

**Essays on mobility and environmental concern in commodity-dependent
countries: case studies of Peru and Bolivia**

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Für meine Eltern Manuel und Ivonne und
für meine Kinder León und Valentín.

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CHAPTER 1

INTRODUCTION

The potential problems faced by commodity-dependent countries have been widely studied in the literature under the term "resource curse" (Auty 1994, 2001). Among these problems, the volatility of commodity prices and the effect of extractive activities on the environment are discussed. One of the main consequences of commodity price volatility is that commodity-exporting countries show low long-term economic growth. In addition, extractive activities generate negative environmental effects and local governance problems, leading to social conflicts. At the beginning of the new millennium, Latin American countries benefited from rising international commodity prices, experiencing improved terms of trade and high rates of economic growth. This period is known as the commodity boom. It came to an end in 2011, initiating what is known as the post-boom period, characterized by a slowdown in Latin American economies.

Based on this context, this cumulative dissertation explores separately the issues of labor income mobility (chapter 2) and transitions from informality to formality (chapter 3), both for the Peruvian case, and the relationship between support for the extractive development model and individual environmental concern in the case of Bolivia (chapter 4).

Chapter 2 is titled "**Labor Income Mobility during the Commodity Boom and the Post-Boom: The Case Study of Peru**" and investigates the distributive developments during the commodity boom and post-boom periods through the lens of individual labor income mobility. This less-explored approach complements existing analyses of inequality and addresses key questions regarding who benefited the most during the boom, the changes in income mobility patterns from the boom to the post-boom, and the dynamics of income convergence over these two periods.

The investigation studies annual labor income changes using longitudinal data from the National Household Survey (Encuesta Nacional de Hogares - ENAHO) for the periods 2007-2011 and 2011-2015. The first panel dataset corresponds to the boom period, and the second to the post-boom periods. Applying standard methodology on income mobility, the study conducts both macromobility and micromobility analyses. Macromobility analysis assesses aggregate

income mobility and examines mobility indicators disaggregated by various socio-economic characteristics, comparing trends between both periods. Micromobility analysis estimates dynamic labor income models to evaluate the convergence hypothesis and the influence of socio-economic factors on income changes.

Three main findings emerge from the analysis. Firstly, overall income mobility displays a declining trend, marked by the Global Financial Crisis in 2008-2009 and the fall of commodity prices in 2011. Secondly, during the boom and post-boom periods, certain groups benefited more from income mobility. Female workers showed higher labor income mobility than males during the boom, but this pattern reversed in the post-boom period. Workers in the primary sector consistently experienced greater mobility. Third, the results suggest a convergence of labor income in the short term, with a greater intensity during the boom period.

This research contributes to the literature by expanding the understanding of labor income mobility in developing countries, particularly Peru, where previous studies have primarily focused on poverty dynamics based on household consumption. Additionally, by examining individual income dynamics across the commodity boom and post-boom periods, the study sheds light on the pattern and temporality of income convergence, highlighting structural inequalities that persisted despite periods of economic expansion.

Chapter 3 is titled “**Labor Transitions from Informality to Formality in Urban Peru: 2007-2019**” and studies the impact of individual and job-related characteristics on transitions from informality to formality in Peru, as well as the distributional effects of these labor transitions. This study also uses longitudinal data from the ENAHO covering the periods of the previous chapter and additionally the 2015-2019 period, in which the post-boom economic slowdown deepened. The analysis compares results using three distinct measures of informality: informal sector, informal employment, and two-tier informality (upper-tier and lower-tier informality), testing the hypothesis that the choice of measure significantly influences outcomes due to the varied characteristics of workers it captures.

Employing standard methodologies in labor transition literature, the study characterizes annual labor dynamics through transition matrices and estimates marginal effects from multinomial logit regressions to assess determinants of transitioning from informality to formality. Additionally, regressions of labor income dynamics on formality transitions evaluate the

implications for workers' economic well-being. All analyses are conducted across the three informality definitions and economic contexts.

The findings reveal that the level and determinants of informal-formal transitions, as well as their impact on income dynamics, are indeed sensitive to the choice of measure. Key findings indicate that the informal/formal sector measure yields a higher probability of transition to formality compared to the informal/formal employment measure. Moreover, the relationship between economic cycles and informal-formal transitions persists across economic phases, with variations depending on the measure used.

Furthermore, in regard to the determinants of the transitions, the study highlights the importance of education in facilitating transitions from informality to formality across all definitions. Additionally, age and occupational category exhibit differential effects on informal-formal transition probabilities depending on the informality measure applied. Concerning the implications on economic well-being, transitions to formality are associated with increased labor income, with variations observed based on the definition of informality. The analysis of the two-tier informality definition reveals that formality does not necessarily lead to higher income. The study shows that low-skilled workers experience a lower earning capacity in formality than in upper-tier informality. Confirming the heterogeneous experiences within the transition from informality to formality.

This study contributes to the literature by providing empirical evidence on labor transitions in developing countries in three ways. First, it expands the literature for the Peruvian case, which predominantly focused on quarterly data only for the capital city. Second, the paper contributes to the small strand of the empirical literature that discusses the sensitivity of the analysis of informality to the choice of measure in developing countries and expands by focusing on the informal-formal transitions, offering valuable insights for policymakers. Finally, the paper links the microanalysis to the different economic contexts, allowing the exploration of possible changes in the effects of the determinants related to the economic cycle determined by the commodity boom and post-boom.

Chapter four, titled **Environmental Concern in Urban Bolivia: Individual Determinants and “Resource Curse Effects”**, explores the concept of environmental concern and the factors influencing people’s willingness to care for the natural environment. Most research on this topic has focused on the Global North, leading to a bias in understanding environmental concern,

neglecting the conditions of the Global South. This research examines environmental concern in Bolivia, a representative country of the Global South facing environmental challenges from extractive industries. It aims to determine whether factors influencing environmental concern in the Global North also apply in Bolivia. In addition, it investigates whether the context of an extractive development model, which provides economic benefits but is detrimental to the environment in practice, significantly influences aspects of environmental concern.

This study operationalizes environmental concern in three dimensions: attitudes of awareness, willingness to accept environmental costs, and environmentally friendly behavior. The research uses exclusive data sourced from the "Ecobarómetro – Encuesta de Cultura Ambiental 2022" (Environmental Culture Survey 2022), conducted in the three largest Bolivian cities: La Paz, Santa Cruz, and Cochabamba (Ciudadanía, 2022). This survey stands out as one of the rare specialized initiatives dedicated to gathering environmental public opinion data beyond the confines of the "Global North." First, the study performed a descriptive statistical analysis to identify primary trends and comparison with other countries. Then, following standard methods, the study estimates marginal effects of multivariate logit regressions to establish statistical correlations of the individual determinants for each dimension.

The study reveals three primary findings. Firstly, environmental concern levels in Bolivia surpass those of many Global North countries, challenging the notion that environmental concern is solely a privilege of the wealthy. Secondly, while the Bolivian case generally aligns with established empirical evidence from the Global North regarding individual determinants of environmental concern, nuances exist across the three dimensions. Particularly, education and values associated with the New Environmental Paradigm emerge as highly robust indicators of environmental concern. Thirdly, the study uncovers a paradox between pro-environmental attitudes and acceptance of the environmental costs of extractivism, influenced by support for the extractive development model. This finding echoes arguments in the "resource curse" literature, suggesting that individuals are inclined to tolerate environmental costs as long as economic gains are promised, thereby establishing a "resource curse effect" on environmental concern in Bolivia.

This investigation contributes in two ways. First, the study expands the analysis of environmental concern and its determinants in developing countries, which is limited mainly due to data scarcity. Secondly, the study includes a "Southern" perspective by analyzing a particular economic characteristic of developing countries in the discussion. To my knowledge,

the relationship between extractivism and environmental concern has been treated marginally in literature, and this investigation is the first one testing this relationship empirically.

In sum, the results of Chapters 2 and 3 demonstrate that the Peruvian labor market is dynamic in terms of income and labor transitions. The economic context set the tone for the convergence of labor income and informal/formal transitions. Chapter 4 shows that support for the extractivist development model influences environmental concern. In all three studies, the results highlight that education plays a decisive role: it allows for higher incomes, increases the probability of moving from informality to formality and the probability of expressing greater concern for the environment.

CHAPTER 2

LABOR INCOME MOBILITY DURING THE BOOM AND POST-BOOM OF COMMODITIES: THE CASE OF PERU

2.1 Introduction

During the so-called “commodity boom” the Peruvian economy presented the highest growth rates in Latin America. Between 2002 and 2011, its average growth was 6% (reaching a peak of 9.8% in 2008), doubling the region's average (CEPAL, 2023). A drop in inequality indicators accompanied the high growth rates. From 2002-2011, household per capita income inequality measured by the Gini coefficient decreased by 7.8 points from 53.0 to 45.2 (CEPAL, 2023). The reduction in inequality in Peru was also greater than the fall of 4.0 points in the average Gini coefficient experienced by the region. Previous studies point out the decrease in labor income inequality as the main driver for the fall of income inequality in Peru (Azevedo et al, 2013).

Motivated by the positive development of the Peruvian economy in terms of growth, macroeconomic stability, and reduction in poverty and inequality, some experts called this episode “the Peruvian miracle” (Mendoza, 2013). However, the expansionary period came to an end by mid-2011. Although the commodity boom, which boosted economic growth, meant for Peru an increase in the terms of trade of 78% from 2003 to 2011, the fall of international prices caused a reduction in the terms of trade by 13% from 2011 to 2014. With the end of the boom, the Peruvian economy slowed down. Between 2011 to 2016 its average growth was 3.2% (with a drop to 1% in 2004). This shift in trend raises questions about whether the distributive improvements effectively disrupted the longstanding history of inequality in the region, or if they were only of a temporary nature (Gasparini et al., 2016).

The objective of this study is to analyze the distributive consequences of the boom and post-boom periods in the Peruvian case from a dynamic perspective of individual labor incomes, i.e., by analyzing the labor income mobility. This less explored approach serves as a complement to the extensively researched analysis of inequality and allows us to answer the following questions: i) which workers benefited the most – experienced more mobility - from the commodity boom? Did the mobility pattern remain the same or change during the post-boom

period? ii) Did the labor income converge during the commodity boom? In so, did the convergence remain or reverse during the post-boom period?

To answer the research questions, the study follows standard methodology on income mobility and conducts a macromobility and micromobility analysis¹. The first step, which refers to macromobility analysis, consists of measuring indicators of income mobility in aggregate (for the whole sample) and disaggregated by groups of workers based on socio-economic characteristics (by quintiles, age groups, educational level, gender, sector of activity and area) and comparing the magnitude and direction of the mobility indicators calculated for the boom period (2007-2011) and the post-boom period (2011-2015). The second step, which refers to micromobility analysis, consists of estimating dynamic labor income models on initial labor income and on other initial observable characteristics to assess the convergence hypothesis and the effect of socioeconomic determinants on changes in income.

The analysis yields three main findings. The first one refers to the overall income mobility. Although mobility was, on average, positive, it presented a decreasing trend. This tendency is marked by two events: the first one in the year 2009, corresponding with the economic contraction due to the Global Financial Crisis, and the second one in the year 2011, associated with the fall of commodity prices. The second one refers to which workers benefited the most, in terms of experiencing larger income mobility, during the boom and post-boom periods. Female workers benefited more than males during the boom, but this pattern reversed in the post-boom period. Workers in the primary sector benefited more than those in the manufacturing and services sectors in both periods. Workers with higher education and urban workers benefited the most during the boom and the post-boom periods. The third finding is that labor income convergence is confirmed. The findings suggest that labor income convergence between the rich and the poor was greater during the commodity boom and lost intensity during the post-boom period, although it could only be confirmed as a transitory trend. The identification of underlying dynamics highlights the complexity of the distributive impact: while income convergence is confirmed for the timeframe, divergent trends are identified based on gender, education, and area.

¹ This paper builds on its previous version published in 2018, but differs in some aspects. This paper presents a broader conceptual framework and literature discussion, uses real monthly labor income from the main occupation, and includes an econometric analysis. The results are similar to those of the 2018 version.

This research contributes to the literature in two ways. First, it expands the limited literature on labor income mobility for developing countries in general and Peru in particular. Given that the study of income mobility in Peru has focused on poverty dynamics and household consumption, relevant dynamics related to labor market functioning have been overlooked. To my knowledge, there is no prior study on individual labor income mobility for the Peruvian case. Second, the analysis spans the period of expansion and slowdown in the context of the recent commodity boom. The literature has extensively discussed changes in income inequality in this context, therefore analyzing individual income dynamics provides new on the pattern and temporality of income convergence during this period, identifying which gaps may have closed and which other gaps persisted, thus highlighting their structural nature.

The paper is organized as follows. Section 2 describes the conceptual framework. Section 3 presents the literature review. Section 4 explains the empirical strategy. Section 5 describes the longitudinal databases and variables of interest in the study. Section 6 presents the descriptive analysis. Section 7 presents the results for each period and by groups. In addition, socio-economic transformations are evaluated during the boom period, and their sustainability is explored during the post-boom period. Finally, section 6 summarizes and discusses the findings.

2.2 Conceptual framework: the relevance of analyzing labor income mobility

Together with income inequality, income mobility is a key notion that serves for the analysis of income distribution within welfare economics². Both concepts are related in a complementary way: while income inequality provides a static analysis of the income distribution, income mobility focuses on the dynamics within income distribution. These notions offer different approaches and use different types of data. On the one hand, inequality studies focus on the differences in the income levels at any given distribution. It is possible to compare different income distributions by using cross-sectional data and provide rankings of inequality for a group of countries or analyze the evolution of income inequality in a particular country over time. On the other hand, income mobility looks at the changes within a given

² Mobility is a broad idea, and it has been studied across disciplines in the social sciences, especially economics and sociology. In fact, the sociologists Blau and Duncan (1967) are pioneers in the research of social mobility within the study of stratification of society. Even though mobility is widely studied in the social sciences, the different disciplines have a specific research scope. Sociologists focus on social class and occupational status mobility, while economists focus mainly on income mobility.

income distribution for the same individuals over time³, also called intragenerational mobility, or from one generation to another, also known as intergenerational mobility⁴. This paper investigates intragenerational mobility also be found in the literature under the label “income dynamics”. By using longitudinal data, studies on income mobility analyze how specific individuals change their economic status in the income distribution from one point in time to another. The concept of income mobility, i.e. movement of individuals’ income or position within income distribution in absolute or relative terms, is better suited to capture dynamics within the income distribution and address the evolution of individuals’ well-being.

The study of income mobility is relevant for many reasons. Atkinson et al. (1992) identified that income mobility could be the goal on its own, or a tool to reach a superior goal. As an ultimate goal, mobility is linked with the notion of social justice. In this sense, in a “mobile” society, individuals do not face obstacles to freely develop their lives and reach their objectives. At the same time, the notion of social justice can be interpreted as “equality of opportunities” or “equality of position” (Dubet, 2011). From the intergenerational mobility view, mobility can be related to “equality of opportunities”. This relationship could be expressed as individuals not being advantaged or disadvantaged because of their parent’s income level. This implies that children from poor families would be able to reach higher income levels than their parents⁵. Intergenerational mobility is possible due to equal access to education and health systems of the same quality as children from rich families; in other words, through equal opportunities. From the intragenerational mobility perspective, which is the one followed in this investigation, mobility relates to “equality of position”, and this can be understood as individuals reaching higher labor income over the course of their career regardless of the characteristics of their career experiences⁶. For instance, individuals working in the manufacturing sector, as well as those working in the service sector, could experience rising income, which would evidence that

³ For a comprehensive literature review see Jäntti and Jenkins (2015).

⁴ The time horizon on which mobility is focused allows to classify income mobility in two types. The analysis of the changes in income patterns of individuals over their lifetime refers to “intragenerational”, also called “within” income mobility. Alternatively, the study of the changes of income levels between parents and children, we refer to “intergenerational” or also called “between” income mobility. The last one is perhaps the most widespread concept since it has been widely studied in sociology and in economics for the case of industrialized countries. Moreover, the concept of “social mobility” usually implies intergenerational mobility. The study of relationship of intergenerational mobility and inequality is widespread specially industrialized countries. Most discussed finding is the so-called “Great Gatsby Curve” that associates higher levels of inequality with lower level of mobility between generations is an important referent on this topic (i.e, Corak, 2013)

⁵ There might be however other aspects apart from the parent’s income which can still affect the children’s economic performance such as genetic endowment or parenting practices (Jencks and Tach, 2006).

⁶ Also called “equality of condition” (Morgan and Kim ,2006).

the sector of employment does not constrain income mobility since workers in both sectors have the same chances to pursue their aspirations.

Regarding the functionality of income mobility as a tool, as pointed out by Atkinson et al. (1992) there are two different goals income mobility can contribute to reach: efficiency in the economy and a more equal income distribution. With respect to the goal of economic efficiency, income mobility can be interpreted as the evidence for labor market flexibility. From a neoclassical perspective, regulations on the labor market lead to inefficient results since they distort the outcomes from the market-clearing and generate economic losses. Therefore, flexible labor markets are proclaimed to lead to more efficiency. Consequently, a high degree of labor income mobility reveals high flexibility since it suggests that workers move freely among jobs, and wages adjust easily to the economic situation. However, as indicated by Atkinson et al. (1992), from these two relationships, the one concerning distributional equity provides the principal relevance for income mobility. Particularly, in the case of intragenerational mobility, mobility is supposed to lead to a reduction in inequality of longer-term incomes. If relative incomes do not change in a given distribution over time, there will not be any changes in the inequality measure. Conversely, inequality is supposed to decline over time in a very mobile society (Shorrocks, 1978).

2.3 Literature review

2.3.1 Commodity boom and labor income

As a commodity-abundant and commodity-export-dependent country, Peru has experienced various boom and bust commodity cycles throughout its history (Orihuela & Gamarra, 2019). The economic growth of the first decade of the 2000s experienced in Peru, and throughout the Latin American region, was driven by the so-called commodity super-cycle (Erten and Ocampo, 2013), which ended in 2011. Studies on the distributive impacts of the economic growth during the expansion period focused especially on income inequality reduction (i.a. López-Calva & Lustig, 2010; Gasparini & Lustig, 2011, Azevedo et al., 2013). It was found that for the Peruvian case, the main factor behind the reduction in income inequality was the reduction in

the skill premium (Azevedo et al., 2013)⁷. According to this literature, three mechanisms can explain this trend: the increase in demand for less skilled workers, the increase in the supply of skilled workers due to investments in education since the 1990s (Paz & Urrutia, 2015). The deceleration in inequality experienced in the region since 2010 was associated with the fall of the terms of trade (Gasparini et al., 2016, Marull Maita & Rosero, 2015).

However, studies on the evolution of labor incomes in Peru during the commodity super-cycle show a low labor income increase despite rapid economic growth (World Bank, 2010; Cruces, 2015). The arguments explaining this stagnation include the high elasticity of labor supply, labor market flexibility, and low labor productivity. The first argument suggests that the increase in labor supply has offset the increase in demand, resulting in increased employment but without significant increases in labor incomes (World Bank, 2010). The second argument is the labor market flexibility implemented in Peru since 1992 within the framework of neoliberal policies, which led to the weakening of labor institutions such as unions and collective bargaining, leaving workers - mostly with temporary contracts - without tools for negotiating wage increases (Vidal et al., 2012). The third argument indicates that employment is concentrated in sectors of low productivity - such as agriculture and commerce. During the studied period, Peru is considered one of the countries with the lowest labor productivity rates among high middle-income countries in the region (World Bank, 2010).

2.3.2 Empirical literature on labor income mobility

The empirical literature on mobility in Peru investigates mainly poverty dynamics based on analysis of changes in the level of household consumption⁸ (Glewwe & Hall, 1998; Herrera, 1999; Herrera, 2001; Herrera & Roubaud, 2005; Grimm, 2007, Gambeta 2007). Other comparative studies for the Latin American region use total income per capital to analyze mobility for the poor, vulnerable and median class (Ferreira et al., 2013). To my knowledge, there are no studies on labor income mobility in Peru, nor studies that investigate the convergence of income during the commodity boom and post-boom.

⁷ The reduction of non-labor income inequality constituted the second driver. While distributive social policies were the main driving force in other countries of the region, in the case of Peru, transfer programs such as *Juntos* played a secondary role (Azevedo et al., 2011; Yamada et al. 2012).

⁸ Expenditures are often a better suited to assess the long-term welfare of the household, as households will smooth consumption to some extent and use savings and credit to cope with volatile income. Moreover, expenditure reporting is more accurate among the poor because it is based on fewer known items, while their income is highly variable (Woolard and Klasen, 2005).

The literature on poverty dynamics provides relevant findings regarding the evolution of mobility during growth and recession periods, as well as the socio-economic determinants of moving out from poverty that are closely related to the object of this study. For the Peruvian case, upward mobility and transitions out poverty have been found lower during recession than during growth periods. This means that both the probability of entering and remaining in poverty increased during recessions (Herrera, 1999; Herrera, 2001). In addition, greater mobility is observed in countries with higher growth rates, which also implies that economic growth during the 2000s in comparison to 1990s in Latin America was pro-poor. (Ferreira et al. 2013). Regarding to the factors explaining poverty transitions, these included household characteristics (type, size), characteristics of the head of household (age, education), number of income-earning members, and determinants related to household income such as economic sector, occupational category, ethnicity, and gender. (i.a. Herrera, 1999; Herrera, 2001; Gambeta 2007). The education level and gender (being male) of the head of household and the initial asset of the household are the most important determinants for escaping poverty⁹.

This research closely follows the individual labor income mobility study approach applied by Duval (2007) for his study on income dynamics in urban Mexico, Fields et al (2007), Fields & Sanchez Puerta (2010) for their comparative study of Argentina, Mexico, and Venezuela. This approach has also been applied to the study of mobility in industrialized countries (Aristei & Perugini, 2015). The aforementioned studies test, among others, the divergent income hypothesis, based on the arguments of cumulative advantage, poverty traps, and skilled-biased technological change, and the convergent income hypothesis, based on the grand mean theory. The studies found evidence of income convergence between the rich and the poor, i.e., those with lower initial incomes tend to earn relatively more. However, convergence is not robust when using other alternative measures of income; therefore, they are interpreted in most cases as temporary convergence, and it cannot be asserted that changes in income observed in years of economic growth are influential in the long run. The main determinants of income mobility among the time-invariant characteristics are gender, age, education, and area/region¹⁰. These studies found that for most of the case studies being male and having higher education are

⁹ Evidence from other developing regions presents similar results. Woolard and Klasen (2005) found four poverty traps in his 1993-1998 South Africa study: large initial household size, poor initial education, poor initial asset endowment, and poor initial access to employment.

¹⁰ Duval (2007) also analyzed the effect of time-variant characteristics refer to employment status changes (employed/unemployed, formal/informal combined with wage worker/self-employed).

positively associated with income mobility in both growth and recession years. While the effects of age and region have no specific pattern.

2.4 Empirical strategy: measuring intragenerational mobility

The notion of income mobility has several interpretations. Fields & Ok (1999 a, b) define the mobility of income as a multifaceted concept. As a result of this characteristic, there is no unified theory for the concept and its measurement. Therefore, the evaluation of different aspects of this concept may lead to opposite results regarding the level of mobility in a society. Consequently, it is necessary to define the notion of mobility that will be analyzed. Of the large number of notions that exist in the literature, this study focuses on absolute mobility. The concept of absolute mobility allows to measure the magnitude and direction of changes in income, thus assessing the changes in absolute well-being. Accordingly, the regression analysis will explore the effect of the initial income (unconditional and conditional convergence) and the socio-economic determinant on absolute mobility.

2.4.1 Macromobility analysis: Mobility as a directional income movement

Absolute mobility refers to changes between an individual's initial and final income. To measure this type of mobility, Field & Ok (1999a, b) suggest the use of the directional mobility indicator. This indicator measures the average of changes in income and is calculated in two ways: the first (1) is by taking income in levels (monetary units), and the second (2) is by taking the logarithmic form of income. The second measure has the advantage of highlighting the changes for lower income workers. The indicators are specified as follows:

$$\overline{\Delta y_n} = \frac{1}{n} \sum_{i=1}^n (y_{it} - y_{it-1}) \quad (1)$$

And in its logarithmic form:

$$\overline{m_n} = \frac{1}{n} \sum_{i=1}^n [\ln(y_{i,t}) - \ln(y_{i,t-1})] \quad (2)$$

Where y is the monthly real labor income of individual i in year t . Individual i belongs to the sample of size n . The indicators are interpreted as the change in average income. The use of logarithmic transformations allows the comparison when scales in levels are different, as it measures proportional changes. Based in their income level, changes in absolute terms will

differ in magnitude between poor and rich individuals. For example, poor individuals will experience less downward mobility due to the low income level. Using logarithms helps to compare labor income changes between poorer and richer individuals (Duval, 2006).

The main potential bias in this analysis is a measurement error of reported incomes. However, if the underestimation of reported income is assumed to be constant over the period of analysis, studying changes in income over time is less problematic (Atkinson & Bourguignon, 1992).

The main advantage of using directional mobility is that it considers both the magnitude and the direction (increases or decreases) of changes in income. Because it measures absolute changes in income, it is possible for all individuals to experience upward (or downward) mobility at the same time, as well as for an individual to experience mobility even though his or her relative position remains the same. For the purposes of this paper, the directional mobility is first calculated for the entire sample for each period. In this way, the magnitude and direction of the change in labor income is determined on an aggregate basis. Subsequently, the same calculation is performed for different groups of workers to determine who benefited more and who benefited less in each period.

2.4.2 Micromobility analysis: Conditional and unconditional mobility

This section closely follows the methodological framework described by Fields et al. (2007), which is considered standard for the study of income mobility and has been applied in various studies (i.a., Fields, et al., 2003, 2007, 2010; Duval, 2007; Aristei, and Perugini, 2015). According to this framework, the model of income dynamics allows to explore the unconditional and conditional convergence and the effect of socio-economic characteristics on income mobility. The unconditional convergence refers to the income convergence between the initially rich and initially poor. While conditional convergence refers to the convergence to a conditional mean. The models are expressed as follows:

First, the unconditional convergence is estimated by a model in which income change of individual i at time t , ($\Delta Y_{i,t}$), depends linearly only on the lagged income ($Y_{i,t-1}$):

$$\Delta Y_{i,t} = \alpha + \beta Y_{i,t-1} + \mu_{i,t} \quad (3)$$

Where β measures the unconditional convergence. If $\beta < 0$ there is convergence, if $\beta > 0$ there is divergence, and if $\beta = 0$ the income change is not affected by the initial income, i.e. the rich and the poor gains and losses are the same.

In the micromobility analysis, the potential biased form measurement error of reported incomes is more problematic than in the macromobility one. As reported income appears on both sides of the equation, the problems that arise are spurious negative correlation and attenuation bias (Fields et al., 2003). This can lead to an overestimation of the convergence. Following the standard approach, to overcome this problem, the initial income in equation (3) is replaced by a proxy for permanent labor income that measures the “permanent advantage”. There are two possible proxies: predicted incomes and average income. Predicted income is estimated based on individual characteristics (we use gender, age, age squared, education, and education squared), while average labor income is calculated based on information from all available years for each individual. The advantage of using average income is that this proxy captures the effects of both observable and unobservable factors, such as ability and social capital. It is used when there are multiple observations over time, and these are spaced out over time. Given the limited time span of each panel dataset used in this investigation (maximum 5 years), the accuracy of the results should be taken with caution.

Second, conditional convergence means that individuals converge to their predicted individual level. This predicted level is determined by a set of observable and unobservable socio-economic characteristics following a Mincer-type equation. The conditional convergence is estimated by an extension of model (3) in which income change of an individual i at time t , ($\Delta Y_{i,t}$), depends on the lagged income ($Y_{i,t-1}$), and a set of observable initial characteristics Z_i , expressed as:

$$\Delta Y_{i,t} = \delta Z_i + \rho Y_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

Where Z_i are underlying determinants of labor income change. This study includes gender, age, education level, occupational category, sector of activity, and area as possible determinants based on the literature review¹¹. Thus, δ measures the effect of the socio-economic determinants, conditional to the initial income level. And ρ measures the degree of conditional

¹¹ A difference with Duval (2007) is that he includes the effect of time-variant characteristics related to employment status changes (employed/unemployed, formal/informal combined with wage worker/self-employed). In this research, it is decided not to include them because these transitions are studied in the next chapter in depth.

convergence, i.e. the extent to which poorer and richer individuals who are observationally equivalent (in terms of Z_i) have income patterns that converge over time. Equation (5) and (6) are estimated also in logarithms approximating proportionate changes.

2.5 The data: ENAHO 2007-2011 and 2011-2015

The analysis uses longitudinal data from the National Households Survey on Living Conditions and Poverty (ENAHO in Spanish) for two periods: 2007 to 2011 and 2011 to 2015. The period from 2007 to 2011 overlaps with years of rapid economic growth due to the commodity boom and economic slowdown due fall of international prices in Peru. The survey provides information on an annual basis and with nationwide coverage. This study uses information from the employment and income, and educational attainment modules. The survey is designed as a rotating sample, which replaces 20% of its sample each year within a time span of 5 years. The observations are annual changes in labor income (from t to $t+1$). In order to get more observations and limit potential attrition bias, the analysis pools the annual dynamics (from t to $t+1$) for each dataset in the regression analysis for the conditional regression analysis. Consequently, the estimations' outcomes are average results for each period.

Since the paper studies labor income mobility, the individuals under consideration are males and females between 25 and 65 years of age, which refers to working age individuals after culminating higher education and previous retirement age according to Peruvian standards. Moreover, the analysis focused on paid employed, which means unemployed, out-of-labor force individuals, and unpaid workers (non-remunerated family workers) are excluded from the analysis since their zero income would bias the analysis. The total size (all individuals aged 25-65) by dataset is 162 517 for the first period (2007-2011) and 203 667 for the second period. Regarding only paid employed workers the sample sizes are: 142 861 and 181 079 for the first and second period, respectively. Finally, for the analysis of mobility, i.e. labor income annual change, the number of observations are: 26 267 and 34 616 for the first and second period, respectively. In Annex A, Table A.1 shows the descriptive statistics for each dataset. The corresponding sampling weights provided by INEI are used in the calculations¹².

¹² According to the INEI, sample weights are calculated based on the following components: the basic sampling factor, the non-response adjustment factors, and the demographic adjustment factors.

The analysis uses real monthly labor income (monetary and in-kind) from the primary occupation imputed and deflated, previously estimated by the INEI and available in the datasets¹³. Since the comparability of income in levels cannot be assured, caution should be exercised when comparing directional mobility in levels between periods. However, logarithmic transformation of labor incomes allows the comparison of results between databases, as they are interpreted as proportional changes in labor income. The variables that capture socio-economic characteristics, selected based on the previous literature review, are: gender (male/female), age groups (25-39, 39-52, 53-65), level of education (primary education or less, secondary education, non-university education, university education), occupational category (wage employee/self-employed), sector of activity (primary/manufacturing/services), and area (urban/rural).

2.6 Descriptive analysis

This section, prior to the mobility analysis, aims to explore the average distribution of workers for each data set. Moreover, the initial conditions of the different groups of workers are analyzed. This allows the identification of the groups that had the highest labor income in 2007, the initial year of the analysis.

2.6.1 Characteristics of the sample

Regarding the sample used for the mobility analysis, Table A.1 shows the distribution of workers in paid employment aged 25 to 65. It is observed that for both periods, 60% of the sample are male and 40% are female. As initially indicated, the mobility analysis focuses on the dynamics experienced by workers in paid employment. We condensed the variables of occupational category into self-employment (owners and self-employed) and wage employment (dependent workers, blue-collar, and domestic workers). The sample is evenly distributed between the two categories, but on average, in the second period (2011-2015), the percentage of workers in self-employment slightly decreases. Regarding age distribution, it is similar between both periods and genders: approximately 46% belong to the age group 25-38, 37% to the age group 39-52, and 17% to the age group 53-65. The average distribution by levels of education is similar in both periods: 26% have primary education or less, 39% have

¹³ The base year for the deflation procedure is not provided either in the description of the variable in the datasets nor complementary documentation available in the ENAHO Panel datasets.

secondary education, 17% have non-university education, and 18% have university education. But differences are observed between genders: more women tend to have lower educational levels compared to men (5 percentage points higher), and they also tend to have more higher education (5 percentage points higher), while men are more concentrated in secondary education. The distribution by sector of activity is similar on average between the two periods: 21% in the primary sector, 11% in the manufacturing sector, and 68% in the service sector. But there are gender differences: women are overrepresented in the service sector due to their low participation in the primary sector. Regarding the distribution between urban and rural areas, we see that 80% of workers are urban and only 20% rural. Employment by gender shows a similar distribution, but paid employment of women tends to concentrate in urban areas compared to that of men.

2.6.2 Initial advantage by subgroups

Following Duval (2006, 2007) and Fields et al (2007), this section undertakes a comparative analysis of the average labor income among selected groups of workers in year 2007 the initial year of the analysis. The aim of this procedure is to determine which subgroup within each group presented an initial advantage and assess the magnitude of the differences relative to other subgroups. In Annex A, Table A.2 shows the Initial Advantage Profiles for the different groups of workers. Seven distinct groups are analyzed based on: quintiles, gender, age group, education level, occupational category, sector of activity, and geographical area. For each group, statistical tests are conducted to determine the significance of the differences between the average labor income of the subgroups, with the null hypothesis being that the average labor income among the subgroups is equal and the alternative hypothesis is that at least one pair of means is different. In case of more than two subgroups, the Bonferroni correction was used, to check for all possible pair of means combination.

By definition, individuals are ranked according to their income levels. Therefore, the top quintile (Q5) represents the 20% of workers with the highest income. While quintile 1 (Q1) represents the 20% of workers with the lowest incomes. The table shows the large differences in average annual income across quintiles. Notably, workers belonging to the highest quintile have an average annual labor income fifty-four times greater than workers with the lowest incomes. Furthermore, when comparing the income of quintile 5 with the rest of the distribution, this subgroup exhibits an average annual labor income eight times higher. As

expected, the statistical test rejects the null hypothesis. However, the means for quintiles 1 and 2 and for quintiles 2 and 3 are not statistically significant.

Regarding initial labor income by gender, the table shows that male workers present a higher average labor income than female workers. The wage gap is 30% and is statistically significant.

The analysis considers three age groups: the first group comprises individuals aged 25 to 38 years, the second group includes those aged 39 to 52 years, and the third group encompasses individuals aged 53 to 65 years. The first group presents the highest average income. Individuals in this age group show approximately 11% higher average labor income compared to the other two subgroups. The difference in average labor income among the subgroups is rather low, which is confirmed by the statistical test that cannot reject the null hypothesis.

The analysis considers four groups of education levels: primary education or less, secondary education, non-university education, and university education. As expected, labor income increases with more years of education. The initial advantage favors those workers with a university education. They present an average labor income 300% higher than those with primary education or less, 70% more than those with secondary education, and 40% more than those with non-university education. The difference in average labor income between workers with secondary education and those with primary education or less is 70%. While the income difference between non-university is lower by only 18%. The statistical test confirms the significance of all these observed differences in average labor income.

