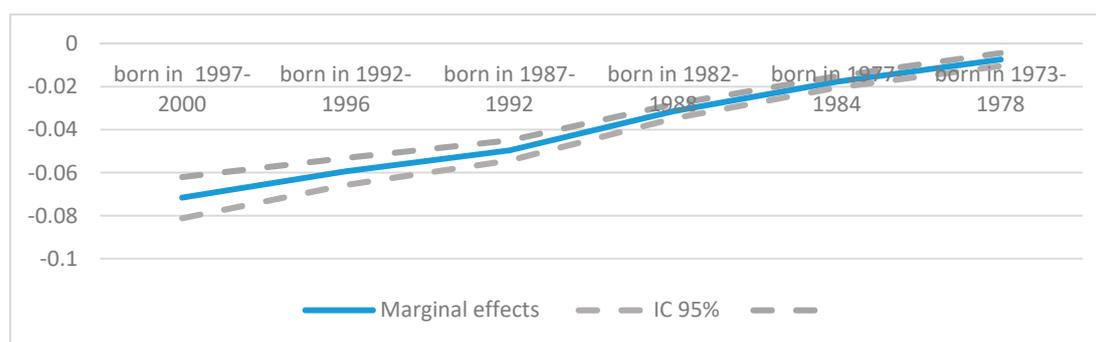
Note: Wald's test shows that the true value of the parameter is based on the estimation of the sample, so the model is useful to show these relationships. Source: Own Elaboration.

The method consists of a two-stage estimate. In the first, the probability of participation of individuals in the labor market is estimated, with a simple Probit/logit model over a dichotomous dependent variable of value 1 for people acting in the labor market and of value 0 otherwise. The explanatory variables for this study are a gender dummy, a dummy to identify the head of the household and a dummy to identify whether the individual is attending school. With this model is obtained the so-called Mills inverse reason that is added in the main probability equation in a second stage of the model, adapted for the first time by Van de [39], the method is a generalization of the original concept proposed by [38] for the case of binary choice models.

In general, it is observed that males are more likely to be employed in comparison with the female sample, confirming the greater difficulty of women's labor insertion, a typical phenomenon in almost all economies, but with more weight in the Latin American region [40]. Also, other classic results of the empirical literature are observed, such as a greater probability of employment among the reference persons in the home and those living as a couple, reflecting the need for maintenance of the family nucleus [41]. In the same way, the labor market in the region of the capital Bogotá is where the greatest employment opportunities appear.

The impacts of education represent the results of the greatest interest in this research, capturing some of the aspects discussed in the SDGs and human capital theory as discussed previously. In contrast to the expected by traditional human capital theory, more educated individuals in Colombia have lower chances of employment, except for those with level postgraduate. In this sense, the idea that education reasserts itself does not generate stimuli or is not a determinant of occupation. It can also mean that companies seeking low-skilled labor or that there is a gap in human capital competencies, in educational terms.

In the case of the variables of age, period, and cohort, the difficulty of obtaining employment for the youngest was observed. While the annual variables show a general increase in employability with respect to the reference year (2008), the negative and significant effects of the age and cohort dummies show that the youngest are less likely to be employed compared to adults. The marginal effects of cohorts can be interpreted as the impact of generational change on the labor market, which is best observed with the help of Figure 1. More recent generations have faced greater employment difficulties throughout the period under investigation, evidencing an increasingly greater difficulty of the Colombian market in absorbing the new labor force entering the economically active population. Together with the effects presented by the years of study, these results can show that the Colombian labor market is more demanding in relation to experience and not with the level of formal qualification of the workforce.



**Figure 1.** Marginal effects for cohorts on probability of employment. Source: Own Elaboration.

On the other hand, Table 5 can observe the behavior of people belonging to the same generation, with models estimated in each year to compare the evolution of the marginal effects of the factors on employment. It is showing that the differential insertion according to gender remains throughout the entire period and among all selected cohorts, although the decreasing effect between and among older people, where younger women have greater problems of labor insertion in the country. As for the regions, Bogotá shows over time as a region that demands more employment compared to the others, but its effect has diminished over time, losing statistical significance in the last two generations.

