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Labor Mobility in Emerging Economies: Evidence from Ecuador

Digna Isabel Andrade Portilla

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RESUMEN

Este documento estudia los determinantes de las transiciones laborales en el Ecuador. Utilizo la Encuesta Nacional de Empleo, Desempleo y Subempleo (ENEMDU) para construir matrices de transición con el fin de estudiar los cambios estructurales en el mercado laboral. Después, realizo regresiones multinomiales logísticas para identificar las características de un individuo que afectan la movilidad laboral. Los resultados muestran que la mayoría de las personas permanecen en su estado laboral inicial a lo largo de los años. Además, es más probable que los individuos se muevan del desempleo al sector informal que al formal. Esto muestra un deterioro en las relaciones laborales, que son el vínculo legal entre empleado y empleador. Finalmente, encontré que el nivel de educación, el estado civil, la raza, el ingreso laboral y la edad, afectan significativamente las transiciones laborales de los trabajadores.

Palabras clave: Matrices de transición, Logit Multinomial, Informalidad, Dinámica del mercado laboral, ENEMDU

ABSTRACT

This paper studies the determinants of labor market transitions in Ecuador. I use the *Encuesta Nacional de Empleo, Desempleo y Subempleo* (ENEMDU) to build transition matrices to study structural changes in the labor market. Then, I compute multinomial logit regressions to identify the individuals' characteristics that affect labor mobility. Results show that most people remain in their initial state over the years. Also, individuals are more likely to move from unemployment to the informal sector than to the formal one. This shows a decline in the employment relationship, which is the legal link between employers and employees. Lastly, I find that education level, marital status, race, labor income, and age significantly affect workers' transitions.

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1 Introduction

Informality is a common characteristic in emerging economies. In Latin America, about 60% of workers are informal. From 2005 to 2017, about 58% of people became informal in Ecuador, and 10% became unemployed. According to the *Instituto Nacional de Estadística y Censos (INEC)*, the entry rate to the social security system ranged between 20% and 30% while the outflow rate was 15% from 2006 to 2015. Therefore, changes in labor conditions are frequent and informality is high. This, in turn, brings high and increasing pressure on the government's budget constraint and the sustainability of the social security system. The questions then become: What is the probability to transition between labor status throughout the years? What are the individuals' characteristics that determine their labor mobility decisions?

To answer these questions, I use the *Encuesta Nacional de Empleo, Desempleo y Subempleo* (ENEMDU) from 2015 to 2016. I build transition matrices with the purpose of analysing structural changes in the labor market over the years. Furthermore, I compute multinomial logit regressions to identify the determinants of labor flows. Then, I do a sensitivity check for multinomial regressions changing age parameters to validate the model's predictions.

There is not enough literature on labor mobility in Ecuador. I thus contribute in two ways. First, by extending the panel data set to study transition probabilities in the labor market, I determine that most people remain in their initial labor state. Also, I find that people are more likely to move from unemployment to the informal sector than to the formal one. Therefore, it exists a decline in the employment relationship, which is the legal link between the employee and the employer through which reciprocal rights and obligations are created. Second, by controlling for different explanatory variables to study the individual's characteristics that could explain labor mobility decisions, I identify that the main determinants of labor mobility are education level, age, marital status, and race.

In the labor transitions literature, binary response probability models have been widely used to determine individual characteristics that affect the decision to move into the labor market. For example, Mora (2018) and Rodríguez & Rodríguez (2012) study the education, individual features, and labor condition impacts in labor mobility using a logit model. In addition, Morales et al. (2010) use a probit model and show that structural reforms helped to reduce labor transitions from formality to informality. Although these papers use this methodology, most of the recent investigations have implemented multinomial response models to improve predictions (e.g. Tansel & Öznur (2017), Vega (2018), and Rodríguez (2019)).

Additionally, transition matrices and multinomial regressions are used to study labor dynamics and its determinants in different countries. In Chile, Cea et al. (2008) apply Markov matrices to analyze labor transitions focusing on entrepreneurship. For this reason, they use self-employed people and business owners to study their labor mobility decisions. They find that labor status is persistent. In Europe, Kaiser (2006) calculates pooled multinomial logistic regressions to study labor transitions in six countries (Denmark, Germany, Netherlands, Portugal, Ireland, UK) and finds that socioeconomic determinants, such as the life cycle or human capital, and gender-related differences, affect the trajectories of labor market transitions.

In Ecuador, Vega (2018) calculates a multinomial logit and finds that education level, years of experience, and wage gaps are labor mobility determinants. Also, Rodríguez (2019) finds that transition matrices are persistent for people that in the first period have an adequate employment. Additionally, he shows that gender, race and income are explanatory variables of labor transitions. These two papers are the only evidence for Ecuador and I corroborate their results.

The outline of the paper is as follows. Section 2 presents the methodology used. Section 3 describes the data. Section 4 discusses transition matrices and multinomial logit regressions results. Section 5 presents a sensibility analysis. Finally, Section 6 concludes.

2 Methodology

The aim is to provide empirical evidence of the mobility patterns across the sectors of the Ecuadorian labor market. Therefore, two methods were used: Transition matrices to estimate transition probabilities between labor states, and multinomial logit regressions to identify the determinants of labor market transitions.

2.1 Transition matrices

Transition matrices are widely used to explain the dynamics of the labor market. For each worker, I define three possible states at any given point in time: Informality, formality, and unemployment. Hence, there are nine possible transitions: six between different states, and three of permanence in the current state. The probability of transitioning between states are represented by matrices based on the Markov transition probability model.

Following Ross (2009), a Markov Chain is formed by a sequence of discrete random variables $\{X_1, X_2, X_3, ...\}$. $X_n = i$ could be interpreted as the system in state i at time n. To build a Markov Chain, there has to be a probability $P_{ij} > 0$ of finding a worker at the end of the period in state j, given that the worker began in state i (Vega, 2018).

