

# **Employment, poverty and redistribution in Ecuador; A minimum wage story?**

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This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

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## List of Acronyms

BCE	Central Bank of Ecuador
BDH	Poverty Direct Cash Transfer Program of Ecuador
CPS	Current Population Survey of The United States
ECLAC	Economic Commission for Latin America and the Caribbean
ENEMDU	Ecuadorian Employment, Underemployment and Unemployment Households Survey
ENEU	Mexican National Urban Employment Survey
ENH	Colombian National Households Survey
FIDEG	International Foundation for Global Economic Challenges
ICLS	International Conferences of Labour Statisticians
ILO	International Labour Organization
INEC	National Institute of Statistics and Census
GIC	Growth Incidence Curve
GDP	Gross Domestic Product
GVA	Gross Value Added
HSMPs	Costa Rican Household Surveys for Multiple Purposes
OLS	Ordinary Least Squares Estimations
PME	Brazilian Monthly Employment Survey
PSU	Primary Sampling Units
SSU	Secondary Sampling Units

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## **Abstract**

This paper examines the effects of minimum wage over labour income, poverty and underemployment in Ecuador during the period 2007 to 2016. For such objective, this research relies on pooled cross section data obtained from the December editions of the National Survey of Employment, Underemployment and Unemployment of Ecuador between the years 2007 and 2016. The paper uses different approaches for each one of the intended outcomes: in terms of labour income, we will use kernel density plots and Lorenz dominance tests, and assess whether there are improvements in the distribution of income after the implementation of minimum wage policy; for the measurement over poverty and underemployment, we will use a probit model; and to analyze the effect of minimum wages over labour income distribution we will use OLS and quantile regressions.

The main findings of this paper are that there is a compression of labour income and informal employment distribution due to an increase of the minimum wage, which is observed in the poorest percentiles of the population, hence there is a relevant link to poverty-alleviation in Ecuador. Consequently we find evidence of poverty reduction due to an increase of minimum wage. The novelty about this paper is the finding that an increase in minimum wage decreases the probabilities of being underemployed within the informal sector.

## **Relevance to Development Studies**

The linkages between growth, employment, poverty and inequality are fundamental for understanding a development process of a country due to how strongly are connected between them. Hence, the performance of each one of these factors have an important impact on the living conditions of the people and finally in their welfare. In this sense, on developing countries especially in Latin America, the performance of the labour markets is fundamental on achieving better results on poverty and inequality reduction. For this reason, it is relevant to understand what kind of policies can improve the key variables on the labour market such as the labour income, formal employment and underemployment, so studying the effect of an institution on the labour market such as the minimum wage is an asset for the policymakers.

## **Keywords**

Minimum wage, underemployment, labour income, poverty, formal employment, informal employment, Ecuador.

# Chapter 1 Introduction

During the last ten years, Ecuador has experienced a process of development without precedent in its history. The Ecuadorian economy has grown by 35.4% between 2007 and 2016 and in absolute real terms from US\$51.0 billion to US\$ 69.1 billion. This process has been accompanied by a greater participation of the state in the economy and an expansion of government expenditure in different areas such as social protection, infrastructure, and security, amongst others (Weisbrot et al. 2017). In fact, social expenditure as a percentage of GDP has doubled from 4.3% to 8.6% between 2006 and 2016 (Weisbrot et al. 2017). This process has enhanced access to and the quality of public services especially of education, health, and social security to the most vulnerable people in Ecuador (Oliva, et al. 2017). One of the sources for financing this development process was the boom in oil prices between 2007 and 2014 which improved Ecuador's terms of trade and generated important income flows to the general budget of the government (León 2015)

While economic growth is maybe one of the most used ways of measuring the welfare of society (Stiglitz et al. 2009), it is perhaps not enough, and it is necessary to complement this measure with others such as poverty, inequality, social expenditure, among others. An examination of these indicators shows that between 2007 and 2016, headcount income poverty has reduced by 13.8 percentage points from 36.7% in 2007 to 22.9% in 2016. This reduction implies that more than 1.5 million have been lifted above the poverty line. During the same period, per capita income in Ecuador grew at an average annual rate of 8.57%, but the median annual rate grew by 31.4%. Furthermore, regarding inequality, the Gini coefficient fell by 5.7 points over the period 2007 to 2016, and the Lorenz curve analysis shows that 2016's income distribution is unequivocally more egalitarian as compared to 2007.

As a result of institutional changes in the legal framework, that is, in the Labour Code and Social Security law, the affiliation of workers to the social security system increased by 100.5% between 2007 and 2016 while, the number of employed only grew by 24% in the same period. Hence, formal employment as a percentage of the employed population (constituted mainly by social security affiliation) in Ecuador has increased considerably between 2007 and 2016 from 25.9% to 39.3% respectively. This increment represents a growth of 51.6% in formal employment.

Furthermore, between 2007 and 2016, Ecuador has implemented an active distributional policy of salaries through repeated increases in its minimum wage. Indeed, between 2007 and 2016 the minimum wage increased by 50.2% in real terms. The interesting characteristic of this process is that common indicator related to the minimum wage theory such as the inflation rate,



and unemployment have been stable in this period. In fact, between 2007 and 2014 the growth rate of the minimum wage has been above the inflation rate, and in the last two years of the period of analysis (2015 and 2016), the growth rate was close the inflation rate.

All indicators explained above can be puzzling when considered within the classical theoretical framework, where all increases in minimum wages are considered to result in detrimental effects over employment offsetting the intended purpose of increasing socio economic welfare.

But such contradiction is not completely valid. There are a great number of studies that have analysed this issue, existing in almost all theoretical lines relevant divergences between empirical and theoretical evidence. For instance, some studies have analyzed the effects of minimum wages focusing on evidence from developed economies such as The United States (US) and European Union, without being able to reach any general consensus on the effect of minimum wages on employment. For example, Card (1992) and Card and Krueger (1995) show positive or non-employment effects of the minimum wage in the US using different econometric approaches. In the same line, Dolado et al. (1996) found a positive effect on total employment for the Spanish case. On the other hand, Neumark and Wascher (1992), Neumark and Wascher (2000) and Williams and Mills (2001), found negative employment effects in the US. Additionally, the literature of minimum wage has a more clear agreement regarding the compression effects of the minimum wage over the wage distribution (Bosch and Manacorda 2010, Lemos 2009b, Neumark et al. 2006, Maloney and Nuñez 2004, Lee 1999, Card and Krueger 1995).

Furthermore, there are important differences between the characteristics of labour markets in developed and developing countries (Latin America). Two main aspects make it hard to compare labour markets between these two groups of countries. First, in developing countries, informality is not a residual population, instead of in several countries it accounts for a large share of the employed population. Second, unemployment is perhaps not the key variable in measuring the performance of the labour market in developing countries, alternative measures such as underemployment or share of employment in the formal versus the informal sector may be more relevant. Hence, the evidence about minimum wages shows a less clear pattern in developing countries. For example, Neumark et al. (2006), Gindling and Terrell (2007) and Gindling and Terrell (2009) show negative employment effects. In contrast, Lemos (2009) found positive or non-employment effects for the Brazilian case.

This research tries to identify the effects of the minimum wage on underemployment, labour incomes, poverty and inequality in Ecuador between 2007 and 2016. The thesis begins by examining the extent to which the minimum wage has affected underemployment and wages in Ecuador in the last ten years and subsequently examines the effect of the minimum wage on

poverty and inequality. The thesis relies on pooled cross-section data covering the period 2007 to 2016. The data were obtained from o the National Surveys of Employment, Underemployment and Unemployment of Ecuador (ENEMDU).

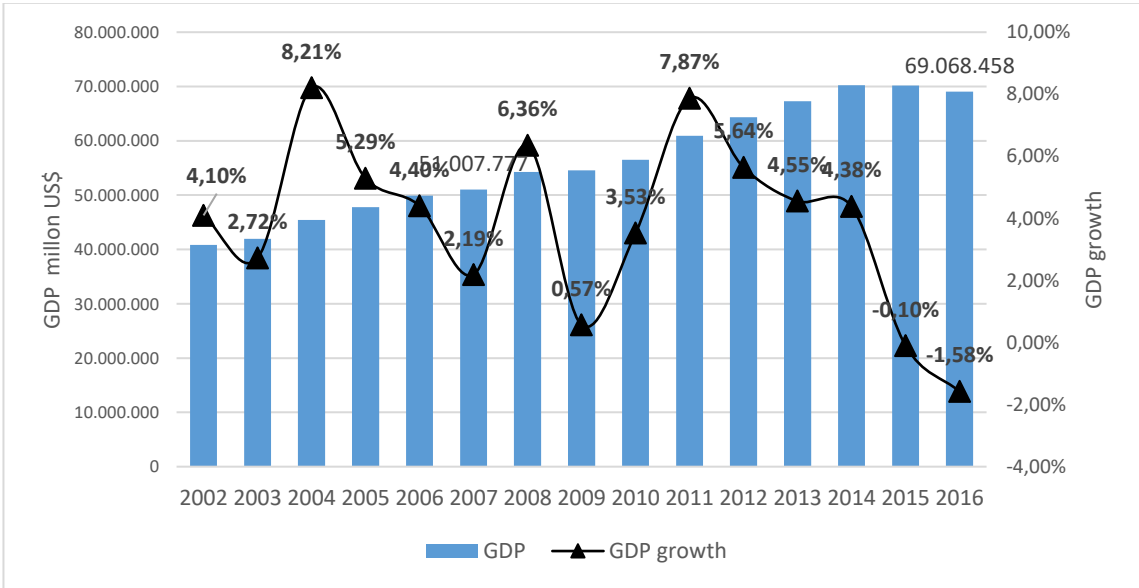
The rest of paper is organised as follows: Section 2 describes the Ecuadorian context between 2007 and 2016 and provides a review of macroeconomic, social and employment indicators. Section 3 discusses minimum wages in Ecuador, how it is determined and its evolution during the period of analysis. Section 4 presents the theoretical framework and literature review. Section 5 shows the data used for this research, minimum wages proxies and descriptive statistics. Section 6 illustrates the specification of the models used in this paper and the main results. Finally, Section 7 presents the conclusions.

# Chapter 2 Ecuadorian Context 2007 – 2016

## 2.1 Economic growth and employment

The Ecuadorian economy has grown by 35.4% between 2007 and 2016 and in absolute (real) terms from US\$51.0 billion to US\$ 69.1 billion over this period. The average growth rate during this period was 3.34% reaching its maximum point in 2011 when the economy grew by 7.87% as can be seen in Figure 1. This process has been led mainly by two aspects: a greater participation of the state in the economy and an expansion of government expenditure in different areas such as social protection, infrastructure, and security, amongst others. It is important to highlight that Ecuador suffered important external shocks such as reduction of oil prices, appreciation of the US dollar, depreciation of Colombian peso (41.4% between December 2014 and December 2016). Additionally, in 2016, Ecuador suffered one of the worst earthquakes in its recent history. All these shocks have created a strong contraction of the economy, indeed in 2015 the economy contracted by -0.10% and in 2016 by -1.58%. This last growth rate has been the lowest since the crisis of 1999.

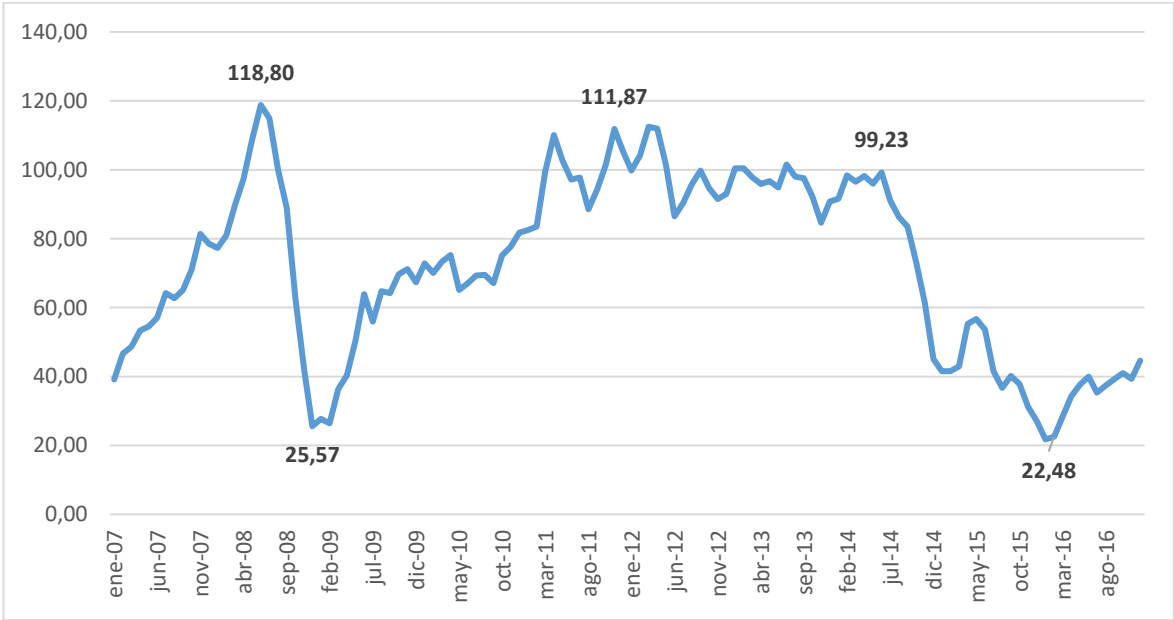
Figure 1: Evolution of Ecuadorian GDP 2002 – 2016



Source: Central Bank of Ecuador (BCE 2016)

The expansion of the government expenditure between 2007 and 2016 was mainly financed by two factors: taxes and, the boom in oil<sup>1</sup> prices from 2007 to 2014. Indeed, among this period the average price of Ecuadorian oil barrel was US\$ 84.78 reaching its maximum point in the first quarter of 2008 when the oil barrel cost US\$ 118.80, but after the international crisis, the oil prices dropped reaching a price of US\$25.57. Since June 2014, the upwards trend has changed radically due to a rapid decline in oil prices as can be seen in Figure 2. In fact, the average oil prices between 2015 and 2016 were US\$38.63 reaching its trough in the first quarter of 2016 (US\$ 22) even lower than the 2008 crisis price.

**Figure 2: Ecuadorian Oil prices 2007 - 2016**



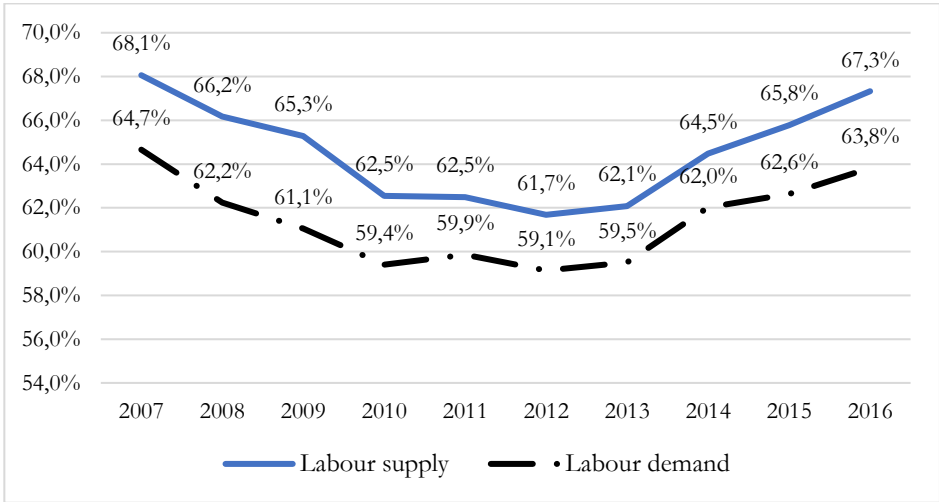
Source: Central Bank of Ecuador (BCE 2017a)

Regarding the Ecuadorian labour market, it is important to analyse labour supply and labour demand between 2007 and 2016. As can be seen in Figure 3 the labour supply presents a U shape during the period of analysis. This “U” shape was driven by a strong decrease of people from the labour force because of two main factors. First, by an increase of workers’ retirement due to changes on the demographic characteristic of the Ecuadorian population trending to a higher percentage of the older population. Second, by an increase of students enrolling to the education system (Atuesta et al. 2016). Additionally, the downward sloping trend reached its trough in 2012 when the indicator was 61.7%. The breakpoint within the evolution of this indicator was in December 2014 (64.5%) when the downward trend changed radically, and more people began entering the labour market. This shift was driven by a change in household’s

<sup>1</sup> In 2014, the oil exports represented the 67.4% of the total exports of Ecuador

expectation which sent more members to pressure the labour market as an anti-crisis tool to maintain the same levels of income. It is important to highlight, that this pattern was not seen during the 2008 crisis where the household's expectation maintained in leaving outside the labour market young and less-skilled potential workers.

**Figure 3: Evolution of labour supply and demand 2007 - 2016**

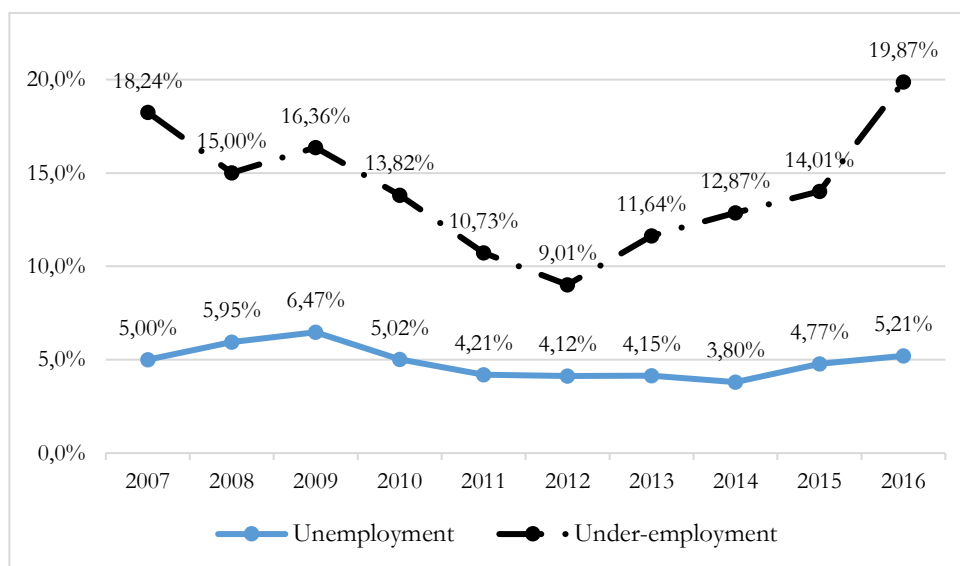


Source: National Institute of Statistics and Census of Ecuador – INEC (INEC 2017a)

The changes in labour supply and demand have a direct impact on the main labour indicators. In this sense, the unemployment rate presented a downward tendency from 2007 (5.0%) to 2014 (3.8%). Indeed, the rate of unemployment<sup>2</sup> in 2014 is the lowest rate in Ecuador's history since there has been data available. This downward tendency changed since 2014 and the unemployment rate increased to 5.21% in 2016 as Figure 4 shows. Furthermore, another key indicator of the Ecuadorian labour market is the underemployment rate. The evolution of this indicator has been more sensitive to shocks in the labour market in the last ten years, so its relevance analysing the Ecuadorian case. Similar to the unemployment rate, the underemployment rate presented a reduction trend between 2007 (18.2%) and 2012 (9.0%). After that, it has presented an upwards trend, so in 2016 this indicator was 19.9% of the labour force (INEC 2017a).

<sup>2</sup> An unemployed in Ecuador is a person of 15 years or older who was without work during the reference period (week previous from the survey) and simultaneously present some of the following characteristics: i) currently available for work; ii) seeking or not for employment in the last four weeks; and iii) had taken specific steps for seeking employment in the last four weeks (INEC 2014b).

**Figure 4: Unemployment and Underemployment in Ecuador 2007 - 2016**



Source: Author calculation using (INEC 2017a)

An important characteristic of the Ecuadorian labour market is the size of its informal sector. In this sense, understanding better the informality in Ecuador is vital. In 2016, the rate of employment in the informal sector was 43.7% of the total of workers in the labour force (INEC 2017a). In contrast, if it is used an alternative and more accurate definition of informality for the aims of this research (informal employment<sup>3</sup>) that focuses on the conditions and security of the worker this percentage increased to 60.7%. These two measures show the relevance of informality within the Ecuadorian economy. It is important to highlight the downward trend that the informal employment has had in the last ten years. In fact, the informal employment reduced by 13.4 percentages points from 74.1% in 2007 to 60.7% in 2016 as can be seen in Table 1.

<sup>3</sup> The Informal employment is based on the job –related characteristics of the employed. In this sense, informal employment will be characterized for this research as the interaction of three main variables: social security contributions, labour benefits and status in employment. The status in employment groups are: self-employed, paid-employed and non-paid employed. For the self-employed, it is considered as informal employment if the employed have the following characteristics: units of production of the informal sector; non-contributions to social security and self-employed who do not received earnings by selling their goods and services, but they use their production for self-consumption. On the other hand, paid-employed will be considered as informal employment if they do not have social security contributions. Finally, all the non-paid workers will be considered as informal employed.

On the other hand, formal employment has increased its size considerable in 51.6% between 2007 and 2016. This increment is explained mainly due to a strong increase in the employed population with social security affiliation. Indeed, this population grew 61.7% during the period of analysis at an average annual rate of 7.4%. The increases in the social security affiliation were led by institutional changes such as reforms to the Labour Code where it was eliminated the possibility of hiring workers by hours. Moreover, the Labour Code made compulsory a clear dependent relationship between employer and employee, so outsourcing workers for the core business of the firm were completely banned. Additionally, it was reformed the social security law to make compulsory the affiliation to the social security of all workers. In fact, by referendum, in 2011, Ecuadorians approved the criminalisation of no affiliation of workers to the Social Security (World Bank 2014). It is important to highlight, that an employer could not affiliate a worker with a salary lower than the legal minimum wage.