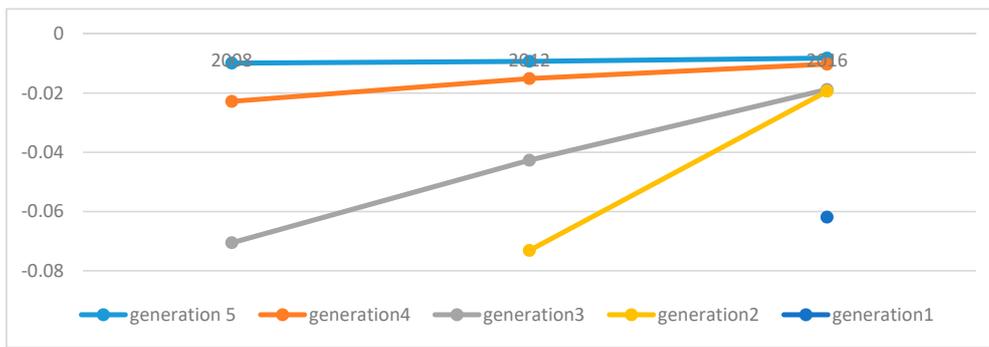
In this sense, the objectives of the SDGs regarding gender equity and access to employment will not be met for the goal of the 2030 Agenda, since women do not have access to employment, not even women with higher levels of education, this would form a gender gap in terms of employment. Similarly, young people who have barriers to entering the labor market and do not increase the probability of employment will generate an employment gap with adults that will affect the employment rates raised by the SDGs. In summary, these objectives will not be met in objectives 5 and 8 because of the lack of youth access to jobs and the gender gap.

