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Climbing the (in)formality job ladder: Determinants and Dynamics of Labour Informality in Peru

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Resumen

El mercado laboral informal constituye una parte significativa del empleo en Perú, donde más de dos tercios de los trabajadores se encuentran en la economía informal. Este estudio explora la prevalencia, los determinantes y las dinámicas de la informalidad laboral en Perú, considerando el margen extensivo, en el que las empresas no registradas contratan trabajadores no registrados, y el margen intensivo, en el que, aunque las empresas estén registradas ante las autoridades tributarias, contratan empleados de manera informal. Aprovechando la Encuesta Nacional de Hogares (ENAHO) entre los años 2007 y 2019, el documento identifica factores clave que determinan la informalidad, como el género, la edad, la experiencia y la educación. Además, se analizan las transiciones hacia y desde la informalidad laboral, así como los factores que influyen en dichas transiciones a lo largo del tiempo. Los hallazgos sugieren que la informalidad laboral está influenciada tanto por condiciones económicas estructurales como por características individuales. Finalmente, el documento explora los vínculos entre las transiciones de los trabajadores y los cambios subsecuentes en sus ingresos laborales. Este estudio contribuye a una comprensión más profunda del empleo informal en Perú, con lecciones para América Latina, y ofrece perspectivas para los responsables de políticas públicas que buscan promover la formalización del mercado laboral y la protección social.

Abstract

The informal labour market represents a significant component of employment in Peru, more than two-thirds of the workers are situated in the informal economy. This paper explores the prevalence, determinants, and dynamics of labour informality in Peru, considering the extensive margin, where unregistered firms hire unregistered workers, and the intensive margin, in which, even when firms are registered with tax authorities, hire employees off the books. Exploiting a rich household survey (ENAHO) between 2007 and 2019, the paper identifies key determinants of informality, such as gender, age, experience and education. Furthermore, the paper analyses transitions into and out of labour informality and the factors influencing these transitions over time. The findings suggest that labour and firm informality are influenced by both structural economic conditions and individual characteristics. Finally, the paper explores the linkages between workers' transitions and subsequent changes in their labour income. This study contributes to a deeper understanding of informal employment in Peru, with lessons for Latin America, offering insights for policymakers aiming to enhance labour market formalisation and social protection.

* I am deeply grateful to Paula Garda and Michael Koelle for their insightful feedback and suggestions, which significantly enrich this work. All errors and omissions are mine. Corresponding author, Email: tomas.opazovalenzuela@oecd.org. OECD Economics Department and Central Bank of Chile.

Introduction

One of the main characteristics of emerging economies is the high prevalence of the informal sector, which has significant implications for economic development and social well-being. In these economies, approximately one-third of the gross domestic product is generated by the informal sector, but more importantly, nearly 70% of employment is situated in the informal economy (Perry et al., 2007[1]), (Ulyssea, 2018[2]) and (Ohnsorge and Yu, 2022[3]).

Latin America is no exception, and despite the region's strong economic performance in recent decades, high rates of labour market informality remain one of the major challenges. In this context, workers and their families are exposed to a greater range of risks compared to formal workers, as informality is associated with no employment protection and very low or inadequate social protection (ILO, 2019[4]) and (OECD, 2023[5]). This sets important challenges for the design of social security systems due to the presence of a dual system where formal sector workers receive social protection benefits. In contrast, informal sector workers are often left without adequate coverage, which exacerbates their vulnerability to economic shocks and instability.

Given its heterogeneous nature, defining informality is not an easy task, and it is equally challenging for policymakers to answer the question of how to improve the security and livelihoods of informal workers and their dependents. Perry (2007[1]) describes the different methods used in the literature to measure informality. The application of the direct method, based on microdata and used to characterise the size of the informal sector and the characteristics of the firms operating within it, has been limited to a few developed countries because of the limited availability of data[2]. Over the recent years, a growing literature has emerged, facilitated by the availability of new sources of information, including household surveys and administrative datasets (Ulyssea, 2020[6]).

Several theories aim to explain how the informal sector interacts within the economy. The first theory was developed by (De Soto, 1989[6]), who argues that the informal sector comprises a group of potentially productive entrepreneurs who remain outside formality due to the high costs of formalisation. The second view considers informal businesses and entrepreneurs as parasites who are productive enough to survive in the formal sector but prefer informality to receive higher incomes and benefit from lower costs (Busso, Fazio and Levy, 2012[7]). The last theory posits that informality is a survival strategy for unproductive individuals with low skills ((Maloney, 2004[8])). (Ulyssea, 2018[2]) shows that these theories are not mutually exclusive but rather complementary, highlighting the importance of empirically determining the relative significance of each perspective.

Studying the characteristics of workers and households, along with those of their jobs, is fundamental to understanding workers' decisions to engage in the informal sector and, more importantly, to understanding the dynamics and labour transitions of workers. Most of the literature examining the determinants of informality and labour transitions focuses on the extensive margin of informality, which includes unregistered firms or workers employed by unregistered firms ((Maloney, 2004[8]), (Perry et al., 2007[1]), (Chong, Galdo and Saavedra, 2008[9]), (Díaz et al., 2018[10]), (Chacaltana, 2016[11]), (Vega, 2018[12]), (Ponczek and Ulyssea, 2022[13])). On the other hand, the intensive margin of informality, which involves workers who

[2] These can be separated into three classes: (1) direct methods, which use economic surveys or tax collection (2) indirect methods or “indicator” approaches, which use discrepancies between aggregate variables, for example, income and expenditure, and (3) the model or theoretical approach. [3] Figures 10 and 11 show the employment distribution across industries.

work "off the books" for registered firms, has been less explored and is gaining more relevance recently ((Ulyssea, 2018[2]) and (Samaniego De La Parra and Fernández Bujanda, 2024[15])). In Peru, informality rates have remained consistently high, over 70% (Abramo, 2022[36]). The extensive margin of labour informality accounts for nearly 80% of informal employment, while the intensive margin comprises the remaining 20%. Informal jobs in the extensive margin are characterised by lower wages, poorer labour conditions, lower levels of education, and a significant overrepresentation of women (Cisneros-Acevedo, 2022[18]).

Differentiating between the intensive and extensive margin of informality is crucial for policymakers because the aggregate effects of reducing informality depend on the policy instrument used to achieve it. For instance, greater enforcement reduces the number of informal firms, increasing aggregate productivity since informal firms tend to be less productive. Nonetheless, the welfare effect is unclear due to higher unemployment and displacement effects. On the other hand, reducing the entry cost induces low-productivity firms to formalise, which decreases firm informality. However, these firms tend to hire a large share of informal workers; thus, the net effect on labour informality could be null (Ulyssea, 2018[2]).

This paper examines the drivers of labour informality using a rich microdata set that distinguishes between the extensive and intensive margins of labour informality in Peru. This approach conceptualises informality as a four-step job ladder. The first step is the informal self-employed margin, comprising individuals who are self-employed without any formal registration or access to social security. The second step is the extensive waged margin of Informality, which includes workers employed by firms not registered with the tax authority and lacking social security benefits. The third step is the intensive margin of informality, involving off-the-books jobs in registered firms. The final step is fully formal workers, who enjoy full formal employment status, including social security coverage and compliance with tax regulations. This job ladder reflects an ascending trajectory in terms of workers' wages and job security, moving from the informal self-employed margin to fully formal employment. By analysing these distinct categories, the paper aims to shed light on the factors influencing transitions within this ladder and labour income changes induced by these labour transitions in the Latin American context.

While informality is a characteristic of labour transitions in emerging economies, evidence on transitions between the margins of informality is scarce. Due to data availability, most of the literature has focused on the labour transition between the formal and the informal sectors, differentiating between informal wage employment and informal self-employment ((Maloney, 2004[9]) (Garda, 2016[16]) (Vega, 2018[13]) and (Aleksynska, La and Manfredi, 2023[17]). The results concerning transitions from informal jobs indicate that informal workers employed in formal firms are more likely to transition to formal employment and less likely to move to informal firms. This finding is particularly significant for women, who have a higher probability of remaining in informal employment compared to their male counterparts. Additionally, workers in informal firms and self-employed individuals are more likely to remain in their current employment status, suggesting that these positions may serve as dead-ends for some workers.

Furthermore, this study provides evidence for the existence of an informality ladder where upward mobility is associated with wage increases and downward mobility with wage decreases. Notably, the findings highlight that larger movements along this ladder, such as transitioning from wage informality to formal employment or from informal self-employment to informal jobs in formal firms (and vice versa), result in more substantial earnings gains (losses) compared to smaller movements, such as an informal worker in a formal firm becoming a formal worker.

The remainder of the paper is organised as follows. The next section provides an overview of the data and the definition of the informality margins, and section 3 describes the empirical strategy of the paper. In Section 4, we present the empirical results, analyse the key findings, and discuss their implications. Section 5 concludes the paper.

Data and Stylized Facts

The main data source is the Peruvian National Household Survey (ENAHO), which is provided by the Peruvian National Institute of Statistics and Informatics (INEI). The ENAHO started in 1995 and, since 2003, has been carried out continually in urban and rural areas across the country, and its annual information is disaggregated by departments (i.e. large regions). The survey includes data on individuals' sociodemographic characteristics, such as age, gender, marital status, race, education level, and region of residence. This information is essential as it helps create a profile of informal workers. Additionally, despite being a household survey, ENAHO also collects specific details about individuals' employers. This information is crucial for the empirical analysis of transitions between different informality statuses. Table 1 offers us a general overview of the characteristics of the Peruvian working population.

Informal employment refers to work arrangements that are not regulated by legal or formal frameworks, often lacking social protection and labour rights. This type of employment is pervasive in many developing economies, including Peru, where a significant portion of the labour force operates outside the formal sector. In this paper, informal employment refers to those workers who report to work for firms not registered with the Tax Collection Agency (SUNAT), workers who report the Tax Collection Agency does not deduct their income or workers who declare that their employer does not pay health insurance on their behalf, definition consistent with the International Labour Organization (ILO)'s recommendations. Figure 1 illustrates the evolution of the informality rate in Peru from 2007 onward. Over the past 15 years, informal employment has consistently constituted a significant portion of the labour market. The informality rate declined between 2007 and 2016; however, since 2016, it has stabilised, fluctuating between 70% and 75% in both the non-agricultural sector and the overall economy[3].

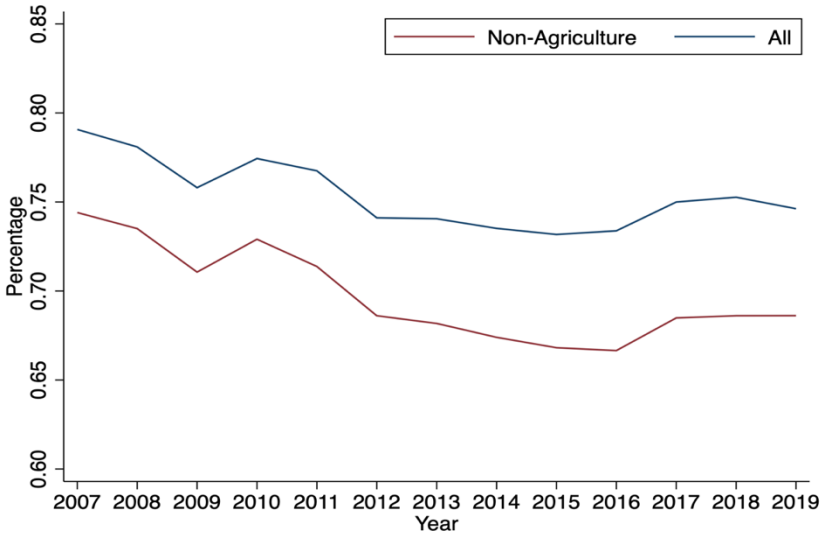
[3] Figures 10 and 11 show the employment distribution across industries.