To sum up, transition probabilities of the Markov Chain are those that $\forall\ i_1, .., i_{n-1}, i, j$, $P\{X_{n+1} = j | X_n = i, X_{n-1} = i_{n-1}, ..., X_1 = i_1\} = P_{ij}$, with $P_{ij} > 0$ and $\sum_{j=1}^{M} P_{ij} = 1$ for $i = \{1, 2, ..., M\}$. Ordering these transition probabilities in a square array, I obtain the following transition matrix **P**:

$$\mathbf{P} = \begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1M} \\ p_{12} & p_{22} & \cdots & p_{2M} \\ \vdots & \cdots & \ddots & \vdots \\ p_{M1} & p_{M2} & \cdots & p_{MM} \end{bmatrix}. \tag{1}$$

2.2 Multinomial Logit

The multinomial logit model is a discrete probabilistic model frequently used when there is a dependent variable with more than two categories that are not ordered. Following Wooldridge (2010), let y be a random variable that takes values from $\{0, 1, ..., J\}$. Using this model allows me to find the effect of each worker's characteristic on the probability that they will change from one state to another. For this reason, I study how the change in the vector of conditioning variables $\mathbf{x}$, such as gender, age, education level, affects the transition probability represented by $P(y = j|\mathbf{x})$, $j = \{0, 1, ..., J\}$. So, the standard exponential form of multinomial logit is:

$$P(y = j|\mathbf{x}) = \frac{exp(\mathbf{x}\beta_j)}{1 + \sum_{h=1}^{J} exp(\mathbf{x}\beta_h)}. \tag{2}$$

Equation (2) represents, for example, the probability that a person will go from formality to informality (j), given that is a woman (x_i).

3   Data

The data used in this study is drawn from the *Encuesta Nacional Empleo, Desempleo y Subempleo* (ENEMDU). The ENEMDU is a probability sampling survey which objective is to provide information about the economic activity and the Ecuadorian population's income sources. The panel is built by choosing a group of households and interviewing them in two consecutive quarters. A new panel replaces it in the following two consecutive quarters, and finally, it returns to the initial group for another two consecutive quarters.

The data cover the period 2005-2016 in the final version where I build six panels to analyze the transition from one year to another. These panels are 2005-2006, 2007-2008, 2009-2010, 2011-2012, 2013-2014, and 2015-2016. These data include only the urban population from 20 years old up to 65 years old, and consider the private and the public sector.

To determine the different labor states, I divide labor force into three categories : Formal, informal, and unemployment. I understand informality as the lack of social security coverage for the employee. This definition has been used in several research papers as Vega (2018) and Canelas (2019). Following the same vein, I understand formality as those workers who contribute to social security, and unemployment as those who do not have employment but are willing to work and are looking for a job.

The categories listed above are mutually exclusive. Labor status frequencies and shares for each panel are reported in Table 1. What can be seen here is that informality has been decreasing in time. Unemployment has also been decreasing until 2015. After that, there is an increase in unemployment.

Table 1: Distribution of sample by panel and labor market states

Panel	Labor Market States		
	Informal	Formal	Unemployment
2005-2006	62.1%	24.74%	13.16%
2007-2008	58.52%	28.88%	12.60%
2009-2010	51.31%	35.03%	13.66%
2011-2012	40.70%	48.26%	11.04%
2013-2014	39.24%	50.08%	10.68%
2015-2016	38.31%	48.01%	13.68%

Lastly, the panel is composed of control variables, such as gender, age, income, marital status, among other characteristics of the individuals. These variables are explained in Table 9 in the Appendix with their respective definitions.

It is essential to show the dynamics of the labor market along the life cycle. In Figure 1, you can observe that in the early years, informality is very high, over 55%, and decreases during the first five years. On the other hand, formality increases between 20 and 25 years old, while unemployment decreases, and the composition of labor market stabilizes around 30 years old. This behavior occurs because between 20 and 25 years, people are completing their studies, so they do not have a stable job, and several are in informality. After this time, people get a formal job, so formal employment tends to increase.

In terms of gender, Table 2 shows that in the formal sector, the male presence is more significant than the female for all the panels. Despite the continued increase in women's percentage in the formal sector, the gap remains around 12%. In the informal sector, around 2005-2006, the gap between male and female presence did not exceed 2%. However, it hiked over 10% around 2015-2016. Moreover, in unemployment, women outnumber men in percentage terms, with the greatest gap in the first few years, but it has decreased in the last years. This behavior
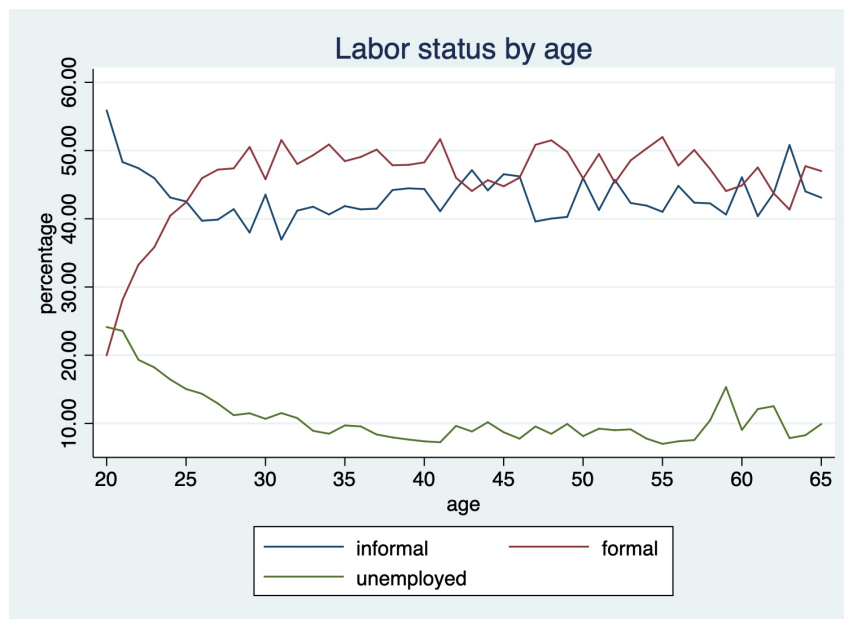
Figure 1: Labor status distribution by age

demonstrates the low insertion of women into the Ecuadorian labor market.

Table 2: Gender distribution by employment status and panel

Gender	Labor Market States			Total
	Informal	Formal	Unemployment	
2005				
male	61.56%	30.58%	7.86%	100%
female	62.66%	18.63%	18.71%	100%
2007				
male	55.14%	35.12%	9.73%	100%
female	61.98%	22.48%	15.54%	100%
2009				
male	47.36%	40.49%	12.14%	100%
female	55.71%	28.93%	15.36%	100%
2011				
male	35.82%	53.53%	10.65%	100%
female	46.34%	42.16%	11.50%	100%
2013				
male	33.79%	56.24%	9.97%	100%
female	45.17%	43.38%	11.45%	100%
2015				
male	33.25%	53.84%	12.91%	100%
female	43.73%	41.75%	14.52%	100%

The race distribution in Table 3 reveals that in the formal sector, white or mestizos represent a racial majority than other ethnic groups including indigenous people. The opposite occurs in the informal sector, but the gap is not wide. Furthermore, people from other ethnic groups tend to be more unemployed than white or mestizos. This distribution may be due to

Table 3: Race distribution by employment status and panel

Race	Labor Market States			Total
	Informal	Formal	Unemployment	
2005				
other	67.92%	13.36%	18.72%	100%
white or mestizo	61.61%	25.70%	12.69%	100%
2007				
other	67.49%	17.85%	14.67%	100%
white or mestizo	57.72%	29.87%	12.42%	100%
2009				
other	56.79%	23.00%	20.21%	100%
white or mestizo	50.81%	36.13%	13.06%	100%
2011				
other	53.00%	33.98%	13.02%	100%
white or mestizo	39.62%	49.50%	10.87%	100%
2013				
other	50.99%	34.39%	14.62%	100%
white or mestizo	37.98%	51.77%	10.26%	100%
2015				
other	47.30%	32.68%	20.02%	100%
white or mestizo	37.29%	49.74%	12.97%	100%

racism in Ecuadorian society, where indigenous or people from different ethnic groups have fewer possibilities than white or mestizos.