**Table 1: Social security affiliation and formal employment 2007 – 2016**

Period	Social Security	Formal employment	Informal employment	Employment	Employed by Social Security	Formal employment	Informal employment
2007	1,634,996	1,560,430	4,458,902	6,019,332	27.2%	25.9%	74.1%
2008	1,728,231	1,703,531	4,301,864	6,005,395	28.8%	28.4%	71.6%
2009	1923854.8	1828346.5	4296788.6	6125135.1	31.4%	29.8%	70.2%
2010	2131743.5	2059133.9	4054096.3	6113230.2	34.9%	33.7%	66.3%
2011	2488553.8	2367376.6	3937457.1	6304833.7	39.5%	37.5%	62.5%
2012	2750141.8	2530947	3893892.9	6424840	42.8%	39.4%	60.6%
2013	2954838.7	2722628.9	3941611.7	6664240.6	44.3%	40.9%	59.1%
2014	3162194.7	2972555.1	3948552.1	6921107.2	45.7%	42.9%	57.1%
2015	3290509.9	3032349.1	4108286.5	7140635.7	46.1%	42.5%	57.5%
2016	3278377.9	2934111.6	4529467.8	7463579.4	43.9%	39.3%	60.7%

Source: National Institute of Statistics and Census of Ecuador – INEC (INEC 2017a)

There are other key characteristics such as wages and hours worked that distinguish the formal from the informal employment. In this sense, wages in the formal employment are approximately three times higher than in the informal employment. Also, the wages of the two sectors have decreased on average in real terms, but the incomes of formal employment decreased at a higher rate -14.8%. Meanwhile, the labour income of the informal employment dropped by -2.7% between 2007 and 2016 as can be seen in Table 2. Furthermore, regarding the number of hours worked, formal employed worked in average 44.2 hours per week in 2016 and an informal employed work in average 33.9 hours per week in the same period. It is important to highlight that the number of hours worked in the formal employment decreased in 8.5% meanwhile the informal sector decreased in 14.5%.

**Table 2: Hours worked per week and average monthly labour income 2007 – 2016**

Year	Labour income <sup>4</sup> (average US\$ 2016)		Hours (Weekly average)	
	Formal employment	Informal employment	Formal employment	Informal employment
2007	886.0	274.2	48.28	39.63
2008	788.5	266.2	47.61	40.32
2009	705.7	257.6	46.84	39.47
2010	729.9	271.5	46.16	39.35
2011	686.3	267.4	45.33	38.60
2012	704.9	276.8	44.36	38.20
2013	776.2	289.0	44.68	37.83
2014	747.6	289.4	44.12	36.00
2015	769.7	281.5	43.99	35.26
2016	756.1	266.7	44.16	33.88

Source: National Institute of Statistics and Census of Ecuador – INEC (INEC 2017a)

## 2.2 Poverty and Inequality Indicators

For a better understanding of the links between growth, poverty and inequality and to characterise a period as pro-poor or not, it is important to review the evolution of key indicators of poverty and inequality and make some specific analysis of those indicators in the period 2007 - 2016. A complete panorama of poverty and inequality indicators of Ecuador can be seen in Table 3. The following part will focus on income poverty, measured by the poverty headcount and income inequality measured by the Gini coefficient.

Regarding the headcount of poverty in Ecuador<sup>5</sup>, it has decreased 13.8 percentage points from 36.74% in 2007 to 22.92% in 2016. This reduction implies that more than 1.5 million

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<sup>4</sup> Labour income is understood as all remuneration that a worker could receive as payment for being involved in a productive or work activity. This payment could be received in money as cash, in kind payments or services. It is important to make a distinction between paid and self-employment earnings. In terms of self-employment, it is used the net income which is equal to the value of goods and services produced by the self-employed and it excludes the operating expenses (salaries, capital goods, depreciations of machines among others). On the other hand, paid-employed income includes remuneration and other benefits such as social security contribution and indirect taxes (INEC 2014b).

<sup>5</sup> The income poverty line ( $z$ ) is calculated as an update of the consumption poverty line of 2006 (US\$56.64) using the consumer index price (CPI). See Appendix 1 for a complete explanation.



people have moved above the poverty line. In 2014, the poverty headcount reached its minimum point (22.49%), but from this point at the national level, it has been stable. This turning point of the poverty reduction coincided with the external shocks that the Ecuadorian economy has suffered since 2015. The turning point of the poverty reduction shows how linked is an economic performance with the household's income and poverty reduction. Additionally, extreme poverty presented a similar reduction pattern from the absolute poverty, so it has reduced 7.8 percentage points from 16.45% in 2007 to 8.69% in 2016. For the first time in history, Ecuador presented an extreme poverty rate of only one digit. It is important to highlight that regardless of the indicator used to measure poverty, there is a clear pattern of reduction between 2007 and 2016 as can be seen in Table 3.

**Table 3: Poverty and Income distribution indicators 2007 – 2016**

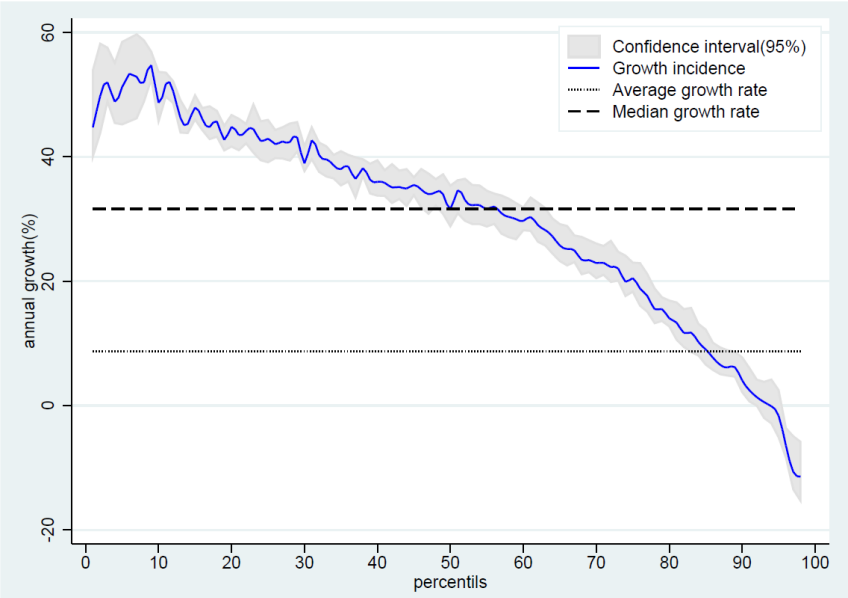
<b>Indicators</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b><u>Poverty:</u></b>										
Headcount poverty (FGT0)	0.37	0.35	0.36	0.33	0.29	0.27	0.26	0.22	0.23	0.23
Poverty gap index (FGT1)	0.15	0.14	0.14	0.13	0.11	0.11	0.09	0.08	0.08	0.09
Severity index (FGT2)	0.09	0.08	0.08	0.07	0.06	0.06	0.05	0.04	0.05	0.05
Unsatisfied basic needs index		0.47	0.45	0.42	0.39	0.37	0.39	0.35	0.33	0.32
Multidimensional poverty			0.51	0.46	0.41	0.38	0.39	0.37	0.35	0.35
<b><u>Inequality:</u></b>										
Gini index	0.551	0.515	0.504	0.505	0.473	0.477	0.485	0.467	0.476	0.494
Theil Index	0.630	0.523	0.507	0.512	0.419	0.443	0.460	0.428	0.445	
Atkinson index [1]	0.429	0.386	0.370	0.368	0.333	0.341	0.341	0.320	0.338	
Atkinson index [1.5]	0.561	0.524	0.499	0.493	0.460	0.474	0.458	0.435	0.471	
Ratio D10 / D1	41.50	33.15	28.26	29.01	24.35	25.12	23.84	22.28	25.06	24.33
<b><u>Labour income (percentile)</u></b>										
Mean	451.3	430.4	403.6	441.0	439.8	459.3	505.5	504.5	509.7	483.2
p10	57.7	66.1	63.5	73.7	69.8	83.3	97.7	101.5	81.0	72.1
p25	144.2	158.5	152.4	172.0	174.6	194.4	217.2	209.3	202.4	185.3
p50	275.4	274.8	279.4	307.1	330.6	353.3	372.5	387.2	389.7	375.6
p75	475.7	475.6	447.0	476.6	512.1	533.2	560.3	570.4	580.0	563.9
p90	879.4	861.3	800.1	872.1	890.4	899.8	964.3	941.9	987.9	941.5
<b><u>Per capita income (percentile)</u></b>										
Mean	205.2	193.4	182.9	204.5	203.8	212.1	224.1	227.2	231.5	223.2
p10	34.2	37.6	38.1	42.2	44.6	44.4	52.1	54.1	52.0	50.9
p25	63.1	65.8	63.9	71.0	77.6	79.6	83.3	90.7	89.1	90.1
p50	114.6	118.9	114.3	126.5	137.1	142.6	144.8	152.4	153.1	150.8
p75	217.3	218.0	206.4	230.3	244.1	252.4	257.9	261.6	270.4	261.8
p90	426.7	406.0	371.5	420.7	424.8	438.5	449.6	449.0	460.2	444.0

Source: Author calculation using (INEC 2017a)

Another important aspect regarding poverty reduction path is to analyse who gains more from the recent economic progress of Ecuador - the rich or the poor. In this sense, if the poor benefit more it can be claimed that this poverty reduction process has characteristics of “Pro-poor growth”. A way to formalise the last statement is by using growth incidence curves (GIC). This graph method was introduced by (Ravallion and Chen 2003) to analyse the poverty reduction path over two periods of time.

The GIC measures the changes in a welfare variable (income or consumption) across different percentiles of the respective distribution. Between 2007 and 2016, per capita income in Ecuador grew at an average annual rate of 8.57% (INEC 2017a). Figure 5 presents the income growth incidence curve. As the graph clearly illustrates the income of the poor grew more than the non-poor between 2007 and 2016. In fact, until the 50<sup>th</sup> percentile, the growth rate of this segment is higher than the median annual growth rate (31.40%). The reduction from the 90<sup>th</sup> percentile onwards could be associated with a small sample in these percentiles, so it allows to conclude that the per capita income has grown all over the distribution.

**Figure 5: Income growth incidence curve between 2007 and 2016 in Ecuador**



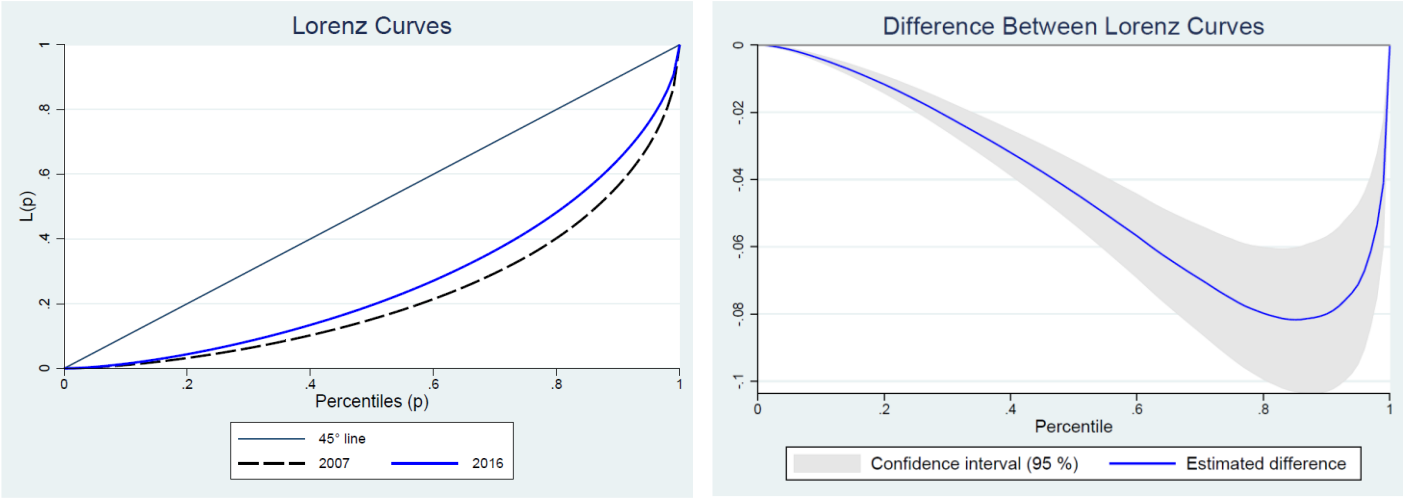
Source: Author calculations using (INEC 2017a)

Concerning inequality measured by the Gini coefficient, the trend over the last ten years shows a reduction in inequality. This indicator presented a reduction of 5.7 Gini points between 2007 and 2016. The minimum point was reached in 2014 (0.467) afterwards the trend changed, and income inequality has shown an upward sloping trend getting to 0.494 in 2016 that is similar to the coefficient in 2010. Like poverty reduction, inequality changed its trend in 2015 due to external shocks and contraction of the economy.

Furthermore, analysing only the trend of this indicator does not allow us to conclude if one distribution is more egalitarian than other. For this reason, the literature has developed the Lorenz curve dominance method that allows us to conclude if a distribution is unequivocally more egalitarian than the other. This method could be interpreted as follows: if one curve is closer to the line of perfect equality across the entire distribution, it is considered as more egalitarian than the other (Castillo 2016). The left-hand graph of Figure 6 shows the income

Lorenz Curves for periods 2007 and 2016 respectively. As can be seen, for all percentiles, the distribution of 2016 clearly dominates the 2007 distribution and is closer to the perfect equity line (45°). Graphically, we can observe that the 2016 income distribution is unequivocally more egalitarian than 2007. Additionally, the right-hand graph in Figure 6 is the difference between the 2007 and 2016 Lorenz curves. This method is a test for robustness due to for the entire distribution the differences among the Lorenz curves of the two periods is below zero. Hence, it does not matter which indicator is used to analyse inequality between this period (Table 3); there is an unequivocal decrease in inequality in Ecuador during the last ten years. It is important to highlight that inequality has declined more for the percentile 40 to 85 due to there is where the redistribution process has to take place.

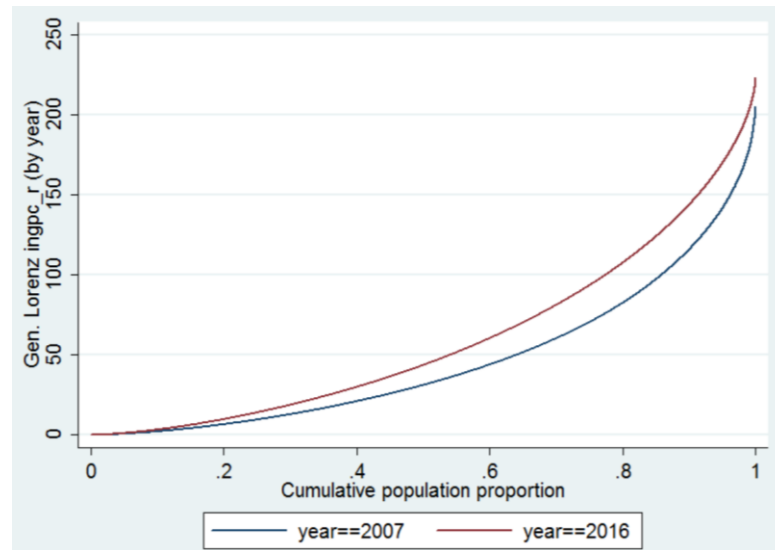
**Figure 6 : Lorenz curve dominance, Ecuador 2007 – 2016**



Source: Author calculations using (INEC 2017a)

One of the limitations of the Lorenz Curve analysis is that it does not take into consideration the mean of the distribution and for this reason, it may not be used to rank distributions regarding social welfare but only in inequality terms. In this sense, a way to solve this limitation is to multiply the mean of the welfare variable used in the analysis by the Lorenz Curve. This method is called in the literature the Generalized Lorenz Curve. The horizontal axis is the same as in the normal Lorenz curve, the cumulative share of the population, but in the vertical axis, it is shown the cumulative share of the welfare variable multiplied by the mean of it. One of its main uses is comparing different distributions with different means and different aggregates (Deaton 1997). Figure 7 shows the Generalized Lorenz Curve of the per capita income distribution for the periods 2007 and 2016. As can be seen, the 2016 distribution (red line) dominates the 2007 (yellow line). This result is in line with the Lorenz Dominance test presented in the last section. In this sense, there is evidence to argue that the 2016 distribution is unequivocally more egalitarian than the 2007 distribution.

**Figure 7: Generalized Lorenz Curve 2007 – 2016**



Source: Author calculations using (INEC 2017a)

To reinforce the key role that redistribution policies have played in Ecuador from 2007 to 2016, consider the base on (Datt and Ravallion 1992)<sup>6</sup>, the poverty headcount can be decomposed in two components: redistribution and growth effect. As it was seen in Table 3, the poverty reduction between 2007 and 2016 was 13.8 percentages points, and the same results are observed in the first part of the decomposition table (Table 4). This part works as a double check for the inputs that are used in the decomposition; the next two parts of the decomposition show the relative contribution of the growth and redistribution effect to the absolute reduction of poverty. As it is explained in Appendix 2, this method is sensitive to the initial period that is taken as the reference period, so there are results for 2007 and 2016 as reference period separately. The last part of the decomposition is the “Shapley”<sup>7</sup> approach.

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<sup>6</sup> For a better understanding of the Datt and Ravallion decomposition method see

<sup>7</sup> The Shapley decomposition uses the same framework of Datt and Ravallion 1992, but the difference between these two approaches is on how the residue is handle. For the Shapley approach there is not a residue due to that this method assigns arbitrary the value of the residue to the redistribution effect.

The poverty reduction path in Ecuador between 2007 and 2016 is mainly explained by the “redistribution effect” due to on average it explains 10.6 percentage points (p.p.) of the total poverty reduction (13.8 p.p.), and the three decomposition methods give the same sign and size. In contrast, the growth effect explains in average 3.3 percentages points of the total reduction of poverty. Moreover, given the weight of the redistribution effect in the absolute reduction of poverty this type of growth can be considered as “pro-poor.”

**Table 4: Decomposition of the poverty headcount**

	<b>Estimate</b>	<b>Stand. errors</b>	<b>Lower bound</b>	<b>Upper bound</b>
Distribution dic-07	36.7%	0.2%	36.4%	37.1%
Distribution dic-16	22.9%	0.2%	22.6%	23.2%
Difference: (dic-16 - dic-07)	-13.8%	0.3%	14.4%	13.3%
<b>Datt &amp; Ravallion approach: reference period dic-07</b>				
Growth	-3.3%	0.4%	-4.0%	-2.7%
Redistribution	-10.7%	0.5%	11.6%	-9.7%
Residue	0.2%	---	---	---
<b>Datt &amp; Ravallion approach: reference period dic-16</b>				
Growth	-3.2%	0.3%	-3.6%	-2.7%
Redistribution	-10.5%	0.5%	11.4%	-9.5%
Residue	-0.2%	---	---	---
<b>Shapley approach</b>				
Growth	-3.3%	0.4%	-4.0%	-2.5%
Redistribution	-10.6%	0.5%	11.5%	-9.7%

Source: Author calculations using (INEC 2017a)

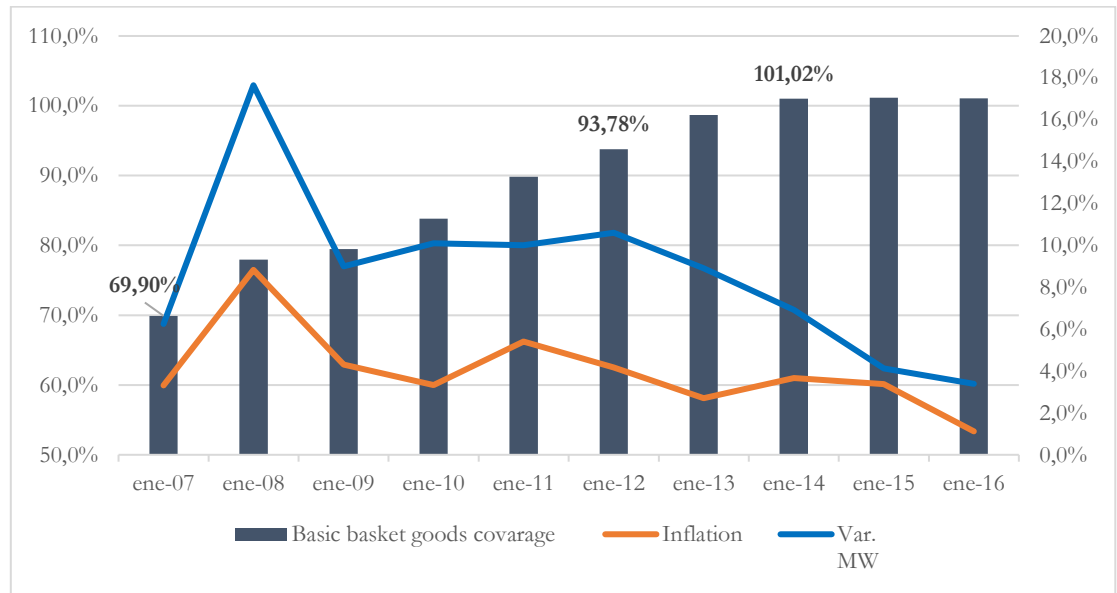
## Chapter 3 Minimum wage in Ecuador

### 3.1 How is the minimum wage settled/determined in Ecuador?

In this section, it will be reviewed the process of settlement of the minimum wage in Ecuador. There are legal and technical – economic aspects that have to be reviewed for determining the legal raise of the minimum wage. In this sense, the National Council of Labour and Salaries (CNTS) has the responsibility to fix and adjust the legal minimum wage and the sectoral wages that are bargained in 21 sectoral commissions (Ministerio del Trabajo 2015). The fixing of the minimum wage is done from the 1<sup>st</sup> of January of each year. In this same line, the Labour Code set that the CNTS is a tripartite committee where are delegates from employers, workers and the government (Congreso Nacional 2005). In this sense, the National Council of Labour and Salaries it is integrated by the Labour Minister or his/her delegate who will act as President of the Council, two delegates from the employers and two delegates from the workers (Ministerio del Trabajo 2015). It is important to highlight that between 2007 and 2016, the increases of the minimum wages were taken by the Labour Ministry as a representant of the Ecuadorian government due to there was no agreement between employers and workers (Astudillo. 2016).