**Table 5.** Marginal effects on probability of employment based on selected generations.

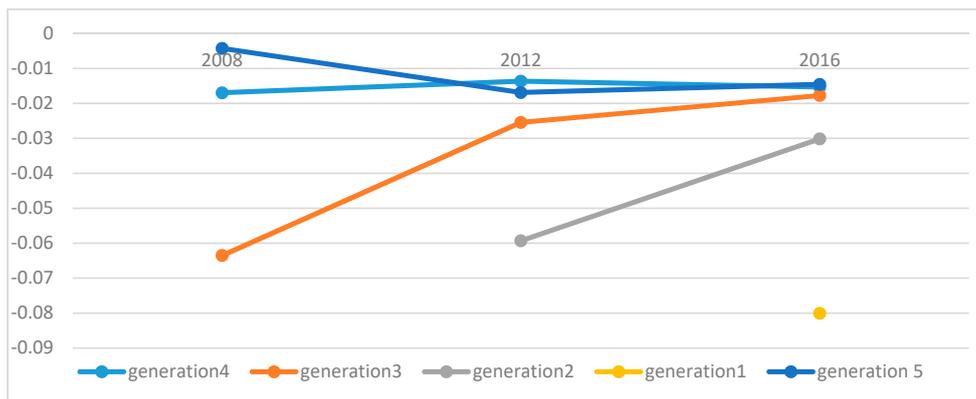
	Generation 5			Generation 4			Generation 3			Generation 2		Generation 1
	2008	2012	2016	2008	2012	2016	2008	2012	2016	2012	2016	2016
Gender	0.062 *	0.0585 *	0.0391 *	0.0734 *	0.0714 *	0.0486 *	0.077 *	0.0913 *	0.0637 *	0.0976 *	0.0734 *	0.079 *
	(0.003)	(0.0029)	(0.0026)	(0.0038)	(0.0030)	(0.0027)	(0.0052)	(0.0035)	(0.0029)	(0.0051)	(0.0036)	(0.006)
Head of household	0.100 *	0.060 *	0.0326 *	0.1245 *	0.0787 *	0.0421 *	0.152 *	0.1184 *	0.0702 *	0.0817 *	0.0894 *	0.042 **
	(0.003)	(0.0030)	(0.0025)	(0.0055)	(0.0036)	(0.0028)	(0.0118)	(0.0054)	(0.0035)	(0.0120)	(0.0056)	(0.0160)
Marital status	0.042 *	0.030 *	0.018 *	0.0598 *	0.0458 *	0.0279 *	0.0430 *	0.0463 *	0.0357 *	0.0265 **	0.0442 *	0.0087
	(0.003)	(0.0027)	(0.0024)	(0.0043)	(0.003)	(0.0025)	(0.0091)	(0.004)	(0.0029)	(0.0103)	(0.0046)	(0.0146)
Bachelor	−0.009 *	−0.0098 **	−0.0081 **	−0.0223 *	−0.0151 *	−0.0109 **	−0.070 *	−0.0426 *	−0.0187 *	−0.0731 *	−0.0193 *	−0.061 *
	(0.003)	(0.00329)	(0.0029)	(0.0043)	(0.0036)	(0.0032)	(0.0054)	(0.0042)	(0.0037)	(0.0053)	(0.0044)	(0.0070)
Technician/Technologist	−0.004	−0.0169 *	−0.0145 *	−0.0169 *	−0.0136 **	−0.0153 *	−0.0635 *	−0.0254 *	−0.0177 *	−0.0593 *	−0.0301 *	−0.080 *
	(0.005)	(0.0044)	(0.0038)	(0.0066)	(0.0047)	(0.0039)	(0.0123)	(0.0057)	(0.0044)	(0.0116)	(0.0058)	(0.0174)
University	0.006	−0.013 *	−0.0180 *	−0.0222 **	−0.0119 **	−0.0205 *	−0.0404	−0.0333 *	−0.0313 *	−0.0166	−0.0456 *	−0.152
	(0.004)	(0.0044)	(0.0040)	(0.00716)	(0.0049)	(0.0042)	(0.0384)	(0.0083)	(0.0049)	(0.0708)	(0.0095)	(0.1579)
Graduate	0.073	0.0390 *	0.0109 **	0.0976 *	0.039 *	−0.0123 **		0.0497	0.0239 *		0.0352	
	(0.008)	(0.0059)	(0.0050)	(0.0199)	(0.008)	(0.0057)		(0.0269)	(0.0083)		(0.0331)	
Eastern	0.049 *	0.0048	0.0025	0.0675 *	0.0035	0.0070 *	0.063 *	0.015 **	0.0166 *	−0.0315 *	0.0304 *	−0.012
	(0.004)	(0.0039)	(0.0039)	(0.0052)	(0.0042)	(0.0038)	(0.0072)	(0.0050)	(0.0042)	(0.0072)	(0.0052)	(0.0097)
Central	0.019 *	−0.0079 **	−0.0009	0.0158 **	−0.0013	0.0098 **	−0.046 *	−0.0153 **	0.0097 **	−0.0748 *	0.0144 *	−0.033 *
	(0.004)	(0.0034)	(0.0030)	(0.0047)	(0.0037)	(0.0033)	(0.006)	(0.0045)	(0.0036)	(0.0066)	(0.0046)	(0.0086)
Pacific	−0.024 *	−0.0393 *	−0.0109 **	−0.026 *	−0.0503 *	−0.0036	−0.0542 *	−0.0508 *	−0.005	−0.0732 *	0.0035	−0.031 *
	(0.005)	(0.0043)	(0.00368)	(0.0060)	(0.0046)	(0.0039)	(0.0083)	(0.0055)	(0.0043)	(0.0079)	(0.0055)	(0.0102)
Bogotá	0.0571 *	0.0303 *	0.0134 *	0.0670 *	0.035 *	0.032 *	0.0383 *	0.0509 *	0.0429 *	−0.0331 *	0.0522 *	−0.017
	(0.0068)	(0.0055)	(0.0053)	(0.0083)	(0.0060)	(0.0052)	(0.0125)	(0.0072)	(0.0058)	(0.0117)	(0.0074)	(0.0162)
Number of obs	47.72	50.46	45.27	46.62	54.06	48.12	30.00	51.99	50.71	29.12	45.60	14.61
Wald chi <sup>2</sup> (11)	1957.2	1583.6	699.8	1846.6	1999.9	1007.6	1014.9	1971.5	1478.09	900.1	1052.5	319.4
Prob > chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R <sup>2</sup>	0.052	0.046	0.030	0.039	0.045	0.035	0.028	0.035	0.040	0.026	0.024	0.020

Desviación típica entre paréntesis. \*  $p < 0.01$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.10$ . Source: Own elaboration based on model results.