Informality appears to be negatively correlated to the level of education. Table 4 shows that in the formal sector, most people have at least a basic education level or a college degree. The opposite occurs in the informal sector. From 2005 to 2016, the percentage of people in all levels of education has increased. On the other hand, unemployed people with a high level of education have been increasing. This could be because higher qualified people require better salaries which companies can not afford.

Another relevant variable is shown in Table 5. Married people represent a higher percentage in the formal sector than single ones. Although the gap between single and married in informality is not representative, single people are majority in it. Single workers tend to be more unemployed than married ones. Moreover, having children could influence a person's

Table 4: Education level distribution by employment status and panel

Last degree obtained	Labor Market States			Total
	Informal	Formal	Unemployment	
2005				
Less than basic	72.19%	15.36%	12.45%	100%
At least basic	70.18%	16.89%	12.94%	100%
Higher	53.09%	33.19%	13.72%	100%
2007				
Less than basic	72.63%	17.03%	10.34%	100%
At least basic	65.86%	23.39%	10.75%	100%
Higher	47.13%	38.29%	14.58%	100%
2009				
Less than basic	65.75%	22.49%	11.76%	100%
At least basic	57.83%	28.41%	13.76%	100%
Higher	40.55%	44.60%	14.85%	100%
2011				
Less than basic	57.52%	33.90%	8.58%	100%
At least basic	48.57%	40.71%	10.73%	100%
Higher	30.34%	57.28%	12.38%	100%
2013				
Less than basic	55.52%	35.87%	8.61%	100%
At least basic	47.75%	42.92%	9.33%	100%
Higher	29.33%	58.68%	11.99%	100%
2015				
Less than basic	53.61%	34.81%	11.58%	100%
At least basic	49.31%	37.98%	12.70%	100%
Higher	29.74%	55.50%	14.76%	100%

Table 5: Marital status distribution by employment status and panel

Marital status	Labor Market States			Total
	Informal	Formal	Unemployment	
2005				
Not married	62.71%	22.31%	14.98%	100%
married	61.52%	27.03%	11.45%	100%
2007				
Not married	58.96%	24.80%	16.24%	100%
married	58.13%	32.54%	9.33%	100%
2009				
Not married	50.98%	31.02%	17.99%	100%
married	51.66%	39.28%	9.06%	100%
2011				
Not married	40.76%	43.57%	15.67%	100%
married	40.63%	53.17%	6.20%	100%
2013				
Not married	40.04%	44.81%	15.15%	100%
married	38.51%	54.92%	6.57%	100%
2015				
Not married	39.45%	41.95%	18.60%	100%
married	37.32%	53.26%	9.43%	100%

employment status. Figure 2(a) illustrates that people with children represent a more significant percentage in the formal sector than those who do not because companies prefer to hire people without children because of time availability.

The *Bono de Desarrollo Humano* (BDH) is a monetary aid from the government to people

in need. Receiving this money may influence the decision to remain informal. Initially, the BDH should be given to poor people, but in 2014 it changed to people in extreme poverty (Martinez et al., 2017). Indeed, there is a problem in handling the information because, as it can be seen in Figure 2(b), there are several people with formal employment who are receiving this benefit instead of people in real need of help.
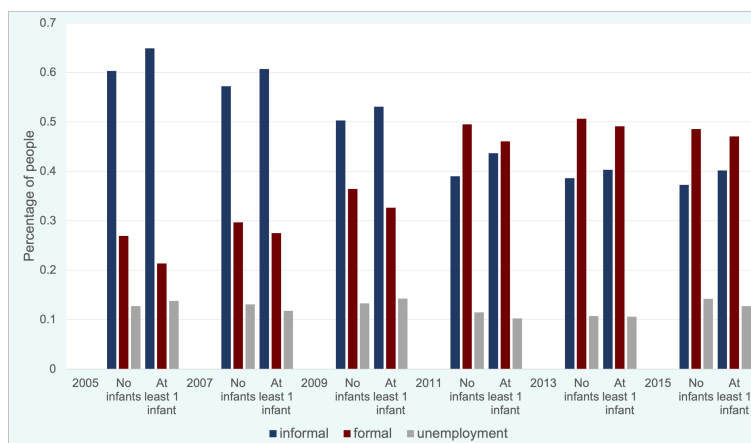
(a) Infants
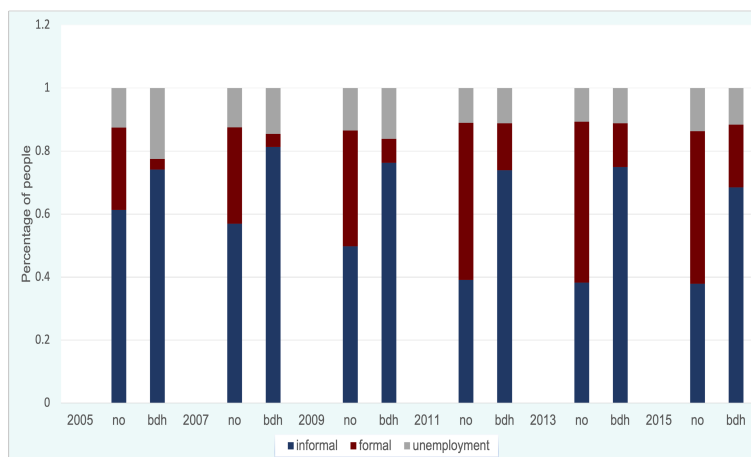
(b) BDH

Figure 2: Descriptive statistics for infants and BDH

Table 6 illustrates the distribution of workers in different industries: Commerce, manufacture, services. Manufacturing sector exhibits a considerable rate of formality, this sector includes food processing companies, textile industries, machinery repair, among others. However, the gap with the other two sectors of commerce and services merges between 6% to 10%. On the other hand, the services and commerce sector have a great number of people in informality. According to how big the company is, Figure 3(a) shows that companies with more than

100 workers, tend to have more formal than informal employees.