Table 1. Descriptive Statistics

Category	Mean	SD	Category	Mean	SD
Gender			Industry sector		
Male	0.57	0.49	Agriculture	0.22	0.41
Female	0.43	0.49	Fishing	0.01	0.08
Age			Minery	0.01	0.12
16-24 years	0.16	0.37	Manufacturing	0.11	0.31
25-30 years	0.14	0.34	Construction	0.06	0.24
31-45 years	0.37	0.48	Retail	0.20	0.40
46-55 years	0.20	0.4	Transport	0.09	0.29
+55 years	0.13	0.34	Government	0.04	0.21
Education			Hospitality	0.07	0.26
No level	0.03	0.18	Real estate	0.04	0.20
Primary	0.25	0.43	Education	0.06	0.24
Secondary	0.41	0.49	Other Services	0.08	0.27
Tertiary non-university	0.15	0.36			
Tertiary university	0.14	0.34	Income		
Postgraduate	0.02	0.13	Real labour income (USD)	350.33	452.63
Mother tongue					
Other	0.82	0.38	Formality		
Quechua	0.18	0.38	Formal employment	0.25	0.43
Marital status			Intensive informality	0.15	0.35
Partner	0.29	0.46	Extensive waged informality	0.15	0.37
Married	0.31	0.46	Extensive self-employed Informality	0.45	0.50
Single	0.26	0.44			
Other	0.14	0.34			
Sample Size 2007-19	435184				

Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

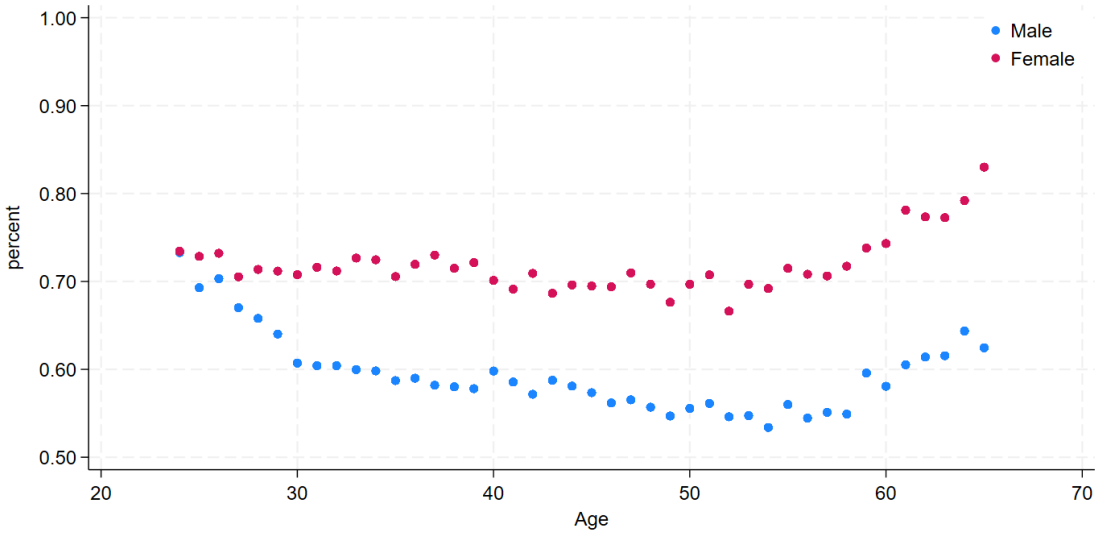
Figure 1. Informality Rate



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 2 shows that women in Peru are more likely to participate in the informal market. On top of that, informality exhibits a U-shaped pattern over the life cycle. Young workers are more likely to engage in informal activities[4]. Workers in their prime working years are more likely to have formal employment. However, as workers approach retirement age, they are increasingly likely to engage in informal work, and this trend continues as they reach retirement age. These patterns persist when we disaggregate our data by educational level. Workers with lower levels of education exhibit higher informality rates compared to highly skilled workers (those with a college degree). Throughout the life cycle, highly skilled workers maintain an informality rate of approximately 30%, while middle- and low-skilled workers experience informality rates of around 70% and 90%, respectively.

Figure 2. Informality Rate



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Between 2007 and 2014, Peru experienced an average GDP growth rate of 6%, standing out as one of the fastest-growing economies in Latin America. This period was marked by the commodity Supercycle, along with favourable external conditions for macroeconomic stability. This era brought about a significant reduction in poverty, an increase in real wages, improvements in income distribution, and enhanced access to education ((World Bank, 2015[17]) (Cavallo and Powell, 2019[17]) and (Balakrishnan et al., 2021[17])). In this context, Peru experienced a sharp drop in informality until 2014, but the rate has remained relatively stagnant in recent years. Fluctuations in the informality rate may reflect changes in the employment structure. To better understand these changes, Table 2 decomposes the informality rate using the (McMillan, Rodrik and Verduzco-Gallo, 2014[15])and (Timmer, de Vries and De Vries, 2015[16]) methodology, which is useful to analyse the dynamics of informality in the Peruvian labour market. This method allows us to distinguish between the within-sector changes and structural

[4] Figure 16 presents the informality rate along the life cycle by the education level.

shifts across sectors contributing to overall changes in informality. The decomposition is represented by the following equation:

$$\Delta I = \sum_i s_i^{t_0} \Delta I_i + \sum_i \Delta s_i I_i^{t_0} + \sum_i \Delta s_i * \Delta I_i$$

Where ΔI is the change in the overall informality rate, s_i is the employment share of the sector i, Δs_i is the change in the employment share of the sector i, I_i is the informality rate in sector i and ΔI_i is the change in the informality rate in the sector i, The first term, $\sum_i s_i^{t_0} \Delta I_i$, captures the within-sector changes in informality rates. The second term measures whether workers move to sectors with below-average informality levels (the between-static effect). The third term represents the joint effect of changes in sector employment and informality levels (the between-dynamic effect).

As we can see, Table 2 illustrates a decrease in the informality rate between 2008 and 2013, primarily attributed to a reduction in intersectoral informality rates. The static component of the between-effect partially compensates for the negative impact of the within-effect. Additionally, the dynamic component contributed only a slight decrease to the informality rate. The opposite effect was experienced between 2014 and 2019, the increase in the informality rate is primarily associated with structural changes in employment. This implies that the reduction in labour informality among workers is largely attributable to shifts in sectoral rates of informality rather than changes in the overall structure of the labour market (static-between effect). The residual effect is linked to variations in labour informality across different industries, the within effect. Interestingly, there is significant variation across industries. The manufacturing and education sectors have experienced a decrease in informality rates, which has been offset by increases in the agriculture, retail, hospitality, and real estate sectors[5].

Table 2. Decomposition of changes in informality rate by industry: 2013-2008

Industry	Within Effect	Between Static	Between Dynamic	Total
Agriculture	-0.37	2.29	-0.05	1.87
Fishing	-0.03	0.06	0.00	0.02
Mining	0.03	0.15	0.01	0.19
Manufacturing	-0.15	-1.37	0.02	-1.50
Construction	-0.31	1.33	-0.10	0.92
Retail	-1.57	-0.41	0.04	-1.94
Transport	-0.33	-1.25	0.05	-1.53
Government	-0.48	0.30	-0.06	-0.24
Hospitality	-0.31	0.46	-0.02	0.12
Real Estate	-0.32	-0.01	0.00	-0.33
Education	-0.25	-0.36	0.04	-0.57
Other Services	-0.76	-0.33	0.04	-1.05
Total	-4.85	0.85	-0.03	-4.03

[5] This methodology has been widely implemented to analyse productivity growth and decomposition, including productivity structural changes.

Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Table 3. Decomposition of changes in informality rate by industry: 2019-2014

Industry	Within Effect	Between Static	Between Dynamic	Total
Agriculture	-0.36	1.85	-0.03	1.47
Fishing	0.04	-0.04	0.00	0.00
Mining	0.09	-0.11	-0.01	-0.03
Manufacturing	-0.18	-0.74	0.02	-0.90
Construction	0.30	-0.44	-0.02	-0.17
Retail	0.06	0.05	0.00	0.11
Transport	0.19	-0.06	0.00	0.13
Government	0.12	-0.34	-0.02	-0.24
Hospitality	0.16	0.31	0.01	0.48
Real Estate	0.14	0.36	0.03	0.53
Education	-0.29	-0.08	0.01	-0.35
Other Services	0.12	-0.05	0.00	0.07
Total	0.40	0.74	-0.03	1.11

Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Informal employment can be analysed through two main margins: extensive and intensive ((Ulyssea, 2018[2]), (Ulyssea, 2020[17]) and (Cisneros-Acevedo, 2022[18])) The extensive margin refers to the participation of workers and firms in the informal sector, which can be influenced by factors such as the regulatory environment, the availability of formal jobs, and individual characteristics like education and skill levels. On the other hand, the intensive margin examines the degree of informality within formal firms since formal firms can employ workers out of the books. Understanding both margins is crucial for developing targeted policies aimed at reducing informality and enhancing job quality. By addressing the factors that drive individuals towards informal employment and improving the conditions within the informal sector, policymakers can better tackle the challenges associated with labour informality. Following (Cisneros-Acevedo, 2022[18]) all employed individuals are classified into intensive informal, extensive informal, or formal employees:

- ***Extensive Informal:*** Workers who declare that their employer is not registered with the Peruvian Tax Collection Agency (SUNAT). Self-employed workers who are not registered as a legal person or as a legal entity (with a Tax Identity Number of RUC, RUS, or RER), thus do not pay taxes on their income[6].
- ***Intensive Informal:*** Salaried individuals who declare that the tax collection agency does not deduct their income (2007-2011), from 2012-2019, salaried workers who declare that their employer does not pay health insurance on their behalf. This includes workers employed in a family firm without a wage. In all these cases, individuals declare that their employer is registered with the tax authority (SUNAT).

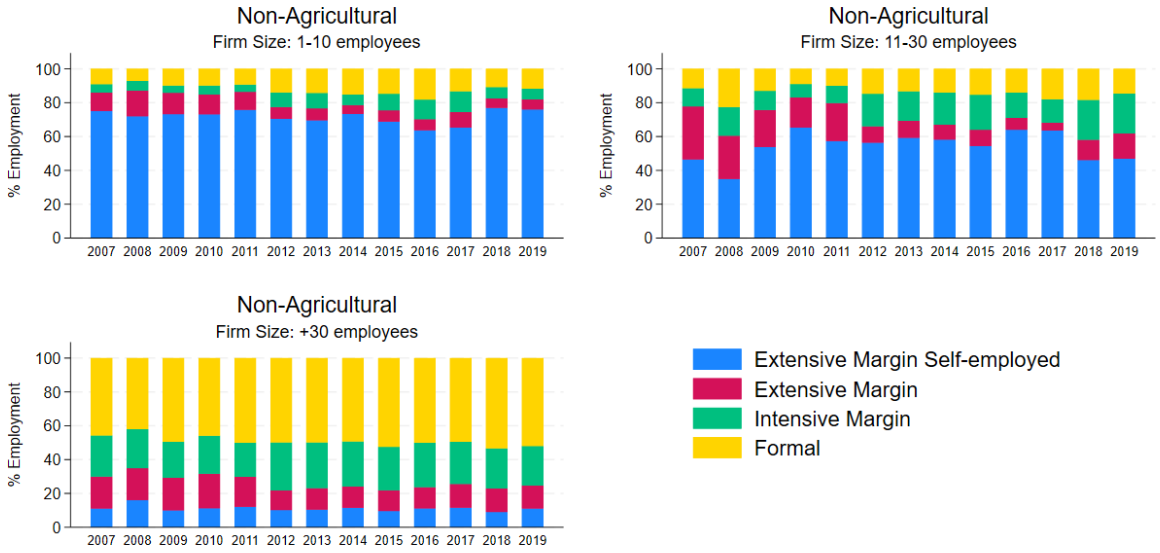
[6] Notice under these definition self-employed workers are classified in the extensive margin of informality or as forma workers.