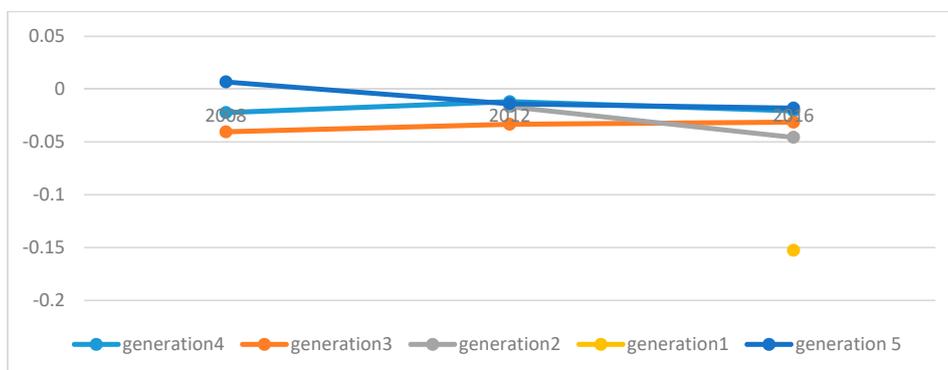
At the center of the specific analysis on education, Table 5 can be analyzed better through the Figures 2–4 soon, where the impact of education is observed in the probability of employment for generations of workers. This allows us to infer about the role of formal human capital in the career of young people and observe that the coefficients have increasing trends as age increases, showing that education has more relevance at the most advanced points of the career path. When comparing the generations, it is observed that the ones with the lowest coefficient, or in which the probability of being employed for each educational level decreases the most, are 2 and 1, that is, the youngest.



**Figure 2.** Marginal effects of high schools on probability of use based on selected cohort. Source: Own elaboration based on model results.



**Figure 3.** Marginal effects of technicians/technologists on probability of use according to selected cohort. Source: Own elaboration based on model results.



**Figure 4.** Marginal effects of university students on the likelihood of employment according to selected cohort. Fuente: Elaboración propia a partir de resultados del modelo.

The younger people, aged 16–19, have the least probability of getting employed, with an effect profound and university. Likewise, it is shown that in general for young people (16–29 years old)

regardless of generation, education has a negative impact on the probability of occupation and this negative impact becomes smaller as age increases. That is, at a higher stage of the work life cycle of people, a phenomenon that could occur due to the accumulation of work experience. These results show two factors. On the one hand, education is relevant as the population ages, that is, a more advanced work cycle and it is also observed that university students have more difficulty than other young people and seem to remain unemployed for longer. This leads to the need to invest in general human capital (such as university students) but also in specific human capital that can be associated with training in companies or work experience, so, within the career path, it must be taken into account both types of human capital to achieve an optimal trajectory.

Moreover, Table 6 and Figures 5 and 6 shows the results of the multinomial logit model to determine, among employed individuals, whether the use is low, medium, or high quality, using the same factors above in addition to the economy sector. In this way it is observed that men are more likely to be in occupations of medium and high quality, while women are more likely to act in occupations of lower quality of work. In the case of the regions, workers in the Eastern, Pacific and Bogotá observe a decrease in the probability of being in low- and high-quality jobs and increase the probability of being in medium quality jobs. Sectors economic of industry and the services offer more opportunities in jobs of low and medium quality compared to trading activities.