The occupation categories were condensed into two subgroups: self-employed workers and wage employees. The initial advantage favors wage employees. These workers present average labor income 76% higher than that of the self-employed workers. The statistical test also confirms the significance of these differences.

The sector of economic activity has three subgroups: primary, manufacturing and services. Notably, the secondary and tertiary sectors exhibit high and comparable average incomes. Conversely, the primary sector displays the lowest average income, approximately 50% lower than that of the other sectors. While the statistical test confirms the significance of the differences across subgroup averages, it indicates that the disparities between the manufacturing and services sectors are not statistically significant.

As expected, the difference in average income between urban and rural areas is very large. Urban workers present average labor income almost three times higher than their rural counterparts. The test confirms that the difference between the averages is statistically significant.

Summing up, the initial advantage is primarily determined based on education level and area of residence, second-order difference based on occupational category and sector of activity, and finally based on gender.

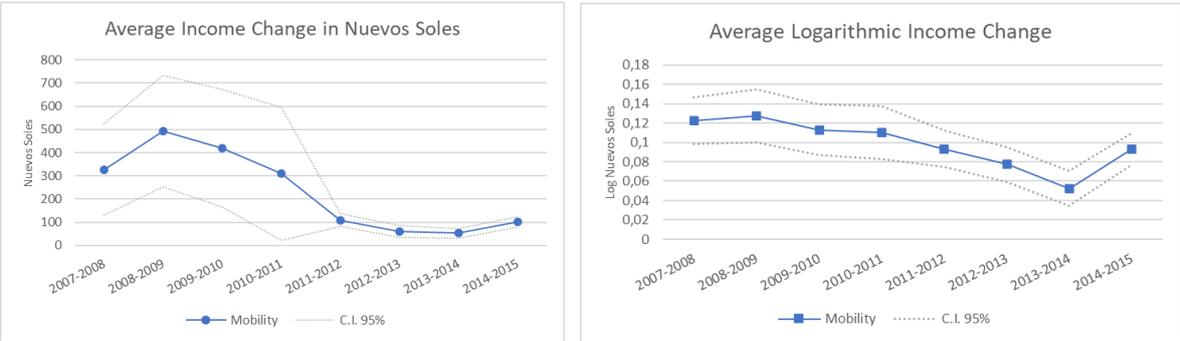
2.7 Results of labor income mobility: macromobility and micromobility

2.7.1 Macromobility Analysis

2.7.1.1 Aggregated mobility

Figure 2.1 shows the directional mobility indicator for employed individuals aged 14 to 65. As mentioned above, mobility is calculated for labor income at levels (in monetary units) and in logarithms. The figure shows the estimated mobility index and the 95% confidence intervals to indicate when these estimates are statistically different from zero. The average mobility during the commodity boom and post-boom periods remained positive, although presents a decreasing tendency since 2009 (year of the Global Financial Crises) which gains intensity since 2011 (fall of commodity prices). Mobility grows again from 2014, although it remains below the levels of the boom period. The mobility index in logarithmic form presents a smoother curve since it approximates proportional income changes.

Figure 2.1: Directional Mobility



Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

2.7.1.2 Mobility by groups

Figure 2.2 shows the directional mobility by quintiles of the initial income distribution. During the commodity boom years, the average change in income levels was positive for quintiles 2 to 4, while the highest quintile experienced negative directional mobility, being the highest in the year 2011. The logarithmic form shows a more nuanced picture, as it shows proportional changes. Log-mobility was positive and was the largest for quintile 1 throughout both periods, explained by their lower income levels. The log-mobility level was also positive but much lower for quintile 2, and also positive but close to zero for quintile 3. While quintiles 4 and 5 experience negative log-mobility, which was larger during the boom period.

Regarding the evolution of directional mobility by gender, Figure 2.3 shows that both genders experienced income gains, although the average mobility experienced by women was greater than that of men mainly during the commodity boom period. Since men had the initial advantage over women, these indicators suggest that economic growth benefited women relatively more in absolute terms. The log-mobility shows that lower income gains in the post-boom period meant, in several years, greater mobility for women in proportion to their lower relative labor income.

Figure 2.4 shows the directional mobility by age groups. It can be observed that individuals from the age group 25-38, which presented the initial advantage, are also those who present the highest levels of upward mobility. They are followed by individuals from the age group 39-52 and lastly by those from the age group 53-65. This last group shows on average downward mobility in the initial years of slow down (2011 and 2012). In general, it is observed that mobility levels are lower in the second period and that estimates tend to converge.

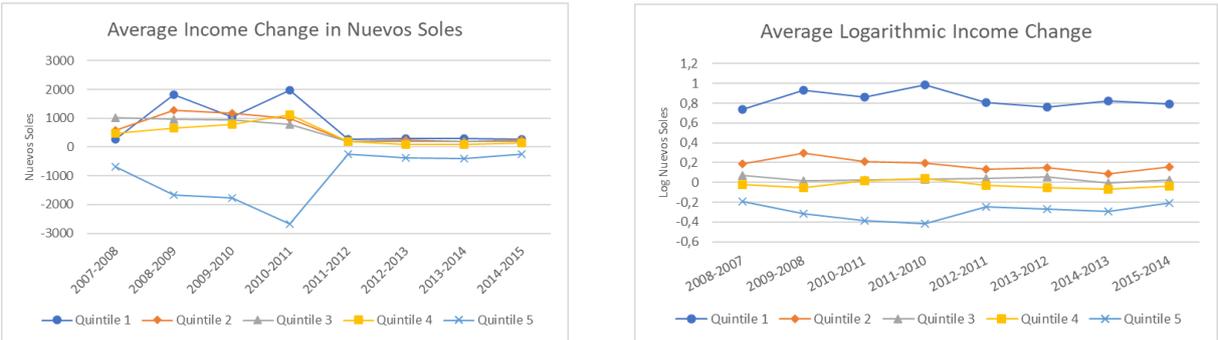
Figure 2.5 shows directional mobility by levels of education. It is observed that during the boom period, the less educated workers (primary or less education level) experienced large average income gains, higher than the rest in many years. The log-average income changes show that workers with university education, subgroup with initial advantage, experienced lower levels of mobility in the boom period, and higher levels of mobility in the post-boom period. This lower relative mobility of the more educated workers relative to the rest of the workers is in line with the evidence on the reduction of the skilled-premium during the boom phase discussed in the literature.

Regarding directional mobility by occupational categories, Figure 2.6 shows that in levels the self-employed experienced higher average earnings during the boom. But in the post-boom period earnings declined reaching average values close to zero in 2013 and negative in 2014. Wage workers experienced income gains during the boom, but also sharp average losses in 2009 (Global financial crisis). In the second period the gains were low but stable. The log-mobility results show a different picture: looking at income changes in proportional terms, the upward mobility experienced by wage earners, subgroup with initial advantage, was three to four times greater than for the self-employed.

The results of directional mobility by sector of activity in Figure 2.7 show that workers in the primary sector had the highest income gains during the boom period and the lowest gains (or even losses) during the post-boom period. Workers in the manufacturing sector had the highest variability in the boom period, being strongly affected in the years 2009 and 2011. The service sector shows the lowest levels of upward mobility in the boom period and these levels continue to be approximately stable in the post-boom period. The log-mobility results amplify mobility for those in the primary sector, because they have the lowest average incomes, and also amplify mobility in services, although having average incomes not significantly different from those in manufacturing, would indicate that it was the poorest in the service sector who experienced the greatest changes in their incomes, indicating that it was those with the lowest incomes who experienced the greatest changes in their incomes. Conversely, the log-mobility of manufacturing workers is smoother.

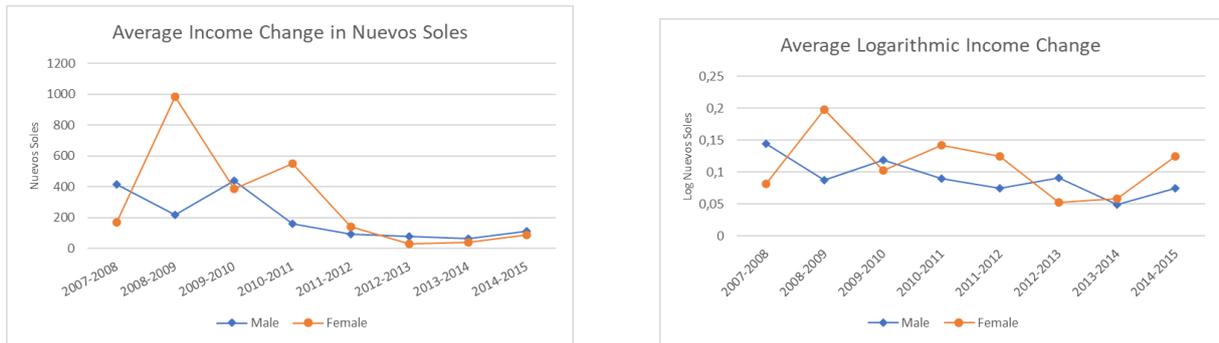
Regarding directional mobility by area, Figure 2.8 shows that workers in rural areas experienced a higher increase in labor income than those in urban areas in 2009. In the other years, mobility in rural areas tended to be lower than in urban areas. The log-mobility confirms the trends.

Figure 2.2: Directional Mobility by Quintile



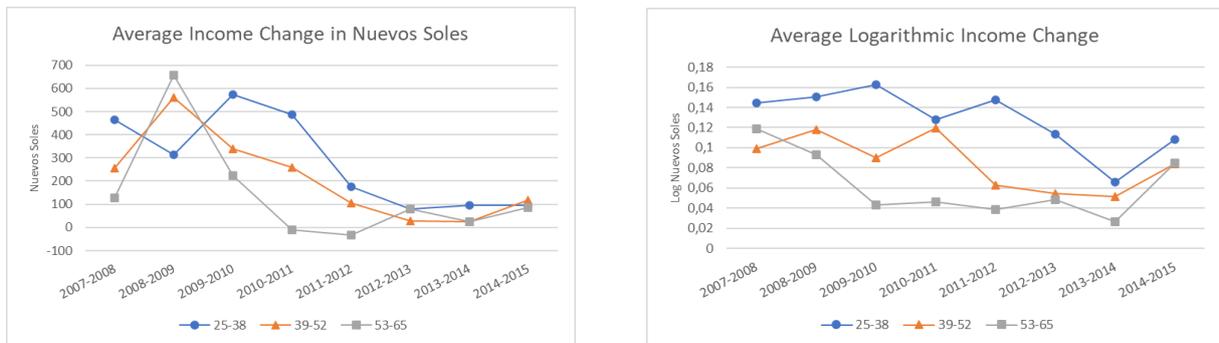
Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.3: Directional Mobility Index by Gender



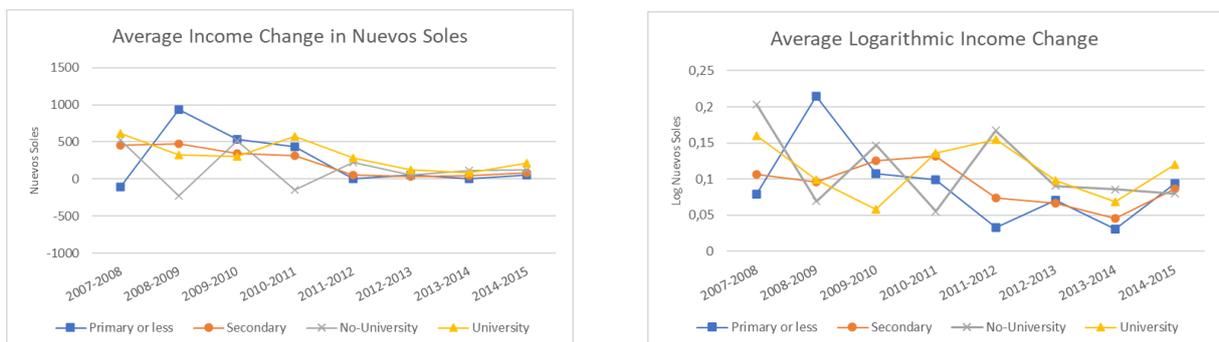
Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.4: Directional Mobility Index by Age Groups



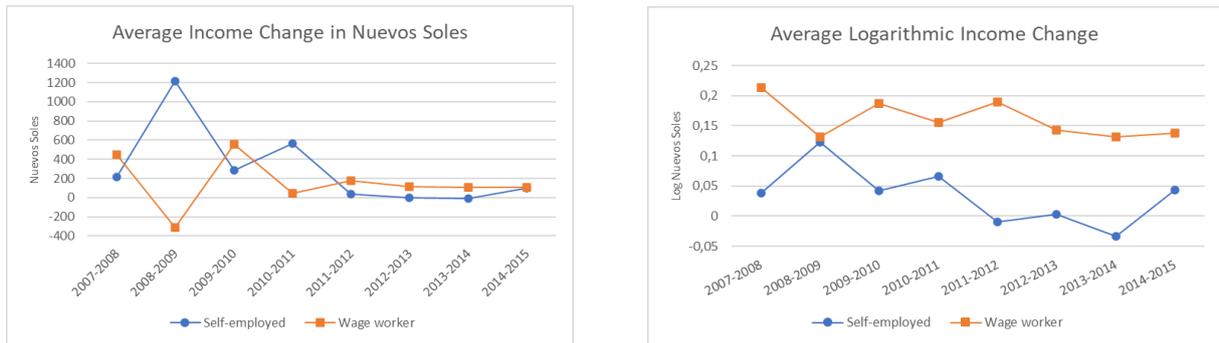
Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.5: Directional Mobility Index by Education Level



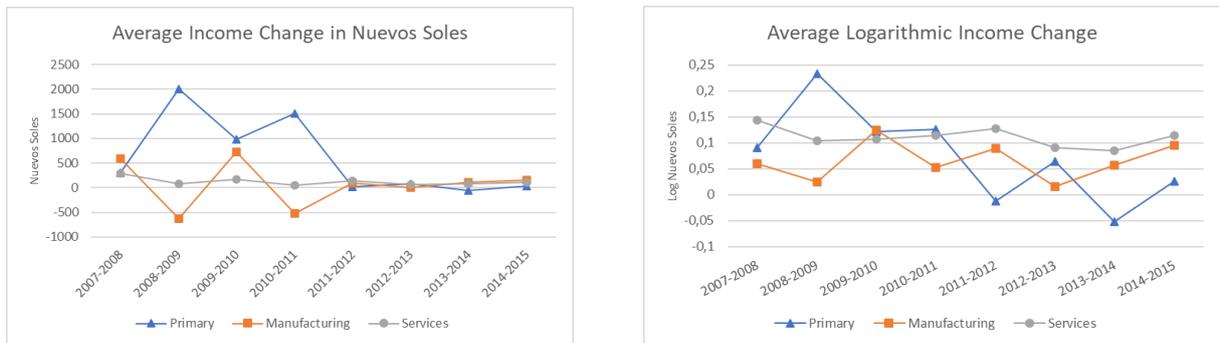
Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.6: Directional Mobility Index by Occupational Category



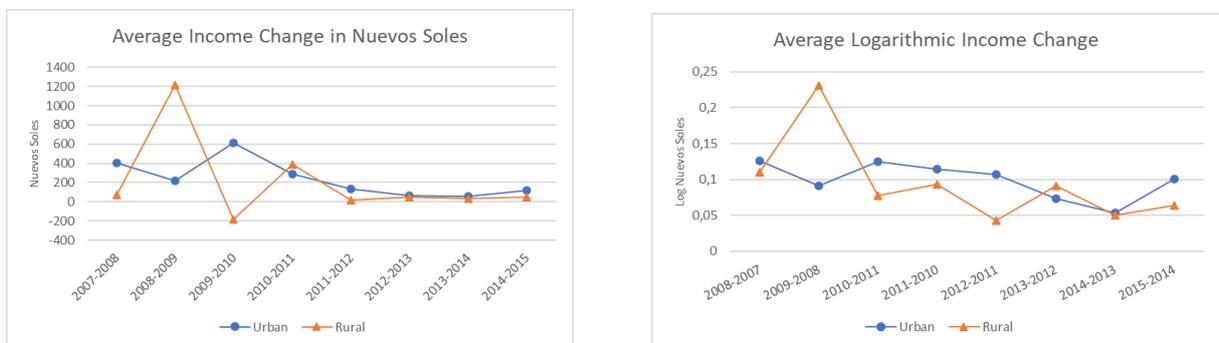
Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.7: Directional Mobility by Sector of Activity



Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.8: Directional Mobility by Area



Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

2.7.2 Micromobility analysis

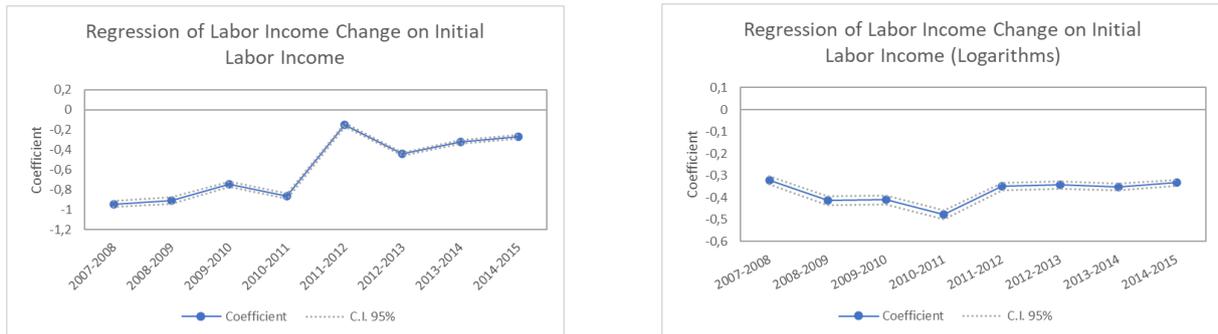
2.7.2.1 Unconditional Mobility: Testing Convergence

This section presents results from the analysis of unconditional mobility, which tests the hypothesis of income convergence between the rich and the poor during the commodity boom and post-boom periods. In this analysis, a negative sign indicates convergence, a positive sign indicates divergence, and non-significance suggests no difference in income mobility between the rich and the poor. Figure 2.9 shows the results of the reported initial income coefficients. Regression results at levels demonstrate a convergence of labor incomes over the period, which was greater during the commodity boom and reduced during the post-boom phase. The estimation in logarithms confirms the convergence of labor incomes, albeit with less variability. In order to assess whether this convergence corresponds to short-term fluctuations or long-term trends, additional regressions are estimated using two different proxies for permanent income: predicted income and the average of incomes.

Figure 2.10 displays the coefficients for predicted income. The results indicate that the initial predicted income was not significant for many years in the analysis, implying that income changes for the rich and the poor were not different. In regression at levels, divergence is observed for the years where the coefficient is significant. Conversely, in logarithmic regressions, the results show divergence in 2008 and convergence in 2009 and 2015. The discrepancy in the effect of estimations between levels and logarithms indicates that using this proxy, the rich gained more in absolute terms, while proportionally, the poor were catching up to the rich. Using this proxy, the convergence found using reported incomes can be confirmed, although not for all years. Figure 2.11 illustrates the coefficient for the average of labor incomes as a proxy for permanent incomes. Regression results at levels show income divergence during the commodity boom period, but with a decreasing trend. In the post-boom period, convergence is only found in 2013, and subsequently the trend becomes divergent again. Logarithmic results indicate non-significant coefficients for several years. While divergence is only observed in 2008, convergence was found during the post boom period in the years 2013 and 2015.

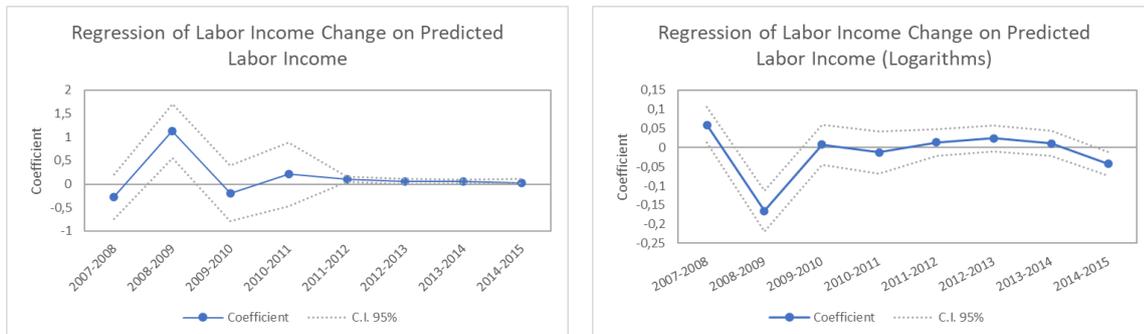
In summary, the analysis reveals income convergence between the rich and the poor when reported incomes are considered, with more pronounced convergence during the commodity boom and less during the post-boom period. However, this convergence seems to be mostly temporary. When using proxies for permanent incomes, convergence is confirmed only for a few years, while for most years, neither convergence nor divergence is evident.

Figure 2.9: Regression Coefficients of Labor Income Change on Initial Labor Income



Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

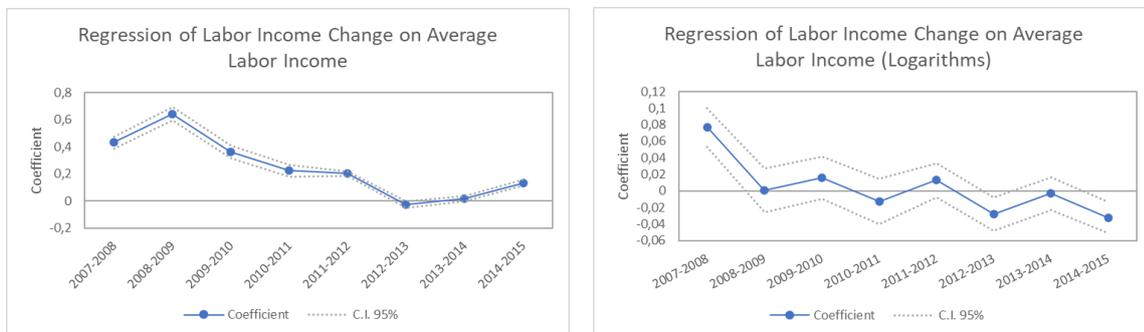
Figure 2.10: Regression Coefficients of Labor Income Change on Predicted Labor Income



Note: Initial predicted income in levels was not significant in years 2008, 2010 and 2011. Initial predicted income in logarithms was not significant in years 2009 to 2014.

Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

Figure 2.11: Regression Coefficients of Labor Income Change on Average Labor Income



Note: Average income was significant in all years. Log-average income was not significant in years 2009, 2010, 2011, 2012 and 2014.

Source: Own estimation based on ENAHO 2007-2011 and 2011-2015. Sample weights used.

2.7.2.2 Conditional Mobility: Determinants of Labor Income Changes

Tables 2.1 present the average outcomes of both unconditional and conditional regressions in levels for each period, while Table 2.2 displays the corresponding results of these regressions for the logarithmic transformations. As previously mentioned, unconditional regressions solely incorporate initial income as a regressor, whereas conditional regressions include additional socio-economic determinants.

The results show that the initial income coefficients in the conditional regressions are greater than those in the unconditional regressions, implying that other socioeconomic determinants have a divergent effect on labor income. Consequently, when these factors are controlled, the convergence effect of the initial incomes becomes more pronounced. This finding is similar to Duval's (2007) findings for the Mexican case. However, the regression in logarithms shows a different picture. In that case, the initial incomes' convergence effect is lower after controlling for the socio-economic factors, indicating that these factors have, in fact, an overall convergent effect on the proportional changes of labor income.

Regarding the drivers of directional mobility, the results indicate that education is the most important determinant of income change. Both in the level and log regressions, higher levels of education increase income mobility. For the regressions in levels, the effect of education decreased between the boom and post-boom periods, but for the regressions in logarithms, the effect increased. Gender had a changing effect between periods, following the economic cycle; being female had a positive average effect during the boom but a negative one in the post-boom. These results are consistent in levels and logarithms. Concerning the effect of age, it is significant only for the logarithmic estimation and has a negative impact on directional mobility in both periods. The effect of being a wage worker differs between the regressions in levels and in logarithms. In the level regression, compared to self-employed, being a wage worker has a positive effect on mobility, but this effect is only significant in the post-boom period. Meanwhile, for the estimations in logarithms, being a wage worker has a negative effect in both periods, but its intensity decreased between the periods. The results regarding the sector of activity vary between level and logarithmic regressions. In levels, the effect of the manufacturing and service sectors, compared to the primary sector, is negative during the boom but positive during the post-boom. However, for the regressions in logarithms, the effects were negative in both periods, especially for services, and decreased between the boom and the post-boom periods. Finally, being an urban worker, compared to rural, increases directional mobility

in both periods using levels and logarithms. But effect for regressions in logarithms increased between the boom and post-boom periods.

In summary, the results show that the effects of socio-economic determinants tend to be convergent when analyzed in levels but divergent when analyzed logarithms. Additionally, overall, the effects of the determinants of directional mobility measured in monetary units decreases during the post-boom period, corresponding to the economic slowdown. However, the effect of determinants measured as proportional to the income level, especially in the case of determinants with positive signs (divergent effects), intensifies during the post-boom period.

Table 2.1: Determinants of Labor Income Change at levels

Variable	1° Period: 2007-2011		2° Period: 2011-2015	
	Unconditional	Conditional	Unconditional	Conditional
Initial Labor Income	-0,846 *** <i>0,008</i>	-0,85035 *** <i>0,008</i>	-0,285 *** <i>0,004</i>	-0,3405 *** <i>0,005</i>
Female		199,005 * <i>113,661</i>		-166,405 *** <i>12,703</i>
<i>Age group (reference: Age group 25-38)</i>				
39-52		115,676 <i>115,788</i>		32,928 ** <i>12,975</i>
53-65		-2,229 <i>159,113</i>		-14,822 <i>16,901</i>
<i>Education Level (reference: Primary or less)</i>				
Secondary Education		114,765 <i>143,198</i>		77,579 *** <i>16,227</i>
No-university Education		328,312 * <i>184,254</i>		210,513 *** <i>20,695</i>
University Education		1039,988 *** <i>185,029</i>		425,564 *** <i>21,372</i>
Wage worker		65,328 <i>114,832</i>		53,069 *** <i>12,765</i>
<i>Sector of activity (reference: Primary sector)</i>				
Manufacturing sector		-473,515 ** <i>218,476</i>		48,775 ** <i>24,629</i>
Services sector		-800,068 *** <i>171,570</i>		50,648 *** <i>18,483</i>
Urban area		540,069 *** <i>165,759</i>		150,538 *** <i>18,616</i>
constant	1595,001 *** <i>52,589</i>	1359,320 *** <i>147,205</i>	401,223 *** <i>7,678</i>	189,952 *** <i>17,564</i>
Adjusted R2	0,321	0,324	0,106	0,129
N	26467	25885	34161	33416

Legend: (i) * p<0,1; ** p<0,05; *** p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO PANEL 2007-2011 and 2011-2015. Sample weights used.

Table 2.2: Determinants of Log-Labor Income Change

Variable	1° Period: 2007-2011		2° Period: 2011-2015	
	Unconditional	Conditional	Unconditional	Conditional
Log Initial Labor Income	-0,403 *** 0,005	-0,00006 *** 0,000	-0,344 *** 0,004	-0,0002 *** 0,000
Female		0,025 * 0,014		-0,065 *** 0,010
<i>Age group (reference: Age group 25-38)</i>				
39-52		-0,036 *** 0,014		-0,012 0,010
53-65		-0,070 *** 0,019		-0,046 *** 0,013
<i>Education Level (reference: Primary or less)</i>				
Secondary Education		0,007 0,017		0,081 *** 0,012
No-university Education		0,070 *** 0,022		0,131 *** 0,016
University Education		0,092 *** 0,022		0,287 *** 0,016
Wage worker		-0,125 *** 0,014		-0,096 *** 0,010
<i>Sector of activity (reference: Primary sector)</i>				
Manufacturing sector		-0,152 *** 0,026		-0,018 0,019
Services sector		-0,166 *** 0,021		-0,042 *** 0,014
Urban area		0,121 *** 0,020		0,140 *** 0,014
constant	2,653 *** 0,033	0,282 *** 0,018	2,342 *** 0,027	0,198 *** 0,013
Adjusted R2	0,191	0,140	0,179	0,082
N	26467	25884	34161	33416

Legend: * p<.1; ** p<.05; *** p<.01

Source: Own estimates from ENAHO PANEL 2007-2011 and 2011-2015. Sample weights used.

2.8 Summary and Discussion

This investigation contributes to the study of labor income dynamics during the boom (2007-2011) and post-boom (2011-2015) in terms of the mobility of labor income. The following set of questions guided the investigation: i) which workers benefited the most from the commodity boom? And, did the mobility pattern remain the same or change during the post-boom period? ii) Did the labor income convergence during the commodity boom? If so, did the convergence remain or reversed during the post-boom period?

The findings for the whole sample suggest that directional mobility was larger in the boom period than in the post-boom. Although mobility was on average positive, it presented decreasing trend. This tendency is marked by two events: the first one in year 2009, corresponding with the economic contraction due to the Global Financial Crisis, and the second one in year 2011, associated with fall of commodity prices.

Previous the estimation of the directional mobility by group of workers, it was identified which groups of workers presented initial advantage, i.e. had the highest average labor income in year 2007. Besides the workers belonging to the highest quintile (Q5), the groups with the highest initial income were: urban workers, workers with university education, wage workers, males and workers belonging to the 25-38 age group. In the case of workers by sector of activity, it was found that the most disadvantaged group was that of the primary sector.

The analysis of directional mobility indicator by groups of workers shows that during the commodity boom period, in many cases, were those workers who did not have an initial advantage, i.e. those with lower initial average income, who presented higher levels of mobility compared to its counterparts. This was the case of the workers belonging to the first quintile of the distribution (the poorest), female workers and those in the primary sector. While during the post-boom period, many workers with initial advantage were the ones who benefited the most. These were the workers with university education, wage workers and those from the urban areas.

The regression analysis of income mobility determinants yields differentiated results when estimated in terms of monetary units (levels) and proportions (logarithms). In general, estimations in levels suggest that socioeconomic determinants have overall convergent effects, whereas estimations in logarithms suggest the opposite. The regression results confirm the findings of directional mobility indicators. Being female had positive effects on income

mobility during the boom, but the effect reversed in the post-boom period. Working in the primary sector had positive effects on income mobility in both periods. Wage workers had positive effects on income mobility, but only for regressions in levels. As expected, education is the most relevant determinant for directional income mobility, and its effect increased in the post-boom period. Being an urban worker increases income mobility, and the effect increases in the post-boom period.

The hypothesis of the labor income convergence is confirmed. The findings suggest that labor income convergence between the rich and the poor was greater during the commodity boom and lost intensity during the post-boom period. Using alternative measures of initial labor income to overcome possible measurement error bias and assess whether these effects were long-term or short-term, income convergence is confirmed but only for some years; in most years, neither convergence nor divergence is found.

Taken together, these results suggest that during the boom period, the economic transformations were positive translated into the possibility of achieving higher labor incomes. And that during the post-boom, this capacity was lost. These results are interpreted as convergence processes during the first period, which, although not fully reversed in the post-boom period, lost intensity. What factors can explain the increase and subsequent stagnation of income mobility? In the literature review two relevant factors can be identified: minimum wage policies and the growth model based on the export of raw materials.

On the one hand, mobility is positively affected by increases in the minimum wage that occurred during the period under analysis. It is expected that an increase in the minimum wage will benefit lower-income workers and have a stimulating effect on the economy by boosting domestic demand. However, the evolution of mobility cannot be attributed exclusively to this labor policy since there were increases in the minimum wage both in the boom period (2007, 2008, and 2010) and the post-boom period (2011 and 2012), and these were of similar magnitudes. On the other hand, both the stagnation of income mobility and the loss of intensity in the convergence could be consequence of the growth model based on the commodity exports per se. The increase in commodity prices at the beginning of the 2000s generated a greater commodity export dependence. The arguments from the "resource curse" (Auty 1994, 2001) suggest that due to weak domestic linkages of mining and commodity price volatility, the investment in other productive activities is low, thereby reducing both long-term economic growth and employment productivity. Peru has failed to change its productive structure

(Hausmann & Klinger, 2008). In the expansionary period, the employment creation is concentrated in low productivity sectors, which have the lowest incomes, contributing to the labor income convergence. Subsequently, in the post-boom period, when the economy slows down and loses dynamism, the level of mobility decreases. And in this context, only the most productive workers (the most educated, the urban) benefit the most, so that the convergence of labor income loses intensity.

APPENDIX A

Table A.1: Descriptive Statistics: Workers in paid employed aged 25-65 (part 1)

Category	1° Period: 2007-2011		2° Period: 2011-2015	
	Percentage	N	Percentage	N
<i>In paid employment (aged 25-65)</i>				
Male	60,0	85460	59,6	106423
Female	40,0	57400	40,4	74656
	100,0	142860	100,0	181079
Occupational Category				
Self-employment	50,3	80374	47,6	97839
Wage employment	49,7	63486	52,4	83240
Total	100,0	143860	100,0	181079
Only males				
Self-employment	48,2	46472	46,1	56087
Wage employment	51,8	38988	53,9	50336
Total	100,0	85460	100,0	106423
Only females				
Self-employment	53,4	33902	50,0	41752
Wage employment	46,6	23498	50,0	32904
Total	100,0	57400	100,0	74656
Age groups				
25-38	46,5	59967	44,4	68704
39-52	37,3	55667	37,7	71876
53-65	16,3	27226	17,9	40499
Total	100,0	142860	100,0	181079
Only males: age groups				
25-38	46,5	35598	44,3	40037
39-52	36,8	32874	37,1	41547
53-65	16,7	16988	18,5	15660
Total	100,0	85460	100,0	97244
Only females: age groups				
25-38	46,4	24369	44,5	28667
39-52	38,0	22793	38,5	30329
53-65	15,6	10238	17,0	15660
Total	100,0	57400	100,0	74656
Education level				
Primary or less	27,2	49225	24,7	57907
Secondary	38,6	5220	40,3	67350
No University	16,6	20664	16,6	26435
University	17,7	20745	18,4	29368
Total	100,0	95854	100,0	181060
Only males: education level				
Primary or less	25,2	27632	22,9	32141
Secondary	41,9	34146	44,0	43486
No University	15,5	11377	15,4	14164
University	17,4	12299	17,6	16621
Total	100,0	85454	100,0	106412
Only females: education level				
Primary or less	30,2	21593	27,3	25766
Secondary	33,7	18074	34,8	23864
No University	18,1	9287	18,3	12271
University	18,1	8446	19,6	12747
Total	100,0	57400	100,0	74648

Source: Own estimates based data from ENAHO Panel (2007-2011) and (2011-2015). Sample weights used.