As previously mentioned, formal employment constitutes approximately 25% of total employment. Notably, the extensive margin of informality accounts for 60% of employment, while the intensive margin represents the remaining 25%. These patterns vary significantly across industries. For instance, the agricultural sector exhibits a substantially higher proportion of informal workers in the extensive margin. Nearly 90% of workers in the agricultural sector are engaged in informal employment, with the extensive margin of informality accounting for over 60%.

A notable feature of our database is its rich information on the characteristics of the firms where the workers are employed, including the number of firm employees. This enables us to analyse the margins of informality considering specific firm characteristics. Previous studies, such as (Ulyssea, 2018[2]) and (Hernando Gutierrez and Rodriguez-Lesmes, 2023[19]), have highlighted that the level of informality is inversely related to firm size, with smaller firms particularly exhibiting larger participation in the extensive margin of informality. Moreover (Infante and Chacaltana, 2014[20]), proves that Peruvian medium-sized firms exhibit greater dynamism in terms of output, employment, and productivity. At the same time, (Kleven, Kreiner and Saez, 2016[21]) and (Samaniego De La Parra and Fernández Bujanda, 2024[22]), posit that the proportion of informal workers in formal firms decreases as the firm's size increases because large firms are more likely to undergo inspections and receive potential fines.

The previous evidence does not imply that small and medium-sized enterprises do not experience intensive informality, but rather that the percentage is lower, Figure 3 precisely illustrates this point. In non-agricultural sectors, firms with 1 to 10 employees exhibit higher informality rates compared to medium and large firms, with a significant predominance of the extensive margin. Almost 90% of the workers are employed in informal firms. It is important to mention that the extensive margin of informality includes waged workers and self-employed independent workers, which represent the larger proportion of informal employment. As firms increase in size, the relevance of the extensive margin diminishes and aligns more closely with the intensive margin, leading to a simultaneous decrease in the total informality rate. The presence of self-employed workers in informal firms decreases as firms get larger. In this context, informal employment in firms with more than 30 employees constitutes approximately 40% of total employment, with informal-extensive and informal-intensive employment being almost evenly distributed.

Figure 3. Informality margins by firm size



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

On the other hand, most of the empirical evidence points out that women are more likely to be involved in informal work (OECD, 2023[5]).
Table 4 suggests that the claim is only true for the extensive margin of informality. Our analysis indicates that the difference in mean gender composition between registered workers (both formal and informal-intensive) and informal-intensive workers is negative and statistically significant. Additionally, registered workers exhibit significantly different individual characteristics, such as age, education, industry, and income, compared to those of workers in the extensive margin. Similar results are observed when comparing the mean differences in characteristics between formal and informal-intensive workers.

Individuals in their prime age (31-45 years) are more likely to be employed in registered firms, while younger and older workers are more involved in the extensive margin of informality. Conversely, educated workers are more likely to be hired in formal employment, whereas younger and less educated individuals have a greater participation in the intensive margin of informality. It is plausible that young and healthier individuals are willing to forgo the benefits of formal jobs. Additionally, individuals whose mother tongue is Spanish are more likely to participate in the formal sector, to the detriment of those who identify with native languages such as Quechua or Aymara. Finally, there is a significant difference in wages. Registered firms pay an average of 560 USD per month, compared to the 230 USD earned by informal-extensive workers. Although informal-intensive workers experience a slight wage increase, their earnings still amount to only half of what formal workers receive.

Figure 4 and Figure 5 illustrate the wage distribution across various firm sizes and informality margins. The data support the concept of an informal job ladder, wherein workers' average incomes differ by their labour market status, and changes in earnings are associated with labour mobility. Significantly higher wages in formal employment explain the tendency of formal-wage workers to have longer job tenures and a lower propensity to leave their positions. Interestingly, there are important differences within the informal sector. Specifically, informal self-employed workers earn considerably lower wages compared to informal workers in informal firms, who, in turn, earn less than informal workers in formal firms. This observation aligns with traditional economic theories, which posit that formal salaried workers earn more than informal workers and that employees in larger firms receive higher compensation compared to those in smaller firms. Additionally, this evidence supports the hypothesis that formal and informal firms coexist within the same economic space (Maloney, 1999[23]), (Meghir, Narita and Robin, 2015[24])and (Ulyssea, 2018[2]).

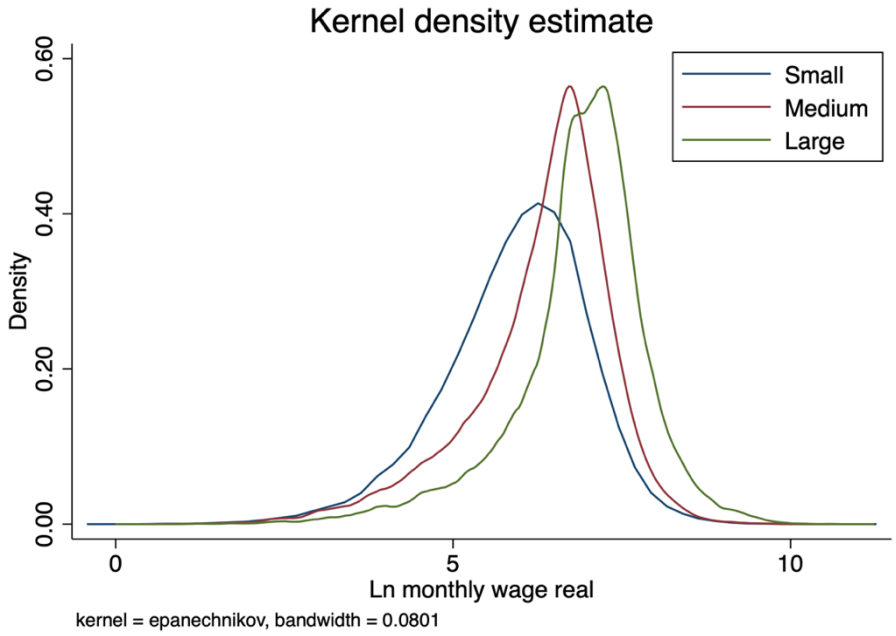
Table 4. Summary statistics Informality Margins

	Formal and informal workers in formal firms	Informal workers in informal firms		Formal Workers	Informal workers in formal firms	
Category	Mean	Mean	Difference	Mean	Mean	Difference
Gender	0.421	0.542	-0.121***	0.407	0.444	-0.037***
16-24 years	0.178	0.173	0.005***	0.075	0.349	-0.274***
25-30 years	0.164	0.130	0.034***	0.141	0.201	-0.059***
31-45 years	0.370	0.366	0.004*	0.414	0.296	0.118***
46-55 years	0.189	0.204	-0.015***	0.240	0.103	0.137***
+55 years	0.100	0.127	-0.027***	0.129	0.051	0.078***
No level	0.004	0.036	-0.032***	0.003	0.007	-0.004***
Primary	0.073	0.279	-0.206***	0.056	0.100	-0.044***
Secondary	0.341	0.489	-0.147***	0.288	0.431	-0.144***
Non-university	0.254	0.123	0.131***	0.274	0.221	0.053***
University	0.281	0.073	0.208***	0.311	0.229	0.082***
Postgraduate	0.047	0.001	0.046***	0.069	0.012	0.057***
Spanish	0.877	0.795	0.082***	0.886	0.860	0.026***
Manufacturing	0.110	0.126	-0.016***	0.100	0.125	-0.025***
Retail	0.180	0.338	-0.159***	0.176	0.186	-0.010***
Real income USD	559.093	230.630	328.462***	694.415	333.046	361.369***

Note: Registered workers represent workers employed by formal firms, including the intensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The sample does not include those workers in the agricultural and fishing industries. Columns 4 and 7 stand for the mean difference between the groups and * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

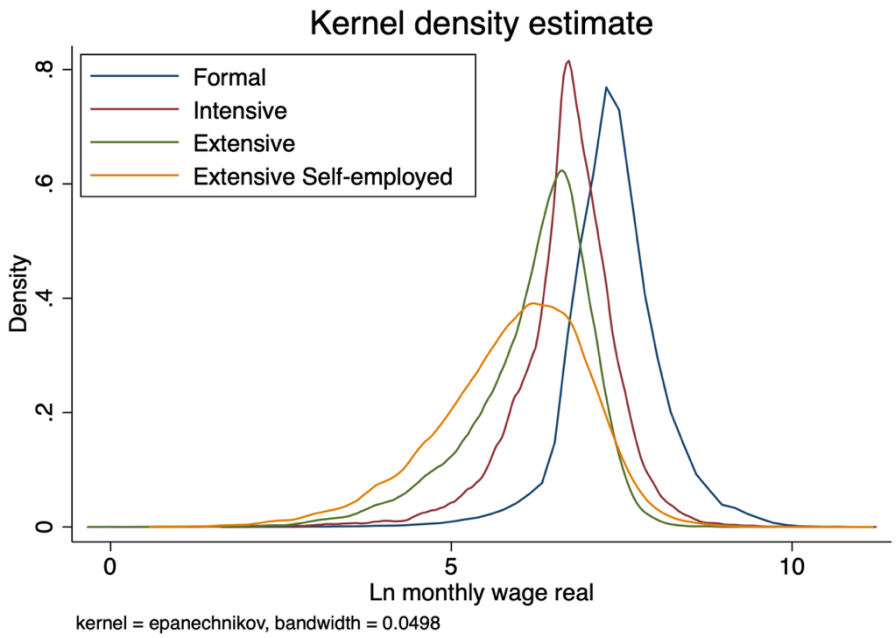
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 4. Wage distribution by firm size



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 5. Wage distribution by informality margins



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Empirical Strategy

This paper aims to identify the key factors driving individuals' decisions to participate in the informal labour market and to analyse how these factors affect different margins of informality. It uses a discrete choice model to first estimate labour supply factors and then identify determinants influencing the choice between formal employment and various forms of informality. Additionally, the paper employs a multinomial logit model to explore transition patterns among six labour market states, including formal and informal employment, unemployment, and out of the labour force. The empirical analysis further investigates the relationship between labour market transitions and changes in income, specifically examining whether moving between informal and formal jobs results in significant income gains or losses and whether these effects differ between the extensive and intensive margins of informality.

Informality Determinants Model

The decision to participate in the labour market is generally influenced by supply factors (worker characteristics) and demand factors (job or employer characteristics). Workers may enter the labour market due to personal preferences (self-selection) or other unobservable variables. Additionally, the choice to engage in the informal labour market can be affected by barriers to accessing formal employment.

To address selection bias, the paper employs an extension of the Heckman model tailored for situations where the dependent variable is binary rather than continuous (Heckprobit). This method allows for a more precise understanding of the determinants of various levels of informality. The Heckprobit model comprises two stages: first, estimating a selection model to determine the probability of an individual participating in the labour market, and second, estimating an outcome equation to model the probability of formal versus informal employment, conditional on labour market participation. The selection equation used is the following:

$$Z_i^* = \gamma_0 + \gamma_1 \mathrm{W_{i1}} + \gamma_2 \mathrm{W_{i2}} + \cdots + \gamma_\mathrm{k} \mathrm{W_{ik}} + \mathrm{u_i}$$

where:

- $\mathrm{Z_i^*}$ is a latent variable indicating the propensity to participate in the labour market, which takes value 1 if the worker participates in the labour market and 0 if the worker is unemployed or inactive in the market.
- $\mathrm{W_{ij}}$ are the explanatory variables affecting labour market participation. In the selection equation, we include individual characteristics, household variables and economic contextual variables.
- $\gamma_0, \gamma_1, \ldots, \gamma_\mathrm{k}$ are the coefficients to be estimated and u_i is the error term.