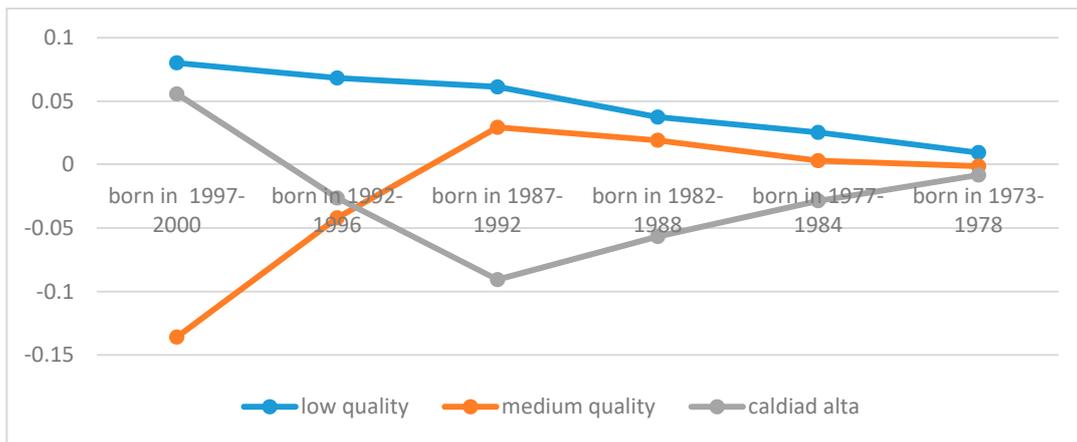


Figure 5. Marginal effects for cohorts on quality of employment. Source: Own elaboration based on model results.

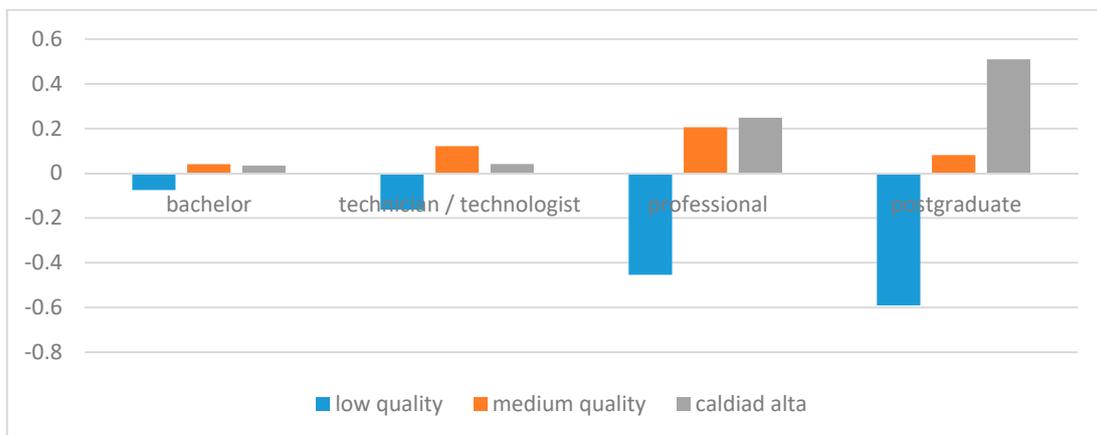


Figure 6. Marginal effects of education on the quality of employment. Source: Own elaboration based on model results.