Methodologically, for fixing and adjusting the minimum wage, there are three components: cost of living, productivity and redistribution of wealth, but in practice, the minimum wage is linked with the basic basket of goods of Ecuador which monitors the level of the price of basic goods and services. Figure 8, illustrates the relationship between inflation, a basic basket of goods coverage, and the variation of the minimum wage between 2007 and 2016. It is clear from Figure 8, the link among the increments in the minimum wage and the increases in the coverage of the basic basket. An important aspect, the variation in the increase in the minimum wage have a downward trend from 2012 onwards where the basket coverage reached more than 90. In fact, in 2014, it was the first time that the coverage of the basket reached the 100% after that the increases in the minimum wage are close to the inflation rate. In this context, it is plausible to assume that **the setting of the minimum wage in Ecuador is exogenous** from the outcomes of this research: underemployment, labour income and poverty due to policymakers has concerned mainly on covering the cost of the basic basket of goods as an exercise of social redistribution.

**Figure 8: Minimum wage and basic basket of goods coverage evolution**



Source: Author calculation using (INEC 2017b)

### 3.2 Minimum wage evolution in Ecuador

Regarding employment and salaries, Ecuadorian government implemented active distributional policies that allow workers to supply basic needs. This process aims to build a more egalitarian society. The minimum wage is an important tool, for a better distribution of the wages (compression of wages) and improving the labour conditions of workers (Lemos 2009b). Moreover, the minimum wage has a characteristic known in the literature as 'lighthouse effect'. This effect explains how the minimum wage plays a coordinator role in the wage distribution due to it is the minimum that a worker would expect to earn. In this sense, between 2007 and 2016, the minimum wage rose from USD\$170 to US\$366, this increment represented an increase of 50.2% in real terms (BCE 2017b). This increment of the minimum wage also reduced the gap between the labour income mean and the minimum wage, so the minimum wage grew faster than the mean of the labour income. The gap passed from 50% in 2007 to 20% in 2016 as can be observed in Table 5. In the informal employment the minimum wage on average covers 115% of the informal wages.

**Table 5: Labour income and minimum wages in US\$ 2016, 2007 - 2016**

<b>Year</b>	<b>Real Minimum wage</b>	<b>Employed</b>	<b>Gap MW / Mean</b>	<b>Formal employment</b>	<b>Informal employment</b>	<b>Gap MW / FE</b>	<b>Gap MW / IE</b>
2007	245	451.3	0.5	886.0	274.2	0.3	0.9
2008	264	430.4	0.6	788.5	266.2	0.3	1.0
2009	277	403.6	0.7	705.7	257.6	0.4	1.1
2010	295	441.0	0.7	729.9	271.5	0.4	1.1
2011	307	439.8	0.7	686.3	267.4	0.4	1.1
2012	324	459.3	0.7	704.9	276.8	0.5	1.2
2013	345	505.5	0.7	776.2	289.0	0.4	1.2
2014	356	504.5	0.7	747.6	289.4	0.5	1.2
2015	358	509.7	0.7	769.7	281.5	0.5	1.3
2016	367	483.2	0.8	756.1	266.7	0.5	1.4

Source: Author calculation using (INEC 2017a)



## Chapter 4 Theoretical Framework and literature review

### 4.1 Theoretical Framework

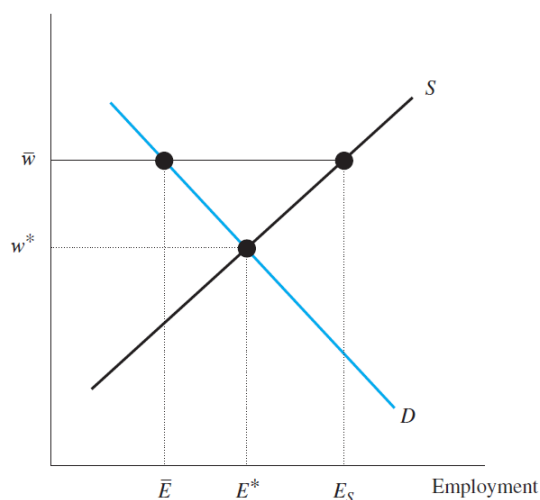
The unemployment rate usually is the most used variable for measuring the performance of a labour market and an economy. This trend is mainly based on theoretical and empirical evidence from developed countries such as The United States, Western European countries among others. In these cases, the unemployment rate is a good thermometer of the labour market due to the small share of the informal economy. For this reason, regarding analysing the effects of a minimum wage policy, the key questions around this topic are: Does the minimum wage reduce employment? Does the minimum wage compress wages?. In this sense, different theories tackle this question from different perspectives and assumptions. This section aims to review the most important theoretical approaches which describe the effect of minimum wages on labour market outcomes.

First, the conventional theory predicts that an increase in the minimum wage increases unemployment. This statement relies on a competitive labour market where a minimum wage policy is a nominal rigidity which has a negative effect on employment (Cunningham 2007) because a minimum wage distorts the labour demand. This distortion increases the wages above their equilibrium, so unemployment rises (Borjas 2013). It is also possible to explain this theory graphically as can be seen in Figure 9. The main assumption of this theory is that there is a competitive labour market that implies that the firms can contract as many workers as they want paying the market wage ( $w^*$ ), workers are paid their marginal product and the employment rate is at level ( $E^*$ ). This is also called in the theory as the “law of one price”. After the increase of the minimum wage, the labour demand ( $D$ ) contracts and it moves to the left. Thus, the firms will try to pay ( $\bar{w}$ ) that is higher than ( $w^*$ ), but the contraction of the labour demand drop the employment rate from ( $E^*$ ) to ( $\bar{E}$ ), so some workers are fired from their job and transit to unemployment as can be seen in Figure 9. Additionally, the higher wage ( $\bar{w}$ ) boost more workers to pressure the labour market, so the labour supply rises. As a result, the ( $E_s$ ) workers cannot find a job due to the labour demand contraction, so this contributes to an additional increase of unemployment (Borjas 2013). The impact on the employment rate will depend on how elastic is the labour supply (Dolado et al. 1996).

A generalisation of the classic model can be implemented easily, allowing the firms some freedom in the amount that they can pay as wages to their workers. The most common case is

the monopsony, and in its simple version, there is only one firm in the market that hires people. The strategy of the firm in a monopsony labour market is to pay higher wages to incentive people to work in their firms. As result of the monopsony, the wages of the new employees and the current worker's increases leading to a break in the law of one price as workers are not paid anymore by their marginal product. The main consequence of the monopsony regarding the minimum wage is that banishes the negative effects on employment that was expected from the neoclassical model (Card and Krueger 1995).

**Figure 9: Minimum wages in a competitive labour market**

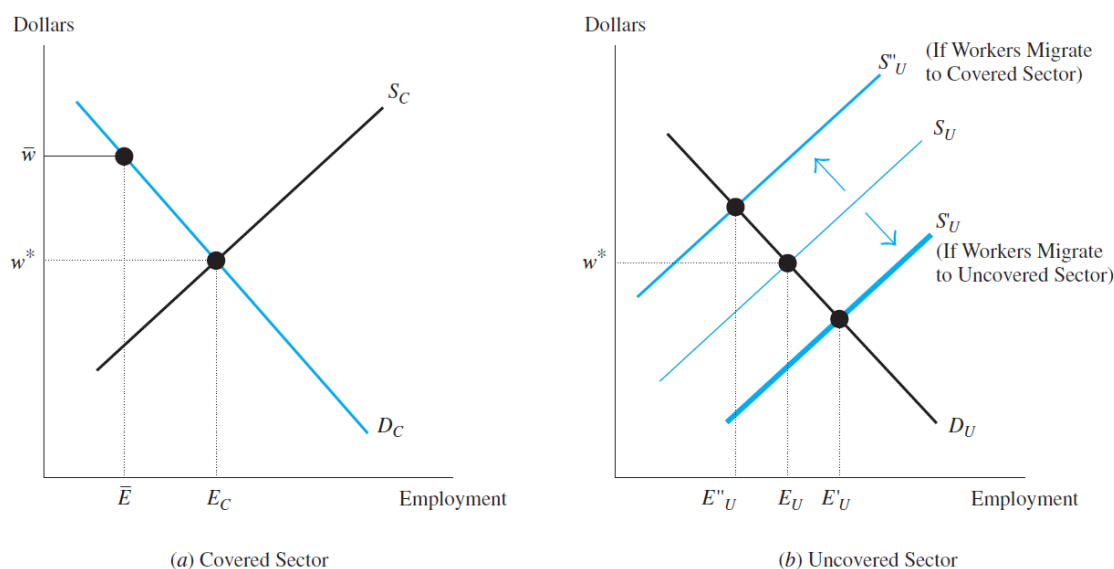


Source: (Borjas 2013: 117)

Another theoretical approach to the effects of minimum wages on employment and the labour income distribution is the two-sector model developed by Welch- Gramlich- Mincer (1976). Commonly, this model is used when the population below the minimum wage is big (Lemos 2009b). The idea behind of the two sector model relies in a sector covered by the regulation of the minimum wage policy and a second sector which is uncovered by this policy. The interpretation of this theoretical model depends if workers migrate to the covered or uncovered sector. In the process of migration from the covered to the uncovered sector, the main idea is that workers that cannot find jobs within the covered sector could shift to the uncovered sector to find jobs of inferior conditions (wages or hours worked). The main prediction is a positive effect on wages in the covered sector, but a negative effect on employment. In contrast, in the uncovered sector this model expects that will be a negative effect on wages, but a positive effect on employment (Borjas 2013). In this conditions, the shift of workers to the uncovered sector decreases the labour supply of the uncovered sector, so it shifts

from  $S_U$  to  $S'_U$  as it can be seen in Figure 10. This effect produces a decrease of the labour incomes, but an increase of employment in the uncovered sector due to employment rate  $E_U$  shifts to  $E'_U$ . Meanwhile, this shift generates a decrease in employment in the covered sector but an increase of the labour income of the same sector (Borjas 2013). For a better understanding of this model, it is important to see Figure 10 where is the graphical solution of the two sectors models

**Figure 10: Minimum wages in a segmented labour market**



Source: (Borjas 2013: 119)

Furthermore, it is fundamental to link theoretically the expected effects of an increase in the minimum wage over the outcomes of this research that are labour income, underemployment, and poverty. Additionally, one of the objectives of this paper is to analyze the effect of the minimum wage on the labour outcomes (labour income and underemployment) across three groups: formal, informal and total employment.

In this context, it is well-described in the literature the positive effect of an increase of the minimum wage over the wage distribution (Bosch and Manacorda 2010, Lemos 2009b, Neumark et al. 2006, Maloney and Nuñez 2004, Lee 1999, Card and Krueger 1995). In this sense, it is expected an increase in the labour income in the total employment. Regarding, formal and informal employment, it is fundamental to analyze the compliance of the minimum wage within these sectors. In this sense, it is expected an increase in the labour incomes on the formal

employment due to the compliance of the minimum wage in these sectors. In contrast, it is expected a decrease in the minimum wage on the informal employment due to within this sector it is not compulsory to pay it (non-compliance).

In terms of, underemployment, there are not a theoretical expectation of an increase in the minimum wage. For this reason, the effects that will be developed in this part are taking into consideration the characteristics of the Ecuadorian labour market and the statistical definitions of this indicator<sup>8</sup>. In this context, it is expected that the probability of being underemployed will decrease for the formal and total employment due to the increase of the expected increases on the labour income. In contrast, in the informal employment, it is expected an increase in the probability of being underemployed as consequence of an expected decrease in the labour income in this sector.

Finally, concerning the poverty headcount, it is not straightforward the expected effect because it strongly linked with the labour income performance. Hence, if total employment has spillovers effects to the lower-income percentiles, it is expected a poverty reduction. However, if there are no spillover effects, it is not expected a reduction of poverty.

## **4.2 Literature review**

### **4.2.1 Evidence of minimum wages on employment and wages distributions**

As it was mentioned in section 1, this research aims to examine the effects of the minimum wage on different outcomes in Ecuador which is a developing country located in Latin America. A particularity of the developing countries is the weight of the informality sector on the labour market in contrast with developed countries. In this context, the literature review of this paper will address the evidence broadly of the minimum wage on employment, wage distribution and underemployment, focusing particularly on Latin American countries.

Regarding developed countries, some studies have analysed the effects of minimum wages focusing on evidence from The United States (US) and Europe, but the results are mixed. For example, Card (1992) and Card and Krueger (1995) show positive or non-employment effects of the minimum wage in the US using different econometric approaches. In the same

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<sup>8</sup> This will be developed deeper in section 4.2.2

line, Dolado et al. (1996) found a positive effect on total employment for the Spanish case. On the other hand, Neumark and Wascher (1992), Neumark and Wascher (2000) and Williams and Mills (2001), found negative employment effects in the US.

Regarding Latin American countries, the evidence shows mixed results as in the case of developed countries. The empirical evidence is mainly focused on Brazil, but there are some studies for Mexico, Costa Rica, Honduras, Colombia and Ecuador. In this sense, the comparison between studies is challenging due to different estimation strategies, data sources, identification strategies, data period among others, but also plays a key role, the specific context of each country and the effective compliance of the minimum wage (Lemos 2009b).

For the Brazilian case, Neumark et al. (2006) evaluate the efficacy of the minimum wage in the income distribution and employment. The study uses the Brazilian Monthly Employment Survey (PME) as a sequence of representative cross-sectional data sets in six metropolitan areas from 1996 to 2001. Also, the minimum wage proxy used in this paper is the proportion of workers below the minimum wage (fraction below<sup>9</sup>). Finally, the main results of this paper find evidence of employment reduction and no evidence of wage compression on average, but they point out positive effects of the minimum wage on the lower percentiles. In fact, these effects concentrate till the 20<sup>th</sup> percentile when the formal and informal sector are combined, but it changes when the sample is restricted to the formal sector where the positive results concentrate till the 10<sup>th</sup> percentile.

On the other hand, Lemos (2009) estimates the effects of the minimum wage on employment and wages in Brazil. The author uses panel data technique on the PME between January 1995 and December 2004. Moreover, the study uses the proportion of workers in a narrow band close to the minimum wage (fraction at) to identify the effects of the minimum wage. Finally, the main results illustrate a wage compression (positive wage effect) for both the informal and formal sector. Additionally, this research does not find evidence of negative employment effects in both sector.

In Colombia, Maloney and Nuñez (2004) examine the effects of the minimum wage on wages and the probability of becoming unemployed. The authors use a panel data from the National Households Survey (ENH) between 1997 and 1999. They use the real minimum wage for identifying the effects of minimum wages on the mentioned outcomes. In this sense, they find a relevant effect of the minimum wage of the wages distribution, especially close to the minimum wage. Regarding employment, the authors find that an increase in the minimum wage has an important effect on the probability of being unemployed.

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<sup>9</sup> For a better explanation of the fraction below see section 5.2

For the Mexican case, Bosch and Manacorda (2010) analyse the role of the minimum wage on the growth in inequality between 1989 and 2001. This paper uses the National Urban Employment Survey (ENEU) and creates a municipality panel data of the 63 larger municipalities that constantly had been present on the sample among from 1989 to 2001. The identification strategy is based on the logarithm of the nominal minimum wage. In terms of findings, the minimum wage had created a floor of wages earned, and it had a spillover effect that impacts the wage distribution but also affected the percentiles above the minimum wage. Additionally, they find that the erosion of the minimum wage contributes strongly to the increase of the wages inequality in Mexico.

Finally, for the Ecuadorian case, the literature available is limited. In this sense, Kristensen and Cunningham (2006) examine the effect of the minimum wage on the distribution of wages using Kernel Density plots and Cumulative density functions. The paper uses the 1998 Labour Force Survey, and they plot the log of the 1998 minimum wage. The study finds a not clear effect on the formal wage distribution, but this seems more accurate for low skilled workers. Furthermore, Canelas (2014) analyses the effects of a change in the minimum wage on the formality and informality rate, and on the level of wages. This research uses a provincial panel data based on the National Employment, Underemployment and Unemployment Survey (ENEMDU) from 2002 to 2012. In this context, the author finds that the minimum wage has a small, but positive effect of the wage distribution and non-negative effects on employment.

#### **4.2.2 Minimum wages and underemployment**

As it was seen in Figure 4, the unemployment rate in Ecuador has been stable at levels of 5% in the last ten years. This creates an interesting panorama regarding the minimum wage literature due to increases in the minimum wage in the net aggregate do not lead to an increase of unemployment. Hence, this research complement the analysis with indicators that consider the labour conditions of workers, so the underemployment rate is a plausible option.

In this context, underemployment is considered as an underutilization of the capacities of the labour employed people due to they are not using the resources as efficiently and productively as possible (ILO 2017). In other words, an underemployed is a person who has a deficit on incomes or worked hours, and it is willing and available for working more hours.

In Ecuador, the thresholds are given by the Labour Legislation, so it is considered underemployed a person who earns monthly less than the legal minimum wage or works less

than 40 hours per week, and they are willing and available for working more hours (INEC 2014b). In this sense, the Ecuadorian underemployment rate gathers three groups: underemployed by income, underemployed by hours and underemployed by hours and income. These groups could make challenging the interpretation of the effects of the minimum wage on underemployment due to the income part of the concept is linked to the minimum wage. However, it will be used as a whole due to this is the official definition that is monitored by the Ecuadorian policymakers.

Regarding empirical evidence, the literature tends to link the number of hours worked as a proxy of underemployment, so there is scarce evidence of minimum wages using underemployment directly as an outcome. Hence, this section examines on developing countries the main empirical evidence of the effects of minimum wages on labour hours worked.

For the Indonesian case, Pratomo (2014) analyses the effects of the minimum wage on hours worked of paid employment using a pooled cross-section time-series data of the Indonesian Labour Force Survey (Sakernas). Moreover, the study uses the log of the real minimum wage as identification strategy of the minimum wage effects. The main finding of this research is that an increase in the minimum wage increases the hours worked.

In Costa Rica, Gindling and Terrell (2007) test the effects of the minimum wage on employment and hours worked using the Costa Rican Household Surveys for Multiple Purposes (HSMPs). Afterwards, the authors create a cross section/time series data (pooled cross-section) from 1988 to 2000. Moreover, the main explanatory variable of this study is the log the real minimum wage. The main findings are an increase of 10% on the minimum wage had negative effects in hours and employment in the covered sector.

### **4.2.3 Minimum wages and poverty**

The relevance of the minimum wage on poverty reduction is through its importance in the labour market. The minimum wage compresses the labour income distribution due to its lighthouse effects. This compression helps especially those who are at the lower section of the distribution, so an increase in their labour income is expected to increase their household income per capita income which is the welfare variable used to measure poverty and inequality. The literature review of the effects of minimum wages on poverty will focus mainly on evidence from Latin America countries.

In a cross-national study of developing countries, Lustig and McLeod (1996) analyse the effects of minimum wages on poverty. This research relies on cross-section data from 22

countries from Latin America, Asia and Africa with comparable indicators of poverty, minimum wage among others compiled by the World Bank and ILO. It is used as a main explanatory variable the real minimum wage. The results show that there is an inverse relationship between minimum wage and poverty. This statement only holds if the increase in the minimum wage, increase the wages of the uncovered sector. Finally, it holds if the net effect is positive, who gains from the increase in the minimum wage are larger than who lose.

In Honduras, Gindling and Terrell (2010) examine if the minimum wage is a good anti-poverty tool. The paper uses pooled data of the Permanent Household Surveys for Multiple Purposes from 2001 to 2004. Moreover, they use the log of the real hourly minimum wage as a main dependent variable. They find that increases in the minimum wage drop poverty and extreme poverty, but the impact is most concentrated in households that their members work in large-scale firms and the formal sector. In sectors where is not compliance with the minimum wage policy, there are no effects on poverty reduction.

For the Nicaraguan case, Alaniz et al. (2011) examine the effects of minimum wages on the transitions into and out poverty. They use an annual panel data of households and individuals from 1998 to 2006. Regarding the minimum wage variable, they include in the model the variation of the log real minimum wage between period  $t$  and  $t+1$ . Finally, the main findings are: an increase of the minimum wage increases the probability that a low-income family with workers will be pushed out from their poor situation; an increment of the minimum wage increase the likelihood of poverty reduction and positive social transition.

For the Ecuadorian case, there is not a specific research about minimum wages and poverty, but there are studies about the poverty reduction path and its determinants. For example, Atuesta et al. (2016) examine which the drivers are of poverty and inequality reduction between 2006 and 2014. They use the Living Standard Conditions Surveys of 2006 and 2014. As the main method, they apply a Shapley decomposition for analysing the contribution of different income sources on the poverty reduction path. As results, they show the key role of the labour income on the poverty reduction of Ecuador. In this sense, this paper highlights the role of the minimum wage of boosting the labour income, but they do not formally test.



## Chapter 5 Data, variables and statistics

### 5.1 Data

This research is based mainly on the National Surveys of Employment, Underemployment and Unemployment of Ecuador, Encuesta Nacional de Empleo, Desempleo y Subempleo (ENEMDU) that are collected quarterly by the National Institute of Statistics and Census of Ecuador (INEC). The representativeness of this survey is national, urban and rural areas, provincial and five main cities (Quito, Guayaquil, Cuenca, Machala y Ambato). The sample design of this survey was updated in September 2013 with the final results and cartography of the 2010 Census of population and housing. The sampling design of ENEMDU's survey is elaborated as two stages probabilistic sample. In this sense, the primary sampling units (PSU) is the census sector that gathered dwellings with similar observable characteristics, and the secondary units of sampling (SUS) are the dwellings within the PSU. The PSUs were probabilistic selected as a proportion to the total number of the dwellings of a geographical unit. It is important to highlight that within the SUS there are chosen 12 occupied dwellings (INEC 2013). Moreover, the sample size of the December's ENEMDU was 21,768 households between 2007 and 2013. Afterwards, since December 2014 the ENEMDU's sample size increased to 31,092 household's (INEC 2013). For this research, the surveys conducted in December of each year (2007 and 2016) are used to create a pooled cross-section dataset. The surveys of Decembers are random samples which allow as to obtain an independently pooled cross-section. This technique is applied for two purposes: increasing the sample size and precision of the estimations, and examining the dynamics of the minimum wage over the outcomes of this research in the last ten years.