On the other hand, the outcome equation models the probability of formal employment conditional on labour market participation:

$$\mathrm{Y_i^*} = \beta_0 + \beta_1 \mathrm{X_{i1}} + \beta_2 \mathrm{X_{i2}} + \cdots + \beta_\mathrm{m} \mathrm{X_{im}} + \epsilon_\mathrm{i}$$

where:

- $\mathrm{Y_i^*}$ is a latent variable indicating the propensity for formal employment.

- $\mathrm{X_{ij}}$ are the explanatory variables affecting employment formality.
- $\beta_0, \beta_1, \ldots, \beta_m$ are the coefficients to be estimated, and ϵ_i is the error term.

In the analysis, four distinct cases are considered. In the first case, the dependent variable is 1 if workers are employed in the informal sector and 0 otherwise. In the second case, it is 1 for informal workers in formal firms and 0 for formal workers. In the third case, the variable takes value 1 for extensive informal waged workers and 0 for both formal workers and informal workers in formal firms. In the fourth case, the dependent variable takes value 1 for extensive self-employed workers and 0 for formal workers and informal workers in formal firms.

Labour Transition Model

The models discussed above provide a clearer understanding of the determinants of various employment statuses, such as formal employment, informal-intensive employment, and informal-extensive employment. However, they do not offer insights into the transitions between these states. Therefore, this section develops an empirical model to elucidate the dynamics of the workforce in Peru.

By exploiting the panel dimension of our dataset, we estimate a multinomial logit model. This model allows us to identify the characteristics of workers that directly influence the probability of transitioning from one employment status *i* to another *j*, relative to the probability of remaining in the same status *i*. Recent literature, including studies by (Vega, 2018[12]) and (Kishi and Kano, 2017[25]), has utilised this type of model to estimate transitions between self-employment, salaried employment, unemployment, and inactivity. In our analysis, we consider five mutually exclusive employment statuses: (1) Formal, (2) Intensive informal, (3) Informal Extensive Waged (4) Informal Extensive Self-employed, (5) Unemployed, and (6) Out of the Labour Force or Inactive.

$$Pr\left(\mathrm{Y_{i,t+1}} = \mathrm{j} \mid \mathrm{Y}_{i,t} = k\right) = \frac{\exp\left(\mathrm{X_i'\beta_{j|k}}\right)}{\sum_{\mathrm{l}=1}^{\mathrm{K}} \exp\left(\mathrm{X_i'\beta_{l|k}}\right)}$$

where X_i are individual characteristics; $Y_i, t \in \{0,1,2, \ldots, K\}$ is the labour market state of individual i at time t. For a Multinomial Logistic Model to be identified, one outcome $k \in K$ is specified as the base or reference group such that $\beta_{k|k=0}$. The parameter vector β is straightforward to estimate using the maximum likelihood estimation method. The estimated coefficients are not directly interpretable and are seldom used for inference. Therefore, we compute the marginal effects of each independent variable to facilitate meaningful interpretation.

As in previous sections, we consider a set of worker characteristics, including gender, age, marital status, education, work experience, household head status, and an indicator for urban residency. Additionally, we incorporate household characteristics, such as the number of children under the ages of 3, 5, 10, and 17, as well as the number of elderly individuals living in the household. To ensure identifiability, the base category selected in every case is remaining in the initial work status.

Income Mobility Model

The final empirical analysis of this paper aims to explore the relationship between labour market transitions and changes in workers' labour income. Specifically, it examines whether shifts from informal to formal jobs (and vice versa) result in significant income gains or losses. Additionally, the analysis investigates whether these effects differ depending on whether the transitions involve the extensive or intensive margins of informality.

Following the approach implemented by (Aleksynska, La and Manfredi, 2023[17]), this paper estimates several models where the dependent variable, $\Delta Income_{ij}$, is a dichotomous variable that indicates whether a worker experienced a large income gain, a large income loss, a small income gain, or a small income loss from period *t* to *t+1*. The variable is set to one if any of the previous changes occurred, and zero otherwise. As (OECD, 2018[30]) and (Aleksynska, La and Manfredi, 2023[17]) a large income gains or losses are defined as a 20% or greater increase or decrease in real income compared to the previous period. On the other hand, a small income gain or loss is defined as less than a 20% increase or decrease in real income compared to the previous period.

$$\Delta Income_{ij} = \alpha_{ij} + \beta_{1,j} * Transition + \sum_{k=1}^{K} \gamma_{k,i} * X_i + \varepsilon_{ij}$$

In this paper, the independent variable of interest is *Transition*. This is a dichotomous variable, which indicates the labour transition of workers from their labour status in period *t* to the final status one period ahead. The variable takes value 1 if the worker exhibits a labour market transition according to the six potential scenarios: (i) moving from a formal job to an informal intensive job, (ii) moving from a formal job to an informal intensive job, (iii) switching from an informal intensive to an informal extensive job, (iv) switching from an informal intensive to a formal job, (v) transitioning from an informal extensive to an informal intensive job, or (vi) transitioning from an informal extensive to an formal job, and zero otherwise. Notice the benchmark is the individuals who remained in their previous work status. Additionally, the models the equations include a large range of socioeconomic characteristics, similar to the one included in previous section, given by the third term of the model, while ε_{ij} is the error term. Two methods of estimation are proposed in this paper, the first one a linear probability model and a logistic regression. In the case of the logistic regression, the parameters are expressed in odds ratios.

Empirical Results

Drivers of Informality

Our initial analysis seeks to identify the determinants influencing various margins of informality in the Peruvian labour market. To address potential endogeneity bias, we first estimate a labour market participation equation (selection equation). In the subsequent stage, we examine workers' choices to engage in formal employment, intensive informal employment, or extensive informal employment, which reflects their decision-making process regarding job quality as described in labour search models. The analysis focuses on individuals aged 16 to 65 years.

The results from the second stage of the Heckprobit model, illustrated in Figure 6, reveal several key insights. Women are more likely to work in informal jobs, with a probability 3% higher than men, consistent with previous studies (Chong, Galdo and Saavedra, 2008[9]) and (Barco and

Vargas, 2010[26]). This higher probability is particularly pronounced in informal self-employment, where wage disparities between men and women are most significant.

Work experience also significantly impacts the likelihood of informal employment. Each additional year of experience reduces the probability of informal employment by 1.5 percentage points, though this effect diminishes with time. The impact is notably stronger in the intensive margin, where the probability of informal work decreases four times more compared to the extensive margin, and these differences are statistically significant. Conversely, each additional year of experience in informal self-employment increases the likelihood of being engaged in the extensive margin of informality.

Education has a clear negative relationship with informal employment. Panel 3 of demonstrates that having elderly individuals in the household reduces the probability of informal employment, particularly in the extensive margin. This can be attributed to increased domestic support, which enhances the likelihood of formal employment. This effect is more pronounced for women, who are more likely to undertake caregiving responsibilities. Additionally, the head of the household is less likely to engage in informal work compared to other household members.

Lastly, residing in an urban area generally decreases the probability of informal employment across all margins. However, the reduction is less pronounced for informal workers in informal firms and informal self-employed workers compared to those in formal firms.

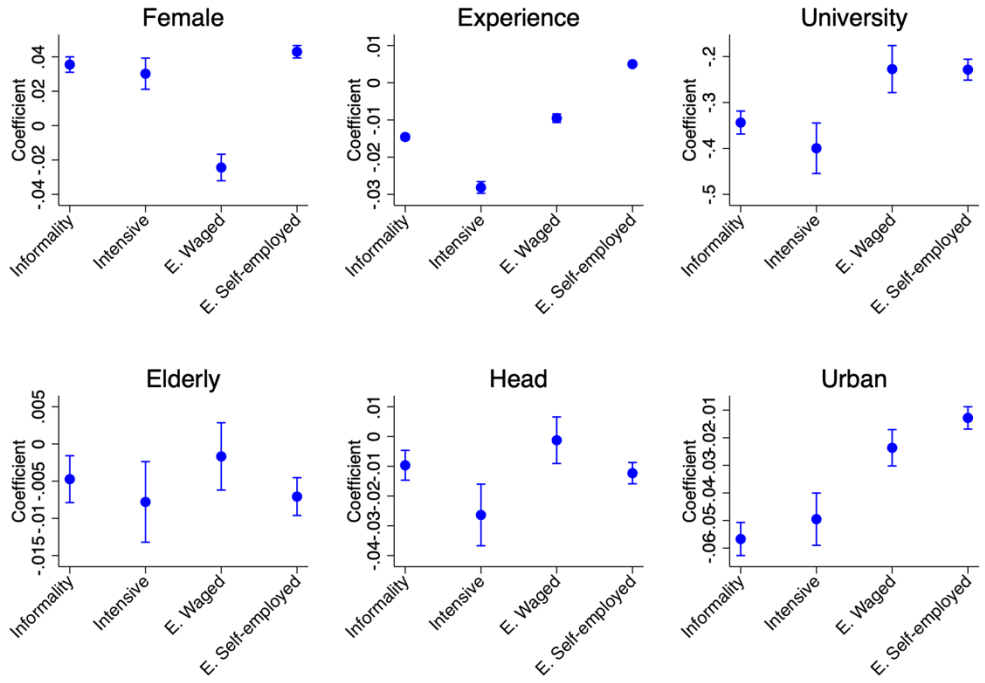
In summary, demographic factors such as gender, work experience, education, and location significantly influence the different margins of informality in the labour market. Panel 3 illustrates that individuals with complete university degrees are less likely to be employed informally. The effect of education is more pronounced in the intensive margin compared to the extensive margin.

Household characteristics also play a crucial role. Panel 4 demonstrates that having elderly individuals in the household reduces the probability of informal employment, particularly in the extensive margin. This can be attributed to increased domestic support, which enhances the likelihood of formal employment. This effect is more pronounced for women, who are more likely to undertake caregiving responsibilities. Additionally, the head of the household is less likely to engage in informal work compared to other household members.

Lastly, residing in an urban area generally decreases the probability of informal employment across all margins. However, the reduction is less pronounced for informal workers in informal firms and informal self-employed workers compared to those in formal firms.

In summary, demographic factors such as gender, work experience, education, and location significantly influence the different margins of informality in the labour market.

Figure 6. Informality drivers (margins)



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The three models include industry and year dummies.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Drivers of labour transitions

The main purpose of this section is to understand the labour transition dynamics in the Peruvian labour market. Before moving to the multinomial logit model, this paper analyses the labour dynamics with transition matrices. The transition matrices are useful to explore the movement of workers between various labour statuses by calculating the conditional probability of a worker being in state j at the end of the period, given that the worker started in state i.

Table 5 describes labour mobility in the Peruvian labour market. Regarding workers who initially held formal employment, we observe that almost 77% remain in formal employment after one period. Interestingly, about 16% transition to informal employment, with a significant portion moving to informal self-employment (7.9%), only 2% to informal jobs in informal firms and the remaining 6% shift to the intensive margin of informality. Overall, these movements indicate a deterioration in the labour conditions of these workers, partly explained by a reduction in employment opportunities within the formal sector ((Perry et al., 2007[1]) and (Vega, 2018[13])). Additionally, formal workers leaving the labour force represent 5% of the transition movements and workers transitioning to unemployment only 1.5%.

Movements in the informality margins exhibit interesting patterns. Starting with outflows from the intensive margin, informal workers in informal firms exhibit a higher propensity to change their employment status. The likelihood of remaining in this category is below 40%, indicating a

preference for seeking alternative employment opportunities. About 18% of these workers secure better prospects in the formal sector, where wages are generally higher. Outflows to the extensive margin account for 29% of the movements, with a significant portion (16%) transitioning to informal self-employment. This suggests that many informal workers in formal firms struggle to improve their working conditions.

Focusing on informal workers within informal firms, the data shows that approximately 70% of these workers remain in the extensive margin after one period. Specifically, 43% continue in informal firms, and 23% shift to informal self-employment. Furthermore, 80% of those who are informally self-employed maintain this status in the subsequent period. Only 6% move to informal positions within informal firms, and 3% take up informal jobs within formal firms. Merely 3% advance to fully formal positions.