Table A.1: Descriptive Statistics: Workers in paid employed aged 25-65 (part 2)

Category	1° Period: 2007-2011		2° Period: 2011-2015	
	Percentage	N	Percentage	N
Sector of activity				
Primary	21,3	42572	20,8	53587
Manufacturing	11,5	12862	10,6	14911
Services	67,2	87426	68,6	112581
Total	100,0	142860	100,0	181079
Only males: sector of activity				
Primary	28,2	33327	27,4	41109
Manufacturing	11,6	7317	10,9	8472
Services	60,2	44816	61,7	56842
Total	100,0	85460	100,0	106423
Only females: sector of activity				
Primary	10,9	9245	10,9	12478
Manufacturing	11,4	5545	10,3	6439
Services	77,7	42610	78,8	55739
Total	100,0	57400	100,0	74656
Area				
Urban	78,8	95512	80,5	122259
Rural	21,2	47345	19,5	58820
Total	100,0	142857	100,0	181079
Only males: area				
Urban	75,1	53277	77,0	67118
Rural	24,9	32182	23,1	39305
Total	100,0	85459	100,0	106423
Only females: area				
Urban	84,5	42235	85,8	55141
Rural	15,6	15163	14,2	19515
Total	100,0	57398	100,0	74656

Source: Own estimates based data from ENAHO Panel (2007-2011) and (2011-2015). Sample weights used.

Table A.2: Initial Advantage Profiles: Labor income by group of workers, year 2007

Group of workers	Mean	Std. Dev	N
Quintile			
Q1	82	42	5578
Q2	246	53	5533
Q3	474	76	5530
Q4	815	136	5533
Q5	4481	13762	5519
F-test statistic = 479,45 ; Prob > F= 0,0000			
Gender			
Male	1470	6905	16799
Female	1134	6422	10894
F-test statistic = 16,51 ; Prob > F= 0,0000			
Age group			
Age group 25-38	1414	7389	12357
Age group 39-52	1266	5796	10531
Age group 53-65	1277	6592	4805
F-test statistic = 1,61 ; Prob > F= 0,2003			
Education level			
Primary Education or less	736	5498	9639
Secondary Education	1307	7322	10208
No University Education	1538	6950	3772
University Education	2189	6838	4074
F-test statistic = 49,05 ; Prob > F= 0,0000			
Occupational Category			
Self-employed	975	5631	15540
Wage-employee	1716	7675	12153
F-test statistic = 84,44 ; Prob > F= 0,0000			
Sector of Economy			
Primary	952	6596	8249
Manufacturing	1526	7141	2570
Services	1435	6681	16874
F-test statistic = 13,32 ; Prob > F= 0,0000			
Area			
Urban	1560	7258	18715
Rural	558	4244	8978
F-test statistic = 106,34 ; Prob > F= 0,0000			

Source: Own estimates based data from ENAHO Panel (2007-2011) . Sample weights used.

CHAPTER 3

Labor Transitions from Informality to Formality in Peru: 2007-2019

3.1 Introduction

Labor informality is a persistent feature of labor markets in Latin America, where more than half of its workforce is engaged in informal employment (CEPAL, 2003). High levels of labor informality in developing countries tend to translate into lower-productivity labor, precarious and unprotected work, leaving workers vulnerable to health, old age, and unemployment risks. Peru stands out as one of the countries with the highest levels of labor informality in Latin America¹⁴. Over the past two decades, the country has experienced a reduction in informal labor, primarily driven by economic growth. The informality rate decreased from 79.2% in 2007 to 68.4% in 2019. The greater shift toward labor formalization occurred during the period of high economic growth, and it has remained stagnant at around 68% since the economic slowdown in 2014. During this period, public policies for formalization were also implemented; however, due to low compliance with regulations, the effectiveness of these measures is ambiguous (Chacaltana, 2008; Tomaselli, 2021).

This paper aims to provide empirical evidence on the effect of individual and job-related characteristics on transitions from informality to formality and the distributional impact of labor transitions. The use of longitudinal data from the National Household Survey (ENAHO) for the periods 2007-2011, 2011-2015, and 2015-2019, years overlapping contexts of rapid economic growth and economic slowdown in Peru, allows to compare the results in different economic contexts. This study compares empirical results using three different concepts and measures of informality: informal sector, informal employment, and two-tier informality (upper-tier and lower-tier informality). This paper tests a hypothesis little discussed in the empirical literature on the effect of the choice of informality measure: the choice of measure matters as it addresses different groups of workers. Therefore, the results regarding the informality rate, trends over time, and possible determinants of entry or exit from informality may differ across existing measures.

¹⁴ In Peru, the extent of informal employment ranks in 2019 lower only when compared to that of Guatemala at 78.9%, El Salvador at 69.1%, and Paraguay at 68.9%, all of which predominantly feature agricultural economies, CEPAL (2023).

Although a process of formalization in the context of economic growth suggests that the new jobs created were predominantly formal, this is not always the only explanation. Similarly, if the informality rate remains constant, it does not necessarily mean that informal workers are always the same. Internal labor market dynamics between informality and formality occur both during formalization processes and when the informality rate remains stable. This study focuses on these labor transitions from informality to formality. The research questions posed in this paper are: What are the individual and job-related determinants of the labor transition between informality and formality? Is the impact of these factors sensitive to the choice of measure and the economic context? What is the effect of these transitions on the individuals' economic well-being?

The analysis follows the standard methodology in the labor transition literature. In the first step, it is possible to characterize the annual labor dynamics among the different employment statuses using transition matrices. In a second step, marginal effects from multinomial logit regressions are estimated to assess the impact of different determinants (individual and job characteristics) on the probability of moving from informality to formality. Finally, regressions of labor income dynamics on the transitions to formality are estimated to assess the implication of such transitions on workers' economic well-being. All steps are completed for the three different informality definitions and during different economic contexts.

The results confirm that the level and determinants of informal-formal transition, as well as their impact on income dynamics, are sensitive to the choice of measure. The estimations yield four main key findings. First, the informal/formal sector measure presents a higher probability of transition to formality than the informal/formal employment measure. The lower-tier informal workers show high persistence in remaining in informality, while upper-tier informal workers have the highest probability rate of transition to formality. Second, informal-formal transitions persistently occur across different phases of the economic cycle, irrespective of whether the economy is booming or experiencing a slowdown. However, the trend of the transition is also sensitive to the choice of measurement. Third, in regard to the determinants of informal-formal transitions, the study confirms that education is positively associated with transitions, and it is the most important determinant of these in all definitions. Notably, the effects of age and occupational category on the informal-formal transition probability differ based on the informal measure applied. Using the informal sector definition, age and being wage-employee reduce the probability of transit to formality, suggesting that employment in the informal sector serves as a stepping stone only for the youngest workers and that self-

employment becomes more formal. While using the informal employment definition, age and being a wage-employee increases the probability of transit to formality. Fourth, the results confirm that informal-formal transitions increase labor income, but this formality premium is greater for the informal/formal sector definition than for the informal/formal employment. Exploring the two-tier informality definition, the expected wage ladder (lower-tier informality, upper-tier informality, formality) is confirmed only for skilled workers. On the contrary, for low-skilled workers, transitions to upper-tier informality are associated with a higher reward than for transitions to formal employment. This suggests that lower-skilled workers experience a lower earning capacity in formality compared to their potential in the upper-tier informality. These findings confirm the multidimensionality of informality and heterogeneous experiences of informal workers in Peru.

The paper contributes to the growing labor transition literature in developing countries. First, the empirical literature is recent and limited due to the scarcity of longitudinal data in developing countries. In the case of Peru, studies on labor informality predominantly rely on aggregate data. The few studies of labor transitions are primarily based on quarterly data only for Metropolitan Lima, therefore capturing mainly very volatile short-term changes for the capital city. Second, the paper contributes to the small strand of the empirical literature that discusses the sensitivity of the analysis of informality to the choice of measure in developing countries and expands by focusing on the informal-formal transitions, making policy implications of this possible. Finally, the paper links the microanalysis to the different economic contexts, allowing the exploration of possible changes in the effects of the determinants related to the economic cycle.

The paper is organized as follows. Section 2 reviews the theoretical approaches and empirical literature on labor transitions. Section 3 presents a conceptual framework for labor informality and discusses the measurements used in the paper. Section 4 explains the empirical strategy to analyze the informal-formal transition and the effect of these transitions on labor income. Section 5 presents the data set and variables. Section 6 provides descriptive statistics of Informality in urban Peru. Section 7 presents the results of the labor transitions analysis and reports the results of the estimations. Finally, section 8 presents the summary and concluding remarks.

3.2 Literature review

3.2.1 Emergence and Prevalence of Informality

While the concept of informality dates back to the original work by Hart (1973) based on his observations in the slum areas of Ghana, the notion of informality can be traced back to the dualism observed in post-colonized countries. The possibility of dualistic or segmented labor markets has been studied since the 1950s (Lewis, 1954; Harris & Todaro, 1970; Fields, 1975). The “traditional” (informal) sector has been defined mainly as opposed to the formal “modern” (formal) sector. The latter has been characterized by capital-intensive production, high labor productivity, and employment covered by law regulations. Therefore, the traditional sector has been described as a sector with an abundant labor force and low productivity and mostly oriented to production for subsistence. The main consequences resulting from the duality are wage differentials and differences in labor conditions, although the evolution of this dualism may have attenuated them. The prediction of development theories that the traditional (informal) sector would decrease with economic growth has not been fulfilled. Over time, with globalization, technological changes, and liberalization of trade and finance, both industrialized and developing countries have made their labor markets more flexible; consequently, the boundaries between formality and informality have become blurred, and expressions of informality can be found within the formal sector (Ghose, 2017; Tokman, 2011).

The following are possible explanations for the emergence and prevalence of informality in developing countries based on different strands of the theory: integrated labor market approach, segmented labor markets perspective, and two-tier system¹⁵. It is relevant to explain them in more detail because they provide the framework for interpreting the results of this analysis.

The integrated labor market approach is grounded in the neoclassical theory. It posits that the functioning of labor markets is based on individuals' and firms' rational and maximizing behavior. In this sense, wage differentials are explained by differences in human capital (Becker, 1962), and labor markets are integrated, meaning that workers with similar characteristics receive similar remuneration and are replaceable among themselves. However, within this approach, it is recognized that there may be labor segmentation due to market distortions caused by institutions such as unionization and minimum wage. The human capital

¹⁵ See Behrman (1999) for comprehensive theoretical review on selected topics relevant for labor markets in developing countries.

model of migration (Harris & Todaro, 1970), which deals with geographical migration, predicts wage differentials between rural and urban areas incentive migrations. The migration decision depends on the present discounted value of the cost-benefit analysis results. Therefore, younger (with larger time horizons) and educated individuals are expected to be prone to migrate (Behrman, 1999). In addition, the efficiency wage theory argues that firms face the cost of hiring and training employees; therefore, they may decide to pay higher wages than market wages as an incentive to increase the productivity of their workers and reduce costly turnover (Stiglitz 1976, 1984). In the context of increasing informality in developing countries during the 80s and 90s, the “exit” approach emerged in line with the neoclassic view. The reasoning is that workers voluntarily choose to seek jobs in the informal sector since they find it to be attractive mainly in terms of working hours flexibility, higher earnings, low attractiveness or quality of pensions and health insurance associated with formal employment, and the possibility of escape from excessive bureaucratic regulations in the formal labor market (Maloney, 1999, 2004; De Soto, 1989). Empirical evidence supports the integrated labor markets approach for Latin American countries' formal and informal sectors, including Peru (Saavedra & Chong, 1999; Carneiro & Henley, 2001; Chong et al., 2008).

According to Taubman and Wachter (1986), the segmented labor market approach is a criticism of the neoclassical explanation of the functioning of the labor markets. Based on a historical-institutional perspective, the segmented labor market approach postulates the existence of two sectors with different reward systems that explain why skills-comparable workers do not gain the same wage. According to this approach, there is a high-wage primary sector and a low-wage secondary sector. The first one presents specific institutions, rules, and mechanisms that generate an internal market of workers with a unique reward system for skills and experience, i.e., the presence of trade unions. While the second draws its workers from an external competitive market. Due to the different logic in wage-setting systems between sectors, the wage differential between primary and secondary sectors is impossible to reduce. Moreover, employment in the secondary market generates negative feedback, leading to these workers suffering from the “scarring effect” of being employed in this sector, which makes them more unattractive for the primary sector the longer they stay in the secondary sector, then hindering mobility across sectors¹⁶. This perspective was also known as the “exclusion” approach. There

¹⁶ See Taubman and Wachter (1986) for a review.

is also evidence supporting the existence of segmented labor markets in Latin America (Maurizio, 2012; Duval, 2020).

Empirical studies find evidence for both integrated and segmented labor markets approach for Latin American countries, which reveals the heterogeneity of informality in the region. Both approaches complement each other due to the multidimensionality of the phenomenon. In this sense, Fields (1990) posits the existence of a two-tier system within informality, delineating two distinct sectors: an easy-entry sector (lower-tier informality) aligned with the “exclusion” approach and a higher-level informal sector (upper-tier informality) corresponding to the “voluntary” perspective. The evidence suggests that although informality has not significantly reduced in developing countries, economic growth in developing countries is generally inclusive by enhancing labor employment conditions, as increases in paid employment and returns to self-employment allow poverty reduction (Fields 2012, Ghose 2017). This evidence supports the perspective about the heterogeneity of informality.

3.2.2 Empirical literature

The decision on which measure of informality to use is based mainly on the availability of data, which, given the nature of the phenomenon, is not available from administrative sources. The analysis of informality in developing countries is based on employment or household survey data. Despite international attempts to standardize informality measures and survey questionnaires, the data has only restricted international comparability. Researchers use the measure of informality their data allow, usually without discussing the implications of this decision. The paper tests the hypothesis posited by Henley et al. (2009) on whether the choice of measure affects the results of informality analysis. They calculated informality for Brazil between 1992 and 2004 using three different measures: having a contract, being covered by social protection, and employer characteristics. The size of informality varies between 40% and 65% according to different definitions. Moreover, they are subjected to different trends and drivers. In the Brazilian case, they find that while there is a growing trend of men's participation in the informal sector, women show an increasing participation in formal employment. On the other hand, women are more likely to work in the informal sector, while higher levels of education have a higher correlation with formal employment. Evidence from Peru suggests that the choice of measure is also relevant for this country. In his analysis of informality in Peru between 2004 and 2014, Cespedes (2015) calculated six different informality measures, yielding an average size of informality between 53% and 75% of the urban population

employed in Metropolitan Lima. He found a correlation between 26% and 84% among the measures. Due to the heterogeneity of results, he constructed an index measuring formality as the share of workers considered formal by at least one definition. The index showed an informality rate of 77%, which was slightly higher than that reported individually by the other measures.

Regarding the determinants of labor transitions, recent empirical studies have analyzed labor transitions using the two-tier informality measure. In their comparative study of Argentina, Brazil, Ecuador, Mexico, Paraguay, and Peru during the formalization process, Maurizio and Monsalvo (2021) identified a general trend that education is highly associated with transitions to informality and upper-tier informality. They also found that age, as a proxy for work experience, reduces the probability of leaving the formal sector, suggesting that accumulated human capital and specific training disincentivize the transition to the formal sector. Evidence of a wage ladder was also found, in which moving from lower-tier informality to upper-tier informality and formality represents an increase in income. Moving out of formality always represents a loss of income, and jobs in the upper-tier category represent an intermediate income level. For the case of Turkey, Tansel & Acar (2017) analyze for the years 2006 to 2009 labor transitions between six types of occupational states: formal-employed, informal-employed, formal self-employed, informal self-employed, unemployed, and inactive. By running six multinomial regressions for each occupational state, they identified that especially gender (being male), education (higher education), and sector of economic activity (industry) had significant effects on mobility towards formality. Similarly, Tansel & Ozdemir (2019) investigated the case of Egypt, finding that being female diminishes the likelihood of transitioning from informality to formality and moving out from self-employment. The lower female turnover in the labor market is generally explained in the literature by the gender roles established by socialization processes and cultural patterns. This characteristic has also been observed in Latin American countries (Cunningham & Bustos Salvagno, 2011).

As for the study of integrated or segmented labor market hypotheses, the empirical evidence shows complex scenarios. Bosh & Maloney (2007, 2010) conducted a comparative study of Argentina, Mexico, and Brazil on formal-informal transitions, defining formal workers as those covered by social protection. Using continuous time Markov processes on panel data, the authors found strong similarities between the countries. On the one hand, they found that a large part of the informal self-employed are in this occupation voluntarily, supporting the integrated

labor markets perspective¹⁷. On the other hand, they found that informal wage employment is rather involuntary, corresponding to the segmentation of labor markets perspective, especially for young workers.

Another related hypothesis is whether informality is a stepping stone to formality rather than a dead-end career path. In this sense, Cunningham and Bustos Salvagno (2011) studied youth employment transitions based on informality measures and methodologies similar to those of Bosh and Maloney (2007, 2010). They found that in the case of Brazil, Mexico, and Argentina, employment in the informal sector serves as an informal training service. After high school, young people enter into informal wage employment, where they acquire the tools and knowledge necessary to subsequently enter the formal wage employment for a prolonged period and later become self-employed. This pattern seems to be particular to Latin American middle-income countries. In the study for Sub-Saharan Africa, Danquah et al. (2019) find a strong segmentation between wage and self-employment status even in lower-tier informality.

Theoretical and empirical literature point out that informality behaves counter-cyclically. On one side, informality functions as a safety net for workers during economic crises, increasing instead or alongside unemployment (Tokman, 2011). Using the share of self-employment as a proxy for informality, Loayza & Rigolini (2011) found for a sample of 54 countries in the period 1984-2008 that the degree of counter-cyclicality decreases with the size of informality. They found that, in the long run, informality is larger in countries with lower productivity, more rigid business regulations, and low-quality legal systems. On the other hand, informality is expected to decrease during the expansion phase. Economic growth promotes the creation of long-term jobs and reduces the probability of layoffs. This reduces the relative costs of firing formal workers, which reduces the attractiveness of hiring informal workers (Maurizio & Vasquez, 2019). In the Peruvian case, Cespedes (2015) found a significant but relatively low effect of economic growth on the reduction of informality. Using the regional unemployment rate as a proxy for economic growth, his results showed that a reduction of 10% in the unemployment rate is associated with a reduction of 0,5% in the informality index from 2004 to 2014. He argues that the reduction in informality is mainly due to the net creation of formal jobs and higher returns to formality. However, he also identifies a decrease in the wage gap between

¹⁷ Similar results are also found for other developing countries. For example, Gutierrez et al. (2019) analyze labor transition statics based on retrospective job histories and working conditions in Bangladesh. They find that self-employment is not always an activity of last resort since only 18% of the sample reported that they started a business because they were unable to find work.

formal and informal jobs since 2009, which predicts less informalization of employment because workers have less incentive to change status¹⁸.

During the period of analysis, microenterprise formalization policies (Law for the Promotion and Formalization of Micro and Small Enterprises (Law No. 28015 of 2003)) that offer tax benefits and reductions in labor costs (Special Labor Regime) were in force in Peru. Chacaltana (2008) found that only 0.6% of the total microenterprises were registered under this law. Moreover, 25% of these registered companies had already ceased to exist by 2007. This showed a low degree of effectiveness of these policies. He warned that labor policies should focus on including workers in social protection systems. Otherwise, if these policies only focus on formalization, they run the risk of generating formal but precarious jobs¹⁹. Tomaselli (2021) suggested that due to low compliance with regulations, the effectiveness of formalization policies in Peru is ambiguous. On the other hand, policies raising formal employment costs were also implemented during this period. Increases in minimum wages are expected to generate a reduction in labor formality. However, empirical evidence suggests that during the 2002-2011 expansion years, increases in the minimum wage had no adverse effects on formality. Using access to health insurance as a proxy for formality, Cespedes and Sanchez (2014) concluded that the increases in the minimum wage do not appear to reduce the probability of people remaining in formal employment.

3.2.3 Conceptual framework: Measuring informality: informal sector, informal employment, and two-tier informality

Several concepts of informality are often used as synonyms, although they are intended to measure different aspects of this phenomenon and are, therefore, complementary concepts. The first two, the informal sector and informal employment, are well established in the literature, and the third, the two-tier informal sector, has recently gained relevance in empirical analysis. The paper separately analyzes informal-formal transitions using the three definitions and compares the results.

¹⁸ The effect of informality on economic growth is beyond the scope of this paper. However, it is noteworthy that macroeconomic studies based on cross-country analysis have found evidence suggesting that informality has statistically and economically significant negative effect on growth, and a significant positive impact on poverty rates. (Loayza et al., 2009)

¹⁹ The legal adaptation that artificially formalizes informal workers is debated in other countries in the region such as Argentina (Poblete, 2019).

The International Labour Organization (ILO) has developed and continuously adapted a conceptual framework aimed at measuring labor informality since the 1970s to provide standard statistical measures that allow international comparability. ILO defines employment in the informal economy as “[...] all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements.” (ILO, 2002, p. 3). Within this broad notion of labor informality, two complementary concepts have been established: employment in the informal sector and informal employment. On the one hand, employment in the informal sector (created in the 15th ICLS²⁰) refers to all jobs within the informal sector. In turn, the informal sector is measured based on the characteristics of the production unit: enterprise organization (registration) and size (number of employees). The objective of creating an international statistical measure of the informal sector was to include it in the system of national accounts to make visible the informal sector's contribution to the economy (Hussmans, 2004). This measure is also called the "productive approach" or "enterprise approach" of informality. It reflects the inability of economies to generate sufficient employment in the formal sector compared to the growth of the labor force (Maurizio and Vasquez, 2019). On the other hand, informal employment (created in the 17th ICLS) is based on job-related characteristics carried out in any institutional sector of the economy (formal sector enterprises, informal sector enterprises, or households). In practice, informal employment is based on the legal or social protection condition offered to the worker and status in employment according to the ICSE-93²¹. This so-called "labor approach" or "legalistic approach" takes into account the effects of the "informalization" of employment, i.e., the proliferation of a variety of atypical and precarious forms of employment (Hussmans, 2004). In the ILO conceptual framework, employment in the informal sector and informal employment refer to all jobs within these categories, regardless of whether they are individuals' primary or secondary occupations, since the purpose is to measure the magnitude of informality in the economy. However, the present study measures labor informality based exclusively on the primary occupation, aiming to understand the transition from informality to formality. Given the widespread practice of holding multiple jobs in developing countries, considering all positions might hide noticeable status changes.

²⁰ ICLS is the abbreviation for International Conference of Labour Statisticians.

²¹ ICSE is the abbreviation for the International Classification of Status in Employment. The ICSE-93 contains five categories: employees, employers, own-account workers, members of producer's categories and contributing family workers.

The conceptual framework elaborated by Fields (1990, 2020) proposes a two-tier informality sector based on the entry barriers. Consequently, the informal sector is separated into two sub-sectors: the upper-tier and the low-tier. On the one hand, the upper-tier informal sector is composed of occupations that require human capital and/or financial capital with high remunerations, which is attractive for workers. Therefore, participation in this sub-sector is voluntary. On the other hand, the lower-informal sector is composed of easy-entry occupations which offer low remunerations. There is no standard measure for the two-tier informal sector. Recent empirical work measures this duality in very different ways. Maurizio and Monsalvo (2021) measure two-tier informality only for wage earners based on firm size, while Danquah et al. (2019) measure two-tier informality for wage earners and the self-employed based on the skill level required by the job or some benefit (contract or de facto benefits). Fields (2020) points out that this definition's main point is to establish a duality within informality and that it represents a job ladder. Regardless of the criteria used to differentiate them (earning, other economic benefits, access to social protection and legal regulation, etc.), the approach posits that lower-tier informal workers are below formal employment, and upper-tier informal workers may be above formal employment for some workers. A comparative table of the three approaches can be found in the Appendix B, Table B.1.

3.3 Empirical strategy

The analysis presented in this paper follows the standard methodology in labor mobility and employment transitions literature. In the first step, it is possible to characterize the annual dynamics among the different occupational categories using transition matrices. In the second step, multinomial logit models are estimated in order to identify the determinants of the probability of moving toward formality. Finally, in the third step, OLS dynamic regressions of labor income changes on the informal-formal transition are estimated. All steps are completed for each informality measure and each period.

3.3.1 Descriptive mobility analysis: Transition Matrices

The paper uses transitional matrices to assess the level of labor mobility across the different labor states between two points in time t and $t+1$. Following conventional methodology discrete time transition matrices conditional to the initial state assuming a Markov process²² is defined:

$$P(t, t + 1) = [p_{i,j}(t, t + 1)] \in R_+^{K \times K}$$

$$p_{ij} = \frac{n_{ij}}{n_i}$$

Assuming K different labor states and i and j are the initial and the final labor states respectively, where $i = 1, \dots, K$ and $j = 1, \dots, K$; each cell of the transition matrix (p_{ij}) measures the probability of transitioning from the initial labor state i to the final labor state j and is calculated by the ratio of the flow out of the origin state into the destination state over the total stock of the origin state. The sum along the rows of matrix P is 100 percent, and the total at the bottom provides the shares of workers in each labor status in $t+1$ ($P_{.j}$). The diagonals represent the share of workers who stay in the same state from t to $t+1$. The turnover rate for each status is calculated as 100 minus the value on the diagonal for each row.

3.3.2 Determinants of informal-formal transitions: Multinomial Logit Model

The determinants of the informal-formal transitions are estimated using multinomial logit regressions. Most empirical literature studies the effect of being informal in $t=0$ on the probability of being formal in $t=1$ (Maloney, 1999; Gong et al., 2004; Danquah et al., 2019). The paper follows Maurizio & Monsalvo (2021) regarding the dependent variable. The dependent variable is the probability of transition from informality in $t=0$ to formality in $t=1$ as a function of individual and job-related characteristics, including education, gender, age, occupational category, and sector of activity. The statistical model adapted for this purpose is formulated as follows:

$$\pi_{i1k} = \Pr(S_{k1,Inf0} = k | X_{i0}) = [1 + \sum_{j=1}^K e^{X_{i0}\beta_j}]^{-1} e^{\beta_k} \quad (1)$$

²² Following Cunningham & Bustos Salvagno (2011), a Markov process means that the transitions between states occur at random points in time. A random draw of a transition at one point in time has the same probability (within a confidence interval) of a draw at any other point in time. According to Lehman & Pignatti (2007), this implies that the transition is only a function of the previous state.

Where π_{i1k} is the probability for the individual i of transit from the initial status informality (S_{Inf0}) to a specific destination status S_{k1} . The regression parameter associated with the individual and job-related characteristics at $t=0$ is β_k . The possible destinations' statuses (k) are:

For informal sector definition: 1) informal sector (used as the baseline), 2) formal sector, 3) otherwise (non-remunerated family worker (NRFW), unemployment or out of the labor force). For informal employment definition: 1) informal employment (used as the baseline), 2) formal employment, 3) otherwise. For lower-tier informality: 1) lower-tier informality (used as the baseline), 2) upper-tier informality, 3) formal employment, 4) otherwise. For upper-tier informality: 1) upper-tier informality (used as the baseline), 2) lower-tier informality, 3) formal employment, 4) otherwise. The specification for the two-tier informality definition only includes gender, age and occupational category based on the results of the Wald test²³. The paper analyzes the results for the probability of the informal-formal transitions and within the two-tier informality.

The functional transformation allows to express the multinomial logit model as a generalized linear model for estimation purposes:

$$\log\left(\frac{\pi_{i1k}}{\pi_{i1(k+1)}}\right) = X_{i0}\beta_k \quad (2)$$

Finally, the marginal effects from equation 2 are estimated to interpret the covariates' effects on the probability of transition directly and compare it among informality measures and different periods.

3.3.3 Economic well-being implications of informal-formal transitions: Labor income dynamic regressions

With the aim of estimating the correlation between informal-formal transitions and labor income changes, the paper follows the approach from Maurizio & Monsalvo (2021). Regression of the change in the logarithm of labor income between $t=1$ and $t=0$ (Δy_1) on a set of dummies to model the informal-formal transitions (D_{ji}) are estimated. The specification also controls for

²³ The results of the Wald test indicate that the hypothesis of non-significance for the variables education and sector of activity cannot be rejected.

the initial log labor income (y_0) and the initial individual and job-related characteristics (X_0). The statistical model is formulated as follows:

$$\Delta y_{1t} = \beta_{0i} + \beta_{1i}y_{0i} + \beta_{2i}X_{0i} + \sum_j \vartheta_{ji}D_{ji} + \mu_i \quad (3)$$

The subindices i represent the initial informal status in $t=0$, and j represents the work status in $t=1$. The reference category is when the workers remain the initial informal status $i=j$. Coefficient ϑ_{ji} represents the premium (when it has a positive sign) or a penalty (when it has a negative sign) when the worker moves from initial informal status i to work status j relative to the worker remaining in informality status i . Four regressions are estimated. In the first regression, D_{ji} models the transition from the informal sector to the formal sector. In the second regression, D_{ji} models the transition from the informal sector to the formal sector. For the third regression, D_{ji} models the transition from upper-tier informality to lower-tier informality and from upper-tier informality to formal employment. In the last regression, D_{ji} models the transition from lower-tier informality to upper-tier informality and from lower-tier informality to formal employment.

3.3.4 Selection bias: Initial employment and attrition

The analysis focuses on the transition from informality to formality. Therefore, the sample consists of individuals working in informal labor in the initial year ($t=0$), which is a non-random sample. Following Heckman (1981), ignoring the potential endogeneity of the initial status leads to a sample selection problem. In order to correct the selection bias, the paper follows the methodology used by employment transition literature (Danquah et al. 2019 following Sarkar et al. 2019) based on Heckman's two-step estimator, which involves estimating a first-stage probit equation of initial employment status and calculating the inverse Mills ratio and include it in the main equation. The estimation is adapted for our analysis:

$$Inf_{i0}^* = \gamma'Z_{i0} + v_{i0} \quad \text{where } Inf_{i0} = I(Inf_{i0}^* > 0) \quad (4)$$

Where Inf_{i0}^* is the latent propensity of being in a specific informal status in $t=0$ and whose counterpart is the observed binary indicator of whether the individual belongs to the informal status in $t=0$ ($Inf_{i0} = 1$) or not ($Inf_{i0}=0$). Z_{i0} is the vector of baseline characteristics that determine the probability of being in informality in the initial year t . The correction term calculated from equation (4) for each informality category is included in the corresponding

labor transition equation (2) and labor income dynamic regression (3). The exclusion restriction needs to be met, i.e., at least one variable included in Z_{i0} should not be part of the main equation, to avoid multicollinearity problems. Danquah et al. (2019) used household position in their employment selection equation. Consequently, this research includes household position, marital status, ethnicity, and household poverty. It is assumed that these variables may increase the probabilities of working in informal jobs but they may not necessarily affect the transition from informality to formality. Based on the determinants of transitions explored by Maurizio & Monsalvo (2021), the transitions are expected to be affected by other individual characteristics (as gender, age and education) and job-related characteristics (as sector of activity and occupational category). Also, other individual and contextual factors, such as the desire for job stability and the availability of formal employment opportunities, may be relevant in the informal-formal transitions.

Attrition could also be a sample selection problem if it is endogenous. In the empirical literature, attrition is corrected the same way as the initial status sample bias. Due to the survey rotation scheme, there is always a loss of cases from one year to the next. As pointed out by Maurizio & Monsalvo (2021) there is no available information in the ENHAO dataset that allows for the differentiation of data loss due to attrition associated with that due to the survey rotation scheme, therefore, it is not possible to correct for attrition.

3.4 Data and Variables

3.4.1 Data description: panel ENAHO 2007-2019

The analysis uses longitudinal data from the National Households Survey on Living Conditions and Poverty (ENAHO in Spanish) for three periods: 2007 to 2011, 2011 to 2015, and 2015 to 2019. The period from 2007 to 2019 overlaps with years of rapid economic growth and economic slowdown in Peru. The survey provides information on an annual basis and with nationwide coverage. Given that rural employment is dominated by agricultural activities, which are merely considered informal, the paper focuses on urban data. This study uses information from the employment and income, and educational attainment modules. Since the paper studies labor market dynamics, the individuals under consideration are males and females between 14 and 65 years of age, which refers to working-age previous retirement age according

to Peruvian standards. The corresponding sampling weights provided by INEI are used in the calculations²⁴.

The survey is designed as a rotating sample, which replaces 20% of its sample each year within a time span of 5 years. In order to get more observations and limit potential attrition bias, the analysis pools the annual transitions (from t to t+1) for each dataset. Consequently, the estimations' outcomes are average results for each period. The total observations (all individuals aged 14-65) by dataset are 183,018 for the first period (2007-2011), 225,993 for the second period, and 260,435 for the third period (2015-2019). In Annex B, Table B.2 shows the descriptive statistics for each data set.

3.4.2 Description of variables

The study tests the hypothesis on the sensibility of the choice of informality measure. For this purpose, the three informality definitions explained in section 3 are calculated²⁵. Based on the data available in the survey, the operational definitions we use are as follows:

Table 3.1: Operational Definition for Formality/Informality

	Employment in Formal/Informal Sector	Formal/Informal Employment	Two-tier-Informality
Formal	Employment within public sector organizations and legally established private companies with proper accounting practices.	Wage workers and self-employed workers (including domestic workers) who are enrolled in the pension system.	Wage workers and self-employed workers (including domestic workers) who are enrolled in the pension system.
Informal	Employment in private companies that are not legal entities or do not maintain accounting records. This definition excludes non-remunerated family workers (NRFW) and domestic workers	Wage workers and self-employed workers (including domestic workers) who are not enrolled in the pension system. The operational definition includes NRFW .	a) Upper Informal: high-skilled informal workers. b) Lower Informal: medium and low-skilled informal workers and NRFW. Operational definition includes NRFW .

Source: Own elaboration.

Workers in the formal sector comprise those employed in the public sector, employees in registered firms (or firms with proper accounting practices), or owners/own-account workers

²⁴ According to the INEI, sample weights are calculated based on the following components: the basic sampling factor, the non-response adjustment factors, and the demographic adjustment factors.

²⁵ Maurizio & Monsalvo (2021) mixed the “productive”, “legal”, and “two-tier” informality. Consequently, they identify five work statuses: formal wage employees, upper-tier informal wage employees, lower-tier informal wage employees, formal self-employed, and informal self-employed. However, they estimate the probabilities across three groups: i) formal wage employees and formal self-employed; ii) upper-tier informal wage employees; and iii) lower-tier informal wage employees and informal self-employed. They only estimate the multinomial logit regression and not the marginal effects; therefore, the outcomes can only be interpreted in their sign and significance but not in their magnitude. The mixture of all approaches in one new informality measure makes the interpretation of results and comparability to other studies rather difficult.

registered (with proper accounting practices). In contrast, workers in informal sector employment are employees in unregistered private enterprises and unregistered self-employed.