Additionally, relying on the pooled cross-section dataset of ENEMDU's 2007 – 2016, a province-level panel data will be created. This panel consists of 15 provinces<sup>10</sup> and the Amazon region as a whole. In this sense, 16 cross-section units are followed over ten periods of time. For balancing the panel, the information of Galápagos that was only available since 2014 was dropped from the dataset. The panel data from these surveys will be used as a robustness test to compare with the results of the pooled cross-section dataset and the effect of using different proxies of the minimum wage.

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<sup>10</sup> In 2007, two new provinces were created: Santo Domingo de los Tsáchilas and Santa Elena. This process changed the political administrative division of Ecuador and also the representativeness of the ENEMDU. In this sense, the for comparability purposes the provinces of Santo Domingo and Santa Elena were added to their past provinces Pichincha and Guayas respectively.

## 5.2 Identification of the minimum wage effect

In this section, it will be reviewed the different approaches that are available in the literature to measure minimum wages effects. As was mentioned in section 3 (Minimum wage in Ecuador), the minimum wage is established at a national level, so proxies of the minimum wage which display temporal and geographical variation need to be used to identify the effect of the minimum wage on outcomes of interest.

There are two types of groups of minimum wages proxies: “relative minimum wage measures” and “degree of impact measures”. The first group includes variables such as the real minimum wage and the “Kaitz index”. On the other hand, the “degree of impact measures” gather the following variables: “fraction affected”, “fraction below” and ‘fraction at’ (Lemos 2009a). These variables analyse directly the workers that are affected by an increase in the minimum wage in different sections of the wage distribution. The next part of this section will be used to explore more deeply the different proxies for the minimum wage.

The variable that will be used as a proxy for the minimum wage on this research is the ‘fraction at’. In this sense, it will be discussed why it is a better proxy variable of minimum wage considering the literature review and characteristics of Ecuadorian labour market. First, the ‘fraction at’ is the proportion of workers that are in a narrowband close to the minimum wage, and it is considered a proxy of the effectiveness of the increase in the minimum wage (Lemos 2009a). In other words, the fraction at population is the most likely to be affected by an increase of the minimum wage due to the population within other sections (above or below) of the wage distribution are heterogeneous, so effects of the minimum wage are not clear. In labour markets that have a national minimum wage policy, there is a spike in the wage distribution at the minimum wage position. Hence, as larger the spike is, it will be higher the effect of the minimum wage over the wage distribution (Dolado et al. 1996). Additionally, a spike in both sectors formal and informal implies that in practice the minimum wage is paid in both sectors regardless the non-compliance in the informal sector (Lemos 2009b). Second, even though the minimum wage is settled at the national level, the ‘fraction at’ or proportion of workers that earn the minimum wage differs across time, provinces, and across the formal and informal sector.

In practice, the fraction at proxy also includes a narrowband close to the minimum wage for correcting identification issues due to measurement errors in the recollection of incomes on household’s surveys. There is no agreement in the literature about how wide the narrowband could be. For this research, the fraction at population will be defined as  $0.95mw \leq mw \leq 1.05mw$ . The exact manner in which the ‘fraction at’ variable enters an econometric model depends on the unit of analysis of the data. If the data are at the individual level, it will be a dummy variable

that takes the value of 1 if the individual's labour income is within the minimum wage's narrow band, and a value of 0 otherwise. If the analysis is at an aggregated level such as regional or province, the 'fraction at' is the proportion of people that lie in the neighbourhood of the minimum wage. For this research, we use both forms of the 'fraction at' variable.

One of the most used proxy variables in the literature is the Kaitz index which is the ratio between the nominal minimum wage and the average wage of the distribution. Commonly, this index is adjusted by the affected minimum wage population (Kaitz 1970). In countries where there is a nationally established minimum wage as in the Ecuadorian case, the Kaitz index will be much higher for the less skilled workers than for more skilled workers as the numerator is the nominal minimum wage. There are some important characteristics of this indicator such as it captures full spillover effects over the wage's distribution (Lemos 2009a). Additionally, the Kaitz index is capable of identifying the effects of a minimum wage change even though it does not take on consideration directly the taxes paid by employers and workers (Dolado et al. 1996). Furthermore, there are some limitations on using the Kaitz index that is described in the literature. First, it is expected that a rise in the minimum wage will affect the average wage. Nevertheless, if the increases in the minimum wage are exactly corresponding with the increase in the average wages, the Kaitz index will not change. Second, the Kaitz index only shows the effects of the minimum wage on the structure of wages, but it does not consider the wage costs due to the increase in the minimum wage. Finally, the Kaitz index could underestimate the impact of the minimum wage where social protection benefits are present and provide another wage floor (Dolado et al. 1996)

Another proxy used for the minimum wage is the "fraction affected" which was introduced by (Card 1992) and it is referred to workers that would be affected by a minimum wage increase. In other words, this population is the gap between those affected by the old and the new minimum wage. The main limitation of this variable is that if there is no increase in the minimum wage, this indicator will be zero. In this sense, this indicator only captures limited spillovers effects within the distribution (Lemos 2009a), so this proxy measures the potential effect of the increase in the minimum wage.

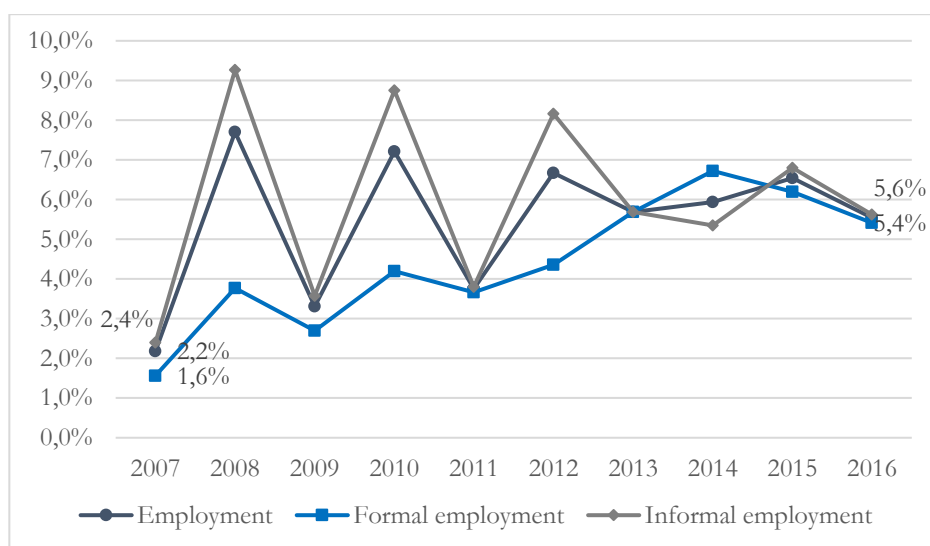
The last variable analysed is the "fraction below" which is defined as the population that earns below the minimum wage. An increase in the minimum wage should rise the workers below the minimum wage (Neumark et al. 2006). In other words, as higher the increase in the minimum wage, more workers will be below the minimum wage. Thus, the "fraction below" changes with the increase in the minimum wage and it is a measure of the non-compliance with the minimum wage policy (Lemos 2009a)

### 5.3 Minimum wage and the ‘fraction at’ variable

This section aims to analyse more deeply the fraction at a variable which is the proxy variable of the minimum wage that will be used in this research and link it with the compliance or non-compliance with the minimum wage in Ecuador. After that, it will be examined the direct relationship between the minimum wage and the fraction at variable.

First, Figure 11, illustrates the evolution of the fraction at variable between 2007 and 2016. The results are presented for three groups: total employment, formal and informal employment. In this sense, the fraction at, in the formal sector has increased by 3.2 p.p. between 2007 and 2016 showing an upwards trend. Since 2015, formal employment at the fraction at has reduced. It is important to highlight, that the informal employment series follows the same pattern of the total employment due to the majority of workers within the fraction at population are informal employed (Appendix 3). On average the informal employed has represented 70% of the fraction at’s population between 2007 and 2016, so this reinforces the statement that **in practice the minimum wage is paid in the informal sector despite the non-compliance**. Regarding the total employment, it is observed that the rate has a volatile trend from 2007 to 2016, but particularly between 2007 and 2012. Moreover, the three groups tend to converge at the end of the period. This variation will be exploited to test the effects of the minimum wages on the outcomes of this research.

Figure 11: Evolution of the fraction at variable 2007 - 2016



Source: Author calculation using (INEC 2017a)

Furthermore, Table 6 presents selected statistics for two groups of interest: the fraction at and the fraction below. This table aims to clearly observe that the population within the fraction at is in better off conditions than the fraction below population. Hence, it reinforces the idea that the minimum wage, in fact, is a differentiator regarding observable characteristics. In general terms, the fraction at population is under better conditions than the fraction below. For example, the poverty rate of the fraction population is 23 p.p. lower than the fraction below; the underemployment is 20 p.p. less rather than the fraction below. Additionally, the fraction at on average earns more than the fraction below, and the number of labour worked hours is higher in the fraction at population. The fraction at is characterized by paid-employed workers (71%), and the main economic activities in the fraction at are the wholesale and retail trade (20%) and agriculture, forestry and fishing (21%). The last column is a mean's comparison test between observable characteristics of these two groups, and the p-value is lower than its critical value, so it means that the difference is statically significant.

**Table 6: Selected statistics of the fraction at variable**

Variables	Fraction below ( <i>fb</i> )		Fraction at ( <i>fa</i> )		$H_0: \bar{X}_{fa} = \bar{X}_{fb}$
	Mean	SD	Mean	SD	P-value
Poverty rate	0.37	0.48	0.14	0.35	0.00
Underemployment rate	0.31	0.46	0.1	0.3	0.00
Worked hours	35.33	15.98	44.26	11.88	0.00
Labour income	136.85	83.64	288.78	62.13	0.00
Paid-employment	0.4	0.49	0.71	0.45	0.00
Self-employment	0.56	0.5	0.24	0.43	0.00
Private-employment	0.39	0.49	0.69	0.46	0.00
Public-employment	0.01	0.09	0.03	0.16	0.00
Agriculture, forestry and fishing	0.38	0.48	0.21	0.41	0.00
Manufacturing	0.1	0.3	0.14	0.35	0.00
Wholesale and retail trade	0.2	0.4	0.20	0.4	0.00
Construction	0.06	0.23	0.11	0.32	0.00
Income perceptors	2.09	1.12	2.19	1.13	0.00

Source: Author calculation using (INEC 2017a)

Second, it is important to highlight that all the measures presented in the last section are proxies of the minimum wage, for this reason, their interpretation on the effect of different outcomes has to be analysed carefully due to the elasticity between the minimum wage, and these

indicators are not equal to one. Hence, a 1% increase in the minimum wage cannot be interpreted as a 1% increase of these variables (Lemos 2009a).

For policy-making decision, it is fundamental to calibrate the results to express them in term of % change and understand the impact of the minimum wage on the fraction at variable. In this sense, the literature of degree of impact measures of the minimum wage tackles this issue calculating the elasticity of the minimum wage and the fraction at variable. The elasticity allows knowing the sensitivity of the fraction when the nominal minimum wage increases. In this context, Table 7 presents the elasticity between the real minimum wage and the fraction  $\mathcal{E}(F/RMW)$  which has been volatile between 2007 and 2016. In fact, the relationship between these two variables has different signs depending on the year of analysis. For example, between the period 2007 and 2008, the elasticity was 32.4%, this means that a 1% increases in the minimum wage increments 32.4% the fraction at population. It is important to highlight, that the elasticity of 2007 and 2008 is the most sensitive change in the period due to the minimum wage also experimented its highest increase (7.8%). After that, the real minimum wage presents a slower growth rate. Finally, on average, **the elasticity between 2007 and 2016 is 5.4%** which is the elasticity that is used for calibrating the results of the models that will be presented in section 6.

**Table 7: Elasticity between minimum wage and the fraction at indicator**

Period	Minimum wage	Real minimum wage	Var. real minimum wage	Fraction at	$\mathcal{E}(F/RMW)$
2007	170.00	245		0.02	
2008	200.00	264	7.8%	0.08	32.4%
2009	218.00	277	4.8%	0.03	-12.0%
2010	240.00	295	6.5%	0.07	18.4%
2011	264.00	307	4.2%	0.04	-11.3%
2012	292.00	324	5.6%	0.07	13.8%
2013	318.00	345	6.5%	0.06	-2.3%
2014	340.00	356	3.0%	0.06	1.5%
2015	354.00	358	0.7%	0.07	15.0%
2016	366.00	367	2.3%	0.06	-6.6%

Source: Author calculation using (INEC 2017a)

## 5.4 Descriptive statistics

Table 8 presents selected statistics by three groups: total employment; formal and informal employment. These groups will be part of our estimation strategy. In general terms, our main outcomes: underemployment, labour income and poverty differ across the three groups. As it is expected, the formal employed are under better conditions compared with the informal employed. For example, the poverty rate (-26 p.p.), underemployment (-17 p.p.), labour worked hours (+ 7 hours) and labour income (+ US\$ 430).

Regarding economic activities, the differences are important. Meanwhile, agriculture, foresting and fishing (37%) is the most representative activity within the informal employed; wholesale and retail trade (20%) concentrate the majority of formal employed. These results are strongly linked with the weight of the area of residence for each one of the groups. Indeed, it is possible to observe that formal employed is an urban phenomenon (84%) instead informal employed is more balance between urban (57%) and rural area (43%). Moreover, it is observed that paid-employed (73%) is a strong characteristic of formal employment. This pattern is not so clear in the informal employment where paid-employment concentrates the 40% and self-employment the 42%.

Regarding, socio-demographic characteristic, it is interesting that women participation is balanced between formal (39%) and informal employment (40%). Furthermore, in the informal employed, the elderly group is higher than the formal employed by five p.p. In contrast, in the formal employed, the population between 30 and 44 years old is bigger by nine p.p. compared with the informal employed. Another important difference between these two groups is the level of education, high-education (42%) concentrates the majority of workers on the formal employed. On the contrary, and informal employed education level is concentrated in basic education (61%).

**Table 8: Descriptive statistics by informality**



Variables	Total employment		Informal employment		Formal employment	
	Mean	SD <sup>1</sup>	Mean	SD <sup>1</sup>	Mean	SD <sup>1</sup>
Fraction at minimum wage	0.05	0.23	0.06	0.24	0.05	0.21
Fraction below minimum wage	0.38	0.49	0.54	0.5	0.11	0.31
Poverty	0.22	0.41	0.31	0.46	0.05	0.22
Underemployment rate	0.15	0.36	0.21	0.41	0.04	0.19
Worked hours (per week)	40.53	15.31	37.85	16.26	45.23	12.13
Labour income (monthly)	409.51	651.7	237.3	279.48	667.26	912.51
Paid-employment	0.52	0.5	0.4	0.49	0.73	0.44
Self-employment	0.36	0.48	0.42	0.49	0.25	0.43
Private-employment	0.43	0.5	0.39	0.49	0.5	0.5
Public-employment	0.09	0.29	0.01	0.09	0.23	0.42
Agriculture, forestry and fishing	0.27	0.44	0.37	0.48	0.08	0.27
Manufacturing	0.11	0.31	0.1	0.3	0.13	0.34
Wholesale and retail trade	0.19	0.39	0.19	0.39	0.2	0.4
Construction	0.07	0.25	0.09	0.29	0.03	0.18
area	0.67	0.47	0.57	0.5	0.84	0.36
Sex	0.4	0.49	0.4	0.49	0.39	0.49
Age	40.37	15.17	40.42	16.37	40.27	12.8
Years of schooling	9.25	4.83	7.57	4.23	12.18	4.4
None	0.04	0.21	0.07	0.25	0.01	0.08
Basic education	0.48	0.5	0.61	0.49	0.26	0.44
Middle education	0.26	0.44	0.24	0.43	0.31	0.46
High education	0.21	0.41	0.09	0.28	0.42	0.49
15 - 19 years old	0.03	0.16	0.04	0.2	0	0.03
18 - 29 years old	0.26	0.44	0.27	0.44	0.24	0.43
30 - 44 years old	0.34	0.47	0.31	0.46	0.4	0.49
45 - 64 years old	0.3	0.46	0.29	0.45	0.33	0.47
65 and above	0.07	0.26	0.09	0.29	0.04	0.19
Household size	4.52	2.15	4.66	2.31	4.26	1.83
Income perceptors	2.08	1.08	2.08	1.12	2.07	1.02
Relation between income perceptors and	2.46	1.37	2.53	1.44	2.35	1.24

1. Standard deviation

Source: Author calculation using (INEC 2017a)

## Chapter 6 Estimation strategy and results

### 6.1 Estimation strategy

As was mentioned in section 1, this research aims to set out the effects of the minimum wage policy on three different outcomes: underemployment, labour income and poverty. For each one of the outcomes, different estimation strategies and models will be adopted to ensure identification of the minimum wage effect. In this sense, the estimation strategy for the labour outcomes: underemployment and labour income will be calculated relying on the model proposed by Lemos (2009). Furthermore, the poverty model relies on the following papers: Gindling and Terrell (2010), Atuesta et al. (2016), and Castillo and Santacruz (2015). Also, the estimations will be calculated separately for the informal employment and formal employment.

Regarding the estimation strategy, for the case of the underemployment rate and the poverty headcount, a probit model will be used, where the outcome variable is the probability of change due to an increase of the minimum wage. On the other hand, the estimation strategy for analysing the effects of the minimum wage on labour incomes during 2007 and 2016 will be analysed by two approaches: ordinary least squares (OLS) and quantile regression techniques. The labour income is transformed in its natural logarithm. Afterwards, the results of the two approaches will be contrasted. The OLS estimation will be used for analysing the changes in income on average of an increase in the minimum wage. The model for the three outcomes can be formalised as follows:

$$Y [I, Z, U]_i = \alpha + \gamma F_i + \gamma A_i + \beta X_i + T_t + P_p + \epsilon_{pt} \quad [1]$$

Where,  $Y [I, Z, U]_i$ , will be labour income, the poverty headcount and the underemployment rate. Additionally,  $F_i$ , is a dummy variable which takes the value of 1 for the ‘fraction at’ population and zero for the population below and above the minimum wage. For a better interpretations of the results, it is included as control variable, the fraction above of the minimum wage ( $A_i$ ). In this sense, the group of reference of the fraction at population will be the fraction below. Indeed, both groups are the most likely to be affected by an increase in the minimum wage. Furthermore,  $X_i$  is a vector of individuals and households characteristics (for labour outcomes these variables are considered labour supply shifters) such as worked hours, sex, area, age, level of education, status in employment (public employed, private employed and self-employed), economic activities (agriculture, manufacturing and trade). These controls are in line with those used by relevant studies (Lemos 2009b, Brown 1999, Card and Krueger 1995). Additionally, this vector of individual and household’s characteristics will include different

interactions terms for each one of the outcome variables (underemployment rate<sup>11</sup>, labour income and poverty headcount<sup>12</sup>). Moreover,  $T_t$  includes 9 years dummies to control for structural changes on time, and  $P_p$  are 24 provinces dummies for controlling structural changes over provinces. Finally,  $\epsilon_{pt}$  is the error term.

As was mentioned before, the estimation strategy for the labour income will consist of two approaches: the OLS and quantile regression techniques. In this sense, equation 1 only specified the OLS approach. For this reason, it is important to develop more about the quantile regression and specified the model that will be used. The quantile regressions will allow us to analyse the effect of the minimum wage on different sections of the labour income distribution. As is well-established in the literature the quantiles regressions techniques offer some advantages over OLS estimations. First, it permits an exploration of heteroscedasticity and an exploration of the shape of the conditional distribution in more detail (Deaton 1997). Second, it is important to remember that the OLS estimation is based on minimising the sum of squared residuals while quantiles regressions are based on minimising the absolute sum of the residuals (Bedi and Edwards 2002). Therefore, quantile regressions are less sensitive to outliers.

The quantiles regression will be adapted from (Bedi and Edwards 2002) can be formalized as follows:

$$Y_{\theta}(w|z) = \alpha_{\theta} + z' \beta_{\theta} + \epsilon_{\theta} \quad [2]$$

Where,  $Y_{\theta}(w|z)$  for  $\theta \in (0,1)$  is the  $\theta_{th}$  quantile of the distribution of the natural logarithm of the labour income, given a vector  $z'$ , of explanatory variables. Furthermore,  $\beta_{\theta}$  is a vector of coefficient for each one of the percentile calculated. The vector  $z'$  of covariates included the same variables that were used for the OLS specification. Finally,  $\epsilon_{\theta}$  is a random error term.

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<sup>11</sup> For the underemployment rate the model will include the following interaction terms: urban area and trade;

<sup>12</sup> In terms of the poverty headcount, the model will include the following interactions terms: urban area and trade, rural area and agriculture, agriculture and gender.