This evidence highlights that extensive informal employment often serves as a dead-end for many workers, with limited opportunities for job improvements. In general terms, these findings support the existence of an informal labour ladder, where workers in informal jobs within informal firms face significant challenges in securing better employment opportunities, both within the intensive margin and in transitioning to fully formal positions. However, once workers shift to informal jobs within formal firms, their likelihood of moving to fully formal employment increases.

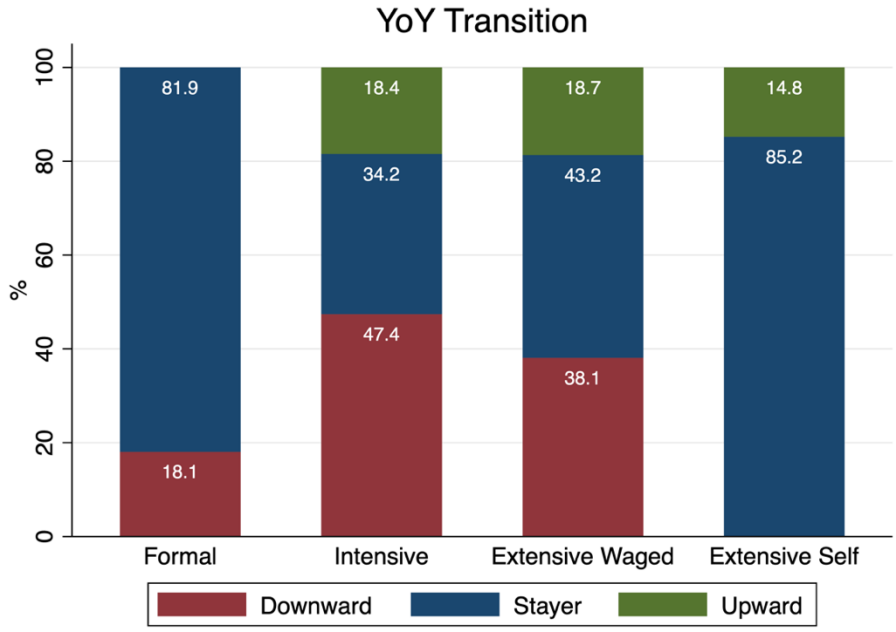
On the other hand, the fifth row indicates high mobility out of the unemployment sector, with only 13% of workers remaining unemployed after one period. It is noteworthy that unemployed workers are more likely to find a job at the extensive margin, which has the worst labour conditions, than to secure an informal job in a formal firm, and it is even less likely for them to find a fully formal job. From a traditional view, this could be due to insufficient human capital or other individual worker characteristics or preferences. As unemployment is the lowest tier in the labour market, individuals in this situation may find it challenging to enter the formal sector, making them more likely to accept jobs with inferior labour conditions and lower earnings (Vega, 2018[13]).

Table 5. Labour Transition Matrix (probabilities)

			Final Status (t+1)			
Initial Status (t)	Formal	Informal Intensive	Extensive Waged	Extensive Self-employed	Unemployed	Out of LF
Formal	76.97	6.32	2.11	7.94	1.52	5.13
Informal Intensive	17.58	36.39	12.88	15.8	3.5	13.85
Extensive Waged	4.27	12.32	42.96	27.45	2.26	10.75
Extensive Self-employed	3.61	3.48	5.77	79.12	0.93	7.09
Unemployed	10.55	15.85	9.78	16.23	12.76	34.83
Out of LF	3.9	6.49	5.06	14.24	4.11	66.19

Note: Each row indicates work status in period t s
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 7. Year-to-year transitions up and down the informality job ladder (%)



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Complementary to the transition matrix table, the destinations after leaving the initial status also provide interesting insights. Figure 7 illustrates the share of workers who stay in their current work status, the share who transition to higher-paying jobs, and the share who transition to lower-paying jobs. This analysis focuses solely on employed workers, excluding those who are unemployed or out of the labour market.

As expected, a significant majority of formal workers (80%) remain in their status after one period, with only a small fraction moving to lower-paying positions. Interestingly, among informal workers in formal firms, almost 50% transition to the extensive margin (either to informal firms or becoming informal self-employed), 34% remain in their current job type, and only 18% move up the job ladder. The figure highlights the challenges faced by workers on the extensive margin of the informality ladder. About 80% of informal workers in informal firms either stay in their status or move to informal self-employment. Furthermore, 85% of the informally self-employed remain in their status, with less than 15% climbing a step on the informality job ladder.

The multinomial analysis considers all labour market transitions, encompassing movements from each of the six initial labour market statuses to each of the six final labour statuses. However, this section will focus specifically on the informality model, examining transitions from the intensive margin, extensive waged margin, and extensive self-employed margin of informality[7].

Starting with the extensive margin of informality, Table 6 provides the results of moving from the informal self-employed status to one of the final statuses, i.e. staying in informal self-employed positions, moving to informal firms, moving to the informal intensive margin, reaching formal works, unemployment or exiting the labour market. Looking at the first row, it is possible to identify that gender plays a significant role in transitions between different work statuses. Specifically, women have a 1% lower probability of transitioning to formal employment compared to men, and this effect is statistically significant (Column 1). Furthermore, it is challenging for women to transition from informal to formal firms, even when they perform informal work in a formal firm (intensive margin). Women are 3% less likely to advance in the informality ladder by working in a formal firm and 7.5% less likely to start working in an informal firm, 3% (Columns 2 and 3, respectively). Moreover, women are more prone to maintain the informal self-employed status (Column 4). Consequently, the results indicate that female workers are 8% more likely to exit the labour market compared to their male counterparts.

Moving to worker characteristics such as experience, it seems that for informal self-employed workers, the experience accumulated over the years does not play an important role in upgrading their job quality. In the case of transitions to formal and informal intensive jobs, each extra year of experience is associated with a negative probability of 0.1% and 1.4%, respectively. However, workers who accumulate experience in informal extensive jobs are more likely to remain in the informal sector. One additional year of experience in the informal self-employed sector increases the probability of remaining in informality by 2,6% while also having a small but negative effect on the likelihood of exiting the labour market. This trend reflects how continued informal employment can entrench self-employed workers in informal roles, making transitions to formal

[7] The results from the formal multinomial model can be found in Table 9.

employment more challenging and thereby reducing overall labour market mobility ((ILO, 2019), (Maurizio, 2021) and (Ohnsorge & Yu, 2022)).

As expected, human capital accumulation is a key determinant when analysing the transition from the informal sector. The results show that one additional year of schooling increases the probability of moving from informal self-employment to formal and intensive informal jobs by 0.7% and 0.4%, respectively. Moreover, the effect of education on the probability of staying in the extensive margin of informality is negative and statistically significant, revealing that those individuals who manage to increase their educational level are more likely to exit informality. According to (Vega, 2018[12]), it is possible that workers initially enter the informal sector as a temporary employment option while continuing their education. As they enhance their skills and achieve higher levels of education, they seek better labour conditions and opportunities in the formal sector. Notice these effects are similar when analysing the transition of informal workers in informal firms in Table 7.

The results also indicate that individuals in urban areas are less likely to remain in the informal self-employed or move to informal firms. Particularly, the probability of maintaining an informal self-employed job or switching to an informal firm is reduced by 8% and 2%, respectively. This suggests that labour opportunities are more plentiful in large cities. Individuals in urban areas are 2.4% more likely to transition to formal employment and 1.6% more likely to move to intensive informal jobs compared to workers in rural areas.

Regarding flows from the intensive margin of informality, Table 8 provides interesting insights. As before, gender is an important determinant of labour flows. Particularly, female workers are 4.3% less likely to move to formal jobs compared to male workers, while it seems that women are 4% more likely to stay in formal firms but carry out informal jobs (Columns 1 and 2, respectively). Interestingly, women are 12% less likely to move from the intensive margin to the extensive margin of informality (Column 3). Notably, years of education play a more significant role for informal workers in formal firms compared to workers in the extensive margin. The educational level row in Table 8 indicates that each additional year of schooling increases the probability of transitioning to the formal sector by 2.2% (Column 1). This effect is three times greater than the impact of transitioning from extensive informal to formal jobs, reflecting a larger payoff of schooling for those workers who are employed by formal firms but remain in informality.

Overall, these results reflect interesting patterns regarding transitions between different margins of informality. It seems that regardless of the starting informality margin, female worker exhibits more difficulties when they move to job positions on a step ahead in the informality ladder. Even if they are hired by formal firms, the probability of remaining (formal to formal jobs) or upgrading (informal intensive to formal jobs) is considerably lower compared to male individuals. Regardless of their initial labour status, women are more likely to exit the labour market, with the probability ranging between 8-15% depending on the informality margin, compared to 5.2% for women starting in formal jobs. On the other hand, experience gained in the informal sector tends to increase the probability of remaining in informality. This is particularly evident among informal self-employed workers. Additionally, education has a positive effect on transitions from the informal sector to the formal sector. However, its impact seems to vary depending on the specific level of the informality ladder that workers occupy. The level of education tends to be more significant for workers holding informal positions within formal firms.

Table 6. Informal Extensive Self-employed Transition Model

		From informal extensive self-employed jobs to				
Variable	Formal	Intensive	Extensive Waged	Extensive Self-employed	Unemployed	No labour force
Female	-0.006*	-0.026***	-0.075***	0.024***	0.003*	0.080***
	-0.003	-0.003	-0.003	-0.006	-0.002	-0.004
Age	0.002***	0.001*	0.002**	0.006***	-0.001**	-0.011***
	-0.001	-0.001	-0.001	-0.001	0.000	-0.001
Experience	-0.001*	-0.014***	-0.011***	0.026***	0.000	-0.001**
	0.000	-0.001	0.000	-0.001	0.000	0.000
Education level (years)	0.007***	0.003***	-0.004***	-0.007***	0.001***	0.000
	0.000	0.000	0.000	-0.001	0.000	0.000
Married	0.010**	-0.004	0.005	-0.013*	-0.006**	0.007
	-0.003	-0.003	-0.004	-0.006	-0.002	-0.004
Spanish	-0.005	-0.014***	0.007	-0.003	0.000	0.014**
	-0.004	-0.003	-0.004	-0.006	-0.002	-0.004
Urban	0.024***	0.016***	-0.018***	-0.084***	0.010***	0.052***
	-0.003	-0.003	-0.004	-0.006	-0.001	-0.003
Observations	45028	45028	45028	45028	45028	45028

Note: Standard deviation in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001. Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Table 7. Informal Extensive Waged Transition Model

		From informal Extensive Waged jobs to				
Variable	Formal	Intensive	Extensive Waged	Extensive Self-employed	Unemployed	No labour force
Female	-0.019***	-0.013	-0.165***	0.039***	0.007	0.151***
	-0.006	-0.009	-0.012	-0.011	-0.005	-0.01
Age	0.007***	0.001	0.004	0.006**	-0.001	-0.016***
	-0.001	-0.002	-0.002	-0.002	-0.001	-0.001
Experience	-0.003***	-0.015***	-0.008***	0.027***	0.001	-0.001
	-0.001	-0.002	-0.002	-0.001	0.000	-0.001
Education level (years)	0.007***	0.007***	-0.014***	-0.001	0.001	0. 000
	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001
Married	0.018*	0.002	-0.029	0.003	0.006	0. 000
	-0.008	-0.012	-0.015	-0.013	-0.005	-0.01
Spanish	0.005	0.008	-0.029*	-0.003	-0.002	0.019*
	-0.007	-0.011	-0.014	-0.011	-0.005	-0.009
Urban	0.023***	0.035***	-0.019	-0.100***	0.019***	0.044***
	-0.005	-0.008	-0.012	-0.01	-0.003	-0.007
Observations	12590	12590	12590	12590	12590	12590