**Table 6.** Marginal effects of the multinomial logit on the quality of employment.

	Low Quality			Average Quality			High Quality		
	dy/dx	Std. Err.	P > z	dy/dx	Std. Err.	P > z	dy/dx	Std. Err.	P > z
Gender	−0.0429425	0.0010954	0.000	0.031662	0.001049	0.000	0.01128	0.0011356	0.000
Head home	0.0012977	0.0011845	0.273	0.03107	0.001132	0.000	−0.03237	0.0012189	0.000
Marital status	−0.0308883	0.0011326	0.000	0.011819	0.0010838	0.000	0.01907	0.0011651	0.000
<b>EDUCATION</b>									
Bachelor	−0.0747831	0.001216	0.000	0.040556	0.0010673	0.000	0.034227	0.0011842	0.000
Technician/Technologist	−0.1627714	0.0017881	0.000	0.121075	0.001825	0.000	0.041696	0.0018042	0.000
University	−0.4541149	0.0019209	0.000	0.205721	0.0021793	0.000	0.248394	0.0023256	0.000
Graduate	−0.5911197	0.0022706	0.000	0.081224	0.0034151	0.000	0.509896	0.0038022	0.000
<b>REGION</b>									
Eastern	−0.0207914	0.0015912	0.000	0.052864	0.0015114	0.000	−0.03207	0.001588	0.000
Central	0.0125688	0.0013268	0.000	0.03877	0.0012644	0.000	−0.05134	0.001356	0.000
Pacific	−0.0230393	0.0016305	0.000	0.014033	0.0014662	0.000	0.009006	0.0017383	0.000
Bogotá	−0.0641428	0.0024486	0.000	0.075935	0.0025441	0.000	−0.01179	0.0024222	0.000
<b>SECTOR</b>									
Services	0.0135238	0.0011994	0.000	0.036893	0.0011174	0.000	−0.05042	0.0012405	0.000
Industrial	0.0029318	0.0016682	0.079	0.02448	0.0016047	0.000	−0.02741	0.001727	0.000
<b>AGE</b>									
16–19 Years	−0.1008618	0.0051819	0.000	−0.03659	0.0041942	0.000	0.137453	0.0052079	0.000
20–24 Years	0.0054109	0.0032609	0.097	−0.04603	0.0026789	0.000	0.040622	0.0031443	0.000
25–29 Years	0.0000702	0.0021968	0.997	−0.02097	0.0019139	0.000	0.020967	0.0020664	0.000
<b>COHORTE</b>									
Born 1997–2000	0.0801981	0.0059239	0.000	−0.13593	0.0038008	0.000	0.055736	0.0061901	0.000
Born 1992–1996	0.0682657	0.004172	0.000	−0.04194	0.0037013	0.000	−0.02632	0.0043826	0.000
Born 1987–1991	0.061227	0.00323	0.000	0.029391	0.0030633	0.000	−0.09062	0.0032231	0.000
Born 1982–1986	0.0374662	0.0023004	0.000	0.019174	0.0021489	0.000	−0.05664	0.0024813	0.000
Born 1977–1981	0.0253981	0.0018121	0.000	0.003129	0.0016694	0.061	−0.02853	0.001902	0.000
Born 1974–1978	0.0094629	0.0021075	0.000	−0.00125	0.0018109	0.491	−0.00822	0.0020576	0.000
<b>YEAR</b>									
Year 2012	0.6146999	0.0012723	0.000	−0.189	0.0017423	0.000	−0.4257	0.0018426	0.000
Year 2016	0.6123525	0.001578	0.000	−0.19849	0.0019344	0.000	−0.41386	0.0020894	0.000
Number of obs	541,046								
Wald chi <sup>2</sup> (48)	166,746.57								
Prob > chi <sup>2</sup>	0.0000								
Pseudo R <sup>2</sup>	0.2438								

Source: Own Elaboration from the resulted from the model.

When analyzing the specific human capital, the age is observed, again taking as reference the people of 30–39 years. This effect is best seen in Figure 5, which shows that the younger generations are more likely to be in low-quality jobs and this trend decreases as it moves toward the older generations. In the case of education (Figure 6), people with a higher educational level are more likely to be in medium and high quality jobs.

This is where the greatest impact of education lies and it is in selecting, within the segmented labor market theory, as analyzes previously, the best jobs, this education is necessary in order to generate younger chances of getting quality jobs higher.

The work experience, represented by the age factors in the estimated models, has the main positive effects on employability and the possibility of employment in high-quality occupations. These results confirm the difficulty of occupational insertion of young people in Colombia, demonstrating the need for political actions that facilitate this process, especially the search for the first job. This leads to determine that there should be differentiated employment policies within the work trajectory of people, where the government should focus on the formal education of the entire population, however, this is not enough so it should help generate the first years of work experience that the market does not provide, in order to generate a better labor transition. In this way, investment in human capital must not only occur in the education variable (or in health and nutrition as the theory explains) but also in work experience, and from there the work trajectory of people will begin to select the labor segment according to its human capital.

This means that the theory of human capital would have application in the labor news of labor segmentation in Colombia but seen from a temporal spectrum and shown that just focusing on education does not solve the problem of youth unemployment. Moreover, in many cases it can be aggravated by high expectations of the university students and low job demand response and companies' higher quality, especially in formal jobs.

## 5. Discussion

The econometric models of the previous section show a greater difficulty of employment among the youngest, in addition to evidencing a behavior of occupational segregation of the Colombian labor market according to gender. Men are more likely to be in high-quality employment compared to women, despite having a similar level of formal qualification (with higher average schooling for women). As Table 1 shows, where the most recent generations show a higher gender gap with a participation of women in unemployment of those of 60% in the youngest and more than 50% in adults, even with levels of average schooling of women above that of men.