## 6.2 Results

### 6.2.1 Minimum wage and the labour income – distributional analysis

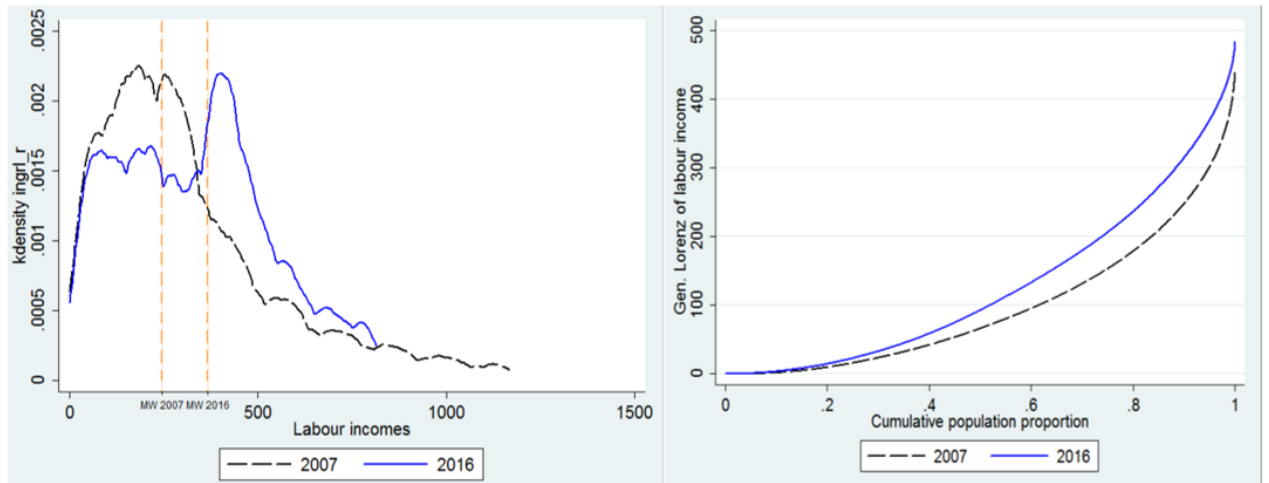
Labour income represents on average 86% of the total individual income of Ecuador (Appendix 4). Hence, the performance of labour income will have a strong impact on the total individual income, household income and finally in the per capita income that is the welfare variable used to measure poverty and inequality. For this reason, it is relevant to analyse the labour income behaviour broadly in the last ten years.

In this sense, Figure 10 presents two graphs, the labour income distributions in 2007 and 2016 (left-hand graph), and the generalized Lorenz curve of labour income (right-hand graph). As can be seen in the left-hand graph, the 2007's distribution (dash line) presents a well-defined asymptotic to the left distribution, meaning that more people are earning in the left of the distribution or low-income percentiles. In contrast, the 2016's distribution (blue line) has moved its mean to the right of the distribution (growth effect), and it also presents a more compressed shape compared with the 2007's distribution (redistribution). In other words, the 2016's distribution presents characteristics of a more egalitarian distribution than 2007's distribution, but to conclude if the 2016 distribution dominates 2007's distribution a deeper analysis has to be done. For this reason, the right-hand graph of Figure 12 presents the generalized Lorenz curve of labour income for 2007 and 2016. Hence, the 2016 distribution is above the 2007 distribution, so it is possible to say that the 2016's labour income distribution is unequivocally more egalitarian than in 2007. These results are in line with INEC (2017) which using administrative records of the Social Security Institute find a decline in salaries inequality.

Furthermore, the left-hand graph of Figure 12 includes the minimum wages of 2007 and 2016 in real terms (orange lines). In this sense, both distributions (2007 and 2016) present a spike close to the minimum wages that can be interpreted as the level of compliance with the minimum wage. Additionally, in the 2007 distribution, the minimum wage (US\$245) is to the left of the mean (US\$ 425). As a result, an important group of workers (37.7%) earned on average less than the legal minimum wage and a 2.2% of workers are earning close to the minimum wage (fraction at). In contrast, in the 2016's distribution, it can be seen that the minimum wage (US\$ 367) is closer to labour income mean (US\$ 483), so both groups: fraction below and fraction at has increased to 39.1% and 5.5% respectively. It is important to highlight that the compression process of the labour income distribution happened

between 2007 and 2010 (Appendix 5) when it was registered an important increase of the fraction at population as can be seen in Table 7.

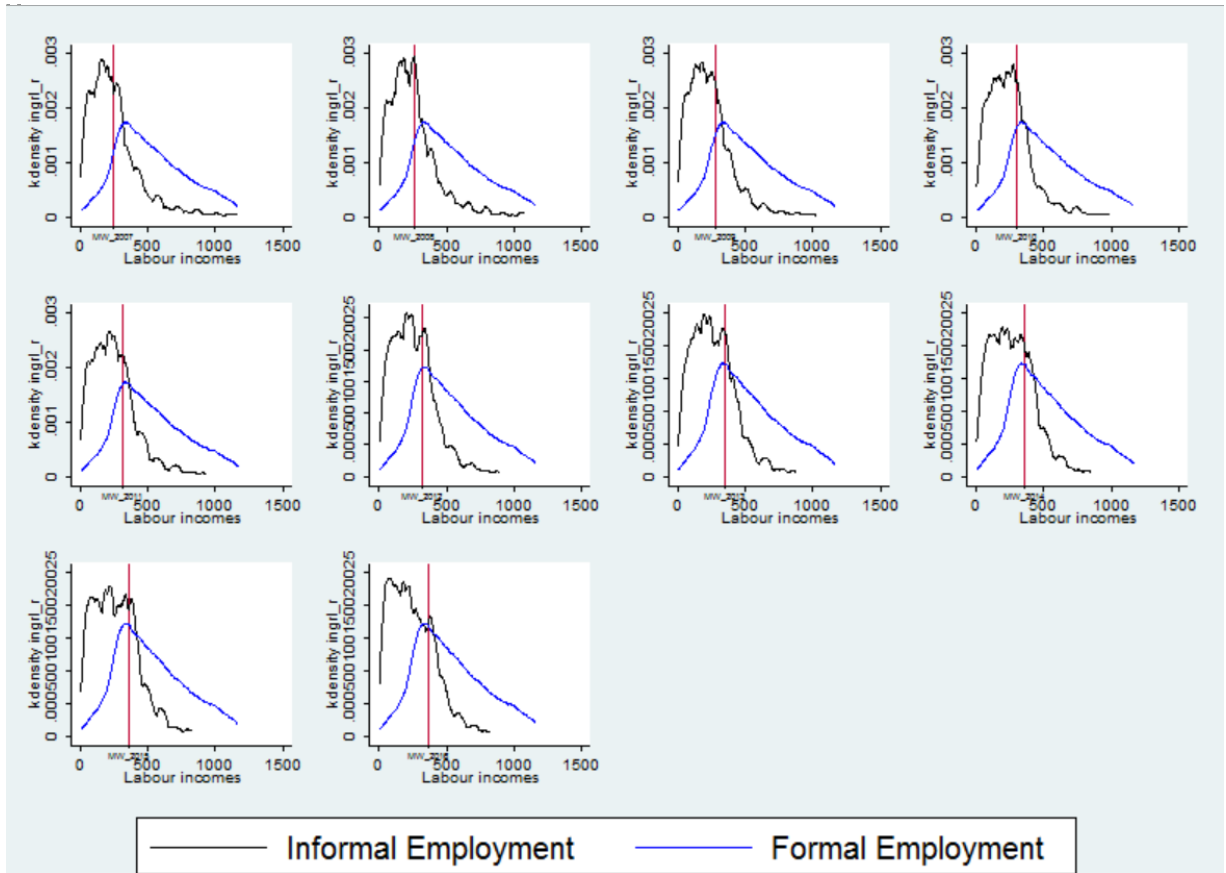
**Figure 12: Distribution of real labour income. US\$ Dec.-16**



Source: Author calculation using (INEC 2017a)

Figure 13, presents ten graphs one for each year between 2007 and 2016, where the kernel distributions of the labour income for the formal employment and informal employment are plotted. Additionally, it is included the legal minimum wage of each year to analyse that if it is paid or not on the informal employment. In general terms, a sizeable spike is observed at the minimum wage level on the covered and uncovered sector; this reflects compliance of the minimum wage also on the informal employment even though it is not compulsory. The non-compulsory compliance shows that expectations of informal workers play a key role in terms of determining their salaries. The formal employment distribution in all graphs is always at the right of the informal employment distribution meaning that on average the labour income in the formal employment is higher than in the informal employment as it can be seen in Table 2. The spike close to the minimum wage population on informal employment was clearly seen between 2007 and 2012 where it was a higher variability of the fraction at variable (Figure 11). After that, the minimum wage moves to the right of the spike, so the non-compliance of the minimum wage increased in the informal sector.

Figure 13: Compliance of the minimum wage by sector. US\$ dic-2016



Source: Author calculation using (INEC 2017a)

## 6.2.2 Effects of the minimum wage policy – regression analysis

### 6.2.2.1 Minimum wage and the compression of the labour income distribution

One of the main puzzles of this research is to understand the role of the minimum wage on the compression of the labour income distribution and its effect on the lowest percentiles of

the labour income distribution which is strongly related to poverty. The compression of the labour income distribution, between 2007 and 2016 was observed in Figure 12. In this sense, it is relevant to find evidence if the minimum wage policy applied in Ecuador during the last decade contributed to the compression of the labour income distribution and to know if the effect is over the entire distribution or only at a particular segment.

Table 9 shows the effects of the minimum wage on the labour income distribution. As it was mentioned in section 6.1.2 (estimation strategy), for answering this question, two approaches are used. In a first step, it was run an OLS model (column 1) to obtain the average effect of the minimum wage on labour income. Moreover, as it is well-known the effect of the minimum wage is not constant all over the distribution, so quantile regressions were estimated to obtain the effect of the minimum wage on selected percentiles of the distribution. For testing the sensitivity of the coefficients from different samples, Table 9 is divided into three panels: A, total employment; B, informal employment; and C, formal employment. From column 2 to column 6 are presented the results for the percentile 10, 25, 50 (median), 75 and 90 respectively.

Furthermore, Panel A shows the results of the total employment which are controlled by informal employment and the rest of supply shifters specified in Table 9. In this sense, it is observed that the effect of the minimum wage on labour income is positive until the 50<sup>th</sup> percentile. The average effect (column 1) shows that those in the fraction at experience an approximately 64% increase in their labour income as compared to those who are below the minimum wage. This result is statically significant at the 99% level of confidence. Moreover, the median effect (column 4) is approximately 54% and is lower than the mean effect by almost ten percentage points. It is important to highlight that the biggest effect is at the lowest percentiles 10 (column 2) and 25 (column 3). In other words, this shows evidence that the minimum wage policy increased the income of the low-income population and the poor's and might be a channel for the poverty reduction observed in Ecuador among 2007 and 2016.

Panel B presents the results of informal employment, which are similar to the results observed for the total employment in panel A. It is important to note that the effects are bigger on the lower-income percentiles. In this same line, there is a positive effect of the minimum wage on the labour income of the informal employed. The mean effect shows that the fraction at labour income is 65% above the labour income of the population below the minimum wage. Meanwhile, the median effect is 23.4%. As it was observed in Panel A, the biggest effect is on the lowest percentiles.

Finally, panel C presents the results of the formal employment, and it is observed that are similarly to the results obtained for total employment and informal employment, but the effects are higher in this population. This was expected due to the higher compliance of the minimum wage in this sector as it was illustrated in Figure 13. These results are statistically

significant at the 99% level of confidence. It is important to highlight, that the results are bigger in the percentile 10 and 25.

**Table 9: Effects of minimum wage on labour income 2007-2016**

	Mean (OLS)	P10	P25	P50	P75	P90
Ln Labour income	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A : Total sample</b> (N= 324,860)						
Fraction at minimum wage	0.6438*** (0.0039)	1.4356*** (0.0081)	0.8703*** (0.0047)	0.5387*** (0.0029)	0.3594*** (0.0027)	0.2576*** (0.0018)
<b>Panel B : Informal employment</b> (N= 324,860)						
Fraction at minimum wage	0.6512*** (0.0042)	1.2224*** (0.0106)	0.8000*** (0.0044)	0.5400*** (0.0027)	0.3635*** (0.0026)	0.2415*** (0.0020)
<b>Panel C : Formal employment</b> (N= 324,860)						
Fraction at minimum wage	0.7583*** (0.0073)	1.4050*** (0.0200)	0.8550*** (0.0098)	0.5847*** (0.0090)	0.5099*** (0.0090)	0.4874*** (0.0102)
<b>Controls:</b>						
Fraction above minimum wage	Yes	Yes	Yes	Yes	Yes	Yes
Labour supply shifters	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



The empirical evidence presented in Table 9 are partially explained by the theory of the two sector models. As it was mentioned earlier, it was expected an increase of the labour income for the formal and total employment, but the two sector model do not fit with the results on the informal employment. This contradiction between the theory and the empirical evidence can be explained by the assumption that within the informal employment there is not any compliance of the minimum wage. Hence, the wages on the informal employment will drop by an increase in the minimum wage. However, this paper shows clear evidence that in practice there is compliance with the minimum wage policy within the informal employment even though it is not compulsory (Figure 13). The divergences between the empirical evidence of Ecuador and the expected results from a segmented labour market model for the informal sector are also observed in the literature of others developing countries (Bosch and Maloney 2010, Lemos 2009b, Pisani and Pagán 2004).

The main conclusion of the results shown in Table 9 is that this research finds some evidence of a compression of the minimum wage in the income distribution of Ecuador in the period of analysis due to the effect is higher on the lowest percentiles of the distribution. These results are in line with the literature that examines the compressions of the wage distribution by an increase in the minimum wage (Lemos 2009b, Neumark et al. 2006, Maloney and Nuñez 2004, Card and Krueger 1995). Additionally, these results show the same pattern with the income per capita growth incidence curve analysis (Figure 5) where the beneficiaries of the pro poor growth were the people in the lowest percentiles of the distribution. Hence, the increase in labour income in those percentile (10 to 25) creates a direct link with the poverty reduction path analysed in section 2.4.

For robustness purposes, as it was mentioned in section 5.1, a provincial panel data was created to analyse the sensitivity of the 'fraction at' as a proxy variable of the minimum wage and the pool cross section as the main dataset for this research. The results focus on labour income. Furthermore, the estimations of the provincial panel dataset are presented for three samples: total employment, informal employment and formal employment following the same structure used for the results of the pooled cross-section dataset. In this sense, Table 10 shows that in terms of sign, the results for total and informal employment are in line with the observed in Table 9 using the pooled cross-section, but the formal employment present a negative sign. It is important to highlight that the total employment coefficient is not statically significant. Meanwhile the coefficients of informal and formal employment are statistically significant. In Appendix 12 can find the complete table with all the coefficient for these estimations.

**Table 10: Robustness check using a provincial panel dataset 2007-2016**

Ln Labour income	Total employment	Informal employment	Formal employment
	(1)	(2)	(3)
Fraction at	0.0182 (0.6903)	1.5327*** (0.5016)	- 0.6236** (0.2631)
Informal employment	0.1078 (0.3082)	-	-
Individuals characteristics	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Time fixed effects	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Provinces fixed effects	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Finally, as it was mentioned in section 5.3 for policy making understanding of the results in Table 9 has to be calibrated with the elasticity among the minimum wage and the 'fraction at' which is the main covariate variable of this research. The average elasticity between these two variables was 5% between 2007 and 2016. In this sense, a 1% increase in the minimum wage increments the labour income by 0.25 percentage points. In the lower percentiles, this effects are bigger, so for the 10<sup>th</sup> percentile, a 1% increase in the minimum wage represents an increase of 0.5% in the labour income of this population.

#### 6.2.2.2 Poverty reduction a minimum wage story?

The poverty headcount is the second last outcome that will be analyzed in terms of an increase of the minimum wage, but first, it is important to analyse the channel on how the minimum wages helps on the reduction of poverty. As was broadly analyzed in section 2.4, the poverty reduction path that Ecuador presented between 2007 and 2016 is known as pro poor growth due to it was mainly driven by the "redistribution effect" which implies a better income distribution between 2007 and 2016. In this same line, Atuesta et al. (2016) and Rojas and Castillo (2016), has shown the importance and linkages between the performance of the labour market and the reduction of income poverty in Ecuador. In fact, according to Atuesta et al. (2016), the labour income explains more than the 70% of the total reduction of poverty among 2007 and 2016. This result is expected due to the individual income structure of Ecuador in the last ten years. As can be seen in Appendix 4, the labour income represented 85% of the total individual

income, meanwhile incomes like transfers where is allocated the poverty cash transfer program (BDH) weighted in average 6% of the total individual income between 2007 and 2016.

For this reason, the poverty headcount is strongly sensitive to what happens with labour income, so as was seen in Figure 12 and Table 5 the labour income distribution moves to the right in the last ten years, meaning an increase of the mean labour income. Additionally, the labour income distribution was compressed implying a more egalitarian distribution as can be seen in the left-hand graph of Figure 12. These two effects boost per capita income which is the welfare variable used for measuring poverty and inequality. In this sense, the growth and a more egalitarian distribution of the labour income between 2007 and 2016 unequivocally dropped the poverty headcount in the period of analysis.

Table 11 presents the effects of the minimum wage on poverty between 2007 and 2016. The following results are tested with different controls to analyse the sensitivity of the poverty headcount to the covariates. In this sense, column 1 shows the results of the parsimonious model; column 2 shows the estimates controlling for different types of covariates such as individual and households characteristics, years and provinces. Finally, column three uses the same specification of the last model but with an additional control if households receive the poverty cash transfer (BDH) of Ecuador. In general terms, the three specifications have the expected sign that means a poverty reduction in the period of analysis and these results are statistically significant at the 99% level of confidence. These results are in line with the findings on researches in developing countries. (See: Atuesta et al. 2016, Gindling 2014, Alaniz et al. 2011, Lustig and McLeod 1996). For a policy-making understanding of the results in Table 11 has to be calibrated with the elasticity of the minimum wage and the 'fraction at'. In this sense, a 1% increase in the minimum wage reduces the poverty headcount by 0.20 percentage points.

**Table 11: Effects of minimum wage on poverty 2007-2016**

	Total sample (1)	Total sample (2)	Total sample (3)
<b>Poverty headcount</b>			
	-	-	-
Fraction at minimum wage	0.1491*** (0.0035)	0.0420*** (0.0010)	0.0421*** (0.0010)
<b>Informality:</b>			
Informal employment		0.0205*** (0.0014)	0.0204*** (0.0014)
<b>Controls:</b>			
BDH	No	No	Yes

Fraction above minimum wage	No	Yes	Yes
Individual characteristics	No	Yes	Yes
Households characteristics	No	Yes	Yes
Time dummies	No	Yes	Yes
Provincial dummies	No	Yes	Yes
Observations	866,798	323,973	323,973
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

### 6.2.2.3 Minimum wage and employment conditions

The underemployment rate is the last outcome that will be analyzed in terms of an increase of the minimum wage. Table 12 presents the results of the probit marginal effects of the proxy of the minimum wage (fraction at) on the probability to be underemployed with different controls and different samples. Additionally, the models shown from column 2 to column 4 were controlled by individual and household's characteristics; and years and provinces effects. In this sense, column 1 presents the estimations of the parsimonious model as a way to know how sensitive the results are to the controls and different samples. Column 2 presents the results for informal employment, and it shows the fraction at population experiences a reduction in the probability of being underemployed by approximately five percentage points as compared to the fraction below the minimum wage. This result is statically significant at the 99% level of confidence. Additionally, it is observed that in column 2, the coefficient of informal employment is statistically significant at the 99% level of confidence. Comparing the results between column 1 and column 2 it is observed that the coefficient of the fraction at population does not suffer a big change. In Appendix 7, it can be seen the complete Table 12 with all the controls.

Furthermore, columns 3 and 4 present the results of informal and formal employment respectively. In this sense, the coefficients present a similar sign, but different size. These results are statistically significant at the 99% level of confidence. In terms of informal employment, the results show that the fraction at population is 10.8 percentages points less likely to be underemployed as compared to fraction below the minimum wage. Similarly, formal employment shows that the fraction at is 0.7 percentages points less likely for being underemployed than the fraction below. It is important to note that the effects on the informal employment are almost ten percentages point above the formal employment.

The results obtained in Table 12 respond to the particular dynamics of the Ecuadorian labour market between 2007 and 2016, so the expected theoretical results of a segmented labour market are partially in line with the empirical evidence find in this paper. As it was mentioned

earlier, it was expected a decrease of the probability of being underemployed for the formal and total employment, but the two sector model do not fit with the results on the informal employment. The explanation of this divergence follows the same channel that was stipulated with the labour income. Thus, the increments of labour income on the informal employment that was observed in Table 9 will drop the probability of being underemployed.

**Table 12: Effects of minimum wage on underemployment 2007-2016**

	Total employment (Parsimonious model)	Total employment	Informal employment	Formal employment
Underemployment	(1)	(2)	(3)	(4)
	-	-	-	-
Fraction at minimum wage	0.0522*** (0.0028)	0.0506*** (0.0012)	0.1078*** (0.0029)	0.0066*** (0.0005)
<b>Informality:</b>				
Informal employment	0.1729*** (0.0018)	0.0390*** (0.0018)		
<b>Hours:</b>				
Worked hours		- 0.0058*** (0.0001)	- 0.0105*** (0.0001)	- 0.0012*** (0.0000)
<b>Controls:</b>				
Fraction above minimum wage	No	Yes	Yes	Yes
Labour supply shifters	No	Yes	Yes	Yes
Time dummies	No	Yes	Yes	Yes
Provincial dummies	No	Yes	Yes	Yes
Observations	385,130	323,974	202,353	121,621

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Finally, as it was mentioned in section 5.3 for a policy-making understanding of the results in Table 12 has to be calibrated with the elasticity among the minimum wage and the 'fraction at' which is the main covariate variable of this research. The average elasticity between these two variables was 5% between 2007 and 2016. In this sense, a 1% increase in the minimum wage reduces the underemployment in 0.25 percentage points.

## Chapter 7 Conclusions

This research presents empirical evidence of the effects of the minimum wage on three outcomes: labour income, poverty and underemployment using a pooled cross-section dataset from 2007 to 2016. In terms of the estimation strategy, the paper uses different approaches for each one of the intended outcomes. Regarding labour income, we use kernel density plots and Lorenz dominance tests, to assess whether there was a compression in the distribution of income. In order to analyze the effect of minimum wages on labour income distribution we use OLS and quantile regressions. For the measurement of poverty and underemployment, we use a probit model.

The main findings of this paper revolve around the role of the minimum wage on the compression of the labour income distribution and the link with the poverty reduction path that Ecuador has presented among 2007 and 2016. First, this paper shows evidence that the labour income, in Ecuador, has a better distribution between 2007 and 2016. In general terms, the 2016 distribution has moved to the right of the distribution implicating an increase of the labour income mean. In other words, there has been a growth effect of the labour income. Additionally, the 2016 distribution presents a more compressed shape (redistribution effect) than the 2007's distribution (Figure 12), that implicates a better distribution of the labour income. These results are in line with the results obtained by Atuesta et al. (2016) and INEC (2017).