Note: Standard deviation in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001. Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

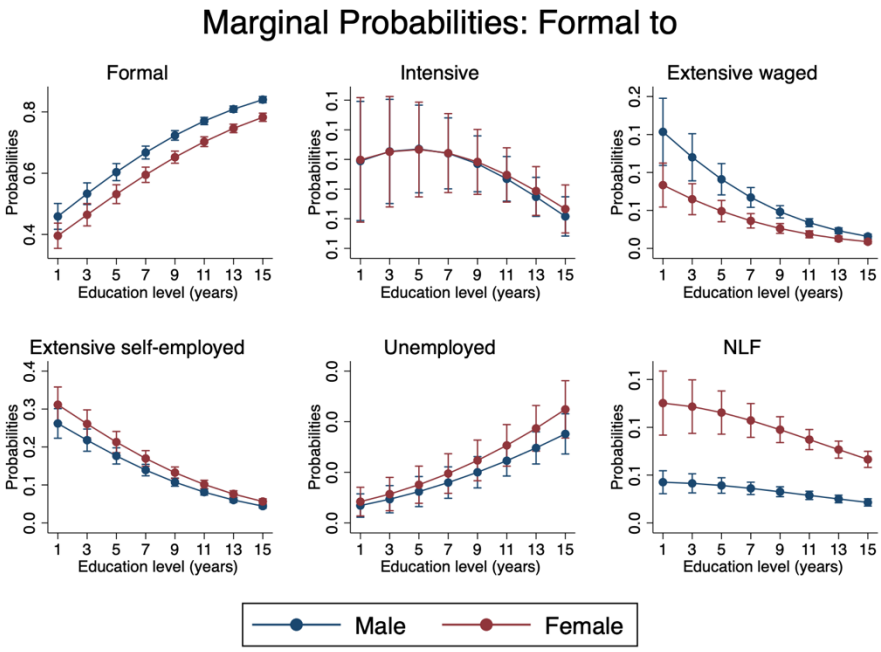
Table 8. Informal Intensive Transition Model

		From informal intensive jobs to				
Variable	Formal	Intensive	Extensive Waged	Extensive Self-employed	Unemployed	No labour force
Female	-0.043***	0.036***	-0.127***	0.009	-0.004	0.128***
	-0.007	-0.01	-0.008	-0.008	-0.005	-0.007
Age	0.009***	0.011***	0.002	0.006***	-0.001	-0.026***
	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001
Experience	0.009***	-0.002	-0.006***	0.014***	-0.003**	-0.012***
	-0.001	-0.003	-0.002	-0.001	-0.001	-0.002
Education level (years)	0.022***	0.009***	-0.016***	-0.011***	0.002**	-0.006***
	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Married	0.000	-0.035*	-0.018	-0.009	-0.003	0.065***
	-0.013	-0.015	-0.01	-0.011	-0.009	-0.013
Spanish	0.022	0.001	-0.027**	-0.022*	0.011	0.015
	-0.013	-0.014	-0.009	-0.009	-0.008	-0.01
Urban	0.063***	0.115***	-0.088***	-0.112***	0.020***	0.002
	-0.008	-0.01	-0.009	-0.009	-0.004	-0.008
Observations	15683	15683	15683	15683	15683	15683

Note: Standard deviation in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001. Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Another interesting empirical exercise in understanding the impact of worker characteristics on labour transition dynamics involved estimating how education influences the likelihood of moving from formal employment to other labour statuses. Figure 8 illustrates the probabilities of formal transition for men and women across different educational levels. Interestingly, as educational attainment increases, the probability of exiting the labour force or moving to the intensive margin of informality remains relatively stable, with no significant statistical differences between men and women. However, the likelihood of transitioning to the extensive margin of informality decreases considerably. Men consistently exhibit a higher probability of remaining in the formal sector, even as women's educational levels increase.

Figure 8. Effect of level of education on formal labour market transitions by gender

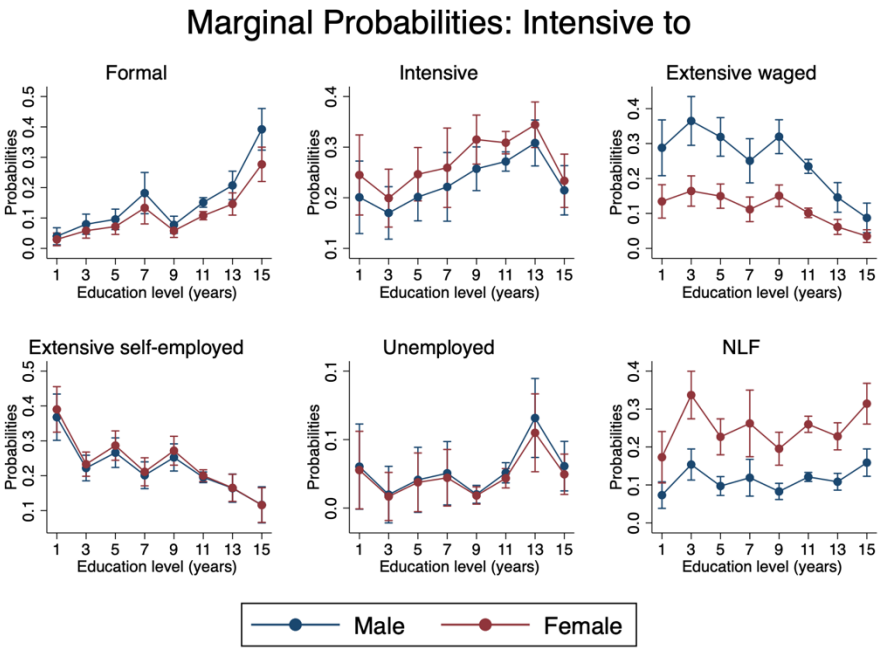


Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Regarding the impact of educational level on informal (both intensive and extensive margin) labour transition dynamics in Peru, the results show that male workers have a higher probability of moving from the extensive margin of informality to the intensive margin compared to female workers. This probability increases rapidly with higher levels of education but becomes statistically not different from women when workers possess a college degree. A key finding is that workers in the extensive margin of informality face greater difficulty transitioning to the intensive margin than those in the intensive margin do moving to the extensive margin. Furthermore, the probability of transitioning from the extensive margin to formal employment is half that of workers moving from intensive informal employment to formal employment. Workers in the intensive margin with a full high school education have more than double the chances of securing better jobs compared to workers in the extensive margin with the same level of education.

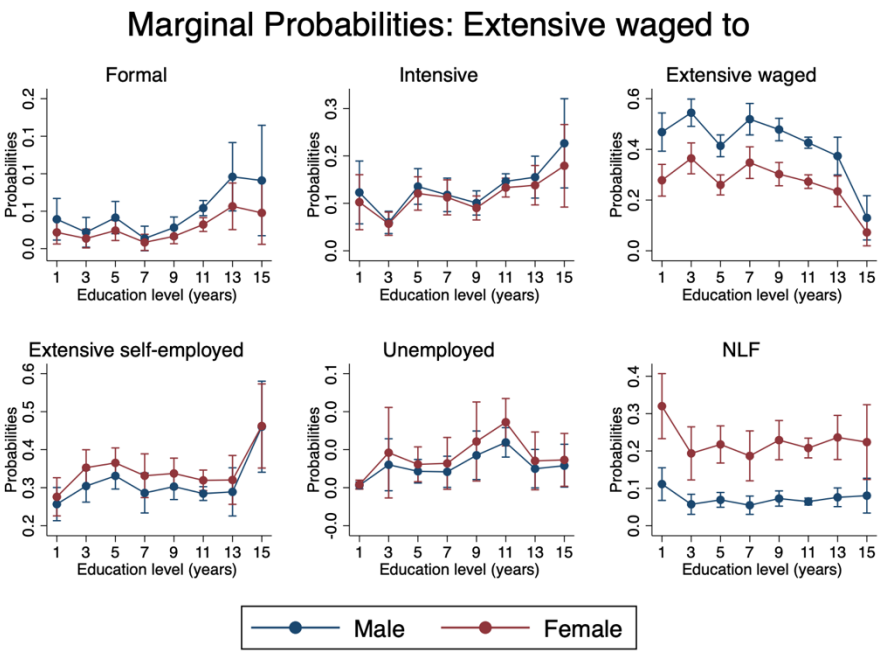
This last finding is very important for the Peruvian context since 80% of informal employment is generated in the extensive margin. This sector is characterised by lower wages, poorer labour conditions, and a significant overrepresentation of women. Women are particularly affected by these adverse conditions, as they are more likely to be employed in the extensive margin, which is also associated with lower levels of education. As previously mentioned, the extensive margin of informality is characterised by workers employed in micro and small firms. These small firms are more exposed to economic vulnerabilities, exacerbating the challenges faced by workers. Given that informal work in informal firms offers inferior labour conditions and reduced economic security, it is critical to address these disparities to improve the overall labour market dynamics in Peru.

Figure 9. Effect of level of education on intensive labour market transitions by gender



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 10. Effect of level of education on extensive waged labour market transitions by gender



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Absolute Income Mobility

The final analysis of the paper aims to test the linkages between labour market transitions and income changes. These findings suggest that in addition to enhancing social protection and regulatory enforcement or monitoring, formalisation can provide immediate and tangible income improvements for workers and their families. Conversely, informalisation increases the likelihood of adverse income outcomes for workers, increasing the probability of substantial income losses.

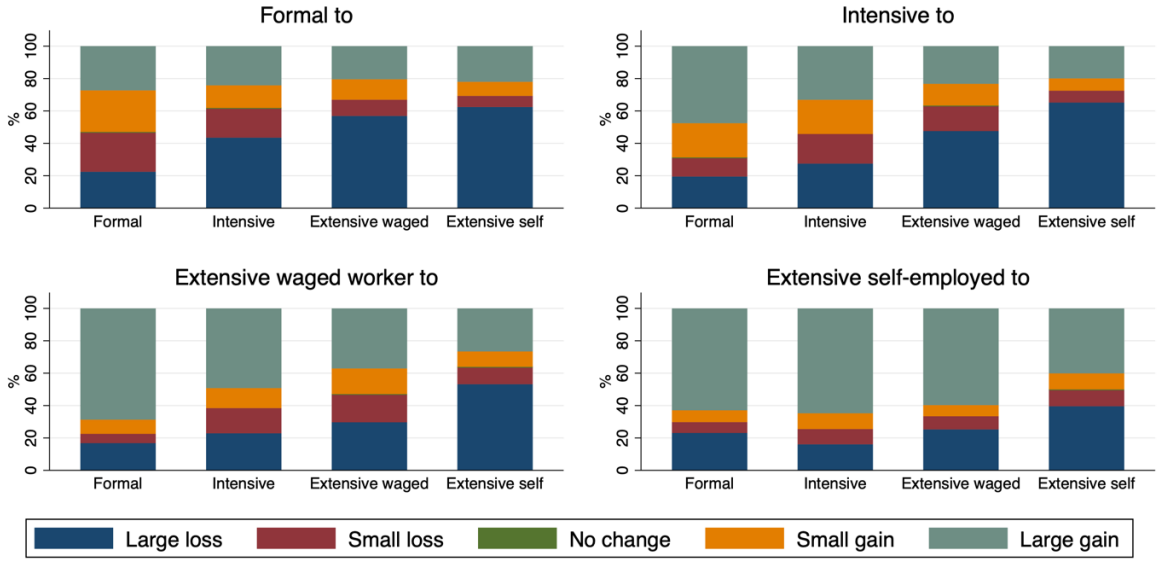
Figure 11 illustrates the proportion of workers experiencing different types of income changes, categorised by whether they maintain their initial employment status or transition to a different one. Among workers who remain in the formal sector in period t+1, more than 50% exhibit small or large income increases. Notably, formal workers who move down the labour ladder show significant income reductions, particularly those who start in the formal sector in period t and transition to the extensive margin of informality in period t+1.