Within the labor demand variables, the region variable shows that Bogotá in the area where people are most commonly used and that they also do it in the formal sector (with respect to the Atlantic), the Pacific and Central region decrease the probability of being employed, but increasing the probability of being in formal employment and the Eastern region increases the probability of being employed, but decreases the probability of formal employment. This indicates that only the city of Bogotá generates an optimal employment space for young people, the rest of the regions that are most likely to use them are in the informal sector, and those that generate the lowest probability of employment leave out young, but those who occupy do it in formality. This regional disparity occurs in the areas of business development and human capital, where regions with greater industrial capacity such as Central and Pacific employ people with greater education, and the other areas with more service and agricultural vocations employ more informal youth with less demand for qualifications.

The economic sector indicates that the services and industrial sector increase the probability of labor insertion with respect to trade, in the same way among young people who overcome the barrier of first employment, the industrial sector is the one that most helps to incorporate young people both for their labor insertion and to a greater extent in young people, so does the services sector, although to a lesser extent in the case of young people. This could happen because the most qualified young people can go to sectors with greater demand for skills such as industry or services, however, these

sectors are not very developed in the country, so their demand is not as high with respect to sectors such as trade, or services, since within this sector there are jobs of high qualification, but also of very low qualification. This implies that without industrial development or business development in sectors that demand more and more qualified skilled labor, young people will have problems to deal with since the most educated will compete in the formal sector and the least educated in the informal sector.

Within the analysis, it has been stated that a fundamental characteristic of human capital, which is education, has differentiated effects between adults and young people. In addition, education has a different impact on general employability and on the modality of occupational insertion. On the one hand, people, especially young people, with a higher educational level are less likely to be employed. Focusing on the youngest, these results lead to greater difficulty in accessing a first job position, delaying the entry into the occupied labor market. If this delay is linked to the continuity of youth studies, this would mean an increase in the stock of human capital in the long term. However, the data also show an increase in the incidence of young people who do not work and do not study (the NEETs) in Colombian reality, which would indicate a possible lack of labor market at the same time that no formal qualification accumulates. This can be partially explained by the difficulty of the most educated young people in achieving a job, demotivating occupational insertion and investment in studies.

On the other hand, education shows positive effects for those already employed, in the sense of facilitating the insertion into occupations of better socioeconomic quality levels. But this result is more relevant for adults, showing that the Colombian labor market has a preference for the accumulation of human capital through experience to the detriment of formal education. In this sense, the greatest difficulty lies in those seeking the first job, that the lack of experience is not compensated by education (both human capital factors). P or both, which are more educated young people are less likely to be employed because they have high expectations about wages and jobs.

In this case, efforts should be made so that young people have work experience, during their study period or in the transition from school to work, so that the barrier of first employment is overcome as soon as possible and to accumulate the years of experience that it requires demand. If this goal is achieved, education will not only cause young people to be employed in higher quality occupations but do so faster. In addition, faster and easier entry into the labor market can serve as an incentive to reduce the rates of young Neets and achieve better conditions as it stands [42,43].

These results show that the theory of human capital applied to the context of young unemployment today in Colombia should be seen from labor segmentation, since the theoretical and empirical components of this theory as shown by the works of [44–47] show a direct relationship between education and employability that would allow SDGS Objective 8 to be met, however, these studies do not fully address the labor market and they just study the formal segment, which leaves aside the larger part that is informality. These studies see on the path of others conducted in developed countries, however, these countries do not have a serious problem of informality, so the effects of education can be similar only if they look at the formal segment.

These results also show the empirical analysis shown in studies such as [40,41]. They do not address the complete relationship between unemployment, education, and experience, as their models address descriptive studies and models that do not confront the two segments to explain unemployment, even though young unemployment is about the entire market of work. In this sense, this research is not the only novel in this analysis but implies that the short-term employability policy must be reformulated to meet SDGs Target 8 to reach the 2030 target.

At the heart of the debate I have to focus on how the labor market is involved with human capital variables, so this research does not invalidate the direct relationship of education and experience with employability but shows how these variables act in a way where experience is the key factor of employability (and quality jobs) in the short term, and education in the medium and long term, rather than all in high-quality jobs. In this way, to meet Objective 8 of the SDGs it is necessary to generate

the first years of experience in young people to use them quickly and then education levels will place them in the segment (formal or informal) depending on the credentials Have.