Formal employment refers to all workers contributing to the pension system (private or public), and informal employment covers those workers without access to the pension system. Unlike the informal sector definition, domestic workers are included in the informal employment definition. Although the employment category non-remunerated family worker (NRFW) is part of the informal employment definition, they are not included in the operational definition because, as those workers perceive zero income, including them would bias the analysis on labor income dynamics.

From informal employment, we calculate two-tier informality. Following Danquah et al. (2019), we use the International System of Classification of Occupations (ISCO) as a proxy for the professional training required for jobs. High-skilled workers comprise managers, professionals, technicians, and associate professionals, and medium- and low-skilled workers comprise occupations such as service and sales workers, plant and machine operators, and assemblers, and elementary occupations.

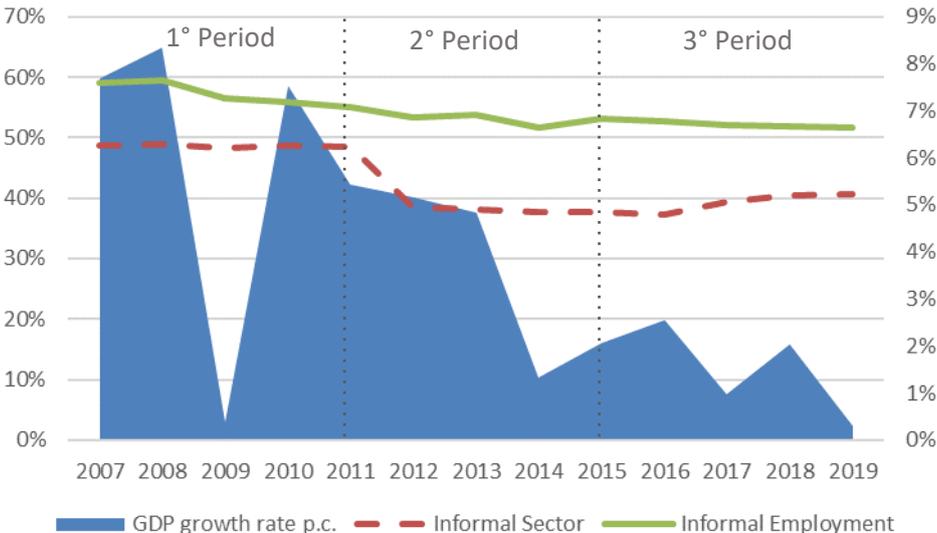
Hourly labor income from the main occupation is calculated by dividing the total gross monthly income from the main occupation by the total hours worked in the main occupation. The most relevant determinants of being an informal worker analyzed in the literature are educational level, gender, age, and occupational category (self-employed and wage-employee). The main labor transition equation (2) includes these variables as variables of interest and also controls for the economic sector of activity (primary, manufacturing, and services). In the initial employment decision equations (4) and (5), in addition to the previously mentioned variables, also include marital status (married, otherwise), position in the household (head of household, spouse, otherwise), native (used the proxy native language mother tongue), poverty (belonging to a poor household). Annex 2 reports the average descriptive statistics for each category for each period.

3.5 Description of Informality in Urban Peru (2007-2019)

This section shows the differences between the three definitions of informality used regarding their evolution over time, their relationship with the business cycle, and the characteristics of

the workers that comprise them. As mentioned, Peru has undergone a formalization process during the years of rapid economic growth. Figure 3.1 shows the annual evolution of economic growth and the rates of informal sector and informal employment based on data used in our analysis. Difference exists both in the levels of informality and in its evolution. Notably, informal employment ("legalistic" definition, based on job characteristics) is higher than informal employment ("productive" approach, based on the characteristics of the production unit). The gap between both informality measures is around 6 points in the first period (2007-2011), then it widens to around 10.5 points in the second period (2011-2015). In the third period, the reduction is due to the increase in the informal sector, thereby yielding a gap of 7 points for the last year of the sample.

Figure 3.1: National GDP growth rate, Informal Sector, and Informal Employment (as a share of total employment), urban Peru



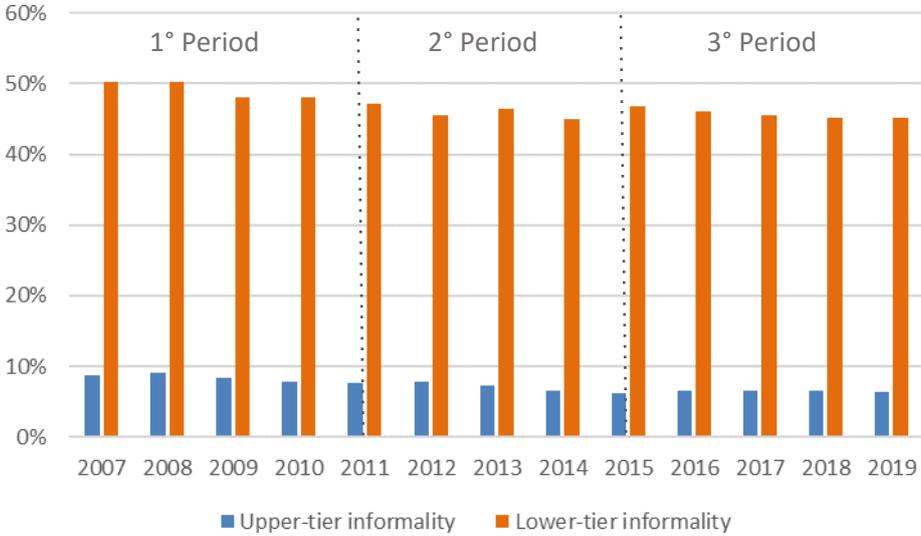
Source: Own estimation based on CEPAL (2023) and ENAHO Panel. Sample weights used.

In line with other empirical studies, our estimates confirm that the formalization process in Peru was strong until 2014, after which informality rates remained relatively constant. The periods under analysis comprise three different contexts. The first period (2007-2011) registers the highest average annual economic growth (5.9%) despite the brief drop due to the effect of the International Financial Crisis. The second period (2011-2015) comprises the first phase of the economic slowdown, with an average annual growth of 3.8%. The third period (2015-2019) comprises the deepest phase of the slowdown, with an average annual growth of 1.6%. Notably, the reduction in informality was greater for both definitions in the second period, but the

reduction was twice as large for employment in the informal sector. In the third period, the trend changes; while informal employment stagnates, employment in the informal sector increases.

Figure 3.2 shows the evolution of employment in upper-tier and lower-tier informality, estimated based on the definition of informal employment. Informal employment is dominated by activities that require lower entry restrictions (middle and low skills). The figure shows that the formalization process throughout the analysis period occurred in both the upper and lower tiers. In absolute terms, the reduction of the lower-tier has been dominant (5.0 points vs. 2.3 points between 2007 and 2019), but in relative terms, the reduction of the upper-tier informality has been greater given its small size. However, the evolutions differ between them. While the reduction of lower-tier informality was greater in the first period (3 points), for upper-tier informality it was in the second period (1.5 points) and increased slightly in the third period.

Figure 3.2: Upper-tier and Lower-tier informality (as a share of total employment), urban Peru



Source: Own estimation based on ENAHO Panel. Sample weights used.

Tables 3.2, 3.3, 3.4, and 3.5 show the average values for each period regarding the distribution of formal and informal workers by the characteristics that have been found relevant in the literature. Regarding gender disparities, men and women are equally represented in informality across all informality measures, and this pattern has remained constant over time. Conversely, large gender differences are observed within formality, with the gender gap particularly pronounced in the formal sector. However, the gender gap is decreasing over time in both categories of formality.

Table 3.2: Composition of Informal Workers by gender, urban Peru

By Gender	1° Period: 2007-2011		2° Period: 2011-2015		3° Period: 2015-2019	
	Male	Female	Male	Female	Male	Female
Formal Sector	62,5	37,5	59,9	40,1	58,7	41,3
Informal Sector	56,4	43,6	57,2	42,8	57,6	42,4
Formal Employment	66,8	33,2	64,3	35,7	63,5	36,5
Informal Employment	51,6	48,5	51,7	48,3	51,2	48,8
Upper-tier Informality	51,1	48,9	51,6	48,4	50,8	49,2
Lower-tier Informality	51,6	48,4	51,8	48,3	51,3	48,7

Note: for Formal and Informal Sector estimates only from 2012 to 2015 for the 2° period.

Source: Own estimates based on data from ENAHO Panel. Sample weights used.

Table 3.3: Composition of Informal Workers by age, urban Peru

By Age Groups	1° Period: 2007-2011			2° Period: 2007-2011			3° Period: 2007-2011		
	14-24	25-44	45-64	14-24	25-44	45-64	14-24	25-44	45-64
Formal Sector	17,4	58,7	23,9	18,0	55,8	26,2	16,8	55,4	27,9
Informal Sector	18,3	51,4	30,3	15,9	50,4	33,7	13,9	49,8	36,4
Formal Employment	8,6	59,2	32,2	10,2	58,5	31,3	9,6	57,9	32,5
Informal Employment	24,1	51,7	24,2	22,7	49,6	27,8	20,3	48,7	31,0
Upper-tier Informality	30,5	56,5	13,1	31,9	53,3	14,8	31,5	51,7	16,7
Lower-tier Informality	23,1	50,9	26,1	21,2	49,0	29,8	18,6	48,3	33,1

Note: for Formal and Informal Sector estimates only from 2012 to 2015 for the 2° period.

Source: Own estimates based on data from ENAHO Panel. Sample weights used.

Table 3.4: Composition of Informal Workers by education, urban Peru

by Education level	1° Period: 2007-2011				2° Period: 2011-2015				3° Period: 2015-2019			
	Primary or less	Secondary	No-university	University	Primaria	Secondary	No-University	University	Primaria	Secondary	No-University	University
Formal Sector	4,9	34,8	26,0	34,4	5,6	37,6	23,8	33,0	5,6	36,6	24,0	33,8
Informal Sector	24,6	51,8	14,1	9,5	25,8	54,2	12,4	7,6	25,3	54,4	12,5	7,8
Formal Employment	5,7	33,4	26,0	34,9	5,2	34,2	25,8	34,9	5,1	34,0	25,4	35,5
Informal Employment	22,3	51,3	15,2	11,2	21,6	52,6	14,2	11,6	21,6	53,2	13,7	11,4
Upper-tier Informality	2,2	24,2	30,9	42,7	2,5	23,8	29,0	44,8	2,2	22,9	29,1	45,7
Lower-tier Informality	25,8	56,0	12,5	5,8	24,6	57,1	11,9	6,4	24,4	57,5	11,5	6,6

Note: for Formal and Informal Sector estimates only from 2012 to 2015 for the 2° period.

Source: Own estimates based on data from ENAHO Panel. Sample weights used.

Table 3.5: Composition of Informal Workers by occupational category, urban Peru

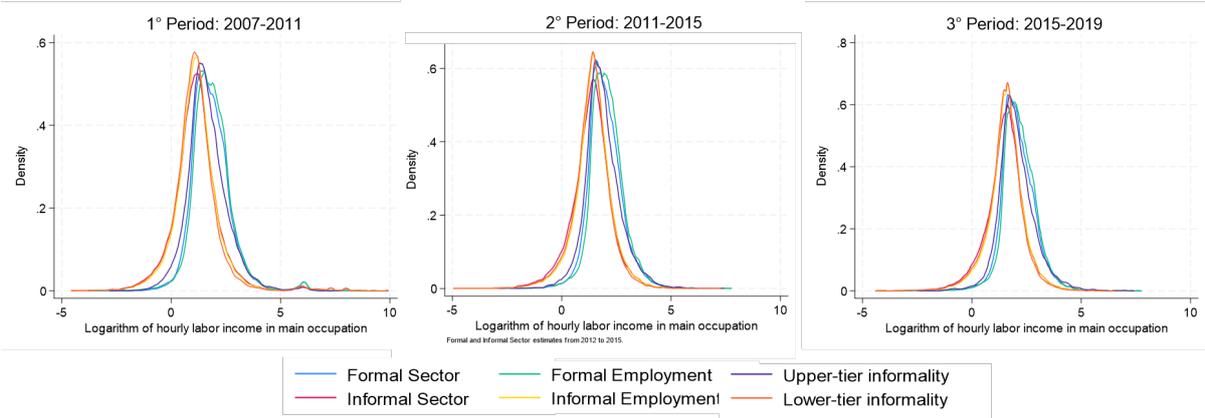
by Occupational Category	1° Period: 2007-2011		2° Period: 2011-2015		3° Period: 2015-2019	
	Self-employment	Wage worker	Self-employment	Wage worker	Self-employment	Wage worker
Formal Sector	7,0	93,1	13,8	86,2	14,7	85,3
Informal Sector	70,8	29,2	73,2	26,8	72,6	27,4
Formal Employment	19,7	80,3	18,1	81,9	19,3	80,7
Informal Employment	52,9	47,1	52,7	47,3	53,5	46,5
Upper-tier Informality	29,1	70,9	29,0	71,1	32,9	67,1
Lower-tier Informality	57,0	43,0	56,4	43,6	56,5	43,5

Note: for Formal and Informal Sector estimates only from 2012 to 2015 for the 2° period.
Source: Own estimates based on data from ENAHO Panel. Sample weights used.

With respect to age, the participation of the youngest cohort (aged 14-24) in informality has decreased over time across three out of the four informality measures. This reduction may be attributed to the reaction of younger workers to returning to school in the face of a slowdown in the economy. Conversely, the share of the older cohort (aged 45-64) is increasing over time in all informality measures. The composition of workers by education level has remained constant. Only for the upper-tier informality, there is a trend towards an increasing representation of more educated workers. Regarding the occupational category, there is an overrepresentation of wage employment in both definitions of formality and in upper-tier informality. Noteworthy is the increasing presence of self-employed in the formal sector, while no change is observed in the definition of informal employment.

Figure 3.3 illustrates the distribution of the average hourly labor income for formal and informal workers in the three periods. The curves reveal that the labor income of both formality definitions is distributed similarly: they present higher income levels and less dispersion than the distributions corresponding to informal workers. Nonetheless, the presence of multiple modes indicates the existence of different groups of workers with different earnings patterns within the formality. The labor income of informal workers is lower; the informal sector and low-tier informality curves are more skewed to the left, whereas the upper-tier informality curve is more skewed to the right. These descriptive statistics suggest the existence of the “wage ladder” between formality and informality.

Figure 3.3: Kernel density functions of log hourly labor income, urban Peru



Source: Own estimates based on data from ENAHO Panel. Sample weights used.

3.6 Results on Informal-Formal Transitions

3.6.1 Transition Matrices

The transition matrices for formal/informal sector definition are presented in Appendix B, Table B.3, for formal/informal employment definition are presented in Table B.4, while for the two-tier informality are presented in Table B.5. The matrices show the transition probability across formality, informality, and other labor statuses (NRFW, unemployed, and out of the labor force). The analysis focuses on the transitions between informality and formality. A comparison of the main patterns identified is presented below.

The first result shows that the category of formal workers, according to the formal/informal sector definition and the formal/informal employment definition, have the highest probability of staying in their status compared to the other categories. this result is relevant for all 3 periods under evaluation, on average the probability of remaining in formality is around 74% of the formal sector workers and more than 78% of workers in formal employment. The characteristics of formality may explain the low turnover rate. Employment in the formal sector corresponds to the employment opportunities offered in medium and large enterprises with higher capital and lower risk of bankruptcy, which offer job stability. Whereas formal employment is subject to contracts with high firing costs that discourage labor instability.

The next result indicates that using both measures, formal/informal sector definition and formal/informal employment definition, the probability of remaining in informality is lower than staying in formality, yet it is a significant percentage. This result is again relevant for all 3 periods under evaluation, on average probability of remaining in informality is around 65% of the informal sector workers and more than 71% of workers in informal employment.

The higher turnover in the case of informal sector definition can be explained by the high mortality rate of the business that characterize this sector. The difference in the probability of remaining in informality using the definition of informal sector and informal employment can be explained by the difference in the relative size of each category using each definition. While using the sector definition, the average size over the three periods is 30.5%, the average is 39.1% using the employment definition. Therefore, it can be interpreted that there are greater employment opportunities created within the category of informal employment.

Different patterns of transitions between informality and formality are observed according to the different measures applied. Using the formal/informal sector definition, the flow out of the informal sector into the formal sector increased along and even surpassed the flow in the opposite direction. However, when using the formal/informal employment definition the flow of workers moving from informal to formal employment increased marginally over time, while the flow from formal to informal remains practically the same. These results suggest that the formalization process in the urban labor market in Peru was characterized by an increased flow of workers from the informal to the formal sector. This was due to an expansion of employment opportunities in the public sector and in registered private enterprises, while improvements in working conditions were of lesser importance. This is consistent with the descriptive statistics from the previous section and with findings from other studies (Diaz et al., 2018) that highlight business formalization over employment formalization.

The transition matrices for two-tier informal sector definition aim to provide further information on the assessment of the definition of employment. This matrix shows that workers in the upper-tier informality are much more likely to move to formality than those in the lower-tier informality, the average of the three periods for each transition is 26% versus 9%, respectively. This confirms the heterogeneity within informal employment.

3.6.2 Determinants of employment transitions from informality to formality

As outlined in the methodology section, estimations have been conducted for the three distinct definitions of informality. In Appendix B, Table B.6 displays the marginal effects of transitions from the informal sector to the formal sector, while Table B.7 presents the marginal effects of transitions from informal employment to formal employment. Additionally, Table B.8 showcases the marginal effects of transitions for the two-tier informality definition. This includes the transition from upper-tier informality to formal employment, as well as the transition from lower-tier informality to formal employment.

Table 3.6: Estimated Average Probabilities of Informal-Formal Transitions by choice of measure

Average Probability of Transition	1° Period Expansionary Period 2007-2012	2° Period Slow Down Period (Initial Stage) 2012-2015	3° Period Slow Down Period 2015-2019
Informal-Formal Sector	12.03%	17.91%	16.68%
Informal- Formal Employment	9.33%	9.80%	11.19%
Upper-tier informality - Formal Employment	25.83%	25.89%	26.12%
Lower-tier informality - Formal Employment	7.56%	8.44%	9.89%

Source: Own estimations using multinomial logit regressions based on ENAHO Panel.

The results of the transition matrices are corroborated with the estimates of the probabilities of informal-formal transition shown in Table 3.6. The estimated average probabilities reveal that informal-formal transitions occur consistently throughout the business cycle, regardless of whether the economy is in an expansionary or slowdown phase. However, there are differences in the magnitude and evolution of the transition probabilities depending on the measure used. Using the informal/formal sector definition, for an average worker, the average probability of transition increases by more than 5 p.p. between the first and second period, and is reduced marginally in the third period. When using the informal/formal employment definition this probability of transition slightly increases from the first to the second period, while the largest increase by 1.3 p.p. occurs in the third period. For the definition of two-tier informality, the average probability of transition from upper-tier informality to formality is marginal increases

across the three periods, while from lower-tier informality, the probability of transitioning increases steadily by about 1 p.p. between each study period.

3.6.2.1 Transitions from the Informal Sector to the Formal Sector

The results confirm that a higher educational level increases the probability of transition to the formal sector. Compared to workers with primary education or less, it can be found that in the first period, those with secondary education are more likely to transition by 5.9 percentage points (p.p.), those with non-university education by 15.4 p.p., and those with university education by 16.9 p.p. The effect of education increased from the first to the second period by about 1.5 p.p. for those with secondary education and 1.8 p.p. for those with non-university education. In contrast, the effect decreased for those with university education by 3 p.p. From the second to the third period, the impact of education decreased for all categories, mainly for those with non-university education, by 5 p.p. In the last period, compared to individuals with primary education or less, those with a university education are more likely to transit by 5.1 p.p.; while those with non-university education by 11.3 p.p., and those with university education by 12.7 p.p. These results suggest that the greater formalization process, which took place in the second period, was more pronounced for those with secondary or non-university education.

Looking at other characteristics relevant to the research, being a woman decreases the probability of moving into the formal sector by about 5,9 p.p., 6 p.p., and 6,3 p.p. on average compared to men for each period analyzed. This indicates that the gender inequalities slightly increase during the formalization process. Regarding age, middle-aged and older workers are less likely to move into the formal sector. Only in the first period, compared to the youngest group (14-24), the 25-44 age group have a slightly higher probability of moving to the formal sector by 0.2 p.p., while the 44-59 and 45- 64 age group have a lower probability of transit to the formal sector by 3.8 p.p. and 6.5 p.p. respectively. The negative age effect increases towards the second period, being 3.6 p.p. for the 25-44 group, 8.1 p.p. for the 45-59 age group, and 7.3 p.p. for the 60-64 age group. In the third period, the effects remain at a similar level for workers within the 25-44 and 45-59 age group and only increase for the 60-64 age group, increasing to 9.4 p.p. in the probability of transition to formality. These results indicate that the process of greater formalization was particularly noticeable among younger workers.

Concerning employment-related characteristics, belonging to the manufacturing or services sector always increases the probability of moving to the formal sector compared to belonging

to the primary sector. In the first period, the effect is similar between manufacturing and services, increasing the probability by about 3 p.p. In the second period, the effect increases for both sectors but is greater for manufacturing. Finally, in the third period, the differences increase and the effect of the manufacturing sector is 10.2 p.p. while for the services sector it is only 6.4 p.p. It can be observed that being a wage-employee has only a small positive effect in the first period compared to being self-employed. However, in the second period, the effect turns negative and represents a decrease in the probability of moving to the formal sector by 4.3 p.p. In the third period, the effect remained negative, but was significantly smaller, only 0.8 p.p. This suggests that the greater formalization process was more pronounced for the self-employed.

The results suggest that for the informal/formal sector definition, the greater formalization process during the second period was higher for workers with second or non-university education, males, the youngest group age, self-employed, and those working in the manufacturing sector. Overall, education is the most important determinant for informal-formal transition, followed by age and gender.

3.6.2.2 Transitions from the Informal Employment to the Formal Employment

The positive association between higher levels of education and the probability of transition to formal employment is also confirmed. In the first period, compared to having primary education or less, secondary education increases the probability of moving to formal employment by 4.1 p.p., non-university education by 10.2 p.p., and university education by 13.8 p.p. In the second period, the effect increases for secondary education by 1 p.p. but decreases for non-university by 0.6 p.p. and university education by 2.8. In the third period, the effect remains the same for those with secondary education but increases for those with non-university and university education. Thus, the effect of education is 5.1 p.p., 11.9 p.p., and 16.5 p.p. respectively for each level of education. The results indicate that the greater formalization process, which took place in the third period, was more pronounced for those with university education.

In all periods, being a female reduces the probability of moving to formal employment, compared to being a male. However, the impact varies across all periods. Female workers are less likely to move to formal employment by 6.7 p.p., 4.9 p.p., and 5.7 p.p. in the first, second, and third periods, respectively. In terms of the definition of formal employment, the findings show that the formalization process can be associated with a smaller gender gap, as the impact

of the characteristic of being a woman versus being a man impacts less between the 1st and 3rd periods.

In contrast to the informal/formal sector results, age is positively associated with a higher probability of moving to informal employment. In the first period, compared to the youngest age group (14-24), the increase in the probability of moving to formal employment was 3.4 p.p. for individuals in the 25-44 age group, 5.3 p.p. for those in the 45-59 age group and 4.6 p.p. for individuals in the 60-64 age group. In the second period, the effect of age was reduced for all groups, becoming negative for the 25-44 age group, insignificant for the 45-59 age group, and reducing to 1.2 p.p. for the 60-64 age group. In the third period, the effects returned to their expected pattern, representing an increase of 3.2 p.p. for the 25-44 age group, 2.9 p.p. for the 44-59 age group, and 3.2 p.p. for the 60-64 age group. The results suggest that the formalization process during the third period of study was relatively equally important for three age groups younger workers between the ages of 14-24 years.

Both working in manufacturing and services increase the probability of moving to formal employment compared to working in the primary sector in all periods. The difference in the effect was only reduced in the second period and then increased again in the third period. This indicates that, opposite to the case of the informal/formal sector, the service sector has a higher probability of moving to formal employment than the manufacturing sector.

Being a wage-employee compared to being self-employed increases the probability of transition to formal employment in all three periods. However, the results show a slight transitory reduction in this effect. Compared to the self-employed, wage workers were more likely to transition by 4.5 p.p., 3.5 p.p., and 5.1 p.p. for the first, second and third period respectively. In contrast to the findings using the informal/formal sector definition, the results suggest that the category of wage workers is more prone to transition to formality during the formalization process.

In summary, for the definition of informal/formal employment, the results indicate that the formalization process during the third period was greater for workers with university education, older workers, those working in the service sector and wage employees; in addition, it suggests a reduction in the gender gap. The most important determinants are education, gender, and occupational category.

3.6.2.3 Differences between Informal-Formal Transitions from Lower-tier and Upper-tier Informality

As expected, the probabilities of transition to formal employment are considerably higher for workers coming from the upper-tier informality than for those coming from the lower-tier informality. The direction of the effects of gender, age, and occupational category are the same for both subcategories. But the patterns over time show some nuances. The gender-effect has considerably reduced over time for transition from upper-tier informality and fluctuates for transition from lower-upper informality. For upper-tier workers, the age group 45-59 was the most prone to transition to formality, while for the lower-tier workers, the age group 25-44 was the most likely to transition to formality. Regarding the occupational category, the positive effect of wage employment steadily increases for upper-tier workers, while it fluctuates for the transitions from lower-upper informality.

3.6.3 Labor income implications of labor transitions

In the following section, the impact on income dynamics associated with informal-formal transitions is addressed. In Appendix B, Table B.9 shows the regressions' outcomes corresponding to the informal/formal sector and informal/formal employment definition. For each informality measure, the proportional change in labor income from year t to $t+1$ attributed to transit from informality to formality is estimated while controlling initial log labor income and the initial individual and job-related characteristics. Table B.10 shows the results corresponding to the two-tier informality definition. For each informality sub-category (upper-tier and lower-tier), the transition to the other informality sub-sector is included. The results determine whether a specific transition leads to an increase (premia) or decrease (penalty) in labor income, *ceteris paribus*.

According to both informal/formal sector and informal/formal employment definitions (Table B.9), compared to workers who remain in informality, those who transit to formality experience, on average, an increase in labor income across the three periods. The formality premium is higher for the informal-formal transition for the sector definition than for the employment definition. Comparing the results across the periods, the formality premium for the sector definition temporally decreased during the second period (higher fall of economic growth) but recovered during the third period. On the contrary, the formality premia for the informal employment definition shows a continuous decline.

The evaluation of informal-formal transitions for the two-tier informality definition (Table B.10) shows interesting results. Compared to remaining in upper-tier informality, transitions to formality increase labor income while transitions to lower-tier informality represent an income penalty. This confirms that for high-skilled workers, the upper-tier informality category takes an intermediate position within the wage ladder, which is in agreement with other studies. At the same time, compared to remaining in lower-tier informality, transitions to formality as well as to upper-tier informality increase labor income. However, on average, the upper-tier informality premium is higher than the formality premium. The findings suggest that lower-skilled workers experience a lower earning capacity in formality compared to their potential in the upper-tier informality. Another interesting pattern is that, the income premium for the transition from upper-tier informality to formal employment increased during the second period, but then decreased significantly during the third period (featured as the deepest slowdown). This suggests that formality loses attractiveness for upper-tier workers in the latter period. In the case of the transitions from lower-tier informality, the formality premium decreased during the second period, but recovered in the third one. The difference between upper-tier and formality premia tends to reduce.

3.7 Summary and conclusions

The objective of this study was to explore the determinants of informal-formal labor transitions in Peru and their effect on labor income. The hypothesis on the sensitivity of the results of the informality analysis to the choice of informality measure was tested. To this purpose, a comparative analysis of three definitions was carried out: informal/formal sector, informal/formal employment, and two-tier informality. In addition, the analysis timeframe comprised different moments of the formalization process and economic cycle.

The analysis confirms that the choice of informality measure leads to different results regarding the determinants of informal-formal transitions and their effects on the individuals' economic well-being. The informal/formal sector measure shows a higher probability of transition to formality than the informal/formal employment measure. Different patterns within the two-tier informality definition are identified. The lower-tier informal workers tend to show high persistence to remain in informality, while upper-tier informal workers show the highest probability of transition to formality.

In addition, the impacts of the determinants of informal-formal transitions vary based on the measure used. The two most important differences are with respect to occupational category and age group. While the self-employed are more likely to transit to the formal sector, wage workers are more likely to move to formal employment. This suggests that for the informal sector definition the formalization process has been promoted by the relaxation of regulatory requirements for registrations for self-employed rather than increasing registration of small and medium enterprises which generate wage employment. Regarding the measure of formal/informal employment compared to the self-employed, wage workers are more likely to transit to formality and therefore be covered by social protection. It can be concluded therefore that the formalization process has not been able to disappear or reduce the social protection gap based on the wage employed occupational category. The second striking difference is that age decreases the likelihood of transit to the formal sector, but increases the likelihood of moving to formal employment. This suggests that the informal sector may be a stepping stone for younger workers while older workers face segmented markets. In contrast, informal workers are more likely to transition to formality with increasing age, probably because of a greater preference to be covered by social protection as they are closer to retirement.

The impact of other determinants varies in some nuances. It is confirmed that education is the most important determinant of transition to formality in both definitions. The higher the level of education, the higher the probability of moving to the formal sector as well as to formal employment. While for the information-formal sector definition, it was workers with high school and non-university education who relatively improved their probability of moving to formality during the period of greater formalization, in the case of the informal-formal employment definition it was only workers with university education. Using both definitions, women are less likely to transit to formality. While the gender effect remains constant in the case of the informal/formal sector, for the informal/formal employment definition, formalization is associated with a smaller gender gap in the probability of moving to formality. Using both definitions, compared to working in the primary sector, working in either sectors, manufacturing or services, increases the probability of transition to formality. For the formal/informal definition working in the manufacturing sector represents the highest increase in probability, whereas for the formal/informal employment measure working in the services sector represents the highest increase.

The findings confirm that informal-formal transitions represent an increase in labor income, but it is greater for the informal/formal sector definition than for informal/formal employment.

Regarding the definition of two-tier informality, the expected wage ladder where upper-tier informality is at an intermediate level is only confirmed for skilled workers. For lower-skilled workers, transitions to upper-tier informality are associated with a higher reward than transitions to formal employment.

In regards to possible association between the economic cycle and the informal-formal transitions, it is observed that these transitions occur consistently throughout the three periods of analysis, regardless of whether the economy is in an expansionary or slow down phase. When using the informal/formal sector measure, the probability of transition to formality is greater during the initial phase of the slowdown. While for the informal/formal employment measure, the probability of transition to formality steadily increases across the three periods.

Summing up, the findings of this study suggest that individual and labor-related characteristics hold more significance than the economic cycle when it comes to understanding the dynamics of informality in Peru. The diverse nature of informality within the country underscores that merely adhering to formal tax regulations does not necessarily translate into improved social protection coverage for workers.

Regarding policy recommendations, when addressing the issue of informality in Peru, it is crucial to adopt a nuanced approach due to the complex nature of this phenomenon. Specifically, it is essential to recognize that promoting certain forms of employment, such as self-employment, may yield contradictory outcomes. While self-employment can offer individuals autonomy and flexibility and are more prone to become formal in terms of registration, it may also perpetuate informality efforts in terms of pension system coverage. Therefore, policymakers should consider the implications of different employment strategies to tackle informality effectively.

Moreover, a key aspect of any comprehensive policy framework aimed at reducing informality in Peru should involve a strong emphasis on promoting education and enhancing skills among the workforce. Education plays a pivotal role in equipping individuals with the necessary tools to thrive in formal employment settings. By prioritizing education and skill development initiatives, policymakers can address the root causes of informality and create pathways for individuals to transition into formal economic activities.

Ultimately, encouraging the creation of wage employment in formal sector companies would lead to higher income levels and better social protection coverage for workers, which can serve as a powerful driver for fostering a sustainable formal economy in Peru.

APPENDIX B

Table B.1: Formality/Informality measurements according to different approaches

	Employment in Formal/Informal Sector	Formal/Informal Employment	Two-tier-Informality
Formal	Employment within public sector organizations and legally established private companies with proper accounting practices.	Wage workers and self-employed workers (including domestic workers) who are enrolled in the pension system.	Wage workers and self-employed workers (including domestic workers) who are enrolled in the pension system.
Informal	Employment in private companies that are not legal entities or do not maintain accounting records. This definition excludes non-remunerated family workers (NRFW) and domestic workers	Wage workers and self-employed workers (including domestic workers) who are not enrolled in the pension system. This definition includes unpaid family workers.	* Upper Informal: high-skilled informal workers. * Lower Informal: low-skilled informal workers and NRFW.

Note: These classifications correspond to the applied criteria based on information from the ENAHO database.
Source: Author’s elaboration.

Table B.2: Descriptive statistics

Categories	1° Period: 2007-2011		2° Period: 2011-2015		3° Period: 2015-2019	
	Shares	N	Shares	N	Shares	N
<i>Formal/Informal Sector Definition</i>						
Sector Formal	29,07	49268	37,37	66396	36,76	94002
Sector Informal	34,06	64539	26,66	51694	27,38	72675
NRFW	4,59	9919	4,08	8722	3,85	11135
Domestic Worker	2,14	3540	1,86	3028	1,9	4237
Unemployed	4,36	7660	3,45	6236	3,63	8353
Out of LF	25,78	48092	26,58	49884	26,47	70033
Total	100	183018	100	185960	100	260435
<i>Formal/Informal Employment Definition</i>						
Formal Employment	25,27	43228	28,46	62886	29,45	77558
Informal Employment	40	74119	37,5	84353	36,59	93356
NRFW	4,59	9919	4,16	10766	3,85	11135
Unemployed	4,36	7660	3,53	7754	3,63	8353
Out of LF	25,78	48092	26,35	60234	26,47	70033
Total	100	183018	100	225993	100	260435
<i>Two-tier Informality Definition</i>						
Formal Employment	25,27	43228	28,46	62886	29,45	77558
Upper-Tier informality	5,85	9902	5,03	10575	4,56	11450
Lower-Tier informality	34,15	64217	32,47	73778	32,03	81906
NRFW	4,59	9919	4,16	10766	3,85	11135
Unemployed	4,36	7660	3,53	7754	3,63	8353
Out of LF	25,78	48092	26,35	60234	26,47	70033
Total	100	183018	100	225993	100	260435
<i>Gender</i>						
Male	49,7	89069	49,66	109016	49,53	124423
Female	50,3	93948	50,34	116977	50,47	136012
Total	100	183017	100	225993	100	260435
<i>Education level</i>						
No Education	1,64	3533	1,41	3755	1,37	4040
Primary	14,11	29205	13,03	33125	12,55	34776
Secondary	49,18	88729	49,12	106909	48,81	120207
Non-University	16,59	29448	16,31	35735	16,28	42289
University	18,48	32090	20,12	46436	20,99	58782
Total	100	183005	100	225960	100	260094
<i>Proxy quality of education</i>						
Public Education	75,39	143448	73,39	170417	71,7	189679
Private Education	24,61	36057	26,61	51855	28,3	66743
Total	100	179505	100	222272	100	256422
<i>Poverty</i>						
Poor household	79,99	138216	85,9	195234	87,37	215353
No Poor household	20,01	34920	14,1	29976	12,63	26286
Total	100	173136	100	225210	100	241639
<i>Age groups</i>						
14-24	30,72	58295	29,91	67443	28,52	72165
25-44	45,31	76164	44,64	89827	44,5	103973
45-59	19,66	40114	20,62	56034	21,63	67770
60-64	4,31	8445	4,83	12689	5,36	16527
Total	100	183018	100	225993	100	260435
<i>Sector of activity</i>						
Primary	7,21	15978	8,05	21166	8,19	24903
Secondary	9,77	15129	8,82	16765	7,99	17360
Tertiary	83,03	151911	83,13	188062	83,82	218172
Total	100	183018	100	225993	100	260435
<i>Ethnicity</i>						
No Native	89,32	161587	89,54	201333	88,81	231676
Native	10,68	21397	10,46	24591	11,19	28650
Total	100	182984	100	225924	100	260326
<i>Marital Status</i>						
No Married	50,15	89974	51,74	113024	51,37	129922
Married	49,85	93035	48,26	112969	48,63	130513
Total	100	183009	100	225993	100	260435
<i>Position in the Household</i>						
Other	11,52	19252	11,01	22714	10,4	25208
HH Head	29,61	55802	29,11	69282	30,52	83303
Spouse	20,8	40331	20,16	49591	20,73	58179
Son/dougther	38,08	67633	39,73	84406	38,36	93745
Total	100	183018	100	225993	100	260435
<i>Occupational Category</i>						
Wageworker	40,03	50673	40,8	60078	38,26	68947
Self-employed	59,97	66674	59,2	87161	61,74	101967
Total	100	117347	100	147239	100	170914

Note: for Formal and Informal Sector estimates only from 2012 to 2015 in 2° period.
Source: Own estimates based on data from ENAHO Panel. Sample weights used.