For informal workers in formal firms, around 70% who transition to the formal sector in t+1 experience income increases, with 50% showing substantial increases (more than 20%). Conversely, those who move to informal firms or become informal self-employed workers generally experience significant income reductions.

Examining the extensive margin of informality, upward movements in the labour ladder are strongly associated with income gains. Specifically, 60% of workers who move to the intensive margin experience income increases, while nearly 80% of those who transition to the formal sector see income gains. Informal workers in informal firms that move to informal self-employment are likely to incur large income losses. Nonetheless, if self-employed workers in the informal sector manage to climb the informal labour ladder to reach informal or formal firms, they have a high likelihood of seeing income improvements.

Overall, these results suggest that remaining in or transitioning to the formal sector is the most effective strategy for workers to achieve significant income gains. However, any upward movement in the labour ladder is generally associated with income gains. It is noteworthy that a portion of workers who remain in their informal status or even move down one step on the labour ladder can still improve their income, although this proportion is much smaller compared to those who make positive job transitions.

Figure 11. Income changes by labour transition



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. Large gain (loss) represents an income change of 20% (-20%) or more (less) from period t to t+1, while small income gain represents an income change smaller than 20% (-20%).
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

The next step is to determine whether these patterns hold in a regression analysis. Using a linear probability model, Figure 11 and Figure 13 present the estimated coefficient of the variable "transition" from the income mobility model[8].

Starting with the impact of changing work status on income losses, the first panel of Figure 11 shows that transitions from formality to any margin of informality are associated with high probabilities of income losses, with all three coefficients being statistically significant. Interestingly, the probability of large income losses increases as workers move further down the informality ladder. Specifically, formal workers who move to informal positions within informal firms are around 16% more likely to experience a decrease of 20% or more in their labour income compared to those who remain in the formal sector. This probability exceeds 30% for formal workers transitioning to self-employment in the informal sector.

Additionally, informal workers in formal firms who move to informal firms are 10% more likely to see a decrease in their labour income. If they transition to informal self-employment, this probability increases by 20 percentage points, exceeding 30%. Conversely, transitions to formal jobs are negatively associated with income losses.

The third and fourth panels of Figure 11 reveal interesting results for the extensive margin of informality. Informal workers within informal firms who move to self-employment face a significantly higher likelihood of experiencing substantial income losses. The estimated coefficient indicates that these workers are 20% more likely to see a large reduction in income compared to those who remain in informal firms. Overall, Figure 11 provides evidence that

[8] The results for small income loss and gain are presented in Figure 19 and Figure 20, respectively. While the odds ratios for big income loss ang gain can be found in Figure 21 and Figure 22, respectively.

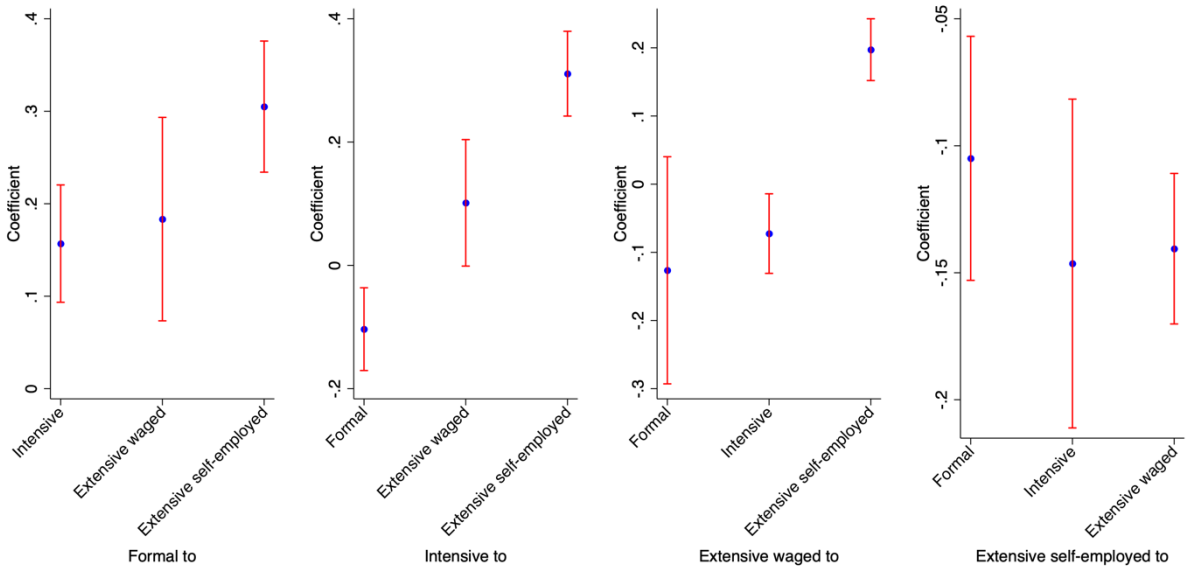
informalisation at any margin is associated with substantial income losses, while upward movements on the informality ladder are not associated with large income losses.

Moving to the results for labour income gains, the first panel of Figure 13 summarises the findings related to informalisation. As shown in previous literature(Aleksynska, La and Manfredi, 2023[17]), the probability that formal workers experience significant income gains by moving to any margin of informality is negative and statistically significant. However, the point estimates are relatively similar and not statistically different, indicating that regardless of the final informal status, informalisation is not associated with income improvements.

Transitions within the informal sector reveal interesting patterns. As shown in the second panel of Figure 13, informal workers in formal firms who transition to fully informal jobs have a negative probability of experiencing an income gain of more than 20% compared to those who remain in the intensive margin. Conversely, movements to the formal sector are associated with substantial labour income gains compared to those who remain in the intensive margin. The third and fourth panels reveal that any upward movement on the informality ladder is associated with significant labour income gains. The probability is particularly high for transitions to formal jobs, with workers moving from the extensive margin being 30% more likely to exhibit a large income gain compared to those who remain in the extensive margin. In this context, the results presented are not statistically different when comparing extensive-waged workers and informal self-employed workers. However, it appears that the probability of a large income gain for informal self-employed workers who move to the intensive margin of informality is higher and statistically different compared to the probability for informal workers in informal firms. The point estimate for informal self-employed workers is twice that of extensive waged workers, with an overlap in the coefficient interval.

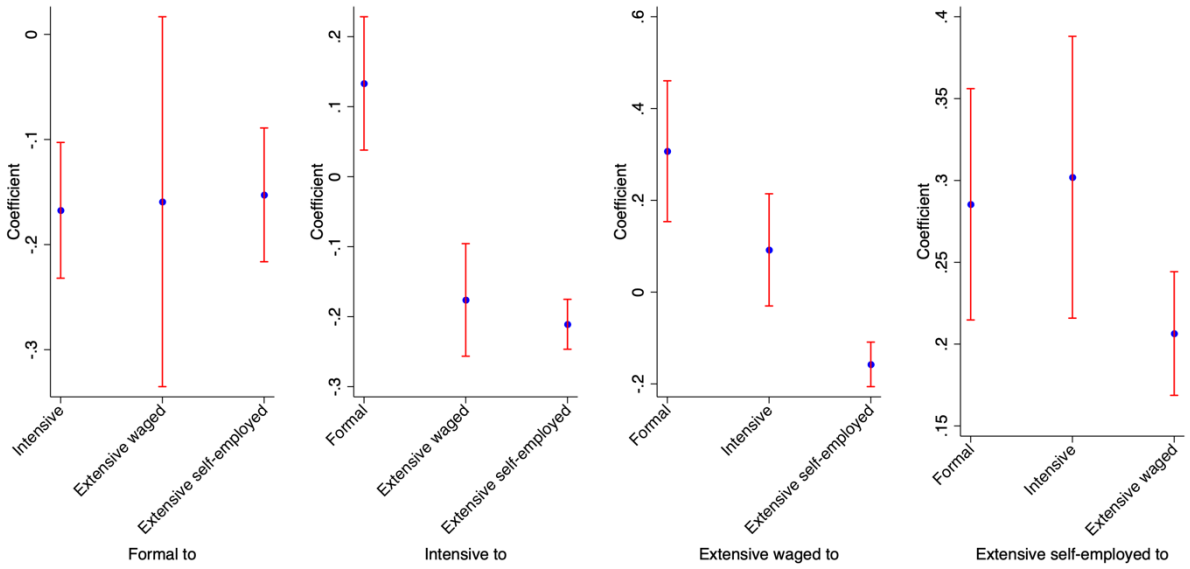
These findings suggest that, in addition to enhancing social protection and regulatory enforcement or monitoring, formalisation can provide immediate and tangible benefits for workers and their families. Conversely, informalisation increases the likelihood of adverse income outcomes for workers, increasing the probability of substantial absolute income losses for Peruvian workers.

Figure 12. Absolute Income Mobility: Big Income Loss (Linear Probability Model)



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 13. Absolute Income Mobility: Big Income Gain (Linear Probability Model)



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Conclusions

Labour informality is a global phenomenon, but it holds particular significance in developing economies, where nearly two-thirds of employment is concentrated in the informal sector. Among Latin American countries, Peru stands out for its high rate of informality. This paper provides a comprehensive analysis of the characteristics of Peru's informal sector, utilising microdata from 2007 to 2019.

Traditionally, the literature has not differentiated between the margins of labour informality. However, distinguishing between the extensive and intensive margins is crucial for understanding the determinants of labour informality and worker transitions. In Peru, as in other developing countries, labour informality disproportionately affects young, less-educated women. Notably, women are more exposed to the extensive margin, encompassing jobs in unregistered firms that do not pay social security contributions (pensions and health). Conversely, the intensive margin, which includes registered firms, also plays a significant role in informal employment, accounting for nearly 20%.

Additionally, this study confirms several other characteristics of Peru's informal sector. We identify a wage ladder where workers in the extensive margin of informality have lower earnings compared to those in the intensive margin or formal employment. Furthermore, the extensive margin is characterised by a higher prevalence of micro and small enterprises. The findings support life cycle theories, indicating that informal workers are more prevalent among younger individuals, who are at the lower end of the income distribution. Moreover, the evidence also corroborates human capital accumulation and investment theories, which link educational levels with labour informality.

To understand the determinants of the different margins of labour informality, this paper estimated a binary choice model corrected for selection bias. The results reveal that characteristics such as work experience, age, educational level, geographical location, and household characteristics have significantly different effects on each margin of labour informality. Specifically, educational level has a greater impact on workers in the intensive margin compared to those in the extensive margin, significantly reducing the likelihood of being in the intensive margin as educational level increases. Similarly, work experience has a significantly greater impact on the intensive margin than on the extensive margin.

The panel data also allows us to estimate the determinants of labour transitions and labour income changes associated with these transitions in Peru. Using a multinomial logit model, this study found that years of experience, educational level, and other characteristics influence the type of work that workers choose and their transitions between different labour statuses. These results highlight important interactions between the formal sector and the different margins of informality. More experienced workers are more likely to remain in the formal sector, but this effect is stronger for men. The probability of leaving informality and obtaining formal employment is higher for educated workers in the intensive margin compared to similar workers in the extensive margin of informality. Additionally, formalisation is associated with significant income gains, with a more pronounced effect for workers transitioning from the extensive margin of informality compared to those moving between the intensive margin of informality and the formal sector. Conversely, informalisation is associated with substantial income losses, with movements

to the intensive margin resulting in smaller losses compared to transitions to the extensive margin of informality.

These findings are important from a public policy perspective. If workers are entering the intensive informal sector, policymakers need to pay special attention to issues such as wage rigidity and the payment of social obligations. For the extensive margin of informality, policies should create incentives for firms to formalise while promoting the regularisation of workers. Policymakers can reduce the costs of entering the formal sector by lowering registration costs and maintaining formal sector status by reducing tax payments. They can also increase the benefits of formality by facilitating access to the financial sector and increasing the costs of informality by enhancing regulation and its enforcement. Alongside these measures, education is a key factor in climbing the job ladder; thus, it is essential to invest in early education to improve young people's skills and create incentives for workers to receive training, thereby upgrading their skills.