Table 6: Workers industry distribution by employment status and panel

Workers industry	Labor Market States		
	Informal	Formal	Total
2005			
Manufacture	58.71%	41.29%	100%
Commerce	67.34%	32.66%	100%
Services	68.23%	31.77%	100%
2007			
Manufacture	61.08%	38.92%	100%
Commerce	68.78%	31.22%	100%
Services	68.80%	31.20%	100%
2009			
Manufacture	54.43%	45.57%	100%
Commerce	60.33%	39.67%	100%
Services	61.45%	38.55%	100%
2011			
Manufacture	39.38%	60.62%	100%
Commerce	49.13%	50.87%	100%
Services	46.60%	53.40%	100%
2013			
Manufacture	41.65%	58.35%	100%
Commerce	44.44%	55.56%	100%
Services	44.68%	55.32%	100%
2015			
Manufacture	38.77%	61.23%	100%
Commerce	45.80%	54.20%	100%
Services	45.93%	54.07%	100%

In terms of labor income, as Figure 3(b) shows, in 2005-2006 people in informality used to have higher labor income than formal employees on average. In subsequent years, the opposite happened, formal workers tend to have higher labor income compared to informal ones. Then, it is important to study the distribution of tenure. Figure 3(c) illustrates that people with no tenure tend to be informal.

Finally, regarding the type of employment contract, Figure 3(d) illustrates that non permanent workers are the most informal at around 60%. Since 2007, employees with permanent contracts became part of the formal sector.

(a) Size of the firm

(b) Labor income

(c) Tenure

(d) Type of contract
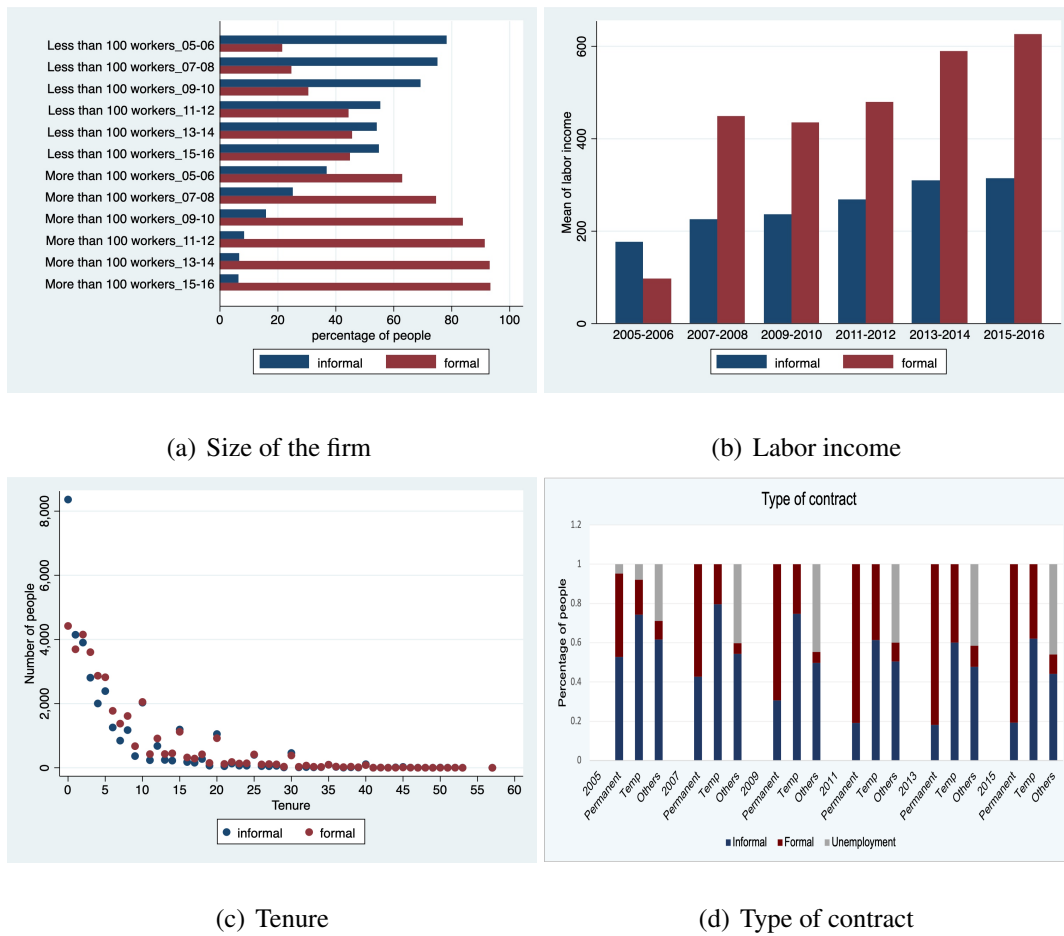
Figure 3: Distribution of workers by labor state for size firm, labor income, tenure, and type of contract

4 Results

This section presents the main findings of the transition probabilities between labor status using transition matrices. In addition, I expand on the knowledge of the principal factors that determine labor market transitions in Ecuador using the multinomial logit model.

4.1 Transition matrices

Table 7 shows the transition probabilities for the six panels. Results show that labor status is persistent. I find that informal employment is more persistent in the first two panels, with a probability of 79.54% and 80.74%, respectively. Jütting et al. (2008) explain that informal employment could offer workers more advantages than a formal one. In fact, young workers need to accumulate experience; therefore, they choose informal employment where sometimes they have training opportunities.

Furthermore, I observe an increase in the probability of remaining in formality since 2007-2008. On average, 85% of people remain in the formal sector. This could be explained by the approval of the *Mandato Consitucional No. 8* in 2008,[1] which aimed to increase the number of formal employees and legalize the way of recruitment. Following INEC (2016), this law reflects results at the end of 2008. From December 2007 to December 2008, the adequate employment rate in the urban sector went from 52.9% to 54%. Also, Duryea et al. (2006) show that workers tend to stay in formal jobs for more extended periods than they do in informal positions.

In 2009-2010, the probability of remaining in unemployment increased to 38.95% due to the world economic crisis. Zapata (2018) argues that the unemployment rate at the end of 2009 stood at 6.47%, it is a very high value compared to previous years.