Table B.3: Transition Matrices for Formal/Informal Sector Definition by periods**1° Period: 2007-2011**

Initial category (t)	Final category (t+1)						
	Sector Formal	Sector Informal	NRFW	Domestic Worker	Unemployed	Out of LF	Turnover rate
Sector Formal	73,4	16,2	1,3	0,6	2,6	5,9	26,6
Sector Informal	14,2	68,2	2,8	1,3	2,1	11,4	31,8
NRFW	11,2	23,7	37,9	0,8	3,0	23,4	62,1
Domestic Worker	9,6	25,2	2,6	39,6	3,7	19,4	60,4
Unemployed	21,9	25,6	3,1	1,5	14,4	33,5	85,6
Out of LF	7,8	17,5	4,3	1,9	6,3	62,2	37,8
Total	28,9	35,4	4,6	2,1	4,0	25,1	

2° Period: 2012-2015

Initial category (t)	Final category (t+1)						
	Sector Formal	Sector Informal	NRFW	Domestic Worker	Unemployed	Out of LF	Turnover rate
Sector Formal	76,9	12,1	1,3	0,7	2,5	6,4	23,1
Sector Informal	18,6	63,8	2,7	1,2	1,9	11,9	36,2
NRFW	15,2	19,5	35,2	0,6	2,4	27,1	64,8
Domestic Worker	12,1	13,7	3,0	51,5	2,1	17,7	48,5
Unemployed	29,1	18,3	2,2	2,1	9,8	38,6	90,2
Out of LF	12,1	11,8	3,8	1,5	4,4	66,4	33,6
Total	38,1	27,2	3,9	2,0	3,1	25,8	

3° Period: 2015-2019

Initial category (t)	Final category (t+1)						
	Sector Formal	Sector Informal	NRFW	Domestic Worker	Unemployed	Out of LF	Turnover rate
Sector Formal	76,1	12,3	1,4	0,6	2,6	7,1	23,9
Sector Informal	17,5	65,8	2,7	1,4	1,7	10,9	34,2
NRFW	15,4	20,2	36,3	0,6	2,6	24,9	63,7
Domestic Worker	14,3	20,1	0,6	47,8	1,5	15,8	52,2
Unemployed	32,8	18,4	2,6	1,5	11,7	33,1	88,3
Out of LF	11,8	14,0	3,9	1,4	5,3	63,5	36,5
Total	37,4	28,2	3,8	2,0	3,4	25,2	

Note: Transition matrices for the urban working-age population aged < 65 in the initial year. The weights provided by INEI are used in the calculations. Panel 2 does not contain information on the transition 2011-2012 due to transcripts problems with the original data. N: 35440 for panel 1, 34064 for panel 2, and 51952 for panel 3.

Source: Own estimates based on Household Surveys (ENAH0 PANEL 2007-2011, 2011-2015, 2015-2019).

Table B.4: Transition Matrices for Formal/Informal Employment Definition**1° Period: 2007-2011**

Initial category (t)	Final category (t+1)					
	Formal Employment	Informal Employment	NRFW	Unemployed	Out of LF	Turnover Rate
Formal Employment	78,8	13,0	0,9	2,3	5,1	21,2
Informal Employment	11,2	71,7	3,0	2,4	11,8	28,4
NRFW	5,1	30,5	37,9	3,0	23,4	62,1
Unemployed	16,0	33,0	3,1	14,4	33,5	85,6
Out of LF	4,7	22,6	4,3	6,3	62,2	37,8
Total	25,5	40,9	4,6	4,0	25,1	

2° Period: 2011-2015

Initial category (t)	Final category (t+1)					
	Formal Employment	Informal Employment	NRFW	Unemployed	Out of LF	Turnover Rate
Formal Employment	78,3	13,8	1,0	2,1	4,8	21,7
Informal Employment	11,5	71,4	2,8	2,2	12,1	28,6
NRFW	6,1	30,3	35,4	2,3	25,9	64,6
Unemployed	18,6	32,6	2,0	11,0	35,8	89,0
Out of LF	5,9	19,6	4,0	4,6	66,0	34,1
Total	28,5	38,8	4,0	3,1	25,6	

3° Period: 2015-2019

Initial category (t)	Final category (t+1)					
	Formal Employment	Informal Employment	NRFW	Unemployed	Out of LF	Turnover Rate
Formal Employment	78,6	13,3	0,8	2,1	5,2	21,4
Informal Employment	12,8	70,3	2,8	2,3	11,8	29,7
NRFW	6,8	29,4	36,3	2,6	24,9	63,7
Unemployed	25,8	26,9	2,6	11,7	33,1	88,3
Out of LF	6,3	20,9	3,9	5,3	63,5	36,5
Total	29,9	37,7	3,8	3,4	25,2	

Note: Transition matrices for the urban working-age population aged < 65 in the initial year. The weights provided by INEI are used in the calculations. N: 35440 for panel 1, 45160 for panel 2, and 51952 for panel 3. Source: Own estimates based on Household Surveys (ENAH0 PANEL 2007-2011, 2011-2015, 2015-2019).

Table B.5: Transition Matrices for “Two-tier Informal Sector” Definition

1° Period: 2007-2011

Initial category (t)	Final category (t+1)						
	Formal Employment	Upper-tier Informal Employment	Lower-tier Informal Employment	NRFW	Unemployed	Out of LF	Turnover rate
Formal Employment	78,8	3,2	9,8	0,9	2,3	5,1	21,2
Upper-tier Informal Employment	26,2	38,3	18,3	2,4	4,5	10,3	61,8
Lower-tier Informal Employment	8,7	3,8	70,4	3,0	2,1	12,0	29,6
NRFW	5,1	4,4	26,2	37,9	3,0	23,4	62,1
Unemployed	16,0	7,1	26,0	3,1	14,4	33,5	85,6
Out of LF	4,7	3,8	18,8	4,3	6,3	62,2	37,8
Total	25,5	5,8	35,1	4,6	4,0	25,1	

2° Period: 2011-2015

Initial category (t)	Final category (t+1)						
	Formal Employment	Upper-tier Informal Employment	Lower-tier Informal Employment	NRFW	Unemployed	Out of LF	Turnover rate
Formal Employment	78,3	3,0	10,8	1,0	2,1	4,8	21,7
Upper-tier Informal Employment	25,4	37,6	19,8	2,3	3,4	11,5	62,4
Lower-tier Informal Employment	9,4	3,3	70,2	2,8	2,0	12,2	29,9
NRFW	6,1	3,2	27,1	35,4	2,3	25,9	64,6
Unemployed	18,6	6,9	25,7	2,0	11,0	35,8	89,0
Out of LF	5,9	3,6	16,0	4,0	4,6	66,0	34,1
Total	28,5	5,1	33,7	4,0	3,1	25,6	

3° Period: 2015-2019

Initial category (t)	Final category (t+1)						
	Formal Employment	Upper-tier Informal Employment	Lower-tier Informal Employment	NRFW	Unemployed	Out of LF	Turnover rate
Formal Employment	78,6	3,3	10,1	0,8	2,1	5,2	21,4
Upper-tier Informal Employment	26,6	36,3	17,0	2,3	4,6	13,2	63,8
Lower-tier Informal Employment	10,9	2,9	69,8	2,8	2,0	11,7	30,2
NRFW	6,8	3,5	25,9	36,3	2,6	24,9	63,7
Unemployed	25,8	5,6	21,3	2,6	11,7	33,1	88,3
Out of LF	6,3	3,5	17,4	3,9	5,3	63,5	36,5
Total	29,9	4,8	32,9	3,8	3,4	25,2	

Note: Transition matrices urban working age population aged < 65 in the initial year. The weights provided by INEI are used in the calculations. N: 35440 for panel 1; 45160 for panel 2; and 51,952 for panel 3.

Source: Own estimates based on Household Surveys (ENAH0 PANEL 2007-2011, 2011-2015, 2015-2019).

Table B.6: Average Marginal Effects of Multinomial Logit Regression – Transitions from Informal Sector (t) to Formal Sector (t+1)

Variables	1° Period: 2007-2011	2° Period: 2012-2015	3° Period: 2015-2019
	Transition from Informal Sector to Formal Sector Pr = 12,03%	Transition from Informal Sector to Formal Sector Pr = 17,91%	Transition from Informal Sector to Formal Sector Pr = 16,68%
<i>Level of education (base: primary education or lower)</i>			
Secondary education	0,059 *** <i>0,001</i>	0,074 *** <i>0,001</i>	0,051 *** <i>0,001</i>
Non-University education	0,154 *** <i>0,001</i>	0,172 *** <i>0,001</i>	0,113 *** <i>0,001</i>
University education	0,169 *** <i>0,001</i>	0,139 *** <i>0,002</i>	0,127 *** <i>0,002</i>
Female	-0,059 *** <i>0,000</i>	-0,063 *** <i>0,000</i>	-0,060 *** <i>0,000</i>
<i>Age group (base: Age group 14-24)</i>			
Age: 25-44	0,002 *** <i>0,000</i>	-0,036 *** <i>0,001</i>	-0,034 *** <i>0,001</i>
Age: 45-59	-0,038 *** <i>0,001</i>	-0,081 *** <i>0,001</i>	-0,080 *** <i>0,001</i>
Age: 60-64	-0,065 *** <i>0,001</i>	-0,073 *** <i>0,001</i>	-0,094 *** <i>0,001</i>
<i>Economic sector (base: Primary sector)</i>			
Manufacture sector	0,030 *** <i>0,001</i>	0,049 *** <i>0,001</i>	0,102 *** <i>0,001</i>
Services sector	0,028 *** <i>0,001</i>	0,035 *** <i>0,001</i>	0,064 *** <i>0,001</i>
Wage job	0,007 *** <i>0,001</i>	-0,043 *** <i>0,001</i>	-0,008 *** <i>0,001</i>
Selecion bias correction	0,096 *** <i>0,001</i>	0,113 *** <i>0,001</i>	0,078 *** <i>0,001</i>
N	11449	9585	12541
Log likelihood	-3999843,0	-3445831,5	-4128420,2
Chi2	817800,3	531455,5	702513,4
PseudoR2	0,093	0,072	0,078

Legend: (i) * p<0,1; ** p<0,05; *** p<0,01. (ii) Standard errors in italics.

Note: Alternative destinations considered were remaining in informality, NRFW, unemployment, and out of the labor force.

Source: Own estimates from ENAHO PANEL 2007-2011, 2011-2015, 2015-2019. Sample weights used.

Table B.7: Average Marginal Effects of Multinomials Logit Regression – Transitions from Informal Employment (t) to Formal Employment (t+1)

Variables	1° Period: 2007-2011	2° Period: 2011-2015	3° Period: 2015-2019
	Transition from Informal Employment to Formal Employment Pr = 9,33%	Transition from Informal Employment to Formal Employment Pr = 9,80%	Transition from Informal Employment to Formal Employment Pr = 11,19%
<i>Level of education (base: primary education or lower)</i>			
Secondary education	0,041 *** <i>0,046</i>	0,051 *** <i>0,000</i>	0,051 *** <i>0,000</i>
Non-University education	0,102 *** <i>0,001</i>	0,096 *** <i>0,001</i>	0,119 *** <i>0,001</i>
University education	0,138 *** <i>0,002</i>	0,110 *** <i>0,001</i>	0,165 *** <i>0,002</i>
Female	-0,067 *** <i>0,000</i>	-0,049 *** <i>0,000</i>	-0,057 *** <i>0,000</i>
<i>Age group (base: Age group 14-24)</i>			
Age: 25-44	0,034 *** <i>0,000</i>	-0,004 *** <i>0,000</i>	0,032 *** <i>0,001</i>
Age:45-59	0,053 *** <i>0,001</i>	0,000 <i>0,001</i>	0,029 *** <i>0,001</i>
Age: 60-64	0,046 *** <i>0,001</i>	0,012 *** <i>0,001</i>	0,032 *** <i>0,001</i>
<i>Economic sector (base: Primary sector)</i>			
Manufacture sector	0,004 *** <i>0,001</i>	0,019 *** <i>0,001</i>	0,026 *** <i>0,001</i>
Services sector	0,021 *** <i>0,000</i>	0,021 *** <i>0,000</i>	0,045 *** <i>0,000</i>
Wage job	0,045 *** <i>0,000</i>	0,035 *** <i>0,001</i>	0,051 *** <i>0,001</i>
Selecion bias correction	0,047 *** <i>0,001</i>	0,090 *** <i>0,001</i>	0,051 *** <i>0,001</i>
N	13053	16906	16178
Log likelihood	-4353723,5	-5491548,8	-5053704,8
Chi2	711470,9	824083,5	765745,7
PseudoR2	0,076	0,070	0,070

Legend: (i) * p<0,1; ** p<0,05; *** p<0,01. (ii) Standard errors in italics.

Note: Alternative destinations considered were remaining in informality, NRFW, unemployment, and out of the labor force.

Source: Own estimates from ENAHO PANEL 2007-2011, 2011-2015, 2015-2019. Sample weights used.

Table B.8: Average Marginal Effects of Multinomials Logit Regression – Transitions from Upper-tier Informal Sector (t) to Formal Employment (t+1) and Lower-tier Informality (t) to Formal Employment (t+1)

Variables	1 ^o Period: 2007-2011		2 ^o Period: 2011-2015		3 ^o Period: 2015-2019	
	Probability of transit from Upper-tier to Formal Employment	Probability of transit from Lower-tier to Formal Employment	Probability of transit from Upper-tier to Formal Employment	Probability of transit from Lower-tier to Formal Employment	Probability of transit from Upper-tier to Formal Employment	Probability of transit from Lower-tier to Formal Employment
	25,83%	7,65%	25,89%	8,44%	26,12%	2,28%
Female	-0,132 *** <i>0,011</i>	-0,069 *** <i>0,000</i>	-0,045 *** <i>0,001</i>	-0,079 *** <i>0,000</i>	-0,038 *** <i>0,001</i>	0,013 *** <i>0,000</i>
Age group (base: Age group 14-24)						
Age: 25-44	0,150 *** <i>0,027</i>	0,023 *** <i>0,000</i>	0,091 *** <i>0,001</i>	0,025 *** <i>0,000</i>	0,186 *** <i>0,001</i>	-0,029 *** <i>0,000</i>
Age:45-59	0,280 *** <i>0,046</i>	0,029 *** <i>0,001</i>	0,163 *** <i>0,002</i>	0,031 *** <i>0,000</i>	0,357 *** <i>0,003</i>	-0,027 *** <i>0,000</i>
Age: 60-64	0,255 *** <i>0,007</i>	0,005 *** <i>0,001</i>	0,163 *** <i>0,006</i>	0,058 *** <i>0,001</i>	0,144 *** <i>0,006</i>	-0,022 *** <i>0,000</i>
Wage job	0,146 <i>0,139</i>	0,009 *** <i>0,000</i>	0,156 *** <i>0,001</i>	0,038 *** <i>0,000</i>	0,161 *** <i>0,001</i>	-0,018 *** <i>0,000</i>
Selecion bias correction	-0,131 <i>0,295</i>	0,064 *** <i>0,000</i>	-0,082 *** <i>0,002</i>	0,085 *** <i>0,000</i>	-0,215 *** <i>0,002</i>	0,043 *** <i>0,000</i>
N	1640	11413	2105	14801	1938	14240
Log likelihood	-911358,12	-4116345	-1059523,3	-5278763,7	-900408	-4782284,3
Chi2	99142,38	674384,15	123200,6	733706,62	102460,88	679868,87
PseudoR2	0,052	0,076	0,055	0,065	0,054	0,066

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Note: Alternative destinations considered were remaining in informality, NRFW, unemployment and OLF.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

Table B.9: Change in log labor income: Informal Sector and Informal Employment

Variables	1 st Period: 2007-2011		2 nd Period: 2011-2015		3 rd Period: 2015-2019	
	From Informal Sector	From Informal Employment	From Informal Sector	From Informal Employment	From Informal Sector	From Informal Employment
Log hourly labor income in t	-0,692 *** 0,000	-0,677 *** 0,000	-0,696 *** 0,001	-0,659 *** 0,000	-0,703 *** 0,000	-0,667 *** 0,000
Labor transition (base: remains in Informal Sector) moves from Informal Sector to Formal Sector	0,262 *** 0,001		0,246 *** 0,001		0,269 *** 0,001	
Labor transition (base: remains in Informal Employment) moves from Informal Employment to Formal Employment		0,247 *** 0,001		0,227 *** 0,001		0,216 *** 0,001
Level of education (base: primary education or lower)						
Secondary education	0,052 *** 0,001	-0,008 *** 0,001	0,073 *** 0,001	0,060 *** 0,001	0,074 *** 0,001	0,016 *** 0,001
Non-University education	0,145 *** 0,002	0,023 *** 0,002	0,000 0,002	0,051 *** 0,002	0,151 *** 0,002	0,019 *** 0,002
University education	0,315 *** 0,003	0,138 *** 0,003	0,155 *** 0,003	0,159 *** 0,002	0,218 *** 0,003	0,119 *** 0,003
Female	-0,250 *** 0,002	-0,111 *** 0,001	-0,272 *** 0,001	-0,167 *** 0,001	-0,237 *** 0,001	-0,120 *** 0,001
Age group (base: Age group 14-24)						
Age: 25-44	0,084 *** 0,002	-0,051 *** 0,002	0,085 *** 0,002	-0,037 *** 0,001	0,114 *** 0,002	-0,025 *** 0,002
Age: 45-59	0,044 *** 0,002	-0,128 *** 0,002	0,029 *** 0,002	-0,067 *** 0,002	0,100 *** 0,002	-0,077 *** 0,002
Age: 60-64	-0,040 *** 0,003	-0,313 *** 0,004	-0,030 *** 0,002	-0,209 *** 0,002	0,024 *** 0,002	-0,170 *** 0,003
Economic sector (base: Primary sector)						
Manufacture sector	-0,115 *** 0,002	-0,072 *** 0,002	-0,051 *** 0,002	0,084 *** 0,001	-0,010 *** 0,002	0,110 *** 0,002
Services sector	-0,057 *** 0,002	-0,011 *** 0,002	0,012 *** 0,002	0,078 *** 0,001	0,096 *** 0,002	0,144 *** 0,001
Wage job	-0,244 *** 0,004	-0,154 *** 0,002	-0,218 *** 0,003	-0,103 *** 0,001	-0,035 *** 0,003	-0,087 *** 0,002
Selection bias correction	0,197 *** 0,003	0,404 *** 0,003	0,240 *** 0,003	0,301 *** 0,002	0,105 *** 0,003	0,324 *** 0,003
constant	0,893 *** 0,003	0,886 *** 0,002	0,912 *** 0,002	0,868 *** 0,002	0,874 *** 0,002	0,897 *** 0,002
Adjusted R2	0,360	0,337	0,391	0,3558	0,374	0,345
N	9412	10707	7790	13717	10208	13137

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

Table B.10: Change in log labor income: Two-tier informality

Variables	1 ^o Period: 2007-2011		2 ^o Period: 2011-2015		3 ^o Period: 2015-2019	
	From Upper-tier	From Lower-tier	From Upper-tier	From Lower-tier	From Upper-tier	From Lower-tier
Log hourly labor income in t	-0,591 *** <i>0,001</i>	-0,703 *** <i>0,001</i>	-0,578 *** <i>0,001</i>	-0,681 *** <i>0,000</i>	-0,693 *** <i>0,001</i>	-0,681 *** <i>0,000</i>
Transit from Upper-tier Informality (base: remains in Upper-tier Informality) to Formal Employment	0,174 *** <i>0,003</i>		0,204 *** <i>0,002</i>		0,080 *** <i>0,002</i>	
to Lower-tier informality	-0,201 *** <i>0,003</i>		-0,267 *** <i>0,002</i>		-0,268 *** <i>0,003</i>	
Transit from Lower-tier Informality (base: remains in Lower-tier Informality) to Formal Employment		0,230 *** <i>0,002</i>		0,214 *** <i>0,001</i>		0,237 *** <i>0,001</i>
to Upper-tier informality		0,330 *** <i>0,002</i>		0,236 *** <i>0,002</i>		0,252 *** <i>0,002</i>
<i>Level of education</i> (base: primary education or lower)						
Secondary education	-0,108 *** <i>0,010</i>	-0,011 *** <i>0,001</i>	0,196 *** <i>0,005</i>	0,117 *** <i>0,001</i>	0,352 *** <i>0,006</i>	0,010 *** <i>0,001</i>
Non-University education	-0,028 *** <i>0,012</i>	-0,083 *** <i>0,003</i>	0,353 *** <i>0,007</i>	0,145 *** <i>0,002</i>	0,375 *** <i>0,009</i>	-0,056 *** <i>0,003</i>
University education	0,120 *** <i>0,013</i>	-0,136 *** <i>0,004</i>	0,483 *** <i>0,008</i>	0,220 *** <i>0,003</i>	0,572 *** <i>0,010</i>	-0,114 *** <i>0,004</i>
Female	-0,123 *** <i>0,003</i>	-0,153 *** <i>0,001</i>	-0,074 *** <i>0,002</i>	-0,238 *** <i>0,001</i>	-0,081 *** <i>0,002</i>	-0,136 *** <i>0,001</i>
<i>Age group (base: Age group 14-24)</i>						
Age: 25-44	0,027 *** <i>0,004</i>	0,029 *** <i>0,002</i>	-0,049 *** <i>0,003</i>	0,085 *** <i>0,001</i>	0,064 *** <i>0,004</i>	0,037 *** <i>0,002</i>
Age:45-59	0,218 *** <i>0,006</i>	-0,040 *** <i>0,002</i>	-0,001 *** <i>0,004</i>	0,088 *** <i>0,001</i>	0,101 *** <i>0,006</i>	-0,011 *** <i>0,002</i>
Age: 60-64	0,074 *** <i>0,012</i>	-0,210 *** <i>0,004</i>	-0,052 *** <i>0,008</i>	-0,019 *** <i>0,002</i>	0,109 *** <i>0,009</i>	-0,112 *** <i>0,002</i>
<i>Economic sector (base: Primary sector)</i>						
Manufacture sector	0,319 *** <i>0,010</i>	-0,081 *** <i>0,002</i>	0,004 <i>0,007</i>	0,083 *** <i>0,001</i>	-0,478 *** <i>0,013</i>	0,095 *** <i>0,002</i>
Services sector	0,445 *** <i>0,010</i>	-0,060 *** <i>0,002</i>	-0,013 * <i>0,007</i>	0,076 *** <i>0,001</i>	-0,580 *** <i>0,014</i>	0,127 *** <i>0,001</i>
Wage job	0,027 *** <i>0,003</i>	-0,170 *** <i>0,002</i>	-0,086 *** <i>0,002</i>	0,030 *** <i>0,001</i>	-0,170 *** <i>0,003</i>	-0,068 *** <i>0,002</i>
Selecion bias correction	0,182 *** <i>0,008</i>	0,311 *** <i>0,003</i>	0,284 *** <i>0,006</i>	0,047 *** <i>0,003</i>	0,061 *** <i>0,010</i>	0,296 *** <i>0,003</i>
Constant	0,428 *** <i>0,026</i>	0,897 *** <i>0,003</i>	0,435 *** <i>0,018</i>	0,819 *** <i>0,002</i>	1,626 *** <i>0,029</i>	0,867 *** <i>0,002</i>
N	1301	9406	1663	12054	1471	11666
Adjusted R2	0,278	0,359	0,360	0,363	0,405	0,348

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

Table B.11: Probability of employment Informal Sector in the initial year (t)

Variables	1° Panel: 2007-2011	2° Panel: 2012-2015	3° Panel: 2007-2015
<i>Level of education (base: primary education or lower)</i>			
Secondary education	-0,394 *** <i>0,002</i>	-0,399 *** <i>0,002</i>	-0,426 *** <i>0,002</i>
Non-University education	-0,885 *** <i>0,002</i>	-0,894 *** <i>0,002</i>	-0,879 *** <i>0,002</i>
University education	-1,320 *** <i>0,002</i>	-1,317 *** <i>0,002</i>	-1,295 *** <i>0,002</i>
Private education	-0,010 *** <i>0,002</i>	-0,112 *** <i>0,002</i>	-0,143 *** <i>0,002</i>
Poverty	0,446 *** <i>0,002</i>	0,542 *** <i>0,002</i>	0,506 *** <i>0,002</i>
Female	-0,168 *** <i>0,002</i>	-0,242 *** <i>0,001</i>	-0,202 *** <i>0,001</i>
<i>Age group (base: Age group 14-24)</i>			
Age: 25-44	-0,399 *** <i>0,002</i>	-0,229 *** <i>0,002</i>	-0,270 *** <i>0,002</i>
Age: 45-59	-0,569 *** <i>0,002</i>	-0,397 *** <i>0,002</i>	-0,417 *** <i>0,002</i>
Age: 60-64	-0,550 *** <i>0,004</i>	-0,334 *** <i>0,003</i>	-0,473 *** <i>0,003</i>
<i>Economic sector (base: Primary sector)</i>			
Manufacture sector	-0,809 *** <i>0,003</i>	-1,042 *** <i>0,002</i>	-1,131 *** <i>0,002</i>
Services sector	-0,643 *** <i>0,002</i>	-0,735 *** <i>0,002</i>	-0,834 *** <i>0,002</i>
Wage worker	-2,332 *** <i>0,001</i>	-1,928 *** <i>0,001</i>	-1,792 *** <i>0,001</i>
Married	-0,131 *** <i>0,002</i>	-0,195 *** <i>0,002</i>	-0,115 *** <i>0,001</i>
<i>Position within the household (base: otherwise)</i>			
HH head	-0,190 *** <i>0,002</i>	-0,070 *** <i>0,002</i>	-0,046 *** <i>0,002</i>
Spouse	0,047 *** <i>0,003</i>	0,163 *** <i>0,002</i>	0,049 *** <i>0,002</i>
Native	0,134 *** <i>0,002</i>	0,101 *** <i>0,002</i>	0,072 *** <i>0,001</i>
constant	3,302 *** <i>0,003</i>	2,620 *** <i>0,003</i>	2,632 *** <i>0,003</i>
N	20469	22015	29329
Log likelihood	-2972005,3	-3265769,2	-4244874
chi2	5357901,8	4586651,5	5436281,8
PseudoR2	0,474	0,413	0,390

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

Table B.12: Probability of employment in Informal Employment in the initial year (t)

Variables	1° Period: 2007-2011	2° Period: 2011-2015	3° Period: 2015-2019
<i>Level of education (base: primary education or lower)</i>			
Secondary education	-0,580 *** <i>0,002</i>	-0,540 *** <i>0,002</i>	-0,517 *** <i>0,002</i>
Non-University education	-1,101 *** <i>0,002</i>	-1,107 *** <i>0,002</i>	-1,136 *** <i>0,002</i>
University education	-1,438 *** <i>0,002</i>	-1,292 *** <i>0,002</i>	-1,424 *** <i>0,002</i>
Private education	-0,059 *** <i>0,001</i>	-0,080 *** <i>0,001</i>	-0,092 *** <i>0,001</i>
Poverty	0,493 *** <i>0,001</i>	0,468 *** <i>0,001</i>	0,362 *** <i>0,002</i>
Female	0,326 *** <i>0,001</i>	0,166 *** <i>0,001</i>	0,322 *** <i>0,001</i>
<i>Age group (base: Age group 14-24)</i>			
Age: 25-44	-0,746 *** <i>0,002</i>	-0,626 *** <i>0,001</i>	-0,716 *** <i>0,001</i>
Age:45-59	-1,093 *** <i>0,002</i>	-0,839 *** <i>0,002</i>	-0,852 *** <i>0,002</i>
Age: 60-64	-1,488 *** <i>0,003</i>	-1,072 *** <i>0,002</i>	-0,995 *** <i>0,002</i>
<i>Economic sector (base: Primary sector)</i>			
Manufacture sector	-0,095 *** <i>0,002</i>	0,047 *** <i>0,002</i>	-0,033 *** <i>0,002</i>
Services sector	-0,016 *** <i>0,002</i>	0,018 *** <i>0,002</i>	-0,036 *** <i>0,002</i>
Wage worker	-0,995 *** <i>0,001</i>	-1,080 *** <i>0,001</i>	-1,009 *** <i>0,001</i>
Married	-0,265 *** <i>0,002</i>	-0,375 *** <i>0,001</i>	-0,172 *** <i>0,001</i>
<i>Position within the household (base: otherwise)</i>			
HH head	-0,218 *** <i>0,002</i>	-0,144 *** <i>0,001</i>	-0,214 *** <i>0,001</i>
Spouse	0,150 *** <i>0,002</i>	0,349 *** <i>0,002</i>	0,029 *** <i>0,002</i>
Native	0,150 *** <i>0,002</i>	0,169 *** <i>0,001</i>	0,215 *** <i>0,001</i>
constant	2,515 *** <i>0,003</i>	2,307 *** <i>0,002</i>	2,276 *** <i>0,002</i>
N	20469	29101	29329
Log likelihood	-3929256,8	-5628743,4	-5288759,4
chi2	2983005	3670855,4	344368,9
PseudoR2	0,275	0,246	0,246

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

Table B.13: Probability of employment Upper-tier Informal in the initial year (t)

Variables	1° Period: 2007-2011	2° Period: 2011-2015	3° Period: 2015-2019
<i>Level of education (base: primary education or lower)</i>			
Secondary education	0,424 *** <i>0,004</i>	0,152 *** <i>0,003</i>	0,154 *** <i>0,003</i>
Non-University education	0,979 *** <i>0,004</i>	0,666 *** <i>0,003</i>	0,716 *** <i>0,003</i>
University education	1,086 *** <i>0,004</i>	0,902 *** <i>0,003</i>	0,871 *** <i>0,003</i>
Private education	0,102 *** <i>0,002</i>	0,000 <i>0,001</i>	0,015 *** <i>0,002</i>
Poverty	-0,264 *** <i>0,002</i>	-0,174 *** <i>0,002</i>	-0,211 *** <i>0,003</i>
Female	0,144 *** <i>0,002</i>	-0,007 *** <i>0,001</i>	0,075 *** <i>0,001</i>
<i>Age group (base: Age group 14-24)</i>			
Age: 25-44	-0,224 *** <i>0,002</i>	-0,261 *** <i>0,002</i>	-0,403 *** <i>0,002</i>
Age: 45-59	-0,384 *** <i>0,003</i>	-0,436 *** <i>0,002</i>	-0,519 *** <i>0,002</i>
Age: 60-64	-0,596 *** <i>0,005</i>	-0,600 *** <i>0,004</i>	-0,577 *** <i>0,004</i>
<i>Economic sector (base: Primary sector)</i>			
Manufacture sector	0,350 *** <i>0,005</i>	0,370 *** <i>0,004</i>	0,643 *** <i>0,006</i>
Services sector	0,513 *** <i>0,004</i>	0,557 *** <i>0,004</i>	0,813 *** <i>0,005</i>
Wage worker	0,016 *** <i>0,001</i>	-0,063 *** <i>0,001</i>	-0,194 *** <i>0,001</i>
Married	-0,131 *** <i>0,002</i>	-0,222 *** <i>0,002</i>	-0,061 *** <i>0,002</i>
<i>Position within the household (base: otherwise)</i>			
HH head	-0,251 *** <i>0,002</i>	-0,229 *** <i>0,002</i>	-0,258 *** <i>0,002</i>
Spouse	-0,300 *** <i>0,003</i>	-0,117 *** <i>0,003</i>	-0,220 *** <i>0,003</i>
Native	0,027 *** <i>0,003</i>	-0,126 *** <i>0,003</i>	-0,036 *** <i>0,002</i>
constant	-2,177 *** <i>0,006</i>	-1,906 *** <i>0,005</i>	-2,124 *** <i>0,006</i>
N	20469	29101	29329
Log likelihood	-2089136,9	-2571186,2	-2234694
chi2	702159,89	784736,68	679494,76
PseudoR2	0,144	0,132	0,132

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

Table B.14: Probability of employment in Lower Informality in the initial year (t)

Variables	1° Period: 2007-2011	2° Period: 2011-2015	3° Period: 2015-2019
<i>Level of education (base: primary education or lower)</i>			
Secondary education	-0,594 *** <i>0,002</i>	-0,558 *** <i>0,002</i>	-0,490 *** <i>0,001</i>
Non-University education	-1,338 *** <i>0,002</i>	-1,598 *** <i>0,003</i>	-1,290 *** <i>0,002</i>
University education	-1,900 *** <i>0,002</i>	-2,324 *** <i>0,003</i>	-1,815 *** <i>0,002</i>
Private education	-0,144 *** <i>0,001</i>	-0,064 *** <i>0,001</i>	-0,116 *** <i>0,001</i>
Poverty	0,547 *** <i>0,001</i>	0,472 *** <i>0,002</i>	0,400 *** <i>0,002</i>
Female	0,222 *** <i>0,001</i>	-0,131 *** <i>0,001</i>	0,291 *** <i>0,001</i>
<i>Age group (base: Age group 14-24)</i>			
Age: 25-44	-0,563 *** <i>0,002</i>	-0,233 *** <i>0,001</i>	-0,539 *** <i>0,001</i>
Age:45-59	-0,849 *** <i>0,002</i>	-0,427 *** <i>0,002</i>	-0,642 *** <i>0,002</i>
Age: 60-64	-1,222 *** <i>0,003</i>	-0,345 *** <i>0,003</i>	-0,777 *** <i>0,002</i>
<i>Economic sector (base: Primary sector)</i>			
Manufacture sector	-0,124 *** <i>0,002</i>	-0,434 *** <i>0,003</i>	-0,082 *** <i>0,002</i>
Services sector	-0,153 *** <i>0,002</i>	-0,737 *** <i>0,003</i>	-0,163 *** <i>0,002</i>
Wage worker	-1,004 *** <i>0,001</i>	-1,076 *** <i>0,001</i>	-0,976 *** <i>0,001</i>
Married	-0,244 *** <i>0,002</i>	-0,057 *** <i>0,001</i>	-0,166 *** <i>0,001</i>
<i>Position within the household (base: otherwise)</i>			
HH head	-0,078 *** <i>0,002</i>	0,078 *** <i>0,001</i>	-0,111 *** <i>0,001</i>
Spouse	0,375 *** <i>0,002</i>	0,246 *** <i>0,002</i>	0,142 *** <i>0,002</i>
Native	0,133 *** <i>0,002</i>	0,219 *** <i>0,002</i>	0,218 *** <i>0,001</i>
constant	2,214 *** <i>0,003</i>	3,378 *** <i>0,004</i>	1,992 *** <i>0,002</i>
N	20469	29101	29329
Log likelihood	0,327	0,396	0,291
chi2	-3804373,9	-4014216	-5031629,9
PseudoR2	3689181,4	5258170,8	4128244,5

Legend: (i) *p<0,1; ** p<0,05; ***p<0,01. (ii) Standard errors in italics.