Finally, this work opens several avenues for future research. We have focused on informality from the workers' perspective, but it is necessary to gain a better understanding from the perspective of firms' incentives to remain informal and how they transition between different margins of informality. This is critically important in relation to firms' productivity since informality distorts incentives and selection processes, allowing less productive firms to survive and compete with more productive ones. In the Peruvian context, this is crucial as a significant fraction of the labour force operates in informality, leading to resource misallocation and lower aggregate productivity.

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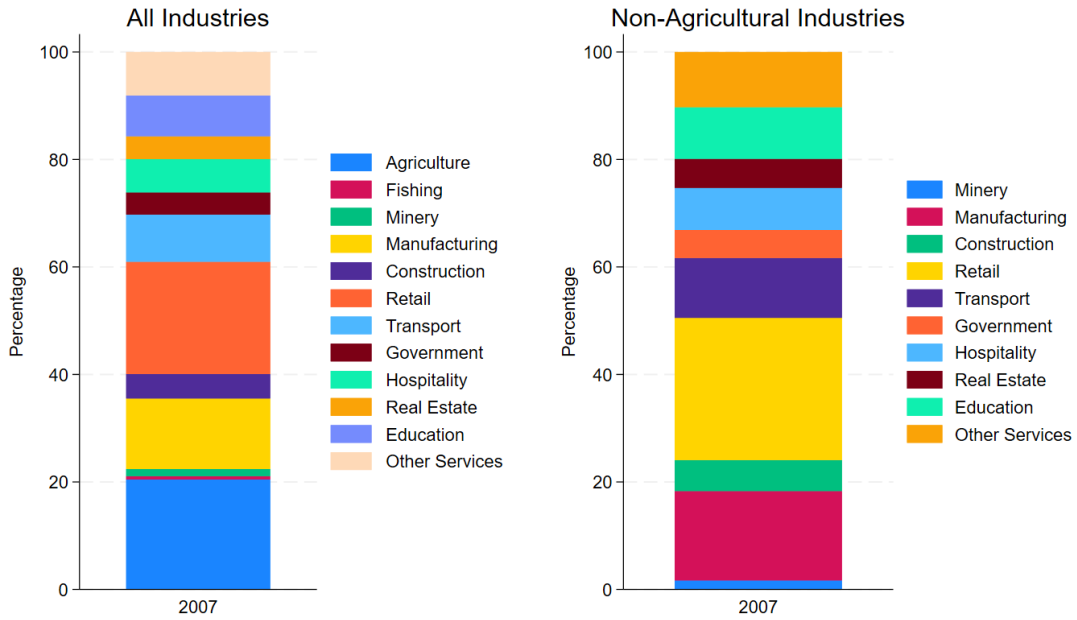
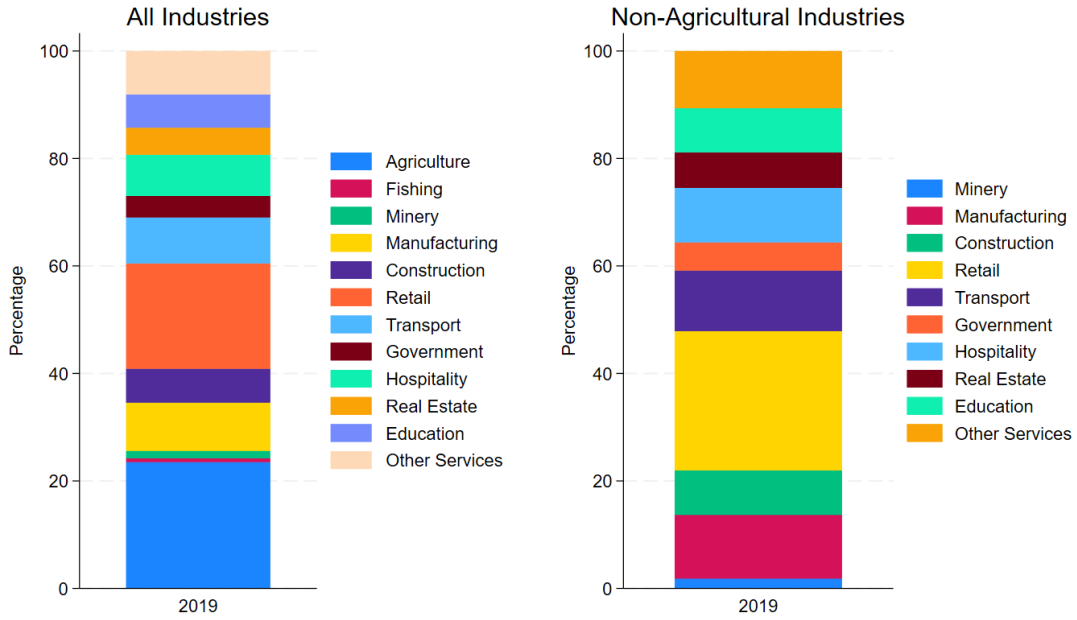
Appendix

Figure 14. Employment distribution 2007



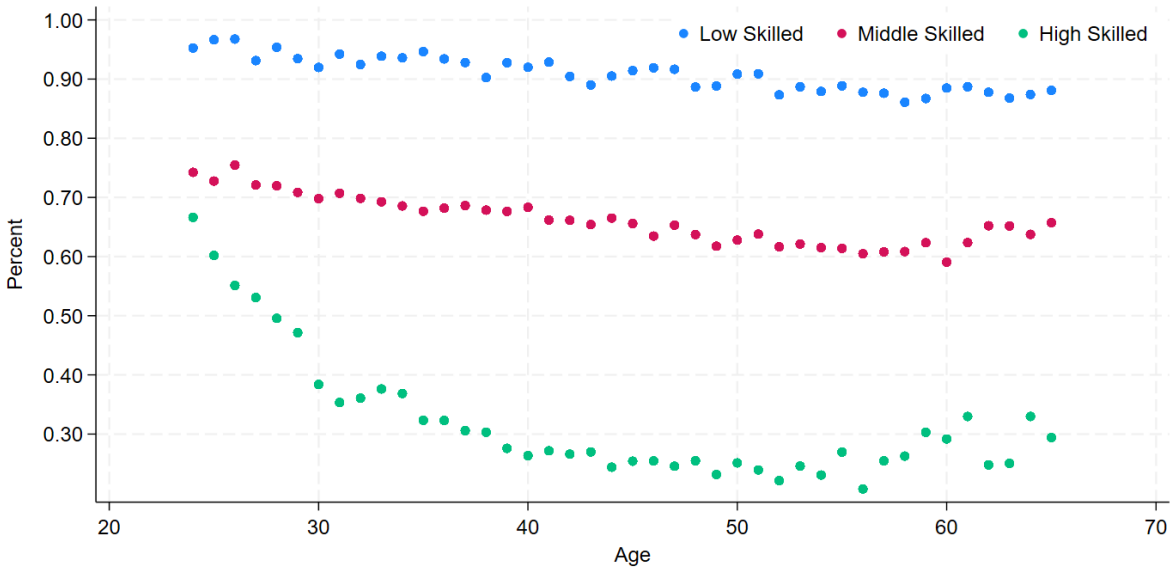
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 15. Employment distribution 2019



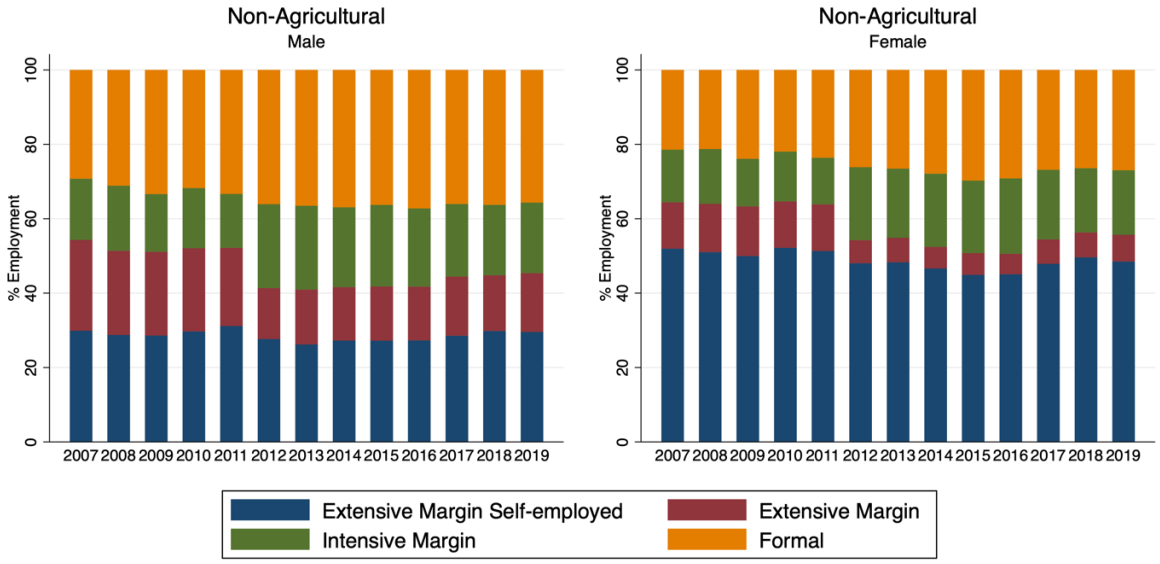
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 16. Informality rate by education



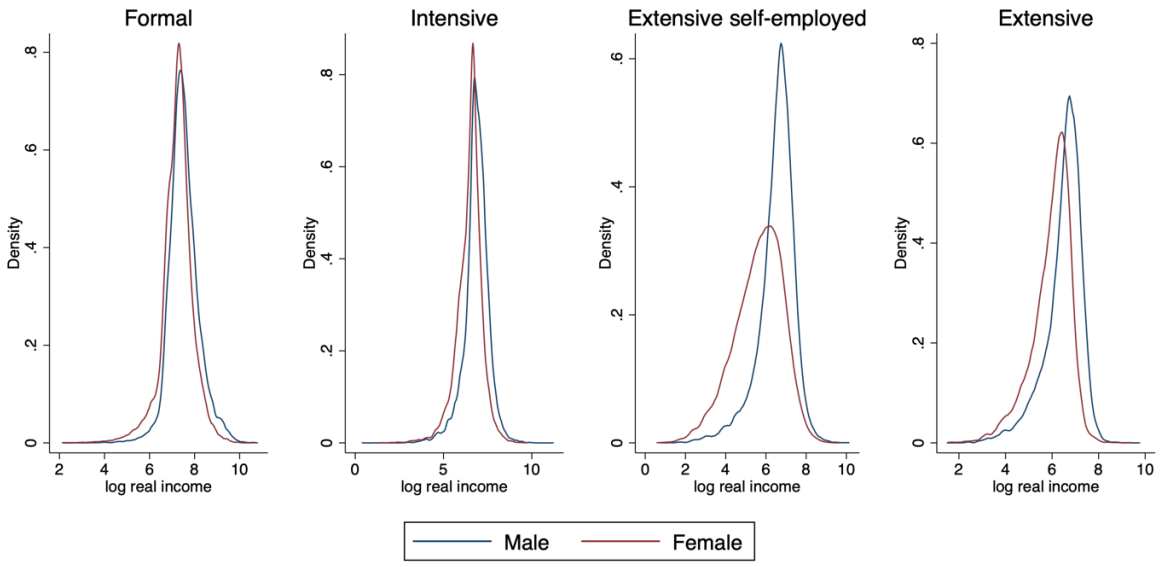
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 17. Informality margins by gender



Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 18. Gender wage gap by informality margin