The probability of becoming unemployed conditional on being formal increased since 2013-2014, and it is important to analyze the transition from unemployment to informality. In all the six panels, it is evident that it is more likely for unemployed people to become informal. This result explains the decline in the employment relationships in the formal sector. Duryea et al. (2006) suggest that an adult has a higher probability of becoming informal. Also, Gonzalez & Iturralde (2009) argue that when an individual has been unemployed for a long time, the

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[1]Outsourcing, employment on an hourly basis, and hiring agencies have been prohibited. (Vallejo Iñiguez, 2009)

employer could take advantage of this situation and offer a lower salary than the minimum wage for the same or more hours worked, i.e., due to necessity an employee has to take informal employment instead of a formal one.

Table 7: Transition matrices (%)

		2006					2008		
		Informal	Formal	Unemployment			Informal	Formal	Unemployment
	Informal	79.54	13.80	6.66		Informal	80.74	13.76	5.50
2005	Formal	28.53	67.83	3.64	2007	Formal	16.04	81.63	2.33
	Unemployment	53.33	12.12	34.55		Unemployment	53.45	13.22	33.33
		2010					2012		
		Informal	Formal	Unemployment			Informal	Formal	Unemployment
	Informal	71.19	21.58	7.22		Informal	68.70	24.89	6.40
2009	Formal	13.02	83.42	3.55	2011	Formal	10.24	87.48	2.29
	Unemployment	41.58	19.47	38.95		Unemployment	35.34	26.72	37.93
		2014					2016		
		Informal	Formal	Unemployment			Informal	Formal	Unemployment
	Informal	69.73	24.61	5.66		Informal	74.92	17.27	7.80
2013	Formal	9.29	86.81	3.91	2015	Formal	10.18	85.50	4.32
	Unemployment	37.50	35.83	26.67		Unemployment	37.07	23.81	39.12

Source: Author's calculations on the basis of the ENEMDU, 2005-2016

Finally, in 2015-2016, the probability of switching from informality to unemployment increased 2.14%, and the probability of changing from formality to unemployment increased 0.41%. It is essential to consider that the *Ley de Justicia Laboral y Reconocimiento del Trabajo en el Hogar* was passed by the *Asamblea Nacional* in 2015. This law made the labor market more rigid. For this reason, the probability of changing from unemployment to formal jobs decreased 12.02% because employers had more obstacles for hiring or were afraid of being reported if they do not complied with the regulations.

4.2 Multinomial Logit Analysis

Multinomial logit analysis provides results of the characteristics that affect workers' probability of moving from one sector to another, relative to the probability of remaining in the initial sector. To analyse the multinomial logit regression, I explored the relative risk ratios (RRR) results. If the relative risk ratio is greater than one (RRR>1), it indicates that the event is more likely to occurs, and a relative risk ratio less than one (RRR<1) means that it is less

likely that the event occurs.

To do the analysis, I use all the data available. Additionally, control variables are different for each dependent variable category. For example, if the dependent variable is the change from unemployment to informality, I do not use a control called *type of contract* because unemployed people do not have signed any contract

There are six multinomial logit regressions analyzed because the dependent variable is divided into three categories: Informal, formal, and unemployment, and each of them has three transition categories. Also, the reference category is remain in the labor status as appropriate for each dependent variable, as can be seen in Figure 4:

(a)   (b)   (c)
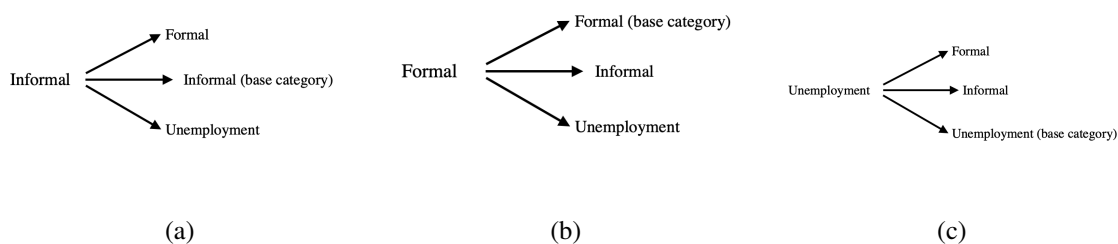
Figure 4: Distribution of the dependent variables for the MNL

4.2.1   Transitions from the informal sector

Table 8 shows the results of the multinomial logit regressions for the transition from informal to another sectors (formality and unemployment) as the dependent variable.

The first thing to notice is that people who have less than the basic education level are 23.7% less likely to move from informal to formal employment than people with at least the basic level. However, people with a higher education level are 29.2% more likely to move from informality to formality. Also, it is 35.9% less likely that people who have less than a basic education level move from informality to unemployment. These results are consistent with

what was found by Vega (2018). Her findings show that informal employees have, on average, five years of educational attainment while formal have six, then she suggests that people with a higher level of education are more likely to enter in the formal sector.

It is essential to show that labor income is a determinant to leave informality. For a one-dollar increase in labor income, it is 0.1% more likely to change from informal to formal jobs relative to staying in informality. This result is consistent with the International Labour Office which mentions that informal people receive a lower income than formal, so it is a long-term goal to reduce this gap to formalize the labor market (ILO, 2014). In regards to the move from informality to unemployment, people with one dollar extra in labor income are 0.1% less likely to move to unemployment relative to staying informal.

The type of contract between employees and employers is a determinant of the end of informality. For permanent contracts relative to non permanent, the probability of switching from the informal sector to the formal is greater than 33.4% . Tokman (2007) shows that people under permanent contracts are more likely to be under social protection, i.e., to be in the formal sector. People with another type of contract relative to non permanent ones are 28.8% less likely to move from informal to formal.

Concerning to the *Bono de Desarrollo Humano* (BDH), people who receive the government's aid from the government are 44% less likely to move to formality than those who do not receive it. It is consistent with Méndez (2016), who shows that the probability of being in a formal job decreases if someone gets the bond because there are incentives to stay in the informal market since no income is registered.

A relevant variable in this analysis is how big the enterprise where people work is. People working in companies with more than 100 workers are 181.7% more likely to move from informality to formality than those working in small companies. This result could be explained by more control, audits, and inspections from authorities to these companies. In addition, if people

work in a large company, there is a 68.2% more probability that they will move to unemployment. However, there is a high risk of suffering a lawsuit. According to the Art. 44 of the 2014 *Código Orgánico Integral Penal*, any employer who fails to provide their employees with the benefits like social security and medicare within thirty days, counted from the first day of work, shall be liable to a penalty with jail time between three and seven days (Asamblea Nacional, 2014).

Regarding to the worker's tenure, it is 5.6% less likely that a person who increases his tenure in one year moves from an informal job to a formal one. The same happens for the movement from informal to unemployment. After a point, it becomes 0.1% more likely for a person with one extra year of experience in the same job to become formal.