Source: Own estimates from ENAHO Panel2007-2011, 2011-2015, 20015-2019. Sample weights used.

CHAPTER 4

ENVIRONMENTAL CONCERN IN URBAN BOLIVIA: INDIVIDUAL DETERMINANTS AND “RESOURCE CURSE EFFECTS”²⁶

4.1 Introduction

Since the 1970s, scholars have examined the factors influencing people’s willingness to care for the natural environment, often addressed as “environmental concern”. Exploring these issues is essential for tackling the many environmental problems afflicting the globe. However, most literature on environmental concern primarily focuses on societies in the Global North. This geographical bias can be partly attributed to a shortage of survey data. As a result, the production of knowledge in this field may be skewed towards the socioeconomic and cultural characteristics of the Global North and ignore the determinants of environmental concern under more “typical” individual and contextual conditions of the Global South, such as economic constraints. This bias has prompted passionate debates about postmaterialist theory (Inglehardt, 1995), and the call for more research on the determinants of environmental concern in countries of the Global South has been recurrent in the literature (i.a., Dunlap & York, 2012).

This article responds to this call by examining environmental concern in Bolivia. Based on its geopolitical location, low income levels, and other development challenges, Bolivia represents a typical country of the Global South. In addition, the country struggles with numerous environmental problems, particularly contamination through extractive industries and the consequences of climate change. The analysis draws on data from a unique survey specifically designed to collect public opinions on the environment, the “Ecobarómetro – *Encuesta de Cultura Ambiental 2022*” (Environmental Culture Survey 2022), conducted in the three largest Bolivian cities La Paz, Santa Cruz, and Cochabamba (Ciudadanía, 2022).

The article pursues two objectives, combining classical and innovative approaches. Firstly, we examine whether the determinants of environmental concern identified for Global North countries also apply to Bolivia. Secondly, we investigate a contextual factor particularly prominent for many Global South countries, including Bolivia, adding an innovative “Southern perspective” to the debate: the potential impact of the dominant extractive development model

²⁶ Co-author of this paper is Dr. Bettina Schorr.

on environmental concern. We aim to understand whether the context of an extractive development model that provides economic gains but relies on environmentally damaging resource extraction significantly influences aspects of environmental concern.

The study yields three key findings. First, the levels of environmental concern in Bolivia are high, even compared to those of Global North countries, and a general “attitude-behavior” gap due to economic constraints cannot be stated, adding to the criticism of postmaterialism. Second, the Bolivian case generally corresponds to established empirical evidence from the Global North regarding individual determinants of environmental concern, although with some nuances. Third, the study finds a contradiction between pro-environmental attitudes and the willingness to accept the environmental costs of extractivism, mediated by the support for the extractive development model. This finding aligns with the argument stated in the “resource curse” literature that people tend to accept the costs of the model as long as it promises economic returns. Thus, we establish a “resource curse effect” on environmental concern in Bolivia.

The following section starts with clarifications regarding the concept of environmental concern and then reviews the empirical literature. Our goal here is to pinpoint indicators of environmental concern that have proven empirically reliable. Subsequently, we characterize the extractive development model that prevails in Bolivia, many other South American nations, and beyond. We provide an overview of the social, economic, and environmental consequences associated with this model and discuss how the presence of this model may impact individual environmental concern. The next section presents the data, the operationalization of the concept of environmental concern, the explanatory variables, and the hypotheses that have emerged from our previous discussions. Afterwards, we detail the empirical strategy and present the results. The last section summarizes and discusses the study’s major findings.

4.2 Comparative Global Perspectives on Environmental Concern

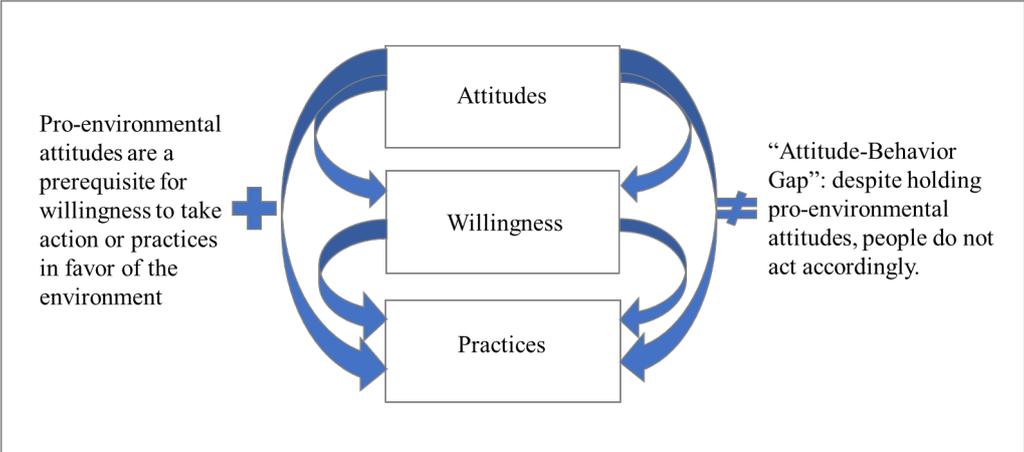
4.2.1 The Concept of “Environmental Concern”

Since the 1970s, scholars have examined the factors underlying individual pro-environmental attitudes to understand environmental protection conditions better. This literature uses different concepts to capture the dependent variable, including environmental concern, attitudes, preferences, willingness to pay for environmental protection, and environmental behavior. Environmental concern is prominent in this literature (Dunlap & Jones, 2002), although there is no universally agreed-upon definition. Generally, environmental concern is understood as a composite of individual awareness of environmental problems and willingness to act to protect nature (Franzen & Meyer, 2010; Dunlap & Jones, 2002).

Studies also differ in operationalizations and measurements evaluating values, attitudes and perceptions, behavior, and practices (Dunlap & Jones, 2002), which are related but different (Cruz & Manata, 2020). Values are general categories and frame the range of possible attitudes, which are organized hierarchically from broad and abstract to specific (Rokeach, 1968; Hunter et al., 1976). Environmental attitudes, thus, “can be defined both as the intensity of positive or negative affect about a particular environmental topic and as a hierarchical attitude system that connects and organizes more specific attitudes about a range of environmental topics” (Cruz & Manata, 2020, p. 2). Values and attitudes, in turn, predict behavioral intentions or willingness to act, and these predict behavior (Fishbein & Ajzen, 1975).

These components are not automatically related. Individuals may be aware and yet be unwilling to act for a variety of reasons, such as suspicion of being taken advantage of by others or lack of trust in government institutions (Liebe et al., 2011). Also, exogenous constraints may produce an “attitude–behavior gap” (Franzen & Vogl, 2013; Botetzagias & Malesios, 2012); individuals may be aware of ecological issues and willing to address them but face challenges in translating this willingness into concrete actions, for instance, due to economic constraints. This latter may be particularly important for Global South countries afflicted by different constraints. Measuring the different dimensions of environmental concern draws a more complete picture of individual environmentalism. Figure 4.1 shows the possible relationship between the different dimensions of environmental concern.

Figure 4.1: Dimensions of Environmental Concern



Source: Authors’ elaboration, based on Cruz & Manata (2002).

Based on these conceptual reflections, in this study, we examine environmental concern as expressed in attitudes of awareness, willingness to accept environmental costs, and environmentally friendly behavior. In the following, we revise the empirical literature for robust predictors of environmental concern.

4.2.2 Socio-demographic Determinants of Environmental Concern

Research on environmental concern has concentrated on European and North American countries (Dunlap & York, 2012). Although increasing, investigations regarding Global South countries remain scarce. This geographical disparity can partly be attributed to a lack of available data from Global South nations, particularly survey data (Seligson & Zechtmeister (2012) for Latin America; Dunlap & York (2012) for the broader Global South).

Nevertheless, Global South countries have figured prominently in the sometimes-passionate debate on postmaterialist theory (Inglehart, 1981; Inglehart & Abramson, 1999). Derived from the particular historical experience of environmentalism in Europe, postmaterialism posits that high levels of environmental concern stem from a broader generational shift in cultural values toward prioritizing “quality of life” issues, including “environmental quality”. This shift has been facilitated by industrialization and economic growth, which have freed individuals from the immediate concerns of meeting their basic material needs. Postmaterialism has been amply criticized, especially for the implications of the theory for poor countries where people have to care for their basic needs. Critics have emphasized the existence of an “environmentalism of the poor” (Martínez-Alier, 1995) in the Global South and rejected “theories of environmental

privilege” (Steinberg, 2001, p. 72; see also Steinberg & VanDeveer, 2012; Dunlap & York, 2008, 2012, 2016; Knight & Messer, 2012).

Empirical studies have identified several robust predictors of environmental concern that apply across countries (mainly from the Global North) and time. These include socio-demographic characteristics, political-ideological factors, and ecological values (Van Liere & Dunlap, 1980; Diekmann & Franzen, 2019; Liu et al., 2014).

Consistent with the basic assumptions of postmaterialism, wealth tends to increase individual environmental concern. Empirical evidence for selected Latin American countries is mixed and depends on specific issues: while it is not a significant determinant for prioritizing environmental protection over economic growth (Evans, 2015), it is a positive predictor for climate change concern (Evans & Zechtmeister, 2018).

Age is generally inversely related to environmental concern, with younger individuals showing greater care for the environment. Explanations stress young peoples’ larger life span as motivating them to care for the environment, differences in socialization and economic conditions between age cohorts (Torgler et al., 2008), and the increased salience of environmental issues in contemporary times compared to previous generations (Weaver, 2002).

Education stands out as an exceptionally robust predictor of environmental concern (i.a. Weaver, 2002; Liu et al., 2014). Education gives individuals more knowledge about ecological problems and enhances their analytical capabilities for assessing causal relationships related to environmental issues.

Gender is also a reliable predictor of environmental concern, with women generally displaying more significant concern for the environment than men (Van Liere & Dunlap, 1980; Jones & Dunlap, 1992; Liu et al., 2014). This difference is attributed to distinct socialization processes, value orientations, and a gender-based division of labor, which result in women being more likely to associate themselves with the role of “caregiver” that expands beyond the walls of their homes to the ecological realm (Dietz et al., 2007; Hunter et al., 2004). In addition, parents, motivated by the well-being of their children, tend to be more environmentally conscious (Dupont, 2004), and being married may enhance the role of “caregiver,” potentially increasing concern for the environment (Weaver, 2002).

Political-ideological factors influence environmental attitudes. Leftist ideological orientations correlate positively with environmental concern (Weaver, 2002). Explanations stress the tendency of rightist ideology to prioritize economic growth over environmental issues. However, Evans & Zechtmeister (2018) find in the case of Latin America that political ideology is a less powerful predictor of climate change concern and disaster risk perception

Finally, ecocentric beliefs and values, as measured in the “New Ecological Paradigm” (NEP) Scale (Dunlap & Van Liere, 2008; Dunlap, 2008), are strong predictors of environmental concern. These values reflect an understanding of humans as part of one ecosystem, other species, and nature. In contrast to individuals with anthropocentric values picturing humans as separate from nature, individuals with ecocentric beliefs generally have a higher environmental concern (Dunlap et al., 2000; Lundmark, 2007).

In the next section, we explore the presence and support for extractive development as a characteristic of many Global South nations potentially affecting environmental concern.

4.2.3 Exploring Global South Context: Extractive Development and Environmental Concern

One of the key economic distinctions between Global North and Global South countries is that the latter are often suppliers of raw materials to the global market, and their economies heavily depend on these commodities. In Latin America, countries have historically leaned on the natural resource sector and continue to adopt extractive development models²⁷, understood as economic frameworks centered around extracting and selling raw materials to generate economic growth (Dietz & Engels, 2017). During the early 2000s, a global surge in commodity demand led to substantial growth in the extractive sectors of nearly all Latin American countries (Erten & Ocampo, 2013). This growth resulted in a “reprimarization” of their export portfolios (Ocampo, 2019). Profits from the extractive sectors saw a substantial increase, and a portion of these gains was directed toward poverty alleviation and reducing inequality (Fritz & Lavinias, 2016).

Bolivia exemplifies these trends. The country’s economy heavily relies on natural resources, primarily natural gas and minerals. In 2021, 91.8% of Bolivia’s exports comprised primary products, contributing 27.8% to the country’s GDP (CEPAL, 2003). Bolivia has dramatically

²⁷ We use the terms extractivism, extractive development and extractive development models synonymously.

benefited from the rising global prices of these commodities during the latest boom period, resulting in significant progress in reducing poverty and inequality (Lustig, 2009).

The extractive development model enjoys widespread popular support in Latin American countries and is generally viewed as a solution to the many economic challenges (for Bolivia see Farthing & Kohl (2012)). However, countries favoring extractive development often face significant problems addressed in the “resource curse” literature (i.a. Auty, 1994, 2001). These challenges encompass macroeconomic imbalances such as inflation and fiscal deficits, the “Dutch disease”, and political distortions, including authoritarianism and corruption (Damonte & Schorr, 2021). Research has demonstrated that people may tolerate these “darker aspects” of the development model, such as authoritarianism (Jones & Weinthal, 2009) or corruption (Moreno, 2021), as long as the income from resource extraction remains steady or the promise of future economic growth can be maintained.

From an environmental perspective, extractive development is highly detrimental because it causes pollution, loss of biodiversity, and the degradation of landscapes, amongst others (Bebbington, 2012). In this paper, we ask if individuals may also be willing to ignore these environmental costs associated with extractivism as long as they perceive it as economically beneficial. Research on this topic has focused on local communities directly affected by extractive industries, which tend to question extractivism (Ballón & Mendoza, (2018) for Peru; Eisenstadt & West (2017) for Ecuador). Consequently, in the last two decades, local conflicts opposing extractive industries have multiplied across the region (Bebbington, 2012; Haslam et al., 2018; Paredes, 2016; Delamaza et al. 2017) and within Bolivia (Barié & Zuazo, 2022; Mulhern et al., 2022; Schilling-Vacaflor, 2016; Radhuber et al., 2021). In contrast, urban areas in Latin America have primarily stayed out of the conflicts related to extractive industries, largely because urban dwellers are usually unaffected by these industries, primarily located in rural areas, often quite distant from the major cities (Odell & Bebbington, 2023). In this study, we ask if the support for the extractive development model in urban areas is associated with the willingness to accept the environmental costs of the model, hence affecting environmental concern.

4.3 Data, Variables, and Hypotheses

We first test a set of hypotheses related to the predictors of environmental concern established in the empirical literature: wealth, age, education, gender, political ideology, and ecocentric

beliefs (NEP). Based on the previous discussion, the second hypothesis assumes that in urban areas, support for extractivism increases the willingness to accept the models' environmental costs.

We test these hypotheses using the data from the “Ecobarómetro – *Encuesta de Cultura Ambiental 2022*”. The sample provides statistically representative and comparative information on the metropolitan areas of Bolivia's three largest departments: La Paz, Cochabamba, and Santa Cruz. According to the Bolivian National Institute of Statistics, departmental contributions to national GDP in 2021 were 24,5% for La Paz, 15,4% for Cochabamba, and 34,2% for Santa Cruz. These departments differ socioeconomically: La Paz and Santa Cruz (with GDP p.c. of US\$3,727 and US\$3,667, respectively) are wealthier than Cochabamba (GDP p.c. US\$2,804) and exceed the national average (the national GDP p.c. is US\$3,345) (INEI Bolivia, 2023).

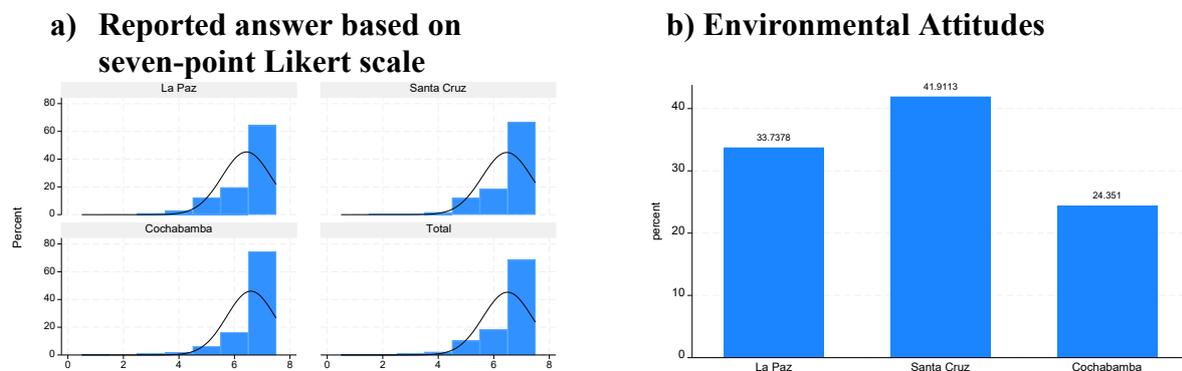
The survey includes 1,502 respondents over 18 years old, randomly selected as household representatives. It compiles questions on the following topics: environmental information, perception of the environmental situation, the environment in metropolitan areas, pro-environmental behavior, climate change, and environmental policies. It applies multiple-choice questions or requires answers based on a seven-point Likert scale ranging from *totally disagree/nothing/not true at all* to *very much in agreement/very much/totally true*.

For our sample, missing values and responses categorized as *don't know* were excluded, resulting in a sample size of 1,124 respondents for our estimations. We apply weights provided by Ecobarómetro 2022 to align the sample with the distribution of the metropolitan area. To assess potential biases in our sample, we contrasted the distribution of metropolitan individuals sourced from Ecobarómetro 2022 with those of urban individuals from the Bolivian National Household Survey 2021, based on socio-economic characteristics. Details regarding the construction of socio-demographic variables and comparing the two surveys can be found in Appendix C (Tables C.2 and C.3). We found that individuals interviewed for the Ecobarómetro tend to belong to lower-income households than those estimated in the national survey for the urban area. Consequently, the distribution of quintiles 1, 2, 3, and 4 in our analysis corresponds to quintiles 1 and 2 in the household survey. We consider this bias when interpreting our results. Regarding other demographic variables (gender, age, and education level), the sample is distributed similarly to the national household survey.

We define environmental concern as “the degree to which people are aware of problems regarding the environment and support efforts to solve them and/or indicate a willingness to contribute personally to their solution” (Dunlap & Jones, 2002, p. 485). We operationalize the concept as comprising three dimensions: (a) *environmental attitudes*, (b) *environmental practices*, and (c) *willingness to accept environmental costs*.

Pro-environmental attitudes are measured by asking, “How important is it to you to protect the environment?” Responses to this question are distributed right-skewed in the three metropolitan areas (Figure 4.2a). A notable 96.54% of respondents indicated that protecting the environment is essential to them, with values ranging from 5 to 7 on the Likert scale. A dummy variable was created since less than 4% of individuals responded below 5. This variable takes 1 for individuals expressing high concern about protecting the environment (value 7) and 0 for the rest (values 1 to 6). Figure 4.2b illustrates variations between metropolitan areas, with Santa Cruz, the economic center of the country, showing the highest levels of pro-environmental attitudes (41.9%), followed by La Paz (33.7%), and Cochabamba (24.4%).

Figure 4.2: Environmental Attitudes

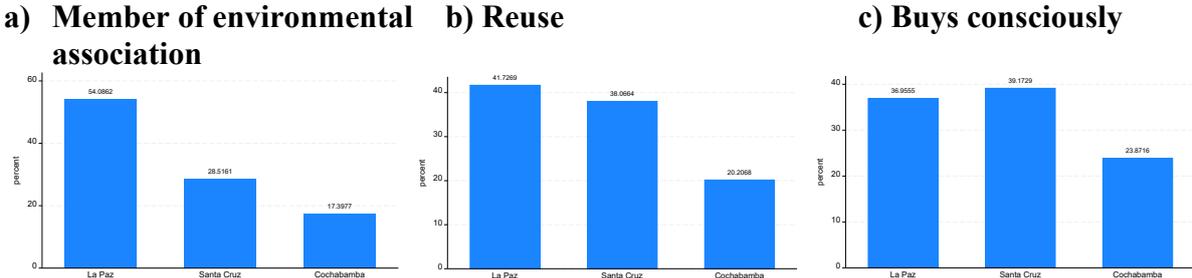


Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

We operationalize environmental practices in three items: *reuse*, *buys consciously*, and *member of an environmental association*. *Reuse* is a dummy variable corresponding to the question measured on a seven-point Likert scale: “Do you reuse products, and the main reason you reuse products is to take care of the environment?”. *Buys consciously* is a dummy variable for the question: “Do you reduce the number of things you buy because of their negative effect on the environment?”. Finally, the dummy variable *Member of an environmental organization* corresponds to the question: “Are you a member of an environmental organization?”. Following standard procedures, we measured the level of association among these variables. The resulting

Cronbach’s alpha score (0.1792) suggests that the three variables are not interrelated; thus, they can be analyzed separately. Figure 4.3 illustrates the distribution of variables across metropolitan areas. Individuals affiliated with environmental associations in La Paz are twice as high (54.1%) compared to Santa Cruz (28.5%) and Cochabamba (17.4%). Conversely, product reuse and conscious purchasing rates exhibit a comparable distribution between La Paz and Santa Cruz (ranging from 36% to 41%). In Cochabamba, it is significantly lower (ranging from 20% to 23%).

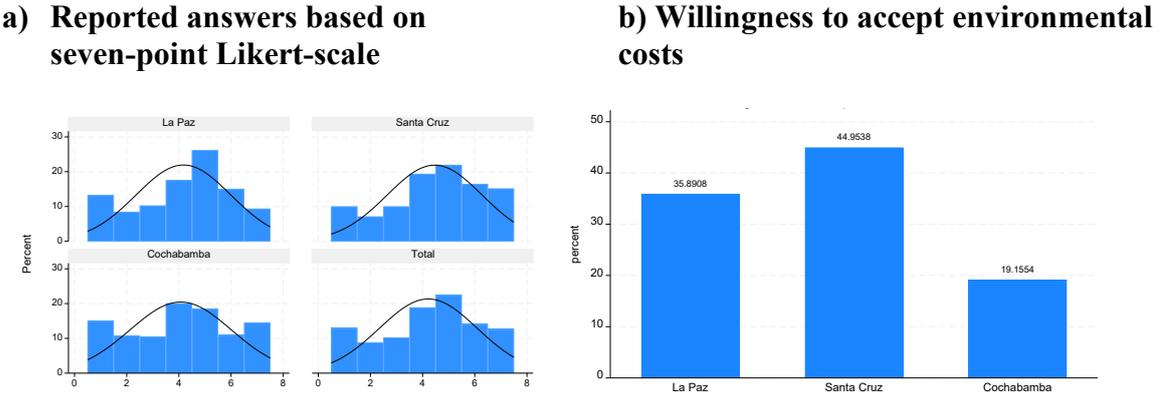
Figure 4.3: Environmental Practices



Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

The willingness to accept environmental costs in exchange for economic gains (generated by extractive development) is gauged through the variable *willingness to accept environmental costs* using responses to the seven-point Likert scale item: “If the country’s economy is in a bad state, we should focus on generating income despite the environmental damages.” Figure 4.4a shows a normal distribution of this variable. A dummy variable was created, taking 1 if respondents agree with the mentioned statement (values ranging from 5 to 7) and 0 if respondents disagree or express indifference (1 to 4). Figure 4.4b illustrates the distribution pattern of the dummy variable, highlighting variations among the three metropolitan areas. Notably, Santa Cruz exhibits higher levels of willingness to accept environmental costs (44.9%), followed by La Paz (35.9%) and Cochabamba (19.2%).

Figure 4.4: Willingness to accept environmental costs



Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

Afterward, we explored the impact of the well-established predictors of environmental concern commonly recognized in the empirical literature (household income, education, gender, age, political preference, and ecocentric values), and the new variable we want to test regarding people’s support for the extractive model, on the three dimensions of interest. Each variable and its expected effect on environmental concern are explained below. Descriptive statistics for each variable, categorized by metropolitan areas and for the entire sample, are summarized in Table 4.1.

We establish *household income* as a proxy for wealth. The Ecobarómetro survey classifies the reported household incomes in seven pre-established income brackets. To facilitate a comparison between the level and distribution of household income from the Ecobarómetro survey and national-level data from the Bolivian Household Survey 2021, we condensed the responses to make them compatible with our analysis. We grouped them into quintiles based on the cumulative percentages of the distribution for the total sample (see Appendix C. Tables C.1 and C.2 and Figure C.1). Because we worked with pre-established categories, the quintile distribution is not exact, ranging from 10,67 in quintile 3 to 29,65 in quintile 1 (see Table 4.1).

Table 4.1 outlines the differences between the cities: in the metropolitan area of La Paz, the distribution tends to be more homogeneous, while in Santa Cruz, household incomes tend to be higher, and in Cochabamba, lower. Existing scholarship suggests that individuals from higher-income households express higher levels of environmental concern.

The variable *educational level* comprises three categories: completion of up to primary education (zero to six years), completion of secondary education (seven to twelve years), and completion of higher education (thirteen or more years). A similar distribution is observed across the three metropolitan areas, with approximately 8.6% of individuals having completed only primary school or less, 51.2% having completed secondary education, and 40.2% having completed higher education. We expect individuals with higher education levels to express higher levels of environmental concern.

The variable *gender* is a dummy comprising the options female and male with an equal and homogeneous distribution between the two categories across cities. For the entire sample, 51.3% are male, and 48.7% are female. According to the literature, we expect that females will express higher levels of environmental concern than males.

The variable for *age* consists of five categories: 18-29, 30-39, 40-49, 50-59, and older than 60. The distribution of individuals by age is similar in all three cities, with 40.0% belonging to the 18-29 age group, 21.8% to 30-39, 14.3% to 40-49, 14.1% to 50-59, and 9.7% over 60. As empirical literature suggests, we expect that younger individuals express higher levels of environmental concern.

Political ideology is assessed by asking survey respondents “Talking about your political point of view: where would you find yourself on this scale?” offering a scale ranging from 1 (*left-wing*) to 10 (*right-wing*). The variable is condensed into three categories: *left-wing* (for values 1 to 4), *center* (5 to 6), and *right-wing* (7 to 10). On average, 50% of individuals identify with the political center (Table 4.1). The remaining respondents in La Paz and Cochabamba tend to the political left. In Santa Cruz, they identify with the political right. Based on existing literature, we expect individuals with leftist political preferences to express higher levels of environmental concern.

The survey provides information on four questions extracted from the NEP scale: “Humans are seriously abusing the environment” (NEP 5), “Despite our abilities, humans are still subject to the laws of nature” (NEP 9), “Humans will eventually learn enough about how nature works to be able to control it” (NEP 14) and “If things continue on their present course, we will soon experience a major ecological catastrophe” (NEP 15). Due to the low reliability test result (Cronbach’s alpha = 0.4776), the questions are treated separately. The distributions of the scores for all NEP questions are shown in Appendix C (Figures C.2 and Table C.4). The distribution

of NEP 5, 9, and 15 is similar among the three cities, with average scores of 6.2, 5.4, and 6.1, respectively; the distribution of NEP 14 tends slightly to the right in Santa Cruz, with an average score of 5 for this city and 4.5 for the other two. This difference indicates that individuals in Santa Cruz tend to have more androcentric values than the rest. We created dummy variables for each NEP item where the dummies take the value 1 for individuals expressing high agreement with the statement (value 7) and 0 for the rest (1 to 6). On average, more than 50% of individuals agree strongly with NEP 5 and NEP 15, and only 28% with NEP 9 (Table 4.1). Regarding androcentric values, only 9% of individuals in La Paz highly agree with them. In Cochabamba and Santa Cruz, the share doubles. Individuals scoring higher on the ecocentric values measured by the NEP are expected to show higher levels of environmental concern.

Support for extractive development is assessed through agreement with the statement, “Natural resources can be further exploited to generate greater development in the country”. This item is converted into the dummy variable *support for extractivism*, taking the value 1 for individuals agreeing with the statement (values 5 to 7) and 0 otherwise (values 1 to 4). On average, 36.78% of urban individuals support the extractive development model. Building on the theoretical considerations developed earlier, we anticipate that individuals supporting the extractive development model exhibit a higher willingness to accept environmental costs and, hence, lower levels of environmental concern.

We controlled for the following variables: marital status, having children, and occupational status. Marital status (single, married/partnered, and separated/divorced/widowed) and parental effects may influence the effects of gender. Occupational status (employed/unemployed/out of the labor force) may represent variations in social status influencing environmental behavior (Van Liere & Dunlap, 1980; Chen et al., 2011).

Table 4.1. Distribution of independent variables by metropolitan area (percentage)

Dependent variables	La Paz	Santa Cruz	Cochabamba	Total
<i>Gender</i>				
Female	49,40	48,06	48,67	48,68
Male	50,60	51,94	51,33	51,32
<i>Age group</i>				
younger than 30	41,26	38,39	41,17	40,03
30-39	19,33	25,16	19,29	21,78
40-49	13,50	13,55	17,10	14,31
50-59	16,56	13,87	10,69	14,14
older than 60	9,34	9,03	11,76	9,74
<i>Education</i>				
Up to primary complete	6,93	10,65	7,20	8,55
some secondary or complete	49,22	55,81	45,69	51,22
superior education	43,85	33,55	47,11	40,23
<i>Household income</i>				
Q1: 1-1,000 Bs	25,07	13,87	29,65	21,36
Q2: 1,001 - 2,000 Bs	21,07	24,84	22,18	23,31
Q3: 2,001 - 2,800 Bs	22,07	13,87	10,67	14,20
Q4: 2,801 - 4,000 Bs	23,07	26,77	16,34	20,41
Q5: more than 4,000 Bs	24,07	20,65	21,16	20,72
<i>Political preference</i>				
Centre	54,31	48,39	52,11	51,33
Left-wing	26,81	20,65	27,29	24,32
Rigt-wing	18,88	30,97	20,60	24,35
<i>NEP 5(ecocentric values)</i>	58,08	54,52	61,55	57,34
<i>NEP 9(ecocentric values)</i>	24,52	29,68	28,58	27,64
<i>NEP 14(androcentric values)</i>	9,36	19,03	17,62	15,24
<i>NEP 15(ecocentric values)</i>	53,58	51,29	62,89	54,66
<i>Support for extractivism</i>	35,80	38,39	35,29	36,78
<i>Marital status</i>				
Single	51,05	39,03	47,53	45,22
Married	41,27	53,87	44,45	47,27
Separated/divorced/widowed	7,67	7,10	8,01	7,51
<i>Parent</i>	54,59	71,61	63,12	63,63
<i>Occupational status</i>				
Unemployed	13,52	11,94	9,05	11,87
Employed	57,26	57,74	58,61	57,76
Out of labor force	29,23	30,32	32,34	30,37
N (obs)	440	310	374	1124

Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

4.4 Empirical Strategy

We explore environmental concern in Bolivia using data from the Ecobarómetro survey with two objectives: first, to test if the determinants of environmental concern found in the established literature also apply to the case of Bolivia, and second, to explore if support for the dominant development model affects individual environmental concern. To accomplish this, we initially performed a descriptive statistical analysis to identify primary trends. Following standard scholarly practices (i.a. Franzen & Vogl, 2013; Liu & Mu, 2016; Evans & Zechmeister, 2018), we employed multivariate logit regressions to establish statistical correlations. We conducted a total of five regression analyses.

The statistical model can be expressed as follows: EC_i represents the individual score for each variable linked to each dimension of environmental concern (attitudes, practices, and willingness (to accept environmental costs)), and it can assume one of two binary answers:

$$EC_i = \begin{cases} 1 & \text{if individual } i \text{ scores positive in the corresponding dimension} \\ 0 & \text{otherwise} \end{cases}$$

For the “attitudes” dimension, the dependent variable *attitude*, takes the value 1 if the individual exhibits a high level of concern about protecting the environment. In the “practices” dimension, the variable *member of environmental association* assumes the value 1 if the individual claims membership in an environmental association. The variable *reuse* takes the value 1 if the individual reuses products, and the variable *buys consciously* takes the value 1 if the individual consciously buys products to protect the environment. Finally, for the “Willingness to accept environmental costs” dimension, the dependent variable *Willingness to accept environmental costs*, takes the value 1 if individuals *strongly agree* to accept environmental costs for the sake of the economy, and 0 otherwise. We expect the regressors signs to be opposite when compared to the other two dimensions of environmental concern.

The probability that individual i scores 1 for each dimension of environmental concern is given the observed sociodemographic characteristics and the support for the extractive model (X_i):

$$E(EC_i|X_i) = Pr(EC_i = 1)$$

The logit model can then be expressed as:

$$E(EC_i|X_i) = F (\beta_1 Female_i + \beta_2 Age\ group_i + \beta_2 Educational\ level_i + \beta_3 Household\ income_i + \beta_4 Political\ preference_i + \beta_5 NEP_i + \beta_6 Support\ for\ extractivism_i + \beta_7 Area_i + \mu_i) \quad (1)$$

Equation (1) is our Model 1, where F(.) represents the cumulative logit distribution function, and each variable related to the environmental concern dimensions (attitudes, practices, and willingness) is regressed on the potential determinants. The regressor's gender, age, education, household income, political preferences, and NEP correspond to the determinants proposed in established literature. Support for extractive development assesses the hypothesis derived from the literature review on the effects of extractivism. The previous descriptive analysis shows differences in the levels of environmental concern between metropolitan areas. Research has shown that the possible particularities of the different cities, such as economic and social context and local policies can affect the local environmental quality and therefore the perception of individuals on environmental issues (i.a. Liu & Mu, 2016). To avoid an omitted variable bias, we control for fixed effects by taking the variable *area_i* as city dummies.