Furthermore, the link between labour income and the minimum wage can be seen graphically in Figure 12 which shows spikes on the labour income distributions (2007 and 2016) close to the minimum wage. Additionally, this research finds evidence that in practice there is compliance of the minimum wage both sectors (Figure 13). Nevertheless, it is not compulsory to pay the minimum wage on the informal employment. There is empirical evidence of this phenomena in other developing countries (Lemos 2009b, Neumark et al. 2006).

In terms of labour income and poverty, this paper presents evidence that the minimum wage has had a positive effect on the labour income distribution. It is important to highlight, that these effects are bigger on the lower-income percentiles, so a clear compression effect is found. The same pattern is observed in the income per capita growth incidence curve (Figure 5) due to the lowest percentiles of the distribution where who gained more of the pro-poor growth. Hence, the increase in labour income in those percentile (10 to 25) creates a direct link with the poverty reduction path. Indeed, this paper suggests evidence that the minimum wage has contributed positively to poverty alleviation among 2007 and 2016.

Moreover, concerning the underemployment rate, this research suggests a positive effect of the minimum wages (negative sign) for the groups of interested: total employment, formal and informal employment. It is important to remember, that this paper focuses on the underemployment due to ex-ante it was analyzed that the unemployment rate has been stable on the period of analysis, so in the net result the increase of the minimum wage has not generated negative employment effects.

Finally, this paper relies on the traditional two-sector model as a theoretical pivot for the empirical analyses. However, the results suggest that the model does not fit accurately the Ecuadorian labour market due to more than the 60% of the total workforce is informal employed. The divergences between the empirical evidence of Ecuador and the segmented labour market are also observed in the literature of others developing countries (Bosch and Maloney 2010, Lemos 2009b, Pisani and Pagán 2004). In this sense, more studies are needed for tackling the contradictions between the theory and the empirical evidence. Additionally, this paper contributes to the available literature of minimum wage and the relationship with the labour market, poverty and inequality in Ecuador and developing countries

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# Appendices

## Appendix 1: Methodology of poverty headcount calculation in Ecuador

The poverty headcount from a theoretical point of view is a function of a poverty line ( $z$ ), the mean income of the distribution ( $u_t$ ) and the Lorenz curve ( $L_t$ ) which shows the structure of relative income inequalities (Datt and Ravallion 1992). The poverty headcount is formalized as follows:

$$P_t = P(z/u_t, L_t)$$

In Ecuador, the component of ( $u_t$ ) is defined by the per capita income that is computed dividing the household's income by the household's members. Additionally, the income poverty line ( $z$ ) is calculated as an update of the consumption poverty line of 2006 using the consumer index price (CPI). The poverty line can be updated as follows:

$$z_t = \alpha_t * z_{(t=2006)}$$

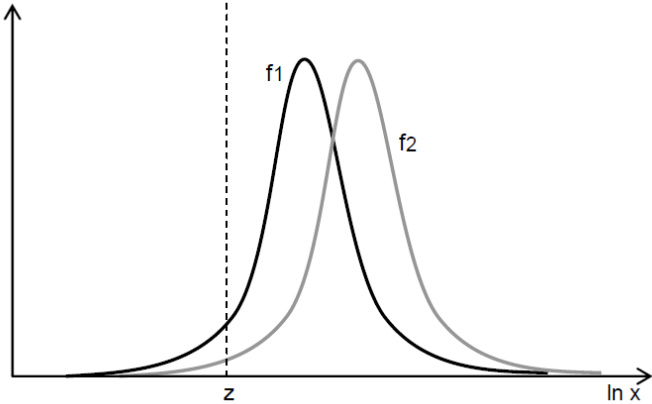
Where  $\alpha_t$  is the adjustment factor using the CPI to update the poverty line from 2006 to the current period  $t$ . Furthermore,  $z_{(t=2006)}$  is the consumption poverty line of 2006 which has a monetary value of US\$56.64.

## Appendix 2: Datt and Ravallion decomposition methodology

The poverty literature of the last 25 years has developed different methodologies that addresses this problematic. In this sense, Datt and Ravallion in 1992, developed a methodology to analyze on an integrated technique the relative contribution of growth and inequality on the changes of the poverty headcount( $P_t$ ). This method consist on decomposing the change of  $P_t$  among the growth and redistribution effects.

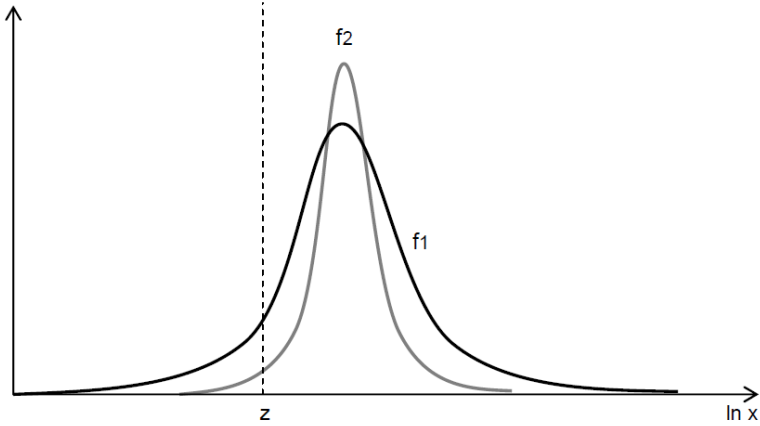
The growth effect, could be defined as a change on the poverty headcount by reason of a change on the mean income of the distribution (Datt and Ravallion 1992). Additionally, this concept could be easier to understand graphically. As can be seen in **¡Error! No se encuentra el origen de la referencia.,**

there are two income distributions graphed as log-normal and the growth effect is represented with the movement from curve f1 to curve f2 as a result of household's incomes grew in a proportional rate without changes in the distributional form given by the Lorenz curve (Gasparini et al. 2013).



Source: (Gasparini et al. 2013: 520)

Furthermore, a change on the Lorenz curve holding constant the mean income of the distribution is defined as redistribution effect (Datt and Ravallion 1992). Likewise with the growth effect, it is possible to graph the redistribution effect. In **¡Error! No se encuentra el origen de la referencia.**, the two income curves (f1 and f2) do not move because the mean of household's income holds without changing. In contrast with the growth effect, the form of f2 changes becoming a more egalitarian income distribution (Gasparini et al. 2013).



Source: (Gasparini et al. 2013: 520)

Afterwards analyzing by separate the growth and redistribution effect, the decomposition method analyzes changes on poverty between periods attributed to these two effect and the jointly contribution of them. Equation 2 formalizes the decomposition as the change on poverty among the period  $t + n$

and period  $t$  is equal to the sum of the growth effect ( $G$ ), redistribution effect ( $D$ ) and the residual ( $R$ ). The reference level ( $r$ ) that could be the initial or final period takes on account the sensibility of the decomposition for which period is taken as reference. The residual ( $R$ ) illustrates the difference among the growth effects and the Lorenz curve of both reference levels ( $t + n$  and  $t$ ). Furthermore, the presence of  $R$  is the result of the poverty tends to be zero when the mean of the income distribution and the Lorenz curve hold without changing over the period of analysis (Datt and Ravallion 1992)

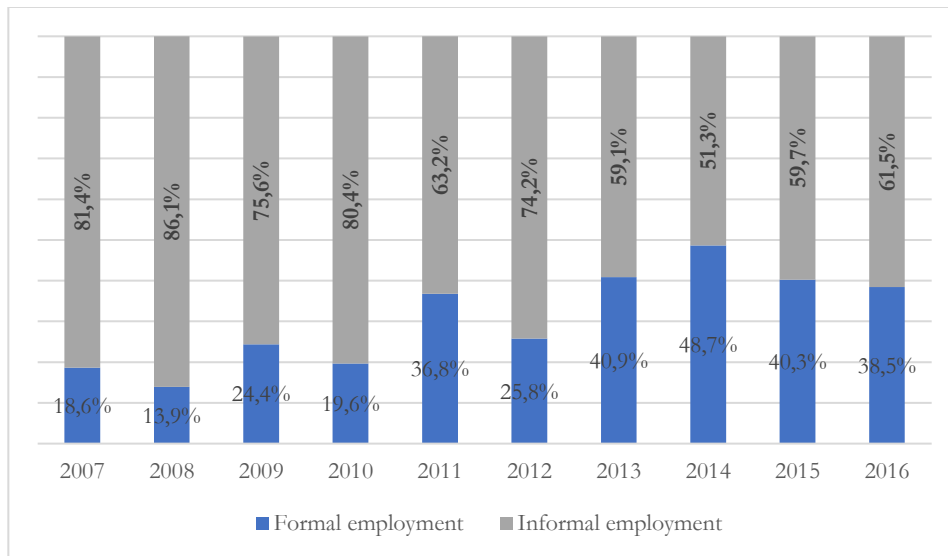
$$P_{t+n} - P_t = G(t, t + n; r) + D(t, t + n; r) + R(t, t + n; r) \quad (1)$$

The growth and distribution effect can be formalized as:

$$G(t, t + n; r) \equiv P(z/u_{t+n}, L_r) - P(z/u_t, L_r)$$

$$D(t, t + n; r) \equiv P(z/u_r, L_{t+n}) - P(z/u_r, L_t)$$

### Appendix 3: Participation of informality in the fraction at variable 2007 - 2016

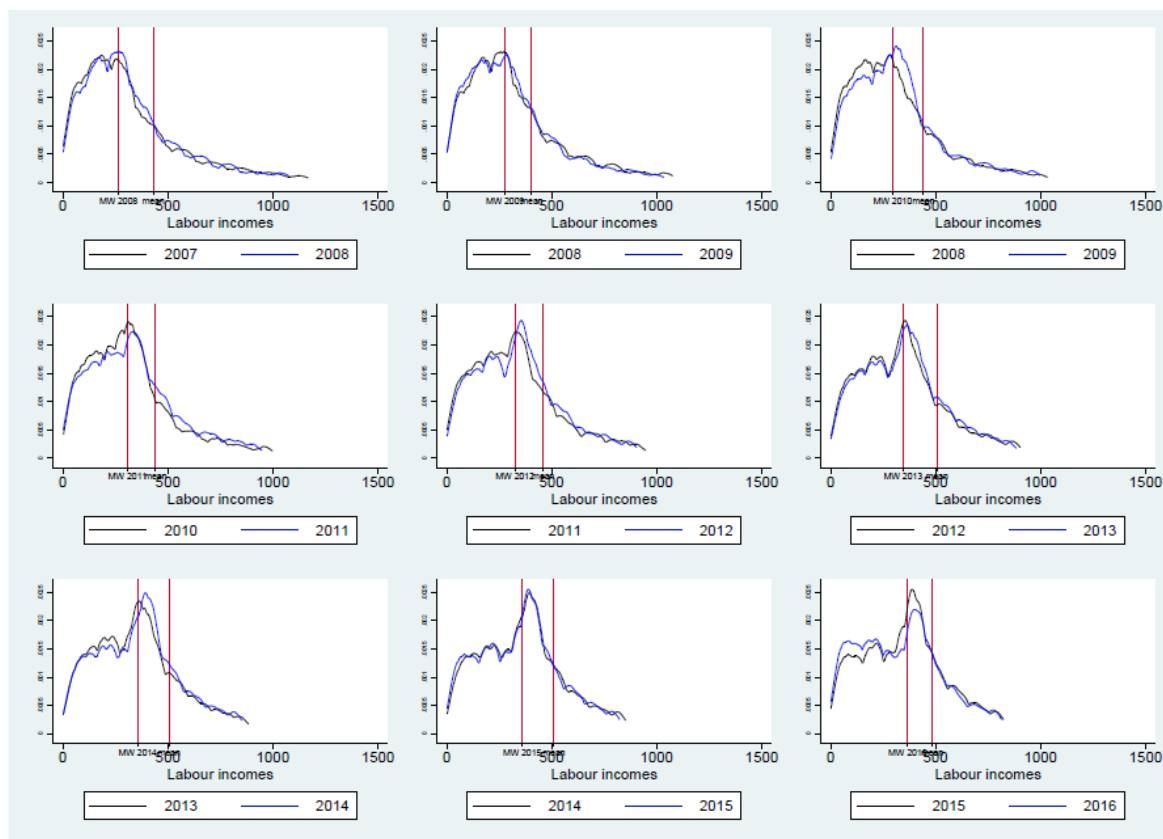


### Appendix 4: Income structure 2007 - 2016

Income structure	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Labour income</b>	86.0%	87.0%	84.9%	85.2%	85.5%	85.0%	86.7%	86.9%	86.1%	84.9%
Main activity	83.1%	85.1%	83.4%	83.8%	84.4%	84.1%	85.6%	85.3%	84.8%	83.2%
Paid-employed	52.1%	54.4%	56.7%	56.3%	56.0%	55.5%	59.4%	60.2%	60.4%	59.0%
Self-employed	31.1%	30.7%	26.7%	27.5%	28.4%	28.6%	26.2%	25.1%	24.4%	24.3%
Second activity	2.8%	1.9%	1.5%	1.4%	1.1%	0.9%	1.1%	1.6%	1.3%	1.7%
<b>Non labour income</b>	14.0%	13.0%	15.1%	14.8%	14.5%	15.0%	13.3%	13.1%	13.9%	15.1%
Capital	5.3%	4.4%	4.4%	4.2%	4.0%	3.5%	3.1%	4.7%	5.1%	5.4%
Pensions	1.5%	1.6%	2.4%	2.0%	1.9%	2.1%	2.4%	1.4%	1.2%	1.1%
Transfers	4.3%	4.2%	5.4%	6.0%	6.5%	7.1%	5.8%	5.2%	5.9%	6.7%
In-kind donations	2.9%	2.7%	3.0%	2.6%	2.1%	2.3%	2.0%	1.9%	1.7%	1.8%
<b>Individual income</b>	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Author calculation using (INEC 2017a) and (Castillo and Puebla 2016)

### Appendix 5: Compliance of the minimum wage 2007 – 2016





Source: Author calculation using (INEC 2017a)

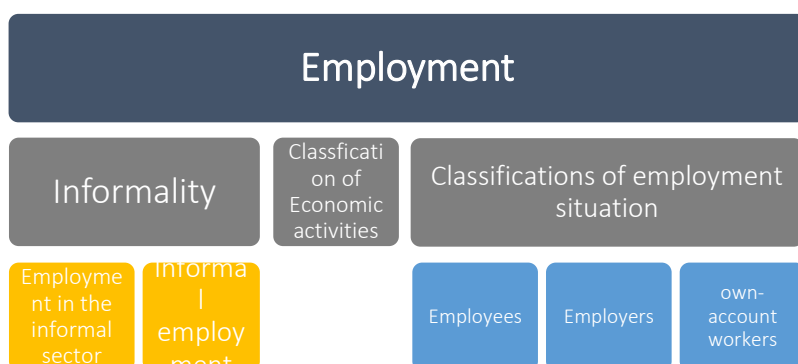
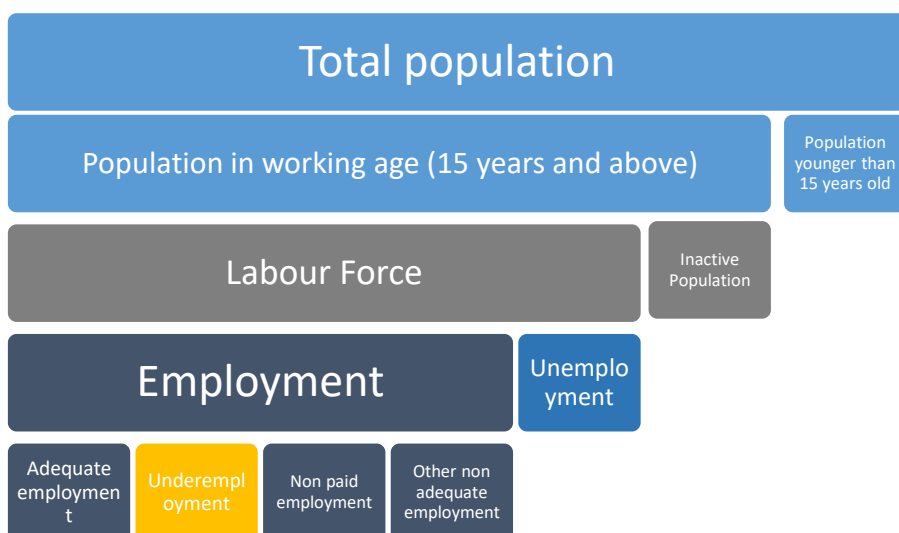
### **Appendix 6: Ecuadorian labour statistical framework**

The Ecuadorian labour statistical framework which relies on the recommendations of the International Conferences of Labour Statisticians (ICLS)<sup>13</sup> of ILO. The total population is divided between the “working age population” who are people of 15 years or above and the “non-working age population” (less than 15 years old) as can be seen in Appendix 6. The working age population is split among the Labour Force and Non-Labour Force. The first group includes those who have worked at least one hour during the reference week, this group is named as “employment or employed population”. The second group is composed of people that do not work and search for jobs in the reference week and are labeled as “unemployment”.

Furthermore, these groups are consistent with the international recommendation of ILO, but Ecuador has characterized its work-force to reflect better its labour market. In this sense, Ecuador has created different categories for the work-force that takes into consideration the interaction of three variables: labour incomes, worked hours and the willingness and availability for working more hours. The combinations of these variables determines if an employed person has adequate employment, is underemployed, is a non-paid worker and non-adequate workers.

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<sup>13</sup> The ICLS is the most important Conference about labour statistics in the UN framework due to it gathered all the National Statistics Offices and Labour Ministries. The aim of these conferences are to provide guidelines about labour statistics for improving the quality of the statistics handle by the National Statistics Offices (ONEs). These conferences are held every 5 years.



Source: Author calculations using (INEC 2017a)

### Appendix 7: Effects of minimum wage on underemployment 2007-2016

	Total sample (Parsimonious model)	Total sample	Informal employment	Formal employment
Underemployment rate	(1)	(2)	(3)	(4)
Fraction at minimum wage	- 0.0522*** (0.0028)	- 0.0506*** (0.0012)	- 0.1078*** (0.0029)	- 0.0066*** (0.0005)
Fraction above minimum wage		- 0.1474***	- 0.1877***	- 0.0711***

		(0.0027)	(0.0028)	(0.0052)
	0.1729*	0.0390*		
	**	**		
Informal employment	(0.0018)	(0.0018)		
		-	-	-
Worked hours		0.0058***	0.0105***	0.0012***
		(0.0001)	(0.0001)	(0.0000)
		-	-	-
Sex		0.0467***	0.0906***	0.0047***
		(0.0013)	(0.0027)	(0.0005)
		0.0095*	0.0216*	
area		**	**	-0.0008
		(0.0018)	(0.0037)	(0.0008)
		0.0084*	0.0163*	0.0011*
Age		**	**	**
		(0.0002)	(0.0004)	(0.0002)
		-	-	-
Age square		0.0001***	0.0002***	0.0000***
		(0.0000)	(0.0000)	(0.0000)
		0.0227*	0.0332*	0.0125*
Basic education		**	**	**
		(0.0029)	(0.0051)	(0.0045)
		0.0207*	0.0326*	0.0092*
Middle education		**	**	*
		(0.0036)	(0.0066)	(0.0038)
		0.0257*	0.0311*	0.0120*
High education		**	**	**
		(0.0041)	(0.0081)	(0.0037)
		0.0082*	0.0166*	0.0042*
private-employment		*	*	*
		(0.0036)	(0.0071)	(0.0019)
		-	-	-
public-employment		0.0369***	0.0030	-0.0022
		(0.0029)	(0.0135)	(0.0017)
				0.0202*
Self-employment		0.0033	-0.0130*	**
		(0.0036)	(0.0072)	(0.0043)
		-	-	-
Agriculture, forestry and fishing		0.0173***	0.0294***	-0.0006
		(0.0017)	(0.0036)	(0.0010)
		-	-	-
Manufacturing		0.0098***	0.0125***	0.0014**
		(0.0020)	(0.0044)	(0.0007)
		-	-	-
Wholesale and retail trade		0.0073**	-0.0089	0.0046***
		(0.0034)	(0.0069)	(0.0011)

Interaction between trade and urban area	-	-	-
	0.0138***	0.0291***	0.0013
	(0.0036)	(0.0073)	(0.0018)
Relation between income perceptors and non-perceptors	0.0044*	0.0088*	0.0007*
	**	**	**
	(0.0004)	(0.0008)	(0.0002)
2015	-	-	-
	0.0098***	0.0142***	0.0024***
	(0.0022)	(0.0048)	(0.0007)
Azuay	-0.0023	-0.0032	-0.0001
	(0.0035)	(0.0072)	(0.0011)
Bolmvar	-0.0003	0.0012	0.0006
	(0.0045)	(0.0090)	(0.0017)
Caqar	0.0150*	0.0262*	
	**	**	0.0031*
	(0.0046)	(0.0090)	(0.0018)
Carchi	0.0110*	0.0221*	
	**	**	-0.0008
	(0.0043)	(0.0085)	(0.0012)
Cotopaxi	-	-	-
	0.0147***	0.0259***	0.0034***
	(0.0036)	(0.0078)	(0.0009)
Chimborazo	-	-	-
	0.0141***	0.0249***	0.0023**
	(0.0036)	(0.0077)	(0.0011)
El Oro	0.0225*	0.0415*	
	**	**	0.0027*
	(0.0041)	(0.0079)	(0.0015)
Esmeraldas	-0.0058*	-0.0113	-0.0008
	(0.0034)	(0.0072)	(0.0011)
Guayas	0.0289*	0.0634*	0.0021*
	**	**	*
	(0.0032)	(0.0066)	(0.0010)
Imbabura	0.0064	0.0035	
	(0.0041)	(0.0081)	0.0042*
Loja	0.0014	0.0058	*
	(0.0040)	(0.0081)	(0.0016)
Los Rmos	0.0373*	0.0698*	
	**	**	-0.0008
	(0.0043)	(0.0078)	(0.0013)
Manabm	0.0177*	0.0349*	
	**	**	0.0026
	(0.0039)	(0.0074)	(0.0016)
Tungurahua	0.0222*	0.0425*	
	**	**	0.0027*
	(0.0043)	(0.0085)	(0.0015)
			0.0022*
			(0.0013)

prov_amazon==Amazonma		-	-	
		0.0097***	0.0198***	-0.0001
		(0.0032)	(0.0069)	(0.0011)
Observations	385,130	323,974	202,353	121,621
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