The likelihood of outflow into the formal sector from informality for a married person is 35% greater than remain in the informal sector. Comparing single to married people, it is more likely for the married ones to become formal (as in Tansel & Öznur (2017)). On the other hand, married people are 39% less likely to move from informality to unemployment. Furthermore, if the person is a woman and is married, it is a 38.8% less likely to move from informality to formality. This result coincides what was found by The World Bank research in 2009.

Finally, the *panel* variable analyzes the various changes in the labor market over the years. In 2009-2010, there was a probability that 70.2% employees switch from informality to formality relative to 2005-2006. The change in the labor code could explain this because over the years, many people started working in formal jobs. One group of workers that receive the benefit of this law were housekeepers, that were required by law to enter to the social security system. Comparing 2011-2012 to 2005-2006, people were 124% more likely to move from informality to formality. The same happens in the next panel, where it was 100.1% more probable to outflow from informality. In 2015-2016, it was 42.6% more likely to move from informality to unemployment, keeping consistency with previous results in transition matrices.

4.2.2 Transitions from the formal sector

Results obtained from the multinomial logistic regression for transitions from the formal sector are presented in Table 8, columns 3 and 4. First, workers with a higher education level are 28.6% less likely to switch from the formal to the informal sector, a result also found by Vega (2018). High skilled people are most valued in formal jobs or large companies, as shown in the section 3. This result is also true for the movement from formal to unemployment status, where there is 27.8% less probability of job displacement.

The findings indicate a negative correlation between people's race and the probability of withdrawal from the formal sector. If a person is white or mestizo, they have a 27.5 % probability of going from the informal to the formal sector, relative to stay in the informal sector. This correlation remains negative in the formal to unemployment transition relative to people from other ethnic groups.

Regarding the industry, commerce and service sectors workers are 9.1% more likely to move from the formal to the informal sector than those working in manufacturing areas. On the other hand, if someone has an extra dollar of labor income, it is 0.1% less likely to experience a formal to informal transition.

The ratio of the type of contract shows that people with a permanent contract are 23.1% less likely to move from formal to informal status, at a 1% significance level. Also, it is 29.7% less probably that a person moves from formality to unemployment. Labor rigidity influenced these results because of the law passed in 2015 and the *Codigo Organico Integral Penal* (COIP) of 2014, layoffs became complicated

Furthermore, about the sizes of the companies, results show that people who work in big ones are 31.7% less likely to switch from formal to the informal sector. This result is significant

at the 1% significance level.

In terms of tenure, results do not differ from the analysis of the displacement from the informal sector. The likelihood of workers moving from the formal to the informal sector decreases 5.1% as a year in the same employment increase. The probability of displacement to unemployment decreases by 8.5%. This probability reverses and becomes positive from one point, i.e., people become 0.1% more likely to move out of the formal sector, and people from formality become 0.2% more likely to move to unemployment.

Evidence from the participation in the labor market indicates that in the period 2010-2016, there are more single women employed than married ones (Ayala & Guachamin, 2018). There, I find that a married woman is 49% more likely to switch from formal to informal employment than a single one. And she is 111.2% more likely to move out from formality to unemployment.

Age is weakly significant at 10% level and exhibits a negative relationship with movements from formality to informality. While the age of a person increases in one year, the probability of moving in the labor market decreases by 1%.

Finally, the *panel* variable shows that compared to 2005-2006, there was 54.5% less probability to move from the formality to informality in 2007-2008. In the following years, 2009-2010, it was 64.8% less likely to change to informal employment. For 2011-2012 and 2013-2014, there was around 76% less probability to move from formality to the informal sector. Lastly, in 2015-2016, it was 72.5% less likely to switch to the informal sector from the formal. Since 2007, it has become less likely to move from formality because of the mechanism to legalize workers, which achieved a positive short-term effect on the adequate employment rate (Zapata, 2018).

4.2.3   Transitions from unemployment

In this section, I analyze the determinants of outflows from unemployment. Results are illustrated in Table 8 in columns 5 and 6. First of all, a higher education level is a determinant to the outflow from unemployment. It is 35.8% more likely to get out from unemployment to formality. This is also shown by Tansel & Öznur (2017) in their study of labor mobility in Turkey.

Another interesting variable is race. Following the results, it is 269.3% more likely that white or mestizos move from unemployment to formality. And it is 42.7% more probably that white or mestizo relative to other ethnic groups move from unemployment to the informal labor market. These results show the intolerance and discrimination of our society for indigenous people or other ethnic groups. Then, it could be a reason for indigenous migration in search of employment that they cannot find in our country.

The result of receiving the monetary aid from the government (BDH) shows that if a person receives it, it is 47.8% more likely to leave unemployment for informal work because people could invest this money in informal businesses.

Gender could explain mobility from unemployment to informal jobs. Still, results confirm that the relationship between them is negative, i.e., women are 75.8% less likely than men to find informal employment. This is consistent with the dynamism of women's labor participation in Ecuador studied by Ayala & Guachamin (2018). However, being woman and married decreases the probability of 76.9% of outflow from unemployment to formality. Furthermore, it is 53.9% less likely that a married woman moves from unemployment to the informal sector. Instead, married people are 212.7% more likely to move from unemployment to formality at the 1% significance level. Also, it is 127.4% more probably to move from unemployment to informality.

Eventually, age plays an essential role in the displacement from unemployment. As the worker's age increases in one year old, people become 3.7% less likely to move from unemployment to formality and 3.5% less likely to move to informality.

Finally, relative to 2005-2006. In 2007-2008, it was 15.7% less likely to become formal. But, since 2009-2010, it turns to be 85% more likely to move from unemployment to the formal sector. In 2013-2014, it was 366.7% more likely to leave unemployment for formality at 1% of the significance level. In other matters, it was 45.3% less likely to become informal in 2011-2012 at 10% of the significance level. These results agree with the previous analysis.

5 Sensitivity analysis

Previously, in Section 3, Figure 1 illustrated that between 20-25 years old, informality shows a negative trend, and it stabilizes at around 25 years old. Moreover, Uribe-Teran et al. (2019) demonstrate that a significant proportion of formal workers increase when they are between 20 and 30 years old. Also, Cunningham & Salvagno (2011) argue that young people end their studies and usually get into informal employments to acquire experience and be ready to enter in the formal sector. Thus, they find that labor mobility is high between young people because they often use to be displaced from their jobs.

The main objective is to recalculate the multinomial regressions and analyze how much the results are affected by a change in the age variable. To do this, I disregarded people's observations between 20-25 years old. Thus, the sample analyzed in this section contains data of people between 25 to 65 years old. Results are shown in Table 10 in the appendix. The main differences occur in the following variables: age, education level, race, and marital status.