To check for robustness, we estimate Model 2 (2) which expands Model 1 by including the control variables (*Z_i*) referring to other socio-economic characteristics (marital status, parent, occupational status):

$$E(EC_i|X_i) = F (\beta_1 Female_i + \beta_2 Age\ group_i + \beta_2 Educational\ level_i + \beta_3 Household\ income_i + \beta_4 Political\ preference_i + \beta_5 NEP_i + \beta_6 Support\ for\ extractivism_i + \beta_7 Area_i + Z_i' \beta_8 + \mu_i) \quad (2)$$

The parameters (β) estimated indicate the change of the predicted values when the corresponding independent variable increases by one unit. In the logistic model, the predicted values are the logarithmic odds of a positive outcome, which are not straightforward to interpret. Therefore, we estimate the average marginal effects from equations (1) and (2). The marginal effects indicate the change in the probability of individuals to: express high pro-environmental concern ($Y = Attitudes$), take pro-environmental action ($Y = Member\ of\ environmental\ association, Reuse, Buys\ consciously$), express high willingness to accept environmental costs ($Y = Willingness\ to\ accept\ environmental\ costs$) when the independent variable increases by one unit, *ceteris paribus*. In the following section, we first provide descriptive statistics and then present the results of the regressions.

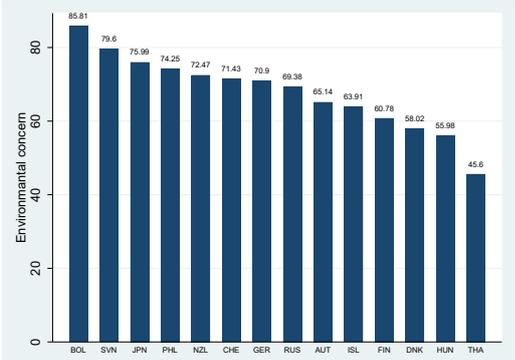
4.5 Results

4.5.1 Stylized Facts: Environmental Concern in Bolivia in a Comparative Perspective

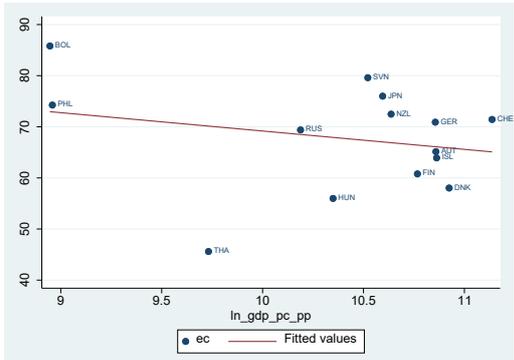
Environmental concern, as measured in a simple declaratory answer is remarkably high in Bolivia, even compared to OECD countries (measured in the ISSP)²⁸. As presented in Figure 4.5a, for Bolivia 86% of individuals express the highest level of concern, while for OECD countries, the results range between 75.9% and 45.6%. Figure 4.5b shows that the correlation between environmental concern and GDP per capita in this small *N* sample is slightly negative.

Figure 4.5: Environmental concern in comparative perspective

a) Share of population with highest Environmental Concern



b) Environmental Concern and GDP p.c.



Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022), ISSP Research Group (2022), and World Development Indicators (2020).

Notes: Number of respondents for each country by income country groups: (i) lower-income-country: Bolivia: 1502 and Philippines: 1500; (ii) Upper-middle-income-country: Russia: 1583 and Thailand: 1498; (iii) high-income-country: Austria: 1261; Switzerland: 4280; Denmark: 1198; Finland: 1137; Germany: 1702; Hungary: 1001; Iceland: 1150; Japan: 1491; New Zealand: 993; Slovenia: 1102. Sample weights were used in calculations.

Table 4.2 presents the percentages of individuals responding positively in each of the three dimensions of our study (attitudes, practices, and willingness to accept environmental costs) and the values for the potential determinants. Notably, for the entire sample, a majority of respondents (averaging 67.1%) exhibit high levels in environmental attitudes. The percentage of individuals engaging in environmental practices varies across different types: conscious purchasing is the most common practice (65.9%), followed by reuse (28.5%), with only a small

²⁸ The question used in the ISSP 2020 survey is slightly different: “Generally speaking, how concerned are you about environmental issues?”. Since the items have different scales and for descriptive purposes only, we take the percentage of individuals who answered at the two highest levels for both items. Bolivia doubles the share of those scoring the highest level (score 5 *very concerned*) (33% ISSP and 67,6% for Bolivia).

percentage (13.8%) being members of environmental organizations. 50% of the sample indicated a high willingness to accept environmental costs for the sake of the economy.

The results also highlight gender differences in the pro-environmental attitudes dimension. Furthermore, shares of environmental concern are lower for older individuals compared to younger ones, particularly in the case of environmental attitudes. Younger individuals also score higher in *buys consciously*.

Those with advanced education levels tend to show a greater propensity for expressing environmental concern across various dimensions. Wealth demonstrates a discernible trend only in the dimension of “willingness to accept environmental costs”. Political left-wing preferences, as anticipated, influence only pro-environmental attitudes. The NEP variables align with expectations for “environmental attitudes” and “willingness to accept environmental costs”. As predicted, people with androcentric values and people supporting extractivism show willingness to accept the environmental costs of the extractivist model. Contrary to expectations, high shares of these two groups also express pro-environmental attitudes. Variations among metropolitan areas may be attributed to other regional or local factors influencing environmental concern, which fall beyond the scope of this analysis.

In Appendix C, Table C.5 shows the estimated average marginal effects of the logit regressions. For each dimension we present the results of Model 1, which includes the explanatory variables of interest, and the results of Model 2, which also includes the effects of the control variables (the logit estimation results can be found in Appendix C, Table C.6; the graphics displaying marginal effects can be found in Appendix C, Figures C.3 to C.7).

Table 4.2: Descriptive statics on dimensions of environmental concern (percentage)

Potential determinants		Dimension of Environmental Concen				
		Enviromental Attitudes	Environmental Practices			Willigness to accept environmental costs
		Highly concerned	Member of environmental association	Reuse	Buys consciously	
<i>Sex</i>						
	Female	70,2	13,4	30,0	66,1	50,8
	Male	64,1	14,2	27,1	65,7	49,6
<i>Age</i>						
	18- 30	71,9	15,2	25,2	67,7	50,3
	30-39	67,3	11,2	30,8	64,5	44,5
	40-59	70,8	13,1	29,1	63,0	49,5
	50-59	57,2	10,1	30,2	65,9	57,1
	60 and older	55,6	20,6	33,9	65,8	53,0
<i>Educational Level</i>						
	Up tp primary complete	54,1	12,9	27,4	51,9	60,6
	Some secondary or complete	62,7	13,1	26,2	62,4	58,6
	Superior education	75,4	14,9	31,8	73,3	37,2
<i>Household income</i>						
	Q1: 0- 1,100 Bs	63,2	16,5	27,8	60,3	53,8
	Q2: 1,101 - 2,000 Bs	71,7	11,9	31,1	72,3	55,8
	Q3: 2,001 - 2,800 Bs	62,1	19,8	27,2	67,2	59,7
	Q4: 2,801 - 4,000 Bs	64,8	8,4	24,0	59,8	43,9
	Q5: more than 4,001 Bs	71,5	14,5	31,9	69,5	39,7
<i>Political preference</i>						
	Left-wing	72,2	14,2	25,8	61,0	51,2
	Center	65,7	13,6	28,7	70,4	47,9
	Right-wing	64,8	14,0	31,0	61,2	53,9
<i>NEP 5(ecocentric values)</i>						
	Highest score in NEP5	76,0	14,3	28,0	65,4	48,1
	Lower score in NEP5	55,1	13,2	29,2	66,5	52,9
<i>NEP 9(ecocentric values)</i>						
	Highest score in NEP9	83,2	15,3	28,6	65,9	47,8
	Lower score in NEP9	60,9	13,2	28,5	65,9	51,1
<i>NEP 14(androcentric values)</i>						
	Highest score in NEP14	80,8	11,7	27,2	61,5	71,1
	Lower score in NEP14	64,6	14,2	28,8	66,7	46,4
<i>NEP 15(ecocentric values)</i>						
	Highest score in NEP15	75,7	13,7	28,6	66,8	46,7
	Lower score in NEP15	56,6	13,9	28,5	64,7	54,6
<i>Support for extractivism</i>						
	Highest support for extractivism	80,8	15,6	30,0	65,9	56,3
	Lower support for extractivism	59,1	12,8	27,7	65,9	46,6
<i>Area</i>						
	La Paz	62,9	20,8	33,1	67,7	50,1
	Santa Cruz	66,8	9,4	25,8	61,3	53,6
	Cochabamba	74,4	11,0	26,3	71,6	43,8
Total sample		67,1	13,8	28,5	65,9	50,2

Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

4.5.2 Regression Results

4.5.2.1 Dimension 1: Environmental attitudes

The findings for the dimension of “environmental attitudes” support the hypothesis of a gender effect, indicating that being a woman or identifying as female increases the probability of expressing high environmental concern by 5.2 percentage points (p.p.), compared to men or those identifying as male in Model 1. However, Model 2 suggests that the parent effect takes precedence over the gender effect. Having children or being a parent, independently of gender, increases the probability of expressing environmental concern by 7.7 p.p., compared to the reference group.

As expected, older individuals express less environmental concern than younger ones. Although the results are not statistically significant for all age groups, the effect’s magnitude increases with some age groups. Belonging to the 30-39 age group reduces the probability of expressing pro-environmental attitudes by 9.2 p.p., while belonging to the 60+ age group reduces it by 11.2 p.p.

The hypothesis regarding the effect of education is confirmed. Higher levels of education increase the probability of environmental concern. However, only higher education is statistically significant, elevating the probability by 15.3 p.p. compared to those with primary education or less.

The relationship between wealth and environmental concern is unclear, although the signs are positive as expected for all quintiles. The estimated effect is only significant for quintile 2.

The influence of political ideology on environmental concern cannot be confirmed. The results are statistically insignificant. On the other hand, as expected, a positive relationship exists between ecocentric values and environmental concern. High levels of eco-centric values increase the probability of expressing high environmental concern between 6 and 12 p.p. Another noteworthy finding is the positive and substantial effect of the variable *support for extractivism*. Expressing high support for extractivism increases the probability of having pro-environmental attitudes by 15.1 p.p. There are some notable differences among metropolitan areas: urban residents in Cochabamba expressing pro-environmental attitudes outnumber those in La Paz by 8.7 p.p.

4.5.2.2 Dimension 2: Environmental practices

The “environmental practices” effects depend on the selected variables. For the variable *member of environmental association*, significant negative effects of similar magnitude are observed for age (specifically, the 50-59 age group), wealth (quintile 4), and socio-economic status (being employed reduces the probability of being a member of an environmental association compared to being unemployed). These results imply that time constraints of those employed hamper the likelihood of participating in environmental activism. Moreover, notable variations between cities are observed, with residing in Santa Cruz and Cochabamba decreasing the probability of being a member of an environmental association by 10.5 and 9.5 percentage points, respectively, compared to La Paz.

For the dependent variable *reuse*, contrary to expectations, the relationship between age and pro-environmental practices inverts and increases with age. However, in Model 1, it is only significant for the 60+ age group, increasing the probability of reusing by 10.8 p.p. compared to the youngest age group. City-specific effects are also observed: residing in Santa Cruz or Cochabamba increases the probability of reuse by 8 and 7 p.p., respectively, compared to residing in La Paz.

Regarding the *buys consciously* variable, education and income are significant determinants, while political ideology has no effects. Higher education levels correlate with a higher probability of purchasing consciously: having a high school education increases this probability by 11 p.p., while having higher education increases it by 20 p.p. compared to those with primary education or less. Wealth as a predictor of environmental concern is only significant for quintile 2, which is 12 p.p. more likely to engage in this practice than quintile 1. Contrary to expectations, having left-wing or right-wing political preferences decreases the probability of an eco-conscious purchase by an equal magnitude compared to centrist political orientations.

4.5.2.3 Dimension 3: Willingness to accept environmental costs

Individuals from the two wealthiest quintiles 4 and 5 are less likely to accept environmental costs, although the effect is significant only for quintile 4. Belonging to quintile 4 reduces the probability of accepting environmental costs by 9 p.p. compared to belonging to quintile 1.

As expected, ecocentric values identified by NEP 9 and NEP 15 reduce the probability of accepting environmental costs by 6 and 8 p.p., respectively. Contrarily, agreeing with the

androcentric statement of NEP 14 increases the probability of being willing to accept environmental costs in favor of the economy by 24 p.p. Contrary to expectations, older age has a negative effect. Individuals aged 30-39 are 9 p.p. less likely to accept environmental costs compared to the reference group aged 18-29.

Finally, as hypothesized, expressing high support for extractivism increases the probability of being willing to accept environmental costs in favor of the economy by 9 p.p. However, there are differences among cities: in residents of Cochabamba the probability decreases by 6 p.p. compared to La Paz.

4.6 Summary and Discussion

This article pursued two objectives: Firstly, we examined whether the determinants of environmental concern identified for Global North countries also apply to the South American country of Bolivia. Secondly, adding an innovative “Southern perspective” to the debate, we investigated whether the context of an extractive development model that provides economic profits and sustains livelihoods, but relies on environmentally damaging resource extraction influences aspects of environmental concern. We tested our hypotheses using data from the Ecobarómetro Survey conducted in Bolivia’s three largest metropolitan areas.

In this concluding section, we emphasize and briefly discuss three key findings, and discern some avenues for further research.

Firstly, the level of environmental concern as expressed in pro-environmental attitudes is remarkable high in Bolivia. It even exceeds the levels found in many countries in the Global North. While these results contribute to the already established criticism of postmaterialism, the underlying reasons for these elevated levels are beyond the scope of this study. Future research could explore the causes behind this phenomenon, establishing if they could be linked to a significant “desirability bias” among Bolivian respondents or if it reflects other specific factors, such as cultural influences. For instance, the public discourse in Bolivia, especially the governmental one, suggests the importance of indigenous culture for socio-environmental relations in the country. Recent research has questioned this factor for the urban context (Moreno & Schorr, 2024).

Secondly, the study shows that the well-established predictors of environmental concern derived from examinations of Global North countries are also applicable in Bolivia, albeit with some nuances across the three dimensions: environmental attitudes, environmentally friendly practices, and willingness to accept environmental costs. The findings carry important implications for public policy and environmental education.

Being female significantly influences environmental attitudes, primarily due to the parent effect. Younger age is associated with a higher likelihood of positive attitudes towards environmental protection than older individuals. On a practical note, this latter finding suggests that fostering intergenerational dialogue could play a pivotal role in instilling pro-environmental attitudes among older demographics. Additionally, in alignment with critiques of postmaterialism, household income demonstrates a positive but insignificant impact on environmental attitudes. Moreover, there is limited variation among the five income groups.

The study identifies two exceptionally robust indicators of environmental concern: Education and NEP values. Education is the most critical predictor of environmental concern in Bolivia. Notably higher education (12 years and more) is strongly associated with pro-environmental attitudes. The practical implication of this finding is that improving access to higher education and fostering knowledge transfer and peer interactions contributes to the development and spread of pro-environmental attitudes.

NEP values are also very strongly correlated with pro-environmental attitudes, suggesting the universality of NEP as a concept applicable across diverse socio-economic contexts. Material constraints do not hamper eco-centric beliefs. Ecocentric values and education are tightly connected since education instills values. In this sense, the Bolivian education system would benefit from including environmental value education in primary and secondary education at earlier stages.

Surprisingly, the study reveals minimal significant effects between individual determinants of environmental concern and pro-environmental practices. Higher education is the only factor linked to a propensity for conscious purchases; income does not influence this practice. Regarding membership in environmental organizations, the city of La Paz, the seat of government where political activism is prevalent, exhibits higher levels. Notably, although NEP values are crucial predictors of pro-environmental attitudes in the Bolivian sample, they do not influence the environmental practices studied here.

Thirdly, our findings reveal a noticeable paradox between pro-environmental attitudes and the willingness to accept environmental costs, influenced by people's support for the extractivist development model. In line with the expectations derived from the resource curse literature, backing extractivism correlates with a greater willingness to accept environmental costs. In simpler terms, individuals who endorse extractivism as an economic strategy are more inclined to accept the environmental consequences associated with that model, influencing their overall stance on environmental issues. This finding supports the initial hypothesis that the extractive development model acts as a distinct force influencing environmental concern in extractivist Global South countries, hindering efforts towards enhanced environmental protection. Especially, as long as economic gains are anticipated, there is a significant likelihood that people elect political leaders sustaining the model, despite the associated environmental harm. This creates a self-reinforcing cycle in countries like Bolivia, perpetuating environmental harm and eroding local living conditions. This cycle could be disrupted through the dissemination of information and the facilitation of debates providing critical assessments of environmental issues together with credible economic alternatives people can believe in. As studies on local conflicts over extractive industries have shown, resistance increases when organizers can discern or implement economic alternatives for the affected community (Bebbington et al., 2008). The finding also aligns with research emphasizing the significance of personal affectation in evaluating extractivism. People directly affected by its side effects tend to question the model. Our sample comprises urban respondents who are not directly affected by the environmental consequences of extractivism, making them less likely to oppose the extractive development model. Interestingly, individuals supporting extractivism do not necessarily exhibit lower pro-environmental attitudes. However, as explained, these attitudes operate at a higher-order level and do not necessarily translate into concrete actions or behaviors. Therefore, statements expressing pro-environmental attitudes should be cautiously approached and consistently cross-referenced with actual lower-level willingness to act or not or behaviors.

While the connection between support for extractivism and environmental concern is mentioned in various kinds of literature, our survey-based study is, to the best of our knowledge, the first to empirically demonstrate the effect of extractivism on people's minds. Future research should examine in greater detail this "resource curse effect", which may not only impact Bolivian society, but also other societies in the Global South.

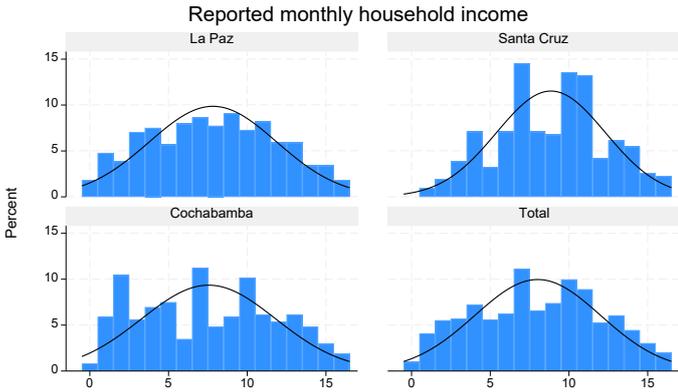
APPENDIX C

Comparison to the Bolivian National Household Survey 2021

The originally reported household incomes in the Ecobarómetro survey are distributed in seven pre-established income brackets. The distribution for the total sample is shown in Table C.1 and the distribution by cities is displayed in Figure C.1.

Table C.1: Reported household income **Figure C.1: Distribution of reported household income by metropolitan areas**

Reported Monthly	Percentage	Cumulative Percentage
No income	0,81	0,81
less than 250 Bs	3,49	4,3
From 250 to 500 Bs	4,53	8,83
From 501 to 800 Bs	5,45	14,28
From 801 to 1,100 Bs	7,08	21,36
From 1,101 to 1,400 Bs	4,94	26,3
From 1,401 to 1,700 Bs	6,57	32,88
From 1,701 to 2,000 Bs	11,79	44,67
From 2,001 to 2,400 Bs	6,8	51,47
From 2,401 to 2,800 Bs	7,4	58,87
From 2,801 to 3,300 Bs	10,66	69,53
From 3,301 to 4,000 Bs	9,75	79,28
From 4,001 to 4,800 Bs	5,07	84,36
From 4,801 to 5,800 Bs	5,93	90,29
From 5,801 to 7,000 Bs	4,6	94,88
From 7,001 to 10,000 Bs	3,03	97,91
More than 10,000 Bs	2,09	100,00
Total	100,00	



Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

Table C.2 shows the distributions of the reported household monthly income in urban areas provided by the national household survey data for Bolivia in 2021 and by the Ecobarómetro Survey 2022.

Table C.2: Comparison of Household income distribution between National Household Survey 2021 and Ecobarómetro 2022

National Household Survey 2021		Ecobarómetro Survey 2022	
Reported Monthly Household income by quintiles (urban)	Percentage	Reported Monthly Household income by quintiles	Percentage
Q1: 25 - 2,850 Bs	20,02	Q1: 0 - 1,100 Bs	21,36
Q2: 2,851 - 4056 Bs	19,98	Q2: 1,101 - 2,000 Bs	23,31
Q3: 4,063 - 5,500 Bs	20,00	Q3: 2,001 - 2,800 Bs	14,2
Q4: 5,502 - 8,041 Bs	20,00	Q4: 2,801 - 4,000 Bs	20,41
Q5: 8,044 - 63,537 Bs	19,99	Q5: More than 4,001 Bs	20,72
Total	100,00	Total	100,00

Source: Own Elaboration based on the datasets: Bolivian Household Survey 2021 (only urban areas) and Ecobarómetro 2022. Sample weights were used in calculations.

Comparing our data with the national household survey data for Bolivia in 2021, we observe that individuals interviewed in the Ecorabarómetro tend to come from lower-income

households than those estimated in the urban area in the national survey. As a result, the distribution of quintiles 1, 2, 3, and 4 in our data for analysis corresponds to quintiles 1 and 2 in the household survey. This indicates a bias in the EcoBarómetro survey which is important to take into account.

Table C.3: Distribution of socio-demographic variables in the National Household Survey 2021 and in EcoBarómetro 2022 (percentage)

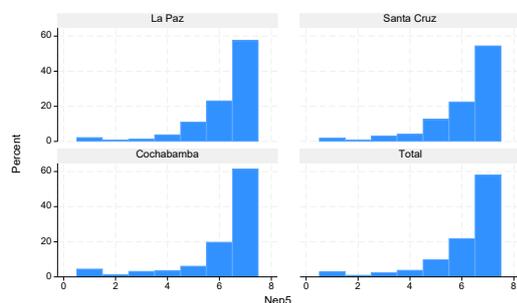
		National Household Survey 2021	EcoBarómetro 2022
Sex	Male	47,82	51,32
	Female	52,18	48,68
Age groups	18-30	32,2	40,03
	30-39	23,26	21,78
	40-49	17,7	14,31
	50-59	12,39	14,14
	older than 60	14,45	9,74
<i>Educational level</i>			
	Up to primary complete	18,84	8,55
	Some secondary or complete	42,07	51,22
	Superior education	39,09	40,23

Source: Own Elaboration based on the datasets: Bolivian Household Survey 2021 (only urban areas) and EcoBarómetro 2022. Sample weights were used in calculations.

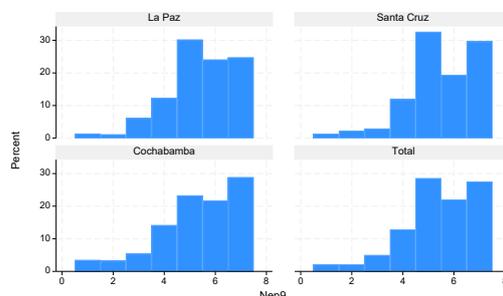
Table C.3 shows the distribution of urban population by gender, age, and educational level according to the National Household Survey 2021 and EcoBarómetro 2022. There are not observable biases.

Figure C.2: Distribution of NEP questions

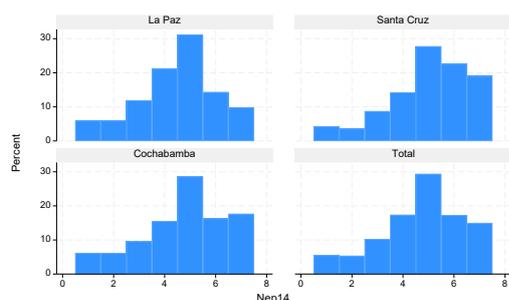
a) NEP5: Humans are seriously abusing the environment



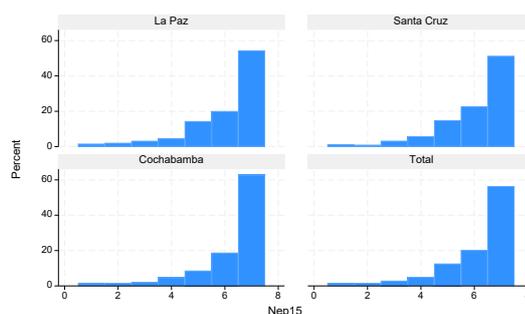
b) NEP9: Despite our special abilities, humans are still subject to the laws of nature



c) NEP14: Humans will eventually learn enough about how nature works to be able to control it



d) NEP15: If things continue on their present course, we will soon experience a major ecological catastrophe



Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Response a seven-point Likert scale ranging from strongly disagree to strongly agree to the mentioned statement.

Table C.4.: Descriptive Statistics: New Environmental Paradigm (EP)

NEP items	La Paz		Santa Cruz		Cochabamba		Total		
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Obs.
NEP5	6,22	1,2499	6,10	1,3277	6,11	1,5643	6,15	1,3566	1124
NEP9	5,38	1,3411	5,49	1,3383	5,31	1,5752	5,41	1,3953	1124
NEP14	4,46	1,5459	5,02	1,5734	4,73	1,6993	4,76	1,6094	1124
NEP15	6,04	1,3763	6,05	1,2901	6,35	1,2749	6,09	1,3202	1124

Source: Own Elaboration based on the dataset of Ecobarómetro Bolivia (2022). Sample weights were used in calculations.

Determinants	Dimension: Environmental Attitudes		Dimension: Environmental Practices						Dimension: Willingness to accept environmental costs	
			Member of environmental association		Reuse		Buys consciously			
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Female	0,0524 **	0,0491	-0,0126	-0,0191	0,0358	0,0233	0,0136	0,0116	-0,0024	-0,0138
Age group (reference: 18-30)										
30-39	-0,0481	-0,0919 **	-0,0342	-0,0347	0,0618	0,0443	-0,0278	-0,0130	-0,0703 **	-0,0993 **
40-49	-0,0057	-0,0553	-0,0291	-0,0306	0,0411	0,0187	-0,0325	-0,0122	-0,0328	-0,0678
50-59	-0,0773 *	-0,1150 ***	-0,0575 **	-0,0611 *	0,0588	0,0335	0,0280	0,0546	0,0252	-0,0047
olther than 60	-0,0847	-0,1124 *	0,0596	0,0417	0,1083 **	0,0738	0,0376	0,0647	0,0091	-0,0220
Education level (reference: Primary education or less)										
Secondary education	0,0462	0,0373	0,0057	0,0031	0,0259	0,0208	0,1224 *	0,1138 *	0,0643	0,0561
Superior education	0,1492 **	0,1527 **	0,0146	0,0120	0,0746	0,0755	0,2140 ***	0,2047 ***	-0,1017	-0,0988
HH income (reference: Q1: 1-1,000 Bs)										
Q2: 1,001 - 2,000 Bs	0,0882 **	0,0789 *	-0,0368	-0,0326	0,0342	0,0352	0,1229 ***	0,1191 ***	0,0315	0,0258
Q3: 2,001 - 2,800 Bs	0,0276	0,0201	0,0349	0,0398	-0,0176	-0,0145	0,0671	0,0631	0,0569	0,0534
Q4: 2,801 - 4,000 Bs	0,0238	0,0103	-0,0746 **	-0,0670 **	-0,0366	-0,0334	-0,0067	-0,0101	-0,0913 **	-0,0996 **
Q5: more than 4,000 Bs	0,0616	0,0509	-0,0210	-0,0102	0,0280	0,0346	0,0589	0,0559	-0,0757	-0,0802
Political preference (reference: Center)										
Left wing	0,0565	0,0547	-0,0008	0,0003	-0,0305	-0,0312	-0,0836 **	-0,0795 **	0,0070	0,0056
Right wing	0,0021	0,0157	0,0154	0,0171	0,0352	0,0427	-0,0685 *	-0,0708 *	0,0224	0,0315
NEP5	0,0903 ***	0,0886 ***	0,0111	0,0111	-0,0225	-0,0204	-0,0225	-0,0238	-0,0250	-0,0243
NEP9	0,1317 ***	0,1260 ***	0,0275	0,0288	0,0040	0,0036	0,0084	0,0077	-0,0639 **	-0,0659 *
NEP14	0,0518	0,0566	-0,0285	-0,0312	-0,0047	-0,0082	-0,0194	-0,0140	0,2415 ***	0,2422 ***
NEP15	0,0539 **	0,0600 **	-0,0134	-0,0133	0,0053	0,0058	0,0027	0,0035	-0,0842 ***	-0,0812 **
Supports extractivism	0,1477 ***	0,1513 ***	0,0311	0,0288	0,0290	0,0282	0,0155	0,0181	0,0908 ***	0,0931 ***
Area (reference: La Paz)										
Santa Cruz	0,0442	0,0309	-0,1036 ***	-0,1052 ***	-0,0729 **	-0,0806 **	-0,0447	-0,0409	0,0074	-0,0026
Cochabamba	0,0943 ***	0,0873 ***	-0,0954 ***	-0,0940 ***	-0,0713 **	-0,0730 **	0,0463	0,0484	-0,0601 **	-0,0655 *
Marital status (reference: single)										
Married/partnered		0,0156		0,0147		0,0145		0,0438		0,0261
Separated/widowed		-0,1168 *		0,0389		0,0144		-0,0419		-0,0486
Parent		0,0766 *		-0,0032		0,0378		-0,0572		0,0481
Occupation (reference: Unemployed)										
Employed		0,0053		-0,0702 **		-0,0668		0,0078		-0,0026
Out of LF		-0,0199		-0,0449		-0,0458		0,0448		0,0072
N	1124	1124	1124	1124	1124	1124	1124	1124	1124	1124
Wald chi2	(20) 138,29	(25) 140,74	(20) 52,22	(25) 53,37	(20) 23,01	(25) 25,61	(20) 42,78	(25) 48,21	(20) 94,03	(25) 95,84
Log pseudolikelihood	-634,54112	-628,48485	-433,1712	-430,57323	-669,68904	-667,72096	-706,07725	-703,14248	-727,35453	-725,16768
Pseudo R2	0,1227	0,131	0,0548	0,0604	0,0188	0,0217	0,0363	0,0403	0,0806	0,0834

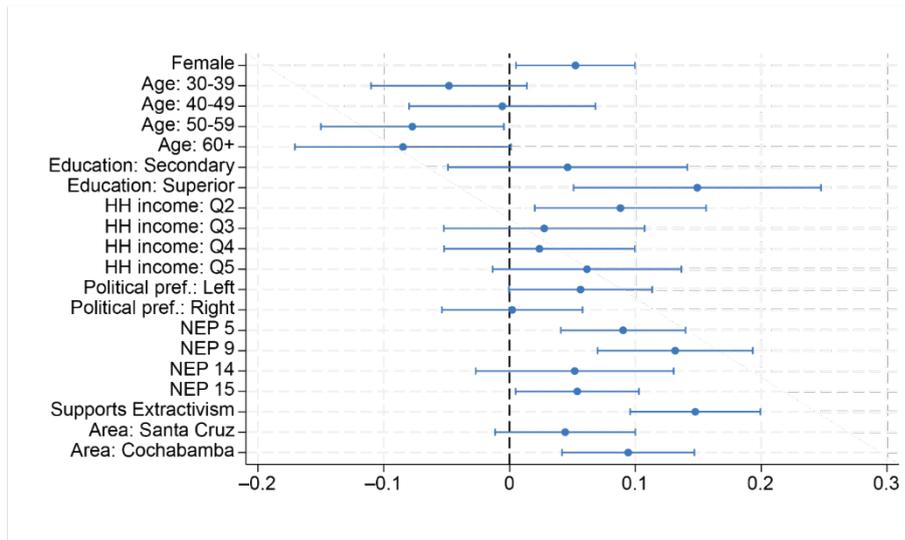
Note: (i) * p<0.1; ** p<0.05; *** p<0.01

Source: EcoBarómetro Bolivia 2022, own estimates.

Table C.5: Average marginal effects of logit estimations

Figure C.3: Results for Environmental Attitudes

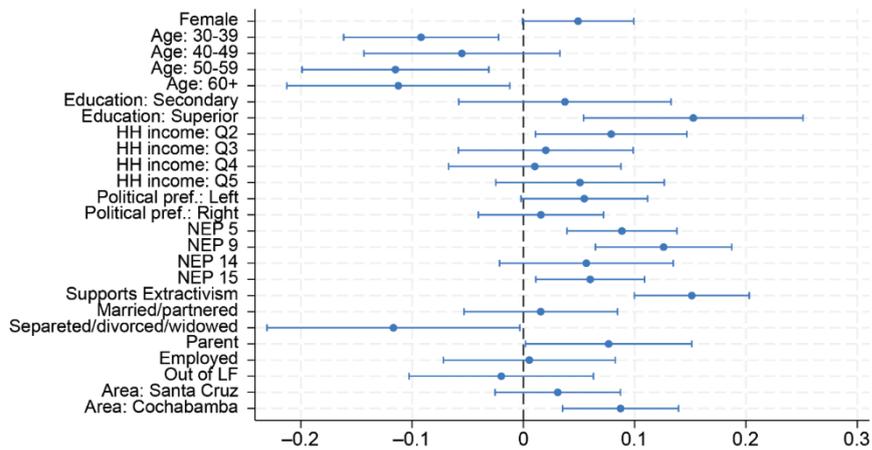
a) Model 1: Average Marginal Effects on Pro-Environmental Attitudes (with 90% CIs)



Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of Ecobarómetro Bolivia 2022.

b) Model 2: Average Marginal Effects on Pro-Environmental Attitudes (with 90% CIs)

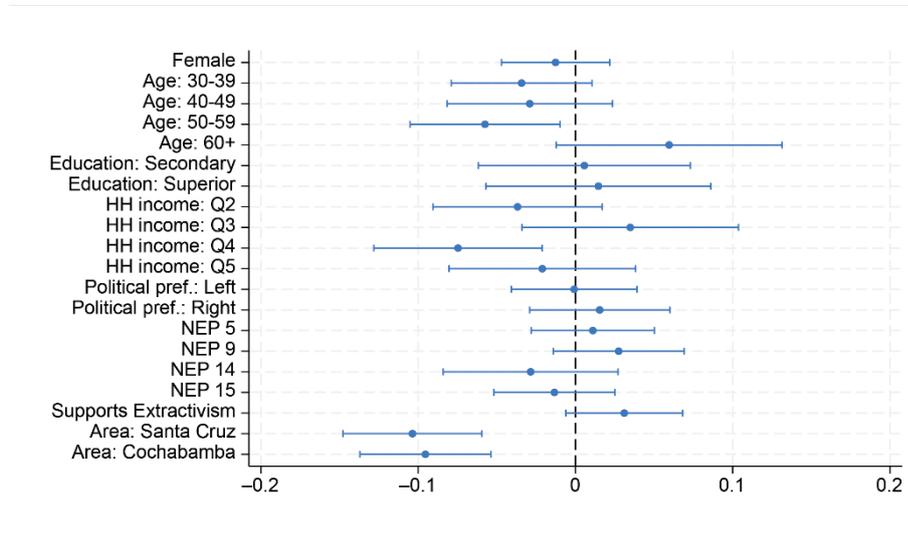


Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of Ecobarómetro Bolivia 2022.