### Appendix 8: Effects of minimum wage on labour income 2007-2016

Total sample		Mean (OLS)	P10	P25	P50	P75	P90
Ln income	Labour	(1)	(2)	(3)	(4)	(5)	(6)
Fraction minimum wage	at	0.6438*** (0.0039)	1.4356*** (0.0081)	0.8703*** (0.0047)	0.5387*** (0.0029)	0.3594*** (0.0027)	0.2576*** (0.0018)
Fraction minimum wage	above	1.0846*** (0.0042)	1.6532*** (0.0074)	1.1297*** (0.0040)	0.8744*** (0.0023)	0.8631*** (0.0031)	1.0942*** (0.0059)
Informal employment	-	0.1277*** (0.0038)	0.0475*** (0.0023)	0.0661*** (0.0024)	0.0929*** (0.0017)	0.1199*** (0.0019)	0.1157*** (0.0040)
Worked hours	-	0.0096*** (0.0001)	0.0064*** (0.0001)	0.0083*** (0.0001)	0.0081*** (0.0001)	0.0069*** (0.0001)	0.0053*** (0.0001)
Sex	-	0.1661*** (0.0036)	0.0896*** (0.0024)	0.1186*** (0.0020)	0.1293*** (0.0023)	0.1347*** (0.0021)	0.1181*** (0.0035)
area	-	0.0266*** (0.0052)	0.0307*** (0.0022)	0.0378*** (0.0028)	0.0405*** (0.0026)	0.0379*** (0.0033)	0.0225*** (0.0037)
Age	-	0.0233*** (0.0006)	0.0217*** (0.0007)	0.0228*** (0.0003)	0.0195*** (0.0004)	0.0144*** (0.0003)	0.0088*** (0.0004)
Age square	-	0.0002*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0002*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)
Basic education	-	0.1620*** (0.0084)	0.1587*** (0.0130)	0.1583*** (0.0120)	0.1319*** (0.0060)	0.0988*** (0.0049)	0.0687*** (0.0032)
Middle education	-	0.2343*** (0.0092)	0.1920*** (0.0130)	0.2069*** (0.0124)	0.1894*** (0.0058)	0.1632*** (0.0051)	0.1235*** (0.0032)
High education	-	0.4924*** (0.0108)	0.2769*** (0.0142)	0.3501*** (0.0131)	0.3907*** (0.0062)	0.4201*** (0.0042)	0.4712*** (0.0063)
private- employment	-	0.0561*** (0.0073)	0.0232*** (0.0041)	0.0241*** (0.0055)	0.0243*** (0.0056)	0.0307*** (0.0045)	0.0413*** (0.0040)

public-employment	0.2202*** (0.0094)	0.1509*** (0.0049)	0.2674*** (0.0082)	0.3276*** (0.0080)	0.3306*** (0.0059)	0.2146*** (0.0065)
	-	-	-	-	-	-
Self-employment	0.1459*** (0.0078)	0.1527*** (0.0060)	0.1536*** (0.0067)	0.1082*** (0.0048)	0.0533*** (0.0048)	0.0233*** (0.0039)
Agriculture, forestry and fishing	0.0270*** (0.0075)	0.0215*** (0.0036)	0.0185*** (0.0039)	0.0137*** (0.0029)	0.0150*** (0.0041)	-0.0069 (0.0047)
Interaction between agriculture and rural area	- 0.0437*** (0.0095)	- 0.0078* (0.0046)	- 0.0019 (0.0055)	- -0.0027 (0.0047)	- -0.0037 (0.0055)	- -0.0132** (0.0059)
Interaction between agriculture and female	- 0.1852*** (0.0091)	- 0.4636*** (0.0173)	- 0.3457*** (0.0102)	- 0.1669*** (0.0056)	- 0.0652*** (0.0067)	- 0.0026 (0.0067)
Manufacturing	- 0.0525*** (0.0054)	- 0.0399*** (0.0039)	- 0.0421*** (0.0038)	- 0.0373*** (0.0030)	- 0.0290*** (0.0038)	- 0.0145*** (0.0039)
Wholesale and retail trade	- 0.0247*** (0.0096)	- 0.0225*** (0.0082)	- 0.0250*** (0.0080)	- -0.0170** (0.0080)	- -0.0082 (0.0058)	- 0.0056 (0.0061)
Interaction between trade and urban area	- -0.0005 (0.0104)	- -0.0021 (0.0075)	- -0.0046 (0.0074)	- -0.0115 (0.0077)	- -0.0077 (0.0069)	- -0.0039 (0.0069)
Relation between income perceptors and non-perceptors	- 0.0125*** (0.0011)	- 0.0029*** (0.0008)	- 0.0059*** (0.0006)	- 0.0079*** (0.0005)	- 0.0077*** (0.0005)	- 0.0049*** (0.0005)
2007	- 0.5688*** (0.0101)	- 0.6952*** (0.0045)	- 0.6569*** (0.0040)	- 0.6147*** (0.0032)	- 0.6080*** (0.0039)	- 0.6242*** (0.0039)
2008	- 0.4533*** (0.0089)	- 0.5361*** (0.0050)	- 0.5047*** (0.0033)	- 0.4835*** (0.0033)	- 0.4875*** (0.0031)	- 0.5139*** (0.0036)
2009	- 0.4020*** (0.0087)	- 0.4741*** (0.0039)	- 0.4519*** (0.0045)	- 0.4296*** (0.0042)	- 0.4182*** (0.0043)	- 0.4297*** (0.0047)
2010	- 0.3176*** (0.0088)	- 0.3794*** (0.0050)	- 0.3592*** (0.0045)	- 0.3447*** (0.0039)	- 0.3416*** (0.0041)	- 0.3588*** (0.0046)
2011	- 0.2383*** (0.0088)	- 0.2897*** (0.0040)	- 0.2695*** (0.0033)	- 0.2512*** (0.0040)	- 0.2421*** (0.0054)	- 0.2584*** (0.0046)

	-	-	-	-	-	-
2012	0.1483*** (0.0083)	0.1862*** (0.0039)	0.1705*** (0.0033)	0.1638*** (0.0042)	0.1731*** (0.0039)	0.1913*** (0.0035)
	-	-	-	-	-	-
2013	0.0569*** (0.0089)	0.0900*** (0.0039)	0.0799*** (0.0038)	0.0753*** (0.0043)	0.0752*** (0.0058)	0.0807*** (0.0044)
	-	-	-	-	-	-
2014	-0.0088 (0.0079)	0.0381*** (0.0045)	0.0331*** (0.0035)	0.0320*** (0.0039)	0.0298*** (0.0032)	0.0288*** (0.0042)
	-	-	-	-	-	-
2015	0.0069 (0.0082)	0.0148*** (0.0047)	-0.0066** (0.0032)	-0.0017 (0.0036)	0.0002 (0.0039)	-0.0015 (0.0038)
	-	-	-	-	-	-
Azuay	0.1063*** (0.0093)	0.0355*** (0.0049)	0.0443*** (0.0052)	0.0394*** (0.0054)	0.0368*** (0.0051)	0.0382*** (0.0067)
	-	-	-	-	-	-
Bolmvar	0.1405*** (0.0127)	0.0235*** (0.0090)	0.0501*** (0.0059)	0.0647*** (0.0062)	0.0697*** (0.0061)	0.0733*** (0.0076)
	-	-	-	-	-	-
Caqar	0.1385*** (0.0109)	0.0619*** (0.0066)	0.0815*** (0.0061)	0.0733*** (0.0046)	0.0622*** (0.0038)	0.0598*** (0.0053)
	-	-	-	-	-	-
Carchi	0.0857*** (0.0099)	0.0359*** (0.0070)	0.0450*** (0.0067)	0.0490*** (0.0042)	0.0541*** (0.0053)	0.0492*** (0.0049)
	-	-	-	-	-	-
Cotopaxi	0.0791*** (0.0099)	0.0119*** (0.0039)	0.0258*** (0.0031)	0.0366*** (0.0045)	0.0392*** (0.0042)	0.0337*** (0.0062)
	-	-	-	-	-	-
Chimborazo	0.1654*** (0.0117)	0.0470*** (0.0075)	0.0762*** (0.0061)	0.0906*** (0.0047)	0.0933*** (0.0063)	0.0722*** (0.0067)
	-	-	-	-	-	-
El Oro	0.0638*** (0.0077)	0.0367*** (0.0028)	0.0471*** (0.0021)	0.0430*** (0.0036)	0.0425*** (0.0049)	0.0402*** (0.0049)
	-	-	-	-	-	-
Esmeraldas	0.0859*** (0.0083)	0.0242*** (0.0053)	0.0524*** (0.0038)	0.0559*** (0.0039)	0.0566*** (0.0037)	0.0477*** (0.0049)
	-	-	-	-	-	-
Guayas	0.0669*** (0.0071)	0.0343*** (0.0030)	0.0449*** (0.0020)	0.0449*** (0.0030)	0.0429*** (0.0025)	0.0401*** (0.0034)
	-	-	-	-	-	-
Imbabura	0.0900*** (0.0081)	0.0286*** (0.0045)	0.0480*** (0.0048)	0.0525*** (0.0059)	0.0514*** (0.0056)	0.0414*** (0.0058)
	-	-	-	-	-	-
Loja	0.1838*** (0.0111)	0.0936*** (0.0079)	0.1147*** (0.0057)	0.1099*** (0.0040)	0.0839*** (0.0057)	0.0633*** (0.0077)
	-	-	-	-	-	-
Los Rmos	0.0203***	0.0211***	0.0162***	-0.0013	0.0125***	0.0243***

		(0.0077)	(0.0035)	(0.0035)	(0.0052)	(0.0039)	(0.0041)
		-	-	-	-	-	-
Manabm		0.0482***	0.0130***	0.0129***	0.0281***	0.0486***	0.0535***
		(0.0079)	(0.0048)	(0.0041)	(0.0028)	(0.0035)	(0.0052)
		-	-	-	-	-	-
Morona Santiago		0.1813***	0.0627***	0.1011***	0.0983***	0.0769***	0.0590***
		(0.0221)	(0.0088)	(0.0060)	(0.0076)	(0.0082)	(0.0076)
		-	-	-	-	-	-
Napo		0.1503***	0.1189***	0.1216***	0.0917***	0.0785***	0.0492***
		(0.0194)	(0.0146)	(0.0120)	(0.0095)	(0.0083)	(0.0100)
		-	-	-	-	-	-
Pastaza		0.0676***	0.0614***	0.0727***	0.0610***	0.0517***	0.0388***
		(0.0173)	(0.0123)	(0.0086)	(0.0087)	(0.0079)	(0.0117)
		-	-	-	-	-	-
Tungurahua		0.0626***	0.0098***	0.0186***	0.0262***	0.0223***	0.0229***
		(0.0091)	(0.0033)	(0.0041)	(0.0040)	(0.0046)	(0.0049)
		-	-	-	-	-	-
Zamora Chinchipe		0.1790***	0.0736***	0.1005***	0.0881***	0.0815***	0.0796***
		(0.0182)	(0.0086)	(0.0100)	(0.0069)	(0.0048)	(0.0091)
Galapagos		0.4331***	0.3914***	0.4398***	0.4562***	0.4580***	0.4615***
		(0.0162)	(0.0254)	(0.0164)	(0.0141)	(0.0240)	(0.0328)
		-	-	-	-	-	-
Sucumbmos		0.0917***	0.0348***	0.0466***	-0.0250**	0.0253***	0.0391***
		(0.0165)	(0.0090)	(0.0100)	(0.0098)	(0.0076)	(0.0106)
		-	-	-	-	-	-
Orellana		0.0868***	0.0365***	0.0591***	0.0413***	0.0303***	0.0353***
		(0.0235)	(0.0086)	(0.0108)	(0.0081)	(0.0065)	(0.0070)
Zonas Delimitadas	no	-	-0.0011	0.0090	0.0206	-0.0016	-0.0105
			(0.0232)	(0.0157)	(0.0298)	(0.0157)	(0.0129)
Constant		4.2835***	3.5310***	4.0304***	4.5319***	4.9873***	5.3724***
		(0.0187)	(0.0149)	(0.0138)	(0.0130)	(0.0114)	(0.0109)
Observations		323,974	324,860	324,860	324,860	324,860	324,860

### Appendix 9: Effects of minimum wage on labour income 2007-2016

Informal employment		Mean (OLS)	P10	P25	P50	P75	P90
Ln	Labour income	(1)	(2)	(3)	(4)	(5)	(6)
Fraction	at	0.6512***	1.2224***	0.8000***	0.5400***	0.3635***	0.2415***
minimum wage		(0.0042)	(0.0106)	(0.0044)	(0.0027)	(0.0026)	(0.0020)



Fraction above minimum wage	1.0573*** (0.0047)	1.4294*** (0.0101)	1.0436*** (0.0045)	0.8528*** (0.0028)	0.8328*** (0.0024)	1.0352*** (0.0056)
Informal employment						
Worked hours	0.0108*** (0.0002)	0.0093*** (0.0002)	0.0106*** (0.0001)	0.0091*** (0.0001)	0.0070*** (0.0001)	0.0040*** (0.0001)
Sex	0.1574*** (0.0055)	0.1533*** (0.0060)	0.1533*** (0.0039)	0.1219*** (0.0023)	0.0894*** (0.0026)	0.0522*** (0.0031)
area	0.0066 (0.0065)	0.0080* (0.0044)	0.0155*** (0.0033)	0.0149*** (0.0024)	0.0110*** (0.0023)	0.0045* (0.0027)
Age	0.0206*** (0.0006)	0.0261*** (0.0007)	0.0239*** (0.0005)	0.0180*** (0.0004)	0.0112*** (0.0003)	0.0059*** (0.0003)
Age square	0.0002*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)	0.0002*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)
Basic education	0.1315*** (0.0087)	0.1191*** (0.0140)	0.1284*** (0.0077)	0.1055*** (0.0054)	0.0842*** (0.0048)	0.0559*** (0.0059)
Middle education	0.1822*** (0.0097)	0.1477*** (0.0155)	0.1724*** (0.0084)	0.1523*** (0.0049)	0.1249*** (0.0045)	0.0822*** (0.0055)
High education	0.3187*** (0.0117)	0.2197*** (0.0164)	0.2560*** (0.0103)	0.2460*** (0.0078)	0.2294*** (0.0060)	0.1741*** (0.0070)
private- employment	0.0439*** (0.0090)	-0.0282** (0.0125)	0.0398*** (0.0073)	0.0259*** (0.0072)	-0.0094* (0.0056)	0.0005 (0.0060)
public- employment	0.1213*** (0.0235)	0.0790*** (0.0143)	0.0734*** (0.0067)	0.0988*** (0.0121)	0.1418*** (0.0115)	0.1656*** (0.0224)
Self-employment	0.2297*** (0.0093)	0.3419*** (0.0146)	0.2703*** (0.0059)	0.1627*** (0.0062)	0.0657*** (0.0050)	0.0175*** (0.0058)
Agriculture, forestry and fishing	0.0106 (0.0081)	0.0312*** (0.0062)	0.0145*** (0.0053)	0.0004 (0.0054)	0.0031 (0.0045)	0.0083*** (0.0026)
Interaction between agriculture and rural area	0.0360*** (0.0103)	-0.0116 (0.0097)	-0.0118* (0.0063)	0.0203*** (0.0064)	0.0252*** (0.0045)	0.0220*** (0.0032)
Interaction between agriculture and female	0.1866*** (0.0104)	0.4192*** (0.0160)	0.3413*** (0.0103)	0.2193*** (0.0111)	0.1055*** (0.0078)	0.0554*** (0.0068)
Manufacturing	0.0617*** (0.0072)	0.0701*** (0.0055)	0.0488*** (0.0058)	0.0321*** (0.0038)	0.0158*** (0.0043)	0.0105*** (0.0038)

Wholesale and retail trade	- 0.0370*** (0.0116)	- 0.0467*** (0.0162)	- 0.0341*** (0.0083)	- 0.0251*** (0.0067)	- 0.0270*** (0.0060)	- -0.0114* (0.0064)
Interaction between trade and urban area	0.0105 (0.0129)	0.0284 (0.0179)	0.0113 (0.0097)	0.0039 (0.0078)	0.0154** (0.0071)	0.0060 (0.0082)
Relation between income perceptors and non-perceptors	0.0152*** (0.0013)	0.0064*** (0.0013)	0.0093*** (0.0011)	0.0095*** (0.0008)	0.0071*** (0.0007)	0.0035*** (0.0005)
2007	- 0.6236*** (0.0102)	- 0.6927*** (0.0097)	- 0.6697*** (0.0061)	- 0.6475*** (0.0051)	- 0.6529*** (0.0052)	- 0.6751*** (0.0055)
2008	- 0.4882*** (0.0096)	- 0.5237*** (0.0093)	- 0.5134*** (0.0045)	- 0.5073*** (0.0061)	- 0.5311*** (0.0040)	- 0.5617*** (0.0034)
2009	- 0.4118*** (0.0098)	- 0.4571*** (0.0094)	- 0.4463*** (0.0043)	- 0.4384*** (0.0032)	- 0.4421*** (0.0046)	- 0.4499*** (0.0031)
2010	- 0.3101*** (0.0098)	- 0.3344*** (0.0092)	- 0.3312*** (0.0048)	- 0.3456*** (0.0046)	- 0.3592*** (0.0034)	- 0.3847*** (0.0039)
2011	- 0.2199*** (0.0112)	- 0.2527*** (0.0107)	- 0.2318*** (0.0063)	- 0.2373*** (0.0041)	- 0.2453*** (0.0047)	- 0.2655*** (0.0046)
2012	- 0.1244*** (0.0108)	- 0.1431*** (0.0134)	- 0.1445*** (0.0061)	- 0.1549*** (0.0052)	- 0.1751*** (0.0041)	- 0.2039*** (0.0033)
2013	- 0.0348*** (0.0105)	- 0.0324*** (0.0077)	- 0.0400*** (0.0051)	- 0.0550*** (0.0037)	- 0.0755*** (0.0027)	- 0.0876*** (0.0036)
2014	- 0.0182* (0.0100)	- 0.0055 (0.0098)	- -0.0015 (0.0048)	- 0.0116*** (0.0042)	- 0.0267*** (0.0033)	- 0.0336*** (0.0041)
2015	- 0.0160 (0.0104)	- 0.0111 (0.0094)	- 0.0135*** (0.0048)	- 0.0165*** (0.0046)	- 0.0034 (0.0043)	- -0.0076** (0.0034)
Azuay	- 0.1348*** (0.0130)	- 0.1042*** (0.0140)	- 0.0948*** (0.0071)	- 0.0628*** (0.0062)	- 0.0364*** (0.0049)	- 0.0198*** (0.0049)
Bolmvar	- 0.1282*** (0.0157)	- 0.0767*** (0.0121)	- 0.0751*** (0.0090)	- 0.0685*** (0.0061)	- 0.0502*** (0.0054)	- 0.0405*** (0.0048)
Cañar	- 0.1451*** (0.0143)	- 0.1119*** (0.0147)	- 0.1095*** (0.0078)	- 0.0832*** (0.0068)	- 0.0521*** (0.0053)	- 0.0375*** (0.0067)

	-	-	-	-	-	-
Carchi	0.0711*** (0.0130)	0.0493*** (0.0114)	0.0578*** (0.0095)	0.0422*** (0.0062)	0.0366*** (0.0056)	0.0259*** (0.0064)
	-	-	-	-	-	-
Cotopaxi	0.0754*** (0.0129)	0.0424*** (0.0132)	0.0454*** (0.0053)	0.0472*** (0.0052)	0.0257*** (0.0052)	0.0134*** (0.0042)
	-	-	-	-	-	-
Chimborazo	0.1662*** (0.0151)	0.0779*** (0.0103)	0.1050*** (0.0097)	0.1020*** (0.0078)	0.0858*** (0.0064)	0.0472*** (0.0064)
	-	-	-	-	-	-
El Oro	0.0309*** (0.0087)	0.0358*** (0.0066)	0.0400*** (0.0055)	0.0288*** (0.0048)	0.0152*** (0.0050)	0.0128*** (0.0038)
	-	-	-	-	-	-
Esmeraldas	0.0740*** (0.0097)	0.0395*** (0.0086)	0.0555*** (0.0078)	0.0526*** (0.0064)	0.0425*** (0.0052)	0.0266*** (0.0040)
	-	-	-	-	-	-
Guayas	-0.0142* (0.0080)	0.0203*** (0.0065)	0.0167*** (0.0049)	0.0128*** (0.0041)	0.0129*** (0.0030)	0.0131*** (0.0029)
	-	-	-	-	-	-
Imbabura	0.0777*** (0.0102)	0.0647*** (0.0102)	0.0670*** (0.0046)	0.0552*** (0.0046)	0.0369*** (0.0039)	0.0224*** (0.0037)
	-	-	-	-	-	-
Loja	0.2156*** (0.0133)	0.1975*** (0.0219)	0.1739*** (0.0115)	0.1390*** (0.0080)	0.0925*** (0.0071)	0.0532*** (0.0055)
	-	-	-	-	-	-
Los Rmos	0.0336*** (0.0088)	-0.0060 (0.0069)	0.0204** (0.0083)	0.0391*** (0.0072)	0.0206*** (0.0052)	-0.0000 (0.0038)
	-	-	-	-	-	-
Manabm	0.0021 (0.0094)	0.0166*** (0.0064)	0.0239*** (0.0070)	-0.0010 (0.0059)	0.0198*** (0.0050)	0.0208*** (0.0040)
	-	-	-	-	-	-
Morona Santiago	0.1903*** (0.0295)	0.1283*** (0.0283)	0.1601*** (0.0162)	0.1197*** (0.0123)	0.0785*** (0.0065)	0.0490*** (0.0079)
	-	-	-	-	-	-
Napo	0.2056*** (0.0264)	0.2451*** (0.0187)	0.2315*** (0.0189)	0.1509*** (0.0159)	0.1002*** (0.0137)	0.0498*** (0.0050)
	-	-	-	-	-	-
Pastaza	-0.0577** (0.0289)	0.1365*** (0.0268)	0.1281*** (0.0144)	0.1050*** (0.0083)	0.0651*** (0.0074)	0.0417*** (0.0114)
	-	-	-	-	-	-
Tungurahua	0.0580*** (0.0116)	-0.0208** (0.0099)	0.0159*** (0.0055)	0.0203*** (0.0069)	0.0168*** (0.0039)	0.0199*** (0.0043)
	-	-	-	-	-	-
Zamora Chinchipe	0.1797*** (0.0239)	0.1578*** (0.0304)	0.1517*** (0.0191)	0.1137*** (0.0120)	0.0739*** (0.0061)	0.0432*** (0.0087)
	-	-	-	-	-	-
Galapagos	0.3327*** (0.0302)	0.3341*** (0.0166)	0.3462*** (0.0169)	0.3718*** (0.0312)	0.3309*** (0.0214)	0.2954*** (0.0519)