Thus, public policy must comply in the medium and long term with SDGS objective 5 in educational coverage and quality of education, and then generate incentives in the market such as the dual model of education or apprenticeship programs, which lead young people to generate the first periods of experience required by the market to make an upward trajectory and thus be able to meet the goal of the 2030 agenda. In this way, the institutional intervention must be done in all human capital, not only in education as a sample [48]

## 6. Conclusions

Youth unemployment is a condition in which young people seek employment without being able to do so, likewise, young people face the possibility of insertion into precarious employment. Because of the magnitude of young unemployment in Colombia, the present study investigated its determinants, conditioned on the informal employment contexts that this population places in a scenario of vulnerability in their career, due to the fact of remaining unemployed or being placed in informal occupations and without social protection.

The economic literature places the theory of human capital at the center of analysis to find education as the main determinant (from the labor supply) of young employment. This theory comes from the classical and neoclassical postulates that speak of the heterogeneity of the workforce, their specialization, and the greatest returns, so that more educated young people have higher salary expectations among higher schooling, which increases their salaries backup.

Likewise, in this investigation the general and specific human capital, proposed by Becker, has different connotations and effects on young people, where this population has greater general but little specific human capital, because they cannot be inserted in companies that provide this training, Thus, companies when valuing specific human capital at the beginning of their career can leave young people with less experience out of the occupation. This also creates difficulties with the salary returns of education, which lead to greater schooling being invested as a maximizing decision of utility, so it increases the opportunity cost of young people by seeing that they are not easily used and changing their salary expectations.

This result is novel for Colombia since it shows that, within human capital, the experience and other aspects of specific human capital, is what most helps to employ young people, in addition to helping them to do so in higher occupations quality.

However, when young people overcome the barrier of first employment they are in greater advantage than adults because they are more educated and with an accumulation of experience, this is reflected in a greater probability of entering medium- and high-quality jobs. This also shows that the employment policy must guarantee the first periods of experience with apprenticeship programs or practices that certify the experience since this is valued more than education at the beginning of the work life cycle, then education selects young people toward one of the labor segments and provides better conditions for educated youth.

Similarly, gender is an important determinant of youth unemployment, since men spend less time seeking employment compared to women, increasing their likelihood of being employed both in people entering the labor market and in young people who have experience (also in adults). The effect of this variable shows that, although women have conditions equal to or similar to those of men, they will have greater difficulties in employing themselves, so they will transition between unemployment, informality, and inactivity (more in-home care than educating yourself).

Thus, economic policy must value the work history, give more importance to the experience in the first years of this practice and help young people who are in the informal sector have training necessary and sufficient to strengthen their specific human capital, so that they are better valued by demand and represent a lower cost for entrepreneurs. The foregoing as a complement to formal education, so necessary in every economy, so in the end the human capital thesis does explain the employability

behavior of young people, but not as the literature clearly reflects, but the condition of segmentation labor and the temporality of their effects, lead to occur in a particular way in these economies.

By confronting these findings with studies on unemployment and its relationship to human capital, it is found that education and experience remain decisive in the employability of young people and can help to meet the SDGs, however, their impact is on different moments of time, something that other studies did not take into account when assuming that the experience naturally occurred after finishing the levels of formal studies.

The implications of these results are seen in the country's labor policy, where, at least in the short term, the target of SDGs Objective 8 should involve the labor market with programs such as the dual model and apprentices that are not just in the program university, as they are the most vulnerable populations in terms of employability. These public policy interventions should be made by generating greater incentives for the recruitment of women since young women are the least likely to be employed.

The results of this research open up several lines of research in countries with segmented labor markets, such as Colombia, since young unemployment in these countries and high informality lead to the same conditions and limitations for young people. This compared to labor productivity, does not make clear the contribution of education alone, as more and more people are educated, but labor productivity is not increasing but falling, which implies that the most educated young people are not entering the productive system, that there is a formal market saturation, or that the most educated people are not contributing to productivity because they do not acquire the necessary or required skills. This in itself generates a worrying situation for young people, although they are more educated, they have greater problems of labor insertion and youth unemployment in the region.

Finally, the career path of young people should continue to be observed because of the displacement effect of the adult workforce that has an average educational level (bachelor's degree), and the analysis of the possible increase in informality in adulthood or unemployment of less qualified adults, for which the training carried out by the Public Employment Service will be vital for this population to be rearranged in the labor market.

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