Firstly, the age variable becomes statistically significant at a 5% significance level. If an

Table 8: Multinomial regressions results (RRR)

	IF	IU	FI	FU	UF	UI
degree						
Less than basic	0.763** (0.019)	0.641*** (0.007)	1.132 (0.376)	0.614* (0.064)	0.935 (0.887)	1.278 (0.456)
Higher	1.292** (0.023)	0.933 (0.659)	0.714** (0.011)	0.722 (0.146)	1.358 (0.452)	0.678 (0.185)
white	1.201 (0.174)	0.621*** (0.003)	0.725** (0.032)	0.790 (0.393)	3.693* (0.071)	1.427 (0.237)
workersInd						
Commerce	1.171 (0.150)	1.129 (0.487)	1.091 (0.424)	1.258 (0.236)	-	-
Services	1.072 (0.481)	1.245 (0.159)	1.128 (0.220)	1.351 (0.102)	-	-
ingrl	1.001** (0.026)	0.999* (0.056)	0.999 (0.459)	1.000 (0.828)	1.001 (0.519)	1.002** (0.020)
type_con						
Permanent	1.334*** (0.001)	1.082 (0.578)	0.769*** (0.004)	0.703** (0.024)	-	-
Others	0.712*** (0.004)	1.044 (0.790)	0.812 (0.321)	1.031 (0.942)	-	-
bdh						
yes	0.560*** (0.002)	0.805 (0.373)	-	-	0.514 (0.825)	1.478 (0.368)
infants						
At least 1 infants	0.881 (0.128)	0.940 (0.604)	1.250** (0.010)	1.078 (0.618)	1.148 (0.594)	1.173 (0.455)
size						
More than 100	2.817*** (0.000)	1.682** (0.025)	0.683*** (0.000)	0.901 (0.483)	-	-
tenure	0.944*** (0.000)	0.914*** (0.000)	0.949*** (0.001)	0.915*** (0.006)	-	-
tenure2	1.001*** (0.005)	1.002*** (0.006)	1.001** (0.011)	1.002** (0.033)	-	-
tenure_15	1.073 (0.737)	1.485 (0.243)	1.121 (0.571)	1.557 (0.260)	-	-
gender						
female	0.886 (0.629)	1.471 (0.318)	0.756 (0.337)	0.791 (0.637)	0.456 (0.316)	0.242** (0.024)
age	0.992 (0.103)	1.007 (0.317)	0.990* (0.067)	0.990 (0.369)	0.963** (0.038)	0.965*** (0.008)
gender#c.age						
female	1.012 (0.104)	0.987 (0.231)	0.998 (0.843)	0.993 (0.649)	1.036 (0.144)	1.046** (0.017)
married						
married	1.350** (0.010)	0.610*** (0.003)	0.596*** (0.000)	0.450*** (0.000)	3.127*** (0.005)	2.274** (0.012)
gender#married						
female#married	0.612*** (0.002)	1.088 (0.728)	1.490** (0.019)	2.112*** (0.009)	0.231*** (0.008)	0.461* (0.070)
panel						
2007	0.893 (0.388)	0.850 (0.404)	0.455*** (0.000)	0.577 (0.108)	0.843 (0.845)	0.984 (0.965)
2009	1.702*** (0.000)	1.322 (0.143)	0.352*** (0.000)	0.762 (0.372)	1.851 (0.128)	0.675 (0.192)
2011	2.240*** (0.000)	1.308 (0.221)	0.238*** (0.000)	0.459** (0.013)	1.472 (0.379)	0.547* (0.083)
2013	2.001*** (0.000)	1.143 (0.571)	0.233*** (0.000)	0.825 (0.500)	4.667*** (0.001)	1.26 (0.555)
2015	1.164 (0.249)	1.426* (0.068)	0.275*** (0.000)	0.930 (0.780)	1.607 (0.198)	0.643 (0.105)

Source: Author's calculation on the basis of the ENEMDU, 2005-2016

Note: Robust standard errors in parentheses. Bootstrap with 5000 repetitions.

IF: Informal to Formal, IU: Informal to Unemployment, FI: Formal to Informal,

FU: Formal to Unemployment, UF: Unemployment to Formal, UI: Unemployment to Informal

Legend: * for p<0.1, ** for p<0.05, *** for p<0.01

individual increases his age by one year old, it is 1.6% less likely to move from informality to formality. Moreover, it is 0.9% less likely to switch from formality to the informal sector. Effectively, it demonstrates that after 25 years old, labor market movements stabilize.

Then, analyzing people's levels of education. I find that it is 58.2% more likely to move from unemployment to formality if an individual has less than a basic education level. The opposite happened in the previous analysis. Furthermore, people with a high education level are 136.2% more likely to move from unemployment to formality. These results show that in the previous analysis, some effects were underestimated.

In terms of race, results show that if a person is white or mestizo, it is 688.6% more likely to move from unemployment to formality. Compared to the previous analysis, this value is extremely high.

Lastly, the probability of displacement from the formal sector to the informal of married people in the previous analysis was underestimated, but it was overestimated in the other regressions. In this section, I find that a married person is 45% more likely to move from informality to the formal sector. However, it is 29.2% less likely to move from informality to unemployment. It becomes 30.4% less likely that a person moves from formality to informality, and 48.8% less likely to move from formality to unemployment. Finally, it shows that a married person is 191.9% more likely to leave unemployment for formality, and 93.6% more likely to move from unemployment to formality.

6 Conclusions

In this paper, I examined the mobility in the Ecuadorian labor market using the *Encuesta Nacional de Empleo, Desempleo y Subempleo* (2005-2016), considering that this is the

most important document to understand the employment situation and the characteristics of the Ecuadorian labor market.

Firstly, I obtained the transition labor probabilities for individuals changing between different labor market states: Informality, formality, and unemployment. I used these matrices to explain structural changes in labor mobility over the years. Then, I estimated multinomial logit regressions to explain the determinants that affect workers' decisions in labor mobility.

Transition probabilities results have shown that most of the people remain in their initial labor status. Since 2007-2008, the probability of staying in the formal market has increased due to the approval of the *Mandato Consitucional No. 8*. Aside from this, I discovered a decline in formal employment relationships because it was more likely to change from unemployment to informal status over the years.

The multinomial logit analysis showed that education level, marital status, race, labor income, and age are important determinants of labor transitions. Other characteristics such as gender and tenure, among others, explained mobility in the labor market. After that, I did a sensitivity analysis to examine how change outcomes if there is a new sample composition. For this reason, I disregarded people's observations between 20-25 years old. As a result, I found that race, education level, and age ratios in the multinomial logit analysis were underestimated. In terms of marital status, the relative risk ratios were underestimated at the beginning and overestimated at the end.