		-	-	-	-	-	-
Sucumbmos		0.1118*** (0.0237)	0.1061*** (0.0135)	0.0873*** (0.0127)	0.0537*** (0.0083)	0.0305*** (0.0109)	0.0249*** (0.0082)
Orellana		0.1104*** (0.0297)	0.0631*** (0.0218)	0.0827*** (0.0131)	0.0610*** (0.0074)	0.0491*** (0.0088)	0.0412*** (0.0060)
Zonas Delimitadas	no	-	0.0131 (0.0211)	0.0270 (0.0248)	0.0419* (0.0220)	0.0413** (0.0185)	0.0161** (0.0069)
Constant		4.2751*** (0.0217)	3.5634*** (0.0304)	4.0204*** (0.0130)	4.5302*** (0.0096)	4.9841*** (0.0091)	5.3812*** (0.0117)
Observations		202,353	203,028	203,028	203,028	203,028	203,028

#### Appendix 10: Effects of minimum wage on labour income 2007-2016

Formal employment		Mean (OLS)	P10	P25	P50	P75	P90
Ln	Labour income	(1)	(2)	(3)	(4)	(5)	(6)
Fraction	at	0.7583*** (0.0073)	1.4050*** (0.0200)	0.8550*** (0.0098)	0.5847*** (0.0090)	0.5099*** (0.0090)	0.4874*** (0.0102)
Fraction	above	1.3041*** (0.0075)	1.6536*** (0.0185)	1.1881*** (0.0084)	1.0088*** (0.0072)	1.0522*** (0.0079)	1.1874*** (0.0108)
Informal employment							
Worked hours		0.0051*** (0.0003)	0.0023*** (0.0001)	0.0040*** (0.0001)	0.0048*** (0.0001)	0.0053*** (0.0002)	0.0059*** (0.0002)
Sex		0.1451*** (0.0033)	0.0496*** (0.0028)	0.0850*** (0.0034)	0.1248*** (0.0043)	0.1727*** (0.0049)	0.2155*** (0.0060)
area		0.0754*** (0.0048)	0.0429*** (0.0040)	0.0619*** (0.0032)	0.0696*** (0.0035)	0.0748*** (0.0058)	0.0802*** (0.0070)
Age		0.0250*** (0.0007)	0.0095*** (0.0006)	0.0149*** (0.0005)	0.0198*** (0.0006)	0.0254*** (0.0009)	0.0270*** (0.0017)
Age squar		0.0002*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0002*** (0.0000)	0.0002*** (0.0000)	0.0002*** (0.0000)
Basic education		0.1284*** (0.0185)	0.0605*** (0.0168)	0.0723*** (0.0107)	0.0872*** (0.0110)	0.0943*** (0.0133)	0.1101*** (0.0194)
Middle education		0.2526*** (0.0187)	0.0991*** (0.0167)	0.1389*** (0.0107)	0.1909*** (0.0100)	0.2442*** (0.0126)	0.2946*** (0.0190)

High education	0.4967*** (0.0190)	0.1770*** (0.0174)	0.2945*** (0.0101)	0.4263*** (0.0104)	0.5470*** (0.0129)	0.6784*** (0.0184)
private- employment	- 0.0275*** (0.0094)	- -0.0113** (0.0057)	- 0.0059 (0.0053)	- 0.0167* (0.0100)	- -0.0253* (0.0137)	- 0.1402*** (0.0188)
public- employment	0.2537*** (0.0097)	0.1761*** (0.0066)	0.2995*** (0.0055)	0.3496*** (0.0108)	0.2936*** (0.0132)	0.1249*** (0.0189)
Self-employment	0.1312*** (0.0103)	-0.0017 (0.0058)	0.0385*** (0.0062)	0.1145*** (0.0108)	0.1672*** (0.0150)	0.1647*** (0.0196)
Agriculture, forestry and fishing	0.0021 (0.0103)	- 0.0176*** (0.0036)	- 0.0347*** (0.0037)	- 0.0336*** (0.0051)	- 0.0354*** (0.0116)	- 0.0085 (0.0177)
Interaction between agriculture and rural area	-0.0265** (0.0121)	0.0271*** (0.0060)	0.0293*** (0.0063)	0.0051 (0.0073)	-0.0162 (0.0133)	-0.0321 (0.0226)
Interaction between agriculture and female	0.0579*** (0.0125)	0.0217*** (0.0074)	0.0461*** (0.0049)	0.0650*** (0.0072)	0.1128*** (0.0121)	0.1716*** (0.0166)
Manufacturing	- 0.0192*** (0.0052)	- -0.0042 (0.0030)	- -0.0097** (0.0042)	- 0.0219*** (0.0041)	- 0.0431*** (0.0071)	- 0.0329*** (0.0114)
Wholesale and retail trade	0.0016 (0.0114)	0.0047 (0.0068)	-0.0033 (0.0064)	-0.0116 (0.0089)	-0.0043 (0.0142)	-0.0073 (0.0216)
Interaction between trade and urban area	- -0.0267** (0.0121)	- 0.0235*** (0.0080)	- 0.0323*** (0.0072)	- 0.0267*** (0.0095)	- 0.0378*** (0.0121)	- -0.0093 (0.0191)
Relation between income perceptors and non-perceptors	0.0078*** (0.0013)	0.0020** (0.0008)	0.0045*** (0.0009)	0.0070*** (0.0012)	0.0110*** (0.0019)	0.0151*** (0.0020)
2007	- 0.5171*** (0.0104)	- 0.6744*** (0.0069)	- 0.6072*** (0.0055)	- 0.5397*** (0.0068)	- 0.4965*** (0.0085)	- 0.4252*** (0.0151)
2008	- 0.4290*** (0.0094)	- 0.5460*** (0.0063)	- 0.5006*** (0.0057)	- 0.4459*** (0.0058)	- 0.4066*** (0.0094)	- 0.3678*** (0.0151)
2009	- 0.4092*** (0.0085)	- 0.4832*** (0.0041)	- 0.4646*** (0.0061)	- 0.4104*** (0.0067)	- 0.3854*** (0.0084)	- 0.3782*** (0.0114)
2010	- 0.3556*** (0.0080)	- 0.4172*** (0.0042)	- 0.4086*** (0.0051)	- 0.3628*** (0.0073)	- 0.3415*** (0.0076)	- 0.3018*** (0.0112)

	-	-	-	-	-	-
2011	0.2541*** (0.0077)	0.3132*** (0.0047)	0.2947*** (0.0051)	0.2563*** (0.0067)	0.2427*** (0.0075)	0.2297*** (0.0107)
	-	-	-	-	-	-
2012	0.1804*** (0.0072)	0.2095*** (0.0047)	0.2008*** (0.0052)	0.1802*** (0.0059)	0.1888*** (0.0081)	0.1937*** (0.0104)
	-	-	-	-	-	-
2013	0.0856*** (0.0077)	0.1246*** (0.0044)	0.1165*** (0.0038)	0.1026*** (0.0050)	0.0979*** (0.0069)	0.0760*** (0.0125)
	-	-	-	-	-	-
2014	0.0274*** (0.0066)	0.0531*** (0.0043)	0.0520*** (0.0039)	0.0438*** (0.0029)	0.0386*** (0.0056)	0.0257*** (0.0086)
	-	-	-	-	-	-
2015	-0.0073 (0.0064)	0.0245*** (0.0032)	0.0207*** (0.0040)	0.0180*** (0.0051)	0.0184*** (0.0052)	-0.0022 (0.0103)
	-	-	-	-	-	-
Azuay	0.0530*** (0.0088)	-0.0075 (0.0047)	0.0143*** (0.0039)	0.0245*** (0.0038)	0.0600*** (0.0060)	0.0894*** (0.0107)
	-	-	-	-	-	-
Bolmvar	0.1133*** (0.0113)	-0.0161** (0.0072)	0.0338*** (0.0071)	0.0752*** (0.0083)	0.1376*** (0.0123)	0.1733*** (0.0198)
	-	-	-	-	-	-
Caqar	0.0872*** (0.0102)	0.0260*** (0.0060)	0.0491*** (0.0064)	0.0580*** (0.0075)	0.0890*** (0.0093)	0.1032*** (0.0145)
	-	-	-	-	-	-
Carchi	0.1149*** (0.0105)	0.0469*** (0.0070)	0.0677*** (0.0066)	0.0715*** (0.0069)	0.1160*** (0.0092)	0.1223*** (0.0135)
	-	-	-	-	-	-
Cotopaxi	0.0656*** (0.0093)	-0.0046 (0.0050)	0.0245*** (0.0057)	0.0423*** (0.0082)	0.0612*** (0.0099)	0.1032*** (0.0126)
	-	-	-	-	-	-
Chimborazo	0.1197*** (0.0108)	0.0303*** (0.0066)	0.0612*** (0.0065)	0.1021*** (0.0079)	0.1315*** (0.0117)	0.1278*** (0.0161)
	-	-	-	-	-	-
El Oro	0.0962*** (0.0092)	0.0379*** (0.0046)	0.0552*** (0.0044)	0.0762*** (0.0075)	0.1063*** (0.0092)	0.1247*** (0.0127)
	-	-	-	-	-	-
Esmeraldas	0.0870*** (0.0100)	0.0306*** (0.0056)	0.0538*** (0.0060)	0.0687*** (0.0061)	0.0902*** (0.0110)	0.1059*** (0.0110)
	-	-	-	-	-	-
Guayas	0.0850*** (0.0085)	0.0235*** (0.0040)	0.0501*** (0.0035)	0.0742*** (0.0041)	0.1008*** (0.0067)	0.1153*** (0.0112)
	-	-	-	-	-	-
Imbabura	0.0923*** (0.0091)	0.0262*** (0.0051)	0.0430*** (0.0045)	0.0642*** (0.0059)	0.0990*** (0.0106)	0.1217*** (0.0128)
	-	-	-	-	-	-
Loja	0.0894***	0.0253***	0.0474***	0.0483***	0.0653***	0.1036***

		(0.0106)	(0.0074)	(0.0061)	(0.0079)	(0.0111)	(0.0135)
		-	-	-	-	-	-
Los Rmos		0.0955***	0.0308***	0.0667***	0.0936***	0.1183***	0.1184***
		(0.0100)	(0.0055)	(0.0058)	(0.0067)	(0.0080)	(0.0192)
		-	-	-	-	-	-
Manabm		0.1196***	0.0430***	0.0750***	0.1025***	0.1430***	0.1615***
		(0.0100)	(0.0075)	(0.0065)	(0.0062)	(0.0107)	(0.0098)
		-	-	-	-	-	-
Morona Santiago		0.0880***	-0.0228*	0.0534***	0.0673***	0.0729***	0.0995***
		(0.0136)	(0.0136)	(0.0135)	(0.0096)	(0.0129)	(0.0132)
		-	-	-	-	-	-
Napo		0.0559***	-0.0318**	0.0283***	-0.0204**	-0.0208	-0.0356
		(0.0141)	(0.0151)	(0.0092)	(0.0080)	(0.0127)	(0.0217)
		-	-	-	-	-	-
Pastaza		0.0624***	0.0278***	0.0336***	0.0382***	0.0405***	-0.0582**
		(0.0132)	(0.0074)	(0.0091)	(0.0114)	(0.0157)	(0.0263)
		-	-	-	-	-	-
Tungurahua		0.0498***	0.0109***	0.0303***	0.0469***	0.0517***	0.0591***
		(0.0090)	(0.0037)	(0.0056)	(0.0062)	(0.0120)	(0.0157)
		-	-	-	-	-	-
Zamora Chinchipe		0.1134***	-0.0231**	0.0501***	0.0671***	0.1069***	0.1474***
		(0.0139)	(0.0102)	(0.0119)	(0.0076)	(0.0136)	(0.0178)
Galapagos		0.4543***	0.4067***	0.4919***	0.5069***	0.5027***	0.4573***
		(0.0152)	(0.0283)	(0.0154)	(0.0142)	(0.0261)	(0.0232)
Sucumbmos		-0.0294**	0.0095	-0.0076	0.0102	0.0038	-0.0399**
		(0.0125)	(0.0097)	(0.0086)	(0.0110)	(0.0137)	(0.0196)
		-	-	-	-	-	-
Orellana		-0.0054	-0.0171	0.0230***	0.0110	0.0299**	0.0266
		(0.0156)	(0.0113)	(0.0073)	(0.0119)	(0.0127)	(0.0243)
Zonas Delimitadas	no	-	-0.0371	-0.0659**	0.0901***	0.1489***	0.1498***
			(0.0243)	(0.0276)	(0.0282)	(0.0217)	(0.0526)
Constant		4.0528***	3.9546***	4.2583***	4.4003***	4.4785***	4.6344***
		(0.0281)	(0.0264)	(0.0168)	(0.0177)	(0.0171)	(0.0430)
Observations		121,621	121,832	121,832	121,832	121,832	121,832

#### Appendix 11: Effects of minimum wage on poverty 2007-2016

Poverty	Total sample	Total sample	Total sample
	(1)	(2)	(3)
	-	-	-
Fraction at minimum wage	0.1493*** (0.0035)	0.0357*** (0.0020)	0.0355*** (0.0021)
<b><u>Informality:</u></b>			
Informal employment		0.1169*** (0.0021)	0.1162*** (0.0021)
<b><u>Controls:</u></b>			
Sex		0.0302*** (0.0019)	0.0271*** (0.0019)
Rural area		0.0359*** (0.0029)	0.0348*** (0.0029)
		-	-
Age		0.0031*** (0.0002)	0.0029*** (0.0002)
Age square		0.0000*** (0.0000)	0.0000*** (0.0000)
		-	-
Basic education		0.0383*** (0.0028)	0.0364*** (0.0028)
		-	-
Middle education		0.0703*** (0.0026)	0.0684*** (0.0027)
		-	-
High education		0.0997*** (0.0024)	0.0981*** (0.0025)
private-employment		-0.0060 (0.0042)	-0.0047 (0.0043)
		-	-
public-employment		0.0643*** (0.0037)	0.0637*** (0.0038)
Self-employment		0.0405*** (0.0047)	0.0414*** (0.0048)
Agriculture, forestry and fishing		0.0659*** (0.0047)	0.0665*** (0.0047)
Interaction between agriculture and rural area		-0.0003 (0.0040)	-0.0003 (0.0040)
		-	-
Interaction between agriculture and female		0.0163*** (0.0027)	0.0192*** (0.0026)
Manufacturing		0.0149*** (0.0030)	0.0150*** (0.0030)
Wholesale and retail trade		0.0146***	0.0149***



Relation between income perceptors and non-perceptors	(0.0025)	(0.0025)
	0.0767***	0.0765***
	(0.0010)	(0.0010)
BDH		-
		0.0185***
		(0.0022)
<b><u>Time contols:</u></b>		
2007	0.0770***	0.0761***
	(0.0069)	(0.0069)
2008	0.0643***	0.0634***
	(0.0064)	(0.0064)
2009	0.0663***	0.0649***
	(0.0064)	(0.0063)
2010	0.0737***	0.0722***
	(0.0063)	(0.0062)
2011	0.0285***	0.0272***
	(0.0055)	(0.0055)
2012	0.0183***	0.0169***
	(0.0051)	(0.0051)
2013	0.0005	-0.0008
	(0.0046)	(0.0046)
2014	-0.0100**	-0.0103**
	(0.0044)	(0.0044)
2015	-0.0032	-0.0034
	(0.0043)	(0.0043)
<b><u>Provinces controls:</u></b>		
Azuay	0.0142**	0.0141**
	(0.0057)	(0.0057)
Bolmvar	0.1193***	0.1169***
	(0.0094)	(0.0094)
Caqar	0.0464***	0.0465***
	(0.0071)	(0.0071)
Carchi	0.0989***	0.0985***
	(0.0077)	(0.0077)
Cotopaxi	0.0420***	0.0416***
	(0.0062)	(0.0062)
Chimborazo	0.1015***	0.0997***
	(0.0092)	(0.0092)
El Oro	-0.0009	-0.0015
	(0.0045)	(0.0045)
Esmeraldas	0.0980***	0.0965***
	(0.0068)	(0.0068)
Guayas	0.0119***	0.0110***
	(0.0041)	(0.0041)
Imbabura	0.0707***	0.0700***
	(0.0066)	(0.0066)
Loja	0.0712***	0.0695***

	(0.0074)	(0.0073)
Los Rmos	0.0229***	0.0219***
	(0.0050)	(0.0050)
Manabm	0.0502***	0.0488***
	(0.0057)	(0.0057)
Morona Santiago	0.0743***	0.0737***
	(0.0138)	(0.0138)
Napo	0.1171***	0.1155***
	(0.0176)	(0.0175)
Pastaza	0.0381***	0.0372***
	(0.0144)	(0.0144)
Tungurahua	0.0376***	0.0376***
	(0.0060)	(0.0060)
Zamora Chinchipe	0.0762***	0.0748***
	(0.0146)	(0.0145)
	-	-
Galapagos	0.0843***	0.0843***
	(0.0016)	(0.0016)
Sucumbmos	0.0505***	0.0497***
	(0.0101)	(0.0101)
Orellana	0.0435***	0.0429***
	(0.0150)	(0.0149)
Zonas no Delimitadas	0.0217	0.0216
	(0.0244)	(0.0242)

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Observations	869,238	324,859	324,859
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Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### Appendix 12: Robustness test using a provincial panel dataset

Ln Labour income	Total	Informal	Formal
	sample	employment	employment
	(1)	(2)	(3)
fraction_at	0.0182 (0.6903)	1.5327*** (0.5016)	-0.6236** (0.2631)
Informal employment	0.1078 (0.3082)	-	-
hours	0.0122* (0.0067)	0.0164** (0.0070)	0.0093** (0.0039)
female	0.4996 (0.4890)	0.1035 (0.4915)	-0.0992 (0.2583)
area	-0.7412* (0.3082)	-0.7414* (0.3082)	-0.0916 (0.3082)

	(0.3731)	(0.3799)	(0.1427)
age	0.0917*	0.0676	0.0010
	(0.0468)	(0.0449)	(0.0455)
age2	-0.0012**	-0.0008*	0.0000
	(0.0005)	(0.0005)	(0.0005)
niv2	0.6155	1.1484***	1.4225
	(0.3639)	(0.3020)	(1.0955)
niv3	1.0637**	1.0809***	1.9071
	(0.4685)	(0.2912)	(1.1187)
niv4	2.3303***	1.9510***	2.4906**
	(0.5014)	(0.6164)	(1.1000)
private_employment	-0.0619	0.1529	1.1191
	(0.2507)	(0.2964)	(1.1683)
public_employment	-0.8308	-1.7300	1.0284
	(0.6509)	(2.4755)	(1.2054)
self_employment	-0.8863	-0.9155**	0.5313
	(0.5954)	(0.4096)	(1.1631)
agr	-0.3544	-0.2867	-0.0455
	(0.6123)	(0.5569)	(0.3164)
agr_rural	-0.3543	-0.6088	0.0078
	(1.0483)	(0.7733)	(0.4980)
agr_female	-1.5689**	-0.9686	-0.6449
	(0.5810)	(0.7332)	(0.6983)
manuf	-0.9829*	-0.9815*	0.3212
	(0.5017)	(0.5529)	(0.2313)
trade	-1.4262*	-0.9950	0.3696
	(0.7936)	(1.0506)	(0.4777)
trade_urb	0.5744	0.1069	-0.5307
	(0.6938)	(0.9722)	(0.5404)
rpn	0.0289	0.0759	-0.0431
	(0.1088)	(0.0743)	(0.0474)
year = 2008	0.1061**	0.0001	0.0970***
	(0.0424)	(0.0402)	(0.0179)
year = 2009	0.1270***	0.1234***	0.0614**
	(0.0319)	(0.0242)	(0.0210)
year = 2010	0.2469***	0.1804***	0.1113***
	(0.0548)	(0.0495)	(0.0276)
year = 2011	0.3725***	0.3974***	0.2131***
	(0.0597)	(0.0496)	(0.0280)
year = 2012	0.4404***	0.3945***	0.2847***
	(0.0644)	(0.0492)	(0.0316)
year = 2013	0.4736***	0.4500***	0.3507***
	(0.0470)	(0.0394)	(0.0275)
year = 2014	0.5369***	0.5032***	0.4327***
	(0.0538)	(0.0498)	(0.0288)
year = 2015	0.5480***	0.4995***	0.4511***
	(0.0544)	(0.0570)	(0.0350)

year = 2016	0.5123*** (0.0651)	0.4853*** (0.0629)	0.4446*** (0.0339)
Constant	3.2979*** (1.0134)	3.0418** (1.0555)	2.7517 (2.0571)
Observations	160	160	160
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, *			
p<0.1			