Figure C.4 Results Environmental Practices: Member of environmental association

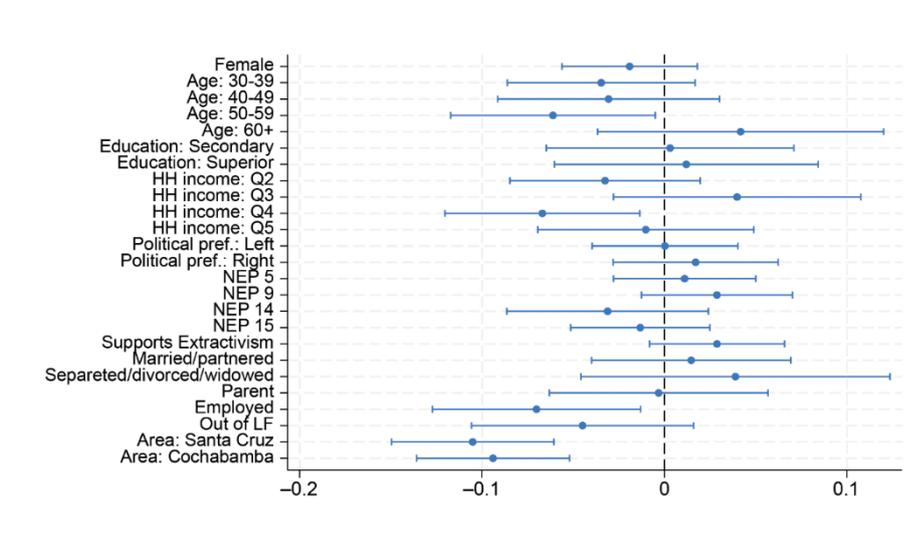
a) Model 1: Average Marginal Effects on Member of environmental association (with 90% CIs)



Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of Ecobarómetro Bolivia 2022.

b) Model 2: Average Marginal Effects on Member of environmental association (with 90% CIs)

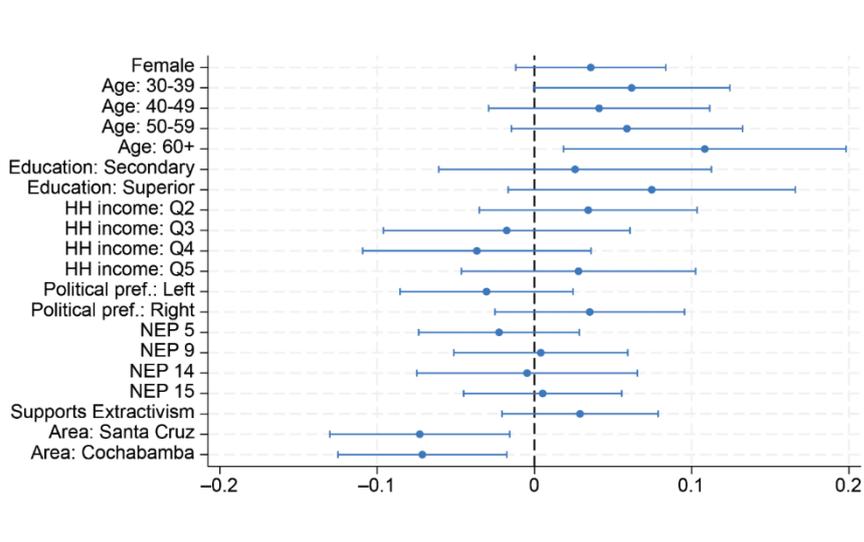


Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of Ecobarómetro Bolivia 2022.

Figure C.5: Results Environmental Practices: Reuse

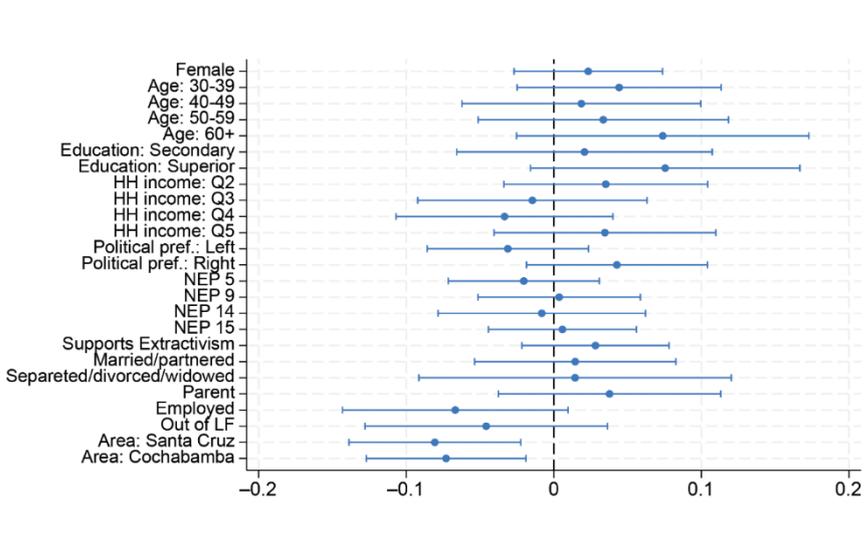
a) Model 1: Average Marginal Effects on Reuse (with 90% CIs)



Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of EcoBarómetro Bolivia 2022.

b) Model 2: Average Marginal Effects on Reuse (with 90% CIs)

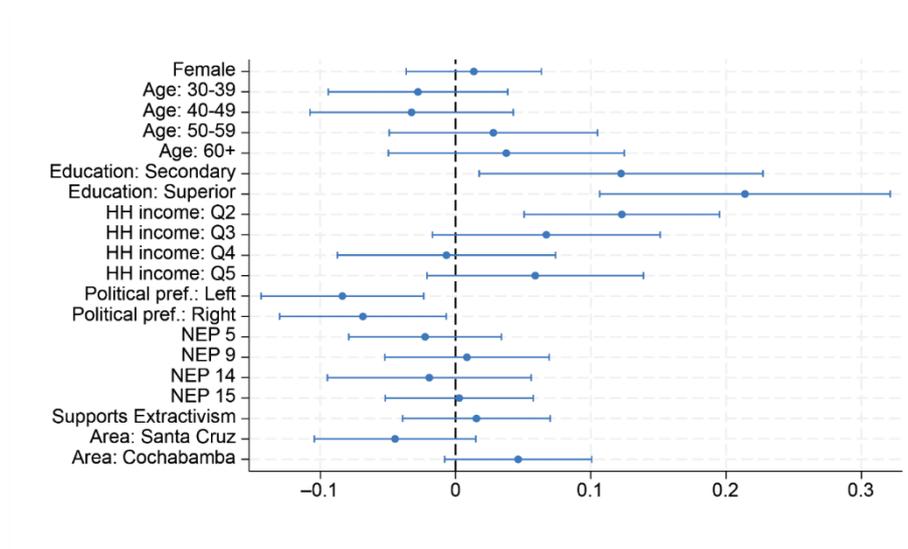


Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of EcoBarómetro Bolivia 2022.

Figure C.6: Results Environmental Practices: Buys consciously

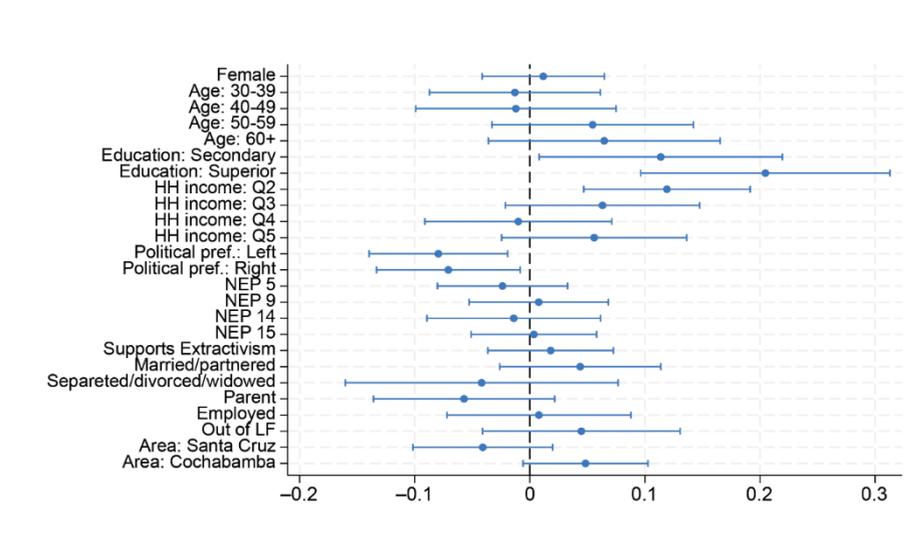
a) Model 1: Average Marginal Effects on Buys Consciously (with 90% CIs)



Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of EcoBarómetro Bolivia 2022.

b) Model 2: Average Marginal Effects on Buys Consciously (with 90% CIs)

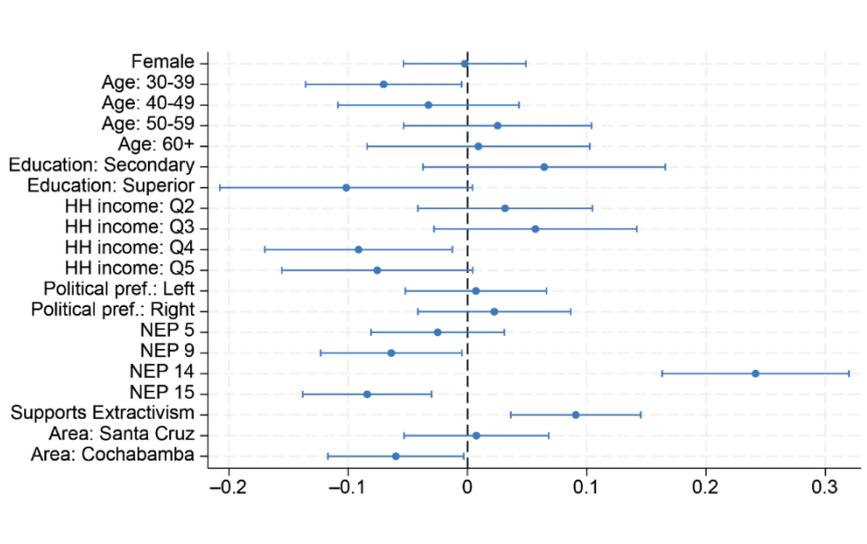


Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of EcoBarómetro Bolivia 2022.

Figure C.7: Results for Willingness to accept environmental costs

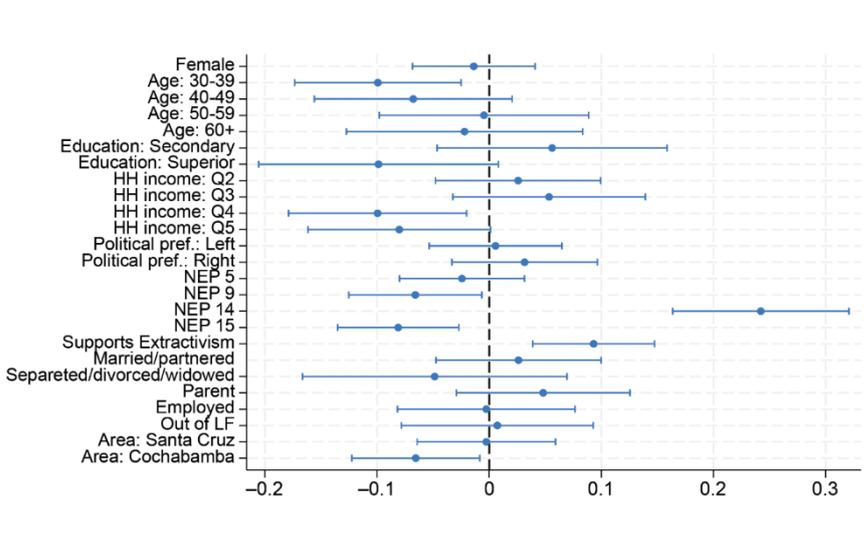
**a) Model 1: Average Marginal Effects on Willingness to Accept Environmental Costs
(with 90% CIs)**



Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of EcoBarómetro Bolivia 2022.

**b) Model 2: Average Marginal Effects on Willingness to Accept Environmental Costs
(with 90% CIs)**



Note: Coefficients compared with the reference group.

Source: Own elaboration based on the dataset of EcoBarómetro Bolivia 2022.

Table C.6: Logit estimation results

Determinants	Dimension: Pro-environmental Attitudes		Dimension: Pro-environmental Practices						Dimension: Willingness to accept environmental costs	
			Member of environmental		Reuse		Buys consciously			
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Female	0,2785* <i>0,1537</i>	0,2641 <i>0,1642</i>	-0,1113 <i>0,1852</i>	-0,1693 <i>0,2011</i>	0,1797 <i>0,1457</i>	0,1174 <i>0,1540</i>	0,0632 <i>0,1419</i>	0,0546 <i>0,1514</i>	-0,0106 <i>0,1396</i>	-0,0620 <i>0,1495</i>
Age group (reference: 18-30)										
30-39	-0,2551 <i>0,1979</i>	-0,4962** <i>0,2288</i>	-0,3059 <i>0,2518</i>	-0,3077 <i>0,2829</i>	0,3144* <i>0,1903</i>	0,2234 <i>0,2112</i>	-0,1278 <i>0,1848</i>	-0,0598 <i>0,2077</i>	-0,3145* <i>0,1790</i>	-0,4471** <i>0,2064</i>
40-49	-0,0314 <i>0,2454</i>	-0,3058 <i>0,2922</i>	-0,2554 <i>0,2939</i>	-0,2684 <i>0,3345</i>	0,2138 <i>0,2178</i>	0,0967 <i>0,2532</i>	-0,1491 <i>0,2081</i>	-0,0560 <i>0,2433</i>	-0,1460 <i>0,2061</i>	-0,3044 <i>0,2425</i>
50-59	-0,4025* <i>0,2253</i>	-0,6124** <i>0,2683</i>	-0,5593* <i>0,3142</i>	-0,5972* <i>0,3608</i>	0,3001 <i>0,2221</i>	0,1710 <i>0,2601</i>	0,1339 <i>0,2265</i>	0,2636 <i>0,2623</i>	0,1127 <i>0,2142</i>	-0,0211 <i>0,2555</i>
olther than 60	-0,4397* <i>0,2636</i>	-0,5995* <i>0,3169</i>	0,4233 <i>0,2890</i>	0,3057 <i>0,3357</i>	0,5284** <i>0,2538</i>	0,3626 <i>0,2873</i>	0,1811 <i>0,2608</i>	0,3152 <i>0,3079</i>	0,0407 <i>0,2533</i>	-0,0989 <i>0,2881</i>
Education level (reference Primary education or less)										
Secondary education	0,2256 <i>0,2792</i>	0,1840 <i>0,2831</i>	0,0519 <i>0,3794</i>	0,0281 <i>0,3793</i>	0,1387 <i>0,2899</i>	0,1119 <i>0,2889</i>	0,5178* <i>0,2658</i>	0,4847* <i>0,2693</i>	0,2787 <i>0,2675</i>	0,2441 <i>0,2710</i>
Superior education	0,7753*** <i>0,2958</i>	0,8062*** <i>0,3011</i>	0,1302 <i>0,3983</i>	0,1063 <i>0,3997</i>	0,3795 <i>0,2992</i>	0,3831 <i>0,2982</i>	0,9511*** <i>0,2797</i>	0,9166*** <i>0,2831</i>	-0,4430 <i>0,2772</i>	-0,4315 <i>0,2807</i>
HH income (reference: Q1: 1-1,000 Bs)										
Q2: 1,001 - 2,000 Bs	0,4695** <i>0,2206</i>	0,4267* <i>0,2232</i>	-0,3137 <i>0,2769</i>	-0,2849 <i>0,2750</i>	0,1667 <i>0,2058</i>	0,1728 <i>0,2068</i>	0,5823*** <i>0,2095</i>	0,5675*** <i>0,2106</i>	0,1390 <i>0,1969</i>	0,1142 <i>0,1988</i>
Q3: 2,001 - 2,800 Bs	0,1412 <i>0,2491</i>	0,1046 <i>0,2488</i>	0,2490 <i>0,2953</i>	0,2903 <i>0,2962</i>	-0,0905 <i>0,2459</i>	-0,0751 <i>0,2447</i>	0,3042 <i>0,2345</i>	0,2878 <i>0,2363</i>	0,2524 <i>0,2307</i>	0,2379 <i>0,2338</i>
Q4: 2,801 - 4,000 Bs	0,1214 <i>0,2355</i>	0,0531 <i>0,2436</i>	-0,7317** <i>0,3185</i>	-0,6650** <i>0,3231</i>	-0,1924 <i>0,2328</i>	-0,1767 <i>0,2370</i>	-0,0292 <i>0,2134</i>	-0,0441 <i>0,2163</i>	-0,4039* <i>0,2122</i>	-0,4421** <i>0,2156</i>
Q5: more than 4,000 Bs	0,3217 <i>0,2387</i>	0,2695 <i>0,2441</i>	-0,1712 <i>0,2931</i>	-0,0840 <i>0,2947</i>	0,1374 <i>0,2217</i>	0,1701 <i>0,2243</i>	0,2656 <i>0,2198</i>	0,2536 <i>0,2223</i>	-0,3339 <i>0,2143</i>	-0,3552 <i>0,2191</i>
Political preference (reference: Center)										
Left wing	0,3054 <i>0,1911</i>	0,2980 <i>0,1920</i>	-0,0073 <i>0,2193</i>	0,0024 <i>0,2202</i>	-0,1582 <i>0,1757</i>	-0,1631 <i>0,1761</i>	-0,3855** <i>0,1663</i>	-0,3691** <i>0,1676</i>	0,0313 <i>0,1609</i>	0,0253 <i>0,1613</i>
Right wing	0,0111 <i>0,1772</i>	0,0834 <i>0,1820</i>	0,1329 <i>0,2300</i>	0,1477 <i>0,2338</i>	0,1707 <i>0,1762</i>	0,2075 <i>0,1792</i>	-0,3185* <i>0,1717</i>	-0,3305* <i>0,1745</i>	0,1004 <i>0,1740</i>	0,1416 <i>0,1770</i>
NEP5	0,4799*** <i>0,1631</i>	0,4761*** <i>0,1646</i>	0,0975 <i>0,2100</i>	0,0980 <i>0,2106</i>	-0,1128 <i>0,1559</i>	-0,1025 <i>0,1566</i>	-0,1048 <i>0,1602</i>	-0,1115 <i>0,1614</i>	-0,1122 <i>0,1522</i>	-0,1093 <i>0,1522</i>
NEP9	0,6999*** <i>0,2018</i>	0,6774*** <i>0,2024</i>	0,2424 <i>0,2226</i>	0,2549 <i>0,2228</i>	0,0203 <i>0,1687</i>	0,0182 <i>0,1684</i>	0,0394 <i>0,1722</i>	0,0361 <i>0,1725</i>	-0,2863* <i>0,1624</i>	-0,2962* <i>0,1634</i>
NEP14	0,2754 <i>0,2545</i>	0,3041 <i>0,2556</i>	-0,2512 <i>0,2970</i>	-0,2765 <i>0,2966</i>	-0,0234 <i>0,2139</i>	-0,0411 <i>0,2151</i>	-0,0904 <i>0,2137</i>	-0,0656 <i>0,2151</i>	1,0814*** <i>0,2238</i>	1,0887*** <i>0,2256</i>
NEP15	0,2862* <i>0,1594</i>	0,3228** <i>0,1609</i>	-0,1178 <i>0,2065</i>	-0,1176 <i>0,2062</i>	0,0264 <i>0,1532</i>	0,0293 <i>0,1535</i>	0,0128 <i>0,1551</i>	0,0164 <i>0,1553</i>	-0,3769** <i>0,1491</i>	-0,3649** <i>0,1497</i>
Supports extractivism	0,7848*** <i>0,1735</i>	0,8137*** <i>0,1757</i>	0,2739 <i>0,1990</i>	0,2554 <i>0,1992</i>	0,1456 <i>0,1514</i>	0,1421 <i>0,1528</i>	0,0721 <i>0,1547</i>	0,0847 <i>0,1556</i>	0,4064*** <i>0,1503</i>	0,4185*** <i>0,1505</i>
Area (reference: La Paz)										
Santa Cruz	0,2289 <i>0,1760</i>	0,1615 <i>0,1794</i>	-0,8643*** <i>0,2398</i>	-0,8851*** <i>0,2456</i>	-0,3578** <i>0,1731</i>	-0,3976** <i>0,1775</i>	-0,2034 <i>0,1647</i>	-0,1873 <i>0,1684</i>	0,0331 <i>0,1645</i>	-0,0115 <i>0,1680</i>
Cochabamba	0,5058*** <i>0,1728</i>	0,4756*** <i>0,1734</i>	-0,7731*** <i>0,2144</i>	-0,7608*** <i>0,2155</i>	-0,3491** <i>0,1614</i>	-0,3569** <i>0,1623</i>	0,2256 <i>0,1620</i>	0,2364 <i>0,1623</i>	-0,2686* <i>0,1553</i>	-0,2942* <i>0,1565</i>
Marital status (reference: single)										
Married/partnered		0,0841 <i>0,2270</i>		0,1315 <i>0,2983</i>		0,0730 <i>0,2092</i>		0,2066 <i>0,2015</i>		0,1172 <i>0,2007</i>
Separated/widowed		-0,5917* <i>0,3440</i>		0,3274 <i>0,4138</i>		0,0726 <i>0,3217</i>		-0,1879 <i>0,3199</i>		-0,2192 <i>0,3257</i>
Parent		0,4118* <i>0,2453</i>		-0,0283 <i>0,3231</i>		0,1901 <i>0,2310</i>		-0,2681 <i>0,2249</i>		0,2162 <i>0,2121</i>
Occupation (reference: Unemployed)										
Employed		0,0288 <i>0,2536</i>		-0,5666** <i>0,2584</i>		-0,3244 <i>0,2189</i>		0,0360 <i>0,2223</i>		-0,0119 <i>0,2163</i>
Out of LF		-0,1059 <i>0,2697</i>		-0,3386 <i>0,2711</i>		-0,2182 <i>0,2348</i>		0,2108 <i>0,2432</i>		0,0324 <i>0,2338</i>
Constant	-1,007*** <i>0,3791</i>	-1,0538** <i>0,4375</i>	-1,2459*** <i>0,4641</i>	-0,8657* <i>0,5167</i>	-1,2421*** <i>0,3861</i>	-1,0451** <i>0,4192</i>	0,0339 <i>0,3450</i>	0,0104 <i>0,3961</i>	0,2516 <i>0,3487</i>	0,2198 <i>0,3951</i>
N	1124	1124	1124	1124	1124	1124	1124	1124	1124	1124
Wald chi2	(20) 138,29	(25) 140,74	(20) 52,22	(25) 53,37	(20) 23,01	(25) 25,61	(20) 42,78	(25) 48,21	(20) 94,03	(25) 95,84
Log pseudolikelihood	-634,54112	-628,48485	-433,1712	-430,57323	-669,68904	-667,72096	-706,07725	-703,14248	-727,35453	-725,16768
Pseudo R2	0,1227	0,131	0,0548	0,0604	0,0188	0,0217	0,0363	0,0403	0,0806	0,0834

Note: (i) * p<0.1; ** p<0.05; *** p<0.01; (ii) Standard errors in italics.

Source: EcoBarómetro Bolivia 2022, own estimates.

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SUMMARY

This dissertation consists of three essays on case studies for commodity-dependent countries. Chapter 2 and 3 deal with mobility analysis of the Peruvian labor market in the context of the commodity boom and post-boom. Chapter 4 investigates the relationship between the support in the extractivist development model and the individual environmental concern in Bolivia.

Chapter 2: Labor Income Mobility during the Commodity Boom and the Post-Boom: The Case Study of Peru

Peru experienced rapid economic growth during the commodity boom and slowdown during the post-boom, the study explores who benefited in both periods, possible changes in mobility patterns and whether there was convergence of labor income. Using data from the ENAHO Panel 2007-2011 and 2011-2015, the analysis calculates indicators of directional mobility in levels and in logarithms, and estimates dynamic income regressions for both unconditional and conditional earnings. A trend of decreasing income mobility is found, marked by the Global Financial Crisis of 2009 and the fall in commodity prices in 2011. During the boom, female workers showed higher labor income mobility than men, but this pattern reversed in the post-boom period. Workers in the primary sector consistently experienced higher mobility. Urban workers and the more educated, who have an initial advantage, always experience greater positive mobility than their counterparts. The results suggest a convergence of labor income in the short run, with greater intensity during the boom period. The study contributes to shed light on the pattern and temporality of income convergence, highlighting the structural inequalities in the labor market.

Chapter 3: Labor Transitions from Informality to Formality in Urban Peru: 2007-2019

Peruvian labor market is characterized by high and persistent informality levels, the paper studies the transitions from informality to formality, in the context of the commodity boom and post-boom. Using ENAHO Panel data 2007-2011, 2011-2015, and 2015-2019, study explores the individual determinants of the transitions by estimating multinomial logit models, and the

transition implication on the individual economic-wellbeing by estimating income dynamic regressions. Three alternative definitions of informality are used in all calculations to assess whether the results are sensitive to the choice of measure is confirmed. Informal-formal transitions persistently occur across different phases of the economic cycle, irrespective of whether the economy is booming or experiencing a slowdown. However, this trend is sensitive to the choice of measure. Education is positively associated with transitions, and it is the most important determinant of these in all definitions. The effects of age and occupational category on the informal-formal transition probability differ based on the informal measure applied. Finally, informal-formal transitions increase labor income, but this formality premium is greater for the informal/formal sector definition than for the informal/formal employment. An interesting finding is that low skilled workers experience lower earning capacity in formality compared to their potential at the higher level of informality. The paper contributes by confirming the relevance of the choice of measure and provides empirical evidence on the multidimensionality of informality and heterogeneous experiences of informal workers in Peru.

Chapter 4: Environmental Concern in Urban Bolivia: Individual Determinants and “Resource Curse Effects”

The paper delves into the conditions of environmental concern in Bolivia, addressing a gap in existing literature that predominantly focuses on the Global North. The study explores two main objectives: assessing whether factors influencing environmental concern in Global North countries are applicable in Bolivia and examining the impact of an extractive development model on individual environmental concern. The analysis employs descriptive statistics and multivariate regressions using data from the 2022 “Ecobarómetro – Environmental Culture Survey” in La Paz, Santa Cruz, and Cochabamba. Three key findings emerge: Bolivia exhibits high levels of environmental concern, surpassing levels in many Global North countries; predictors for environmental concern in Global North countries also apply for Bolivia, albeit with some nuances. Education is the most robust predictor of individual environmental concern in Bolivia. Finally, a paradoxical relationship emerges between pro-environmental attitudes and the willingness to accept extractivism’s environmental costs. People tend to accept the costs of the model as long as it promises economic returns, revealing a “resource curse effect” on Bolivia’s environmental concern. The study is the first to confirm this effect empirically.

ZUSAMMENFASSUNG

Diese Dissertation besteht aus drei Essays zu Fallstudien von rohstoffabhängigen Ländern Südamerikas. Kapitel 2 und 3 entwickeln Mobilitätsanalysen für den peruanischen Arbeitsmarkt im Kontext des Rohstoffbooms und der Zeit danach für den Fall Perus. Kapitel 4 untersucht die Wechselwirkung zwischen der Unterstützung des extraktivistischen Entwicklungsmodells einerseits und dem individuellen Umweltbewusstsein andererseits am Beispiel Boliviens.

Kapitel 2: “Labor Income Mobility during the Commodity Boom and the Post-Boom: The Case Study of Peru”

Peru durchlief während des Rohstoffbooms ein schnelles Wirtschaftswachstum, welches sich in der Periode nach dem Boom verlangsamte. Die Analyse untersucht, welche Gruppen im jeweiligen Zeitraum profitiert haben, inwiefern sich Strukturen in der Einkommensmobilität verändert haben und, ob es zu einer Konvergenz der Arbeitseinkommen gekommen ist. Unter Verwendung von Daten aus dem ENAHO-Panel 2007-20011 und 2011-2015 werden im Rahmen der Analyse Indikatoren zur Einkommensmobilität sowohl in absoluten Werten als auch logarithmiert berechnet und liefert eine dynamische Regressionsanalyse, um die Determinanten von Einkommensmobilität in ihrer Signifikanz und ihrem Einfluss zu bestimmen. Die Untersuchung weist im Zeitverlauf eine rückläufige Einkommensmobilität nach, welche durch die globale Finanzkrise von 2009 und den Rückgang der Rohstoffpreise im Jahr 2011 gekennzeichnet ist. Während des Booms zeigte sich für Frauen eine höhere Mobilität des Arbeitseinkommens auf als für männliche Arbeiter, aber dieses Muster kehrte sich in der Zeit nach dem Boom um. Arbeitnehmer im Primärsektor wiesen durchweg eine höhere Mobilität auf. Städtische ArbeitnehmerInnen und höher Gebildete, die einen anfänglichen Vorteil haben, weisen stets eine höhere positive Mobilität. Die Ergebnisse deuten auf eine kurzfristige Konvergenz der Arbeitseinkommen hin, die sich in der Boomphase besonders ausgeprägt zeigt. Die Studie trägt dazu bei, Muster und die Temporalität von Einkommenskonvergenzen zu erhellen und die strukturellen Ungleichheiten auf dem Arbeitsmarkt zu verdeutlichen.

Kapitel 3: “Labor Transitions from Informality to Formality in Urban Peru: 2007-2019”

Der peruanische Arbeitsmarkt ist durch ein hohes und anhaltendes Maß an Informalität gekennzeichnet. Die Analyse untersucht entsprechend Übergangs-Prozesse von informellen in formelle Arbeitsverhältnisse im Kontext des Rohstoffbooms und der post-Boom Phase. Auf Basis von ENAHO-Paneldaten aus den Jahren 2007-2011, 2011-2015 und 2015-2019 erfolgt eine Schätzung, inwieweit verschiedene individuellen Einflussfaktoren den Übergang aus der Informalität in formelle Beschäftigung beeinflussen. Die Berechnung entsprechender Übergangsprozesse erfolgt mittels multinominaler Logit-Modelle, während Wirkungen dieser Transition auf das individuelle ökonomische Wohlbefinden über dynamische Einkommensregressionen analysiert werden. Bei allen Berechnungen finden drei alternative Definitionen von Informalität Anwendung, um zu verifizieren, wie beständig sich die Ergebnisse zeigen bzw. inwiefern sie vom gewählten Informalitäts-Konzept abhängen.

Ein Übergang von Informalität in Formalität vollzieht sich durchgängig während aller Phasen des Konjunkturzyklus, unabhängig davon, ob die Wirtschaft boomt oder eine Rezession durchläuft. Demgegenüber hängt der Trend jedoch von der Wahl des spezifischen Maßes ab. Das Bildungsniveau ist positiv mit dem Informalität-Formalität Übergang korreliert und stellt für alle Definitionen die jeweils wichtigste Determinante für entsprechende Veränderungen im Beschäftigungsverhältnis dar. Alters und der Berufskategorie zeigen demgegenüber je nach verwendetem Maß unterschiedliche Effekte auf die Wahrscheinlichkeit dieses Übergangs. Ein Übergang von Informalität in Formalität erhöht das Arbeitseinkommen, wobei diese „Formalitäts-Prämie“ jedoch bei der Unterscheidung von Beschäftigungen in informellem bzw. formellem Sektor ausgeprägter ist als zwischen informellen und formellen Arbeitsverhältnissen. Ein interessantes Ergebnis ist, dass gering qualifizierte Arbeitnehmer in der formalen Beschäftigung eine geringere Verdienstmöglichkeit finden als bei einem höheren Grad an Informalität. Die Untersuchung bestätigt die Bedeutung und Einfluss der gewählten Messgröße, liefert empirische Belege für die Multidimensionalität von Informalität und stellt heterogenen Erfahrungen von informell Beschäftigten in Peru dar.

Kapitel 4: “Environmental Concern in Urban Bolivia: Individual Determinants and “Resource Curse Effects””

Die Studie stellt Status Quo und Entwicklungen im Umweltbewusstsein der bolivianischen Bevölkerung dar. Damit schließt die Analyse eine Forschungslücke, da sich bisherige Betrachtungen zum Umweltbewusstsein vorwiegend auf den Globalen Norden fokussieren. Die Studie verfolgt zwei Hauptziele: Zunächst analysiert sie, ob die Faktoren, die das Umweltbewusstsein in den Ländern des globalen Nordens beeinflussen, auch auf Bolivien zutreffen. In einem nachfolgenden Schritt ordnet sie den Einfluss eines extraktiven Entwicklungsmodells auf das individuelle Umweltbewusstsein ein. Bei der Analyse finden deskriptive Statistik und multivariate Regressionen Anwendung. Sie fußt auf Daten aus dem "EcoBarómetro - Environmental Culture Survey" aus dem Jahr 2022 in La Paz, Santa Cruz und Cochabamba. Hierbei zeigen sich drei zentrale Ergebnisse: Boliviens Bevölkerung weist ein weit entwickeltes Umweltbewusstsein auf, das das Niveau vieler Länder im globalen Norden übertrifft; die Einflussfaktoren, welche das Umweltbewusstsein in den Ländern des globalen Nordens formen, gelten auch für Bolivien, wenn auch mit einigen spezifischen Ausprägungen: Bildung stellt die stärkste und eindeutigste Prognosevariable dar, um das individuelle Umweltbewusstsein in Bolivien zu determinieren. Schließlich zeigt sich ein widersprüchliches Bild: Ein grundsätzlich bestehendes und auch formuliertes Bewusstsein hinsichtlich der Umwelt einerseits wird dadurch konterkariert, dass die bolivianische Bevölkerung vielfach negative Umweltimplikationen als Folge extraktiver Wirtschaftsaktivitäten hinnimmt. Die lokale Bevölkerung scheint ökologische Folgen des bestehenden Wirtschaftssystems hinzunehmen, solange dieses wirtschaftliche Erträge verspricht. Dies offenbart den Effekt eines „Ressourcenfluchs“ auf das Umweltbewusstsein in Bolivien. Die vorliegende Studie ist die erste, welche diesen Effekt empirisch bestätigt.

EHRENWÖRTLICHE ERKLÄRUNG

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