In addition, new questions may arise from this study. I analyzed the private and the public sector together. A significant improvement in this investigation could be examine the effect on the determinants of labor mobility focusing only in the private sector because labor status in the public sector tends to be more persistent. To conclude, this study provides results of the labor market transitions and its determinants, which can be helpful to policymakers or future investigations about labor market mobility in developing countries.

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Appendix

Table 9: Definition of control variables

Definition of Labor Market States		
Informal employment	It includes the regular or casual employee who receives a salary, but is not registered with social security.	
Formal employment	It includes the regular or casual employee who receives a salary, an is registered with social security.	
Unemployment	It includes people aged 15 years or over who do not work, but who are qualified to work and are looking for a job.	
Definition of Multinomial Logit Model explanatory variables		
Gender	"male"	Male (Base category)
	"female"	Female
Age	"age"	Age 20-65 years
Race	"white"	White or Half blood.
	"other"	Other race. (Base category).
Education	"less than basic"	The person has an education below the basic level.
	"at least the basic"	The person has at least basic or higher education. (Base category)
	"higher"	It has a higher education level.
Human Development Bond (BDH)	"bdh"	Receives the human development bonus
	"no"	Does not receive the human development bonus. (Base category)
Infants	"no infants"	There are no children under 5 years old in the house. (Base category)
	"infants"	There is at least one child under 5 years old in the house.
Marital Status	"single"	The person is not married. (Base category)
	"married"	The person is married.
Industry	"manufacture"	The person works in the manufacturing sector. (Base category)
	"commerce"	The person works in the commerce sector.
	"services"	The person works in the services sector.
Labor Income	"ingrl"	Labor income of people with employment.
Firm Size	"small"	The firm has least than 100 workers. (Base category)
	"big"	The firm has more than 100 workers.
Tenure	"tenure"	Years of permanence in the same job.
Tenure more than 15 years	"perman_15"	More than 15 years of permanence in the same job.
Type of contract	"permanent"	Permanent employment contract.
	"temporal"	Temporal employment contract.
	"other"	Other type of employment contract. (Base category)
Female-Age Interaction	"femaleXage"	
Gender-Marital Status Interaction	"femaleXsingle"	(Base category)
	"femaleXMarried"	
Years of the panel	"2005"	2005-2006 (Base category)
	"2007"	2007-2008
	"2009"	2009-2010
	"2011"	2011-2012
	"2013"	2013-2014
	"2015"	2015-2016

Table 10: Sensitivity check multinomial regression results (RRR)

	IF	IU	FI	FU	UF	UI
degree						
Less than basic	0.809 (0.105)	0.691* (0.060)	1.183 (0.274)	0.519** (0.022)	1.582 (0.711)	1.479 (0.324)
Higher	1.340** (0.026)	0.925 (0.695)	0.750* (0.051)	0.656* (0.082)	2.362 (0.479)	0.715 (0.348)
white	1.243 (0.158)	0.609** (0.011)	0.663** (0.011)	0.828 (0.570)	7.886 (0.659)	1.325 (0.459)
workersInd						
Commerce	1.272* (0.063)	1.098 (0.668)	0.986 (0.906)	1.118 (0.628)	-	-
Services	1.097 (0.412)	1.152 (0.445)	1.062 (0.579)	1.249 (0.277)	-	-
ingrl	1.001* (0.079)	0.999 (0.358)	0.999 (0.642)	1.000 (0.648)	1.001 (0.377)	1.002* (0.088)
type_con						
Permanent	1.373*** (0.002)	1.017 (0.921)	0.773** (0.013)	0.778 (0.190)	-	-
Others	0.669*** (0.004)	0.942 (0.762)	0.891 (0.609)	1.268 (0.714)	-	-
bdh						
yes	0.598*** (0.006)	0.866 (0.576)	-	-	0.595 (0.869)	1.216 (0.716)
infants						
At least 1 infants	0.856 (0.100)	1.058 (0.691)	1.247** (0.020)	1.133 (0.453)	1.321 (0.389)	1.210 (0.481)
size						
More than 100	2.825*** (0.000)	1.797** (0.035)	0.680*** (0.000)	1.016 (0.925)	-	-
tenure	0.948*** (0.001)	0.928*** (0.008)	0.944*** (0.001)	0.930** (0.029)	-	-
tenure2	1.001*** (0.009)	1.001* (0.053)	1.001** (0.013)	1.001 (0.141)	-	-
tenure_15	1.027 (0.904)	1.400 (0.342)	1.154 (0.493)	1.400 (0.383)	-	-
gender						
female	0.929 (0.846)	1.643 (0.405)	0.849 (0.668)	1.186 (0.799)	0.580 (0.678)	0.188* (0.080)
age	0.984** (0.015)	1.0141 (0.152)	0.991 (0.197)	0.995 (0.708)	0.956* (0.082)	0.961** (0.021)
gender#c.age						
female	1.011 (0.235)	0.988 (0.397)	0.999 (0.930)	0.988 (0.508)	1.029 (0.423)	1.049** (0.048)
married						
married	1.450*** (0.007)	0.708* (0.082)	0.696*** (0.006)	0.512*** (0.002)	2.919** (0.025)	1.936* (0.075)
gender#married						
female#married	0.579*** (0.003)	0.999 (0.999)	1.231 (0.271)	1.680* (0.099)	0.232** (0.022)	0.523 (0.187)
panel						
2007	0.865 (0.338)	0.894 (0.614)	0.442*** (0.000)	0.628 (0.223)	0.815 (0.881)	0.657 (0.353)
2009	1.745*** (0.000)	1.200 (0.419)	0.348*** (0.000)	0.756 (0.425)	1.252 (0.664)	0.526* (0.088)
2011	2.514*** (0.000)	1.078 (0.789)	0.238*** (0.000)	0.539* (0.079)	1.217 (0.735)	0.373** (0.029)
2013	1.999*** (0.000)	0.982 (0.949)	0.228*** (0.000)	0.890 (0.717)	4.913** (0.015)	1.274 (0.654)
2015	1.122 (0.456)	1.328 (0.208)	0.270*** (0.000)	0.977 (0.939)	1.531 (0.365)	0.550* (0.069)

Source: Author's calculation on the basis of the ENEMDU, 2005-2016

Note: Robust standard errors in parentheses. Bootstrap with 5000 repetitions

IF: Informal to Formal, IU: Informal to Unemployment, FI: Formal to Informal,

FU: Formal to Unemployment, UF: Unemployment to Formal, UI: Unemployment to Informal

Legend: * for $p<0.1$, ** for $p<0.05$, *** for $p<0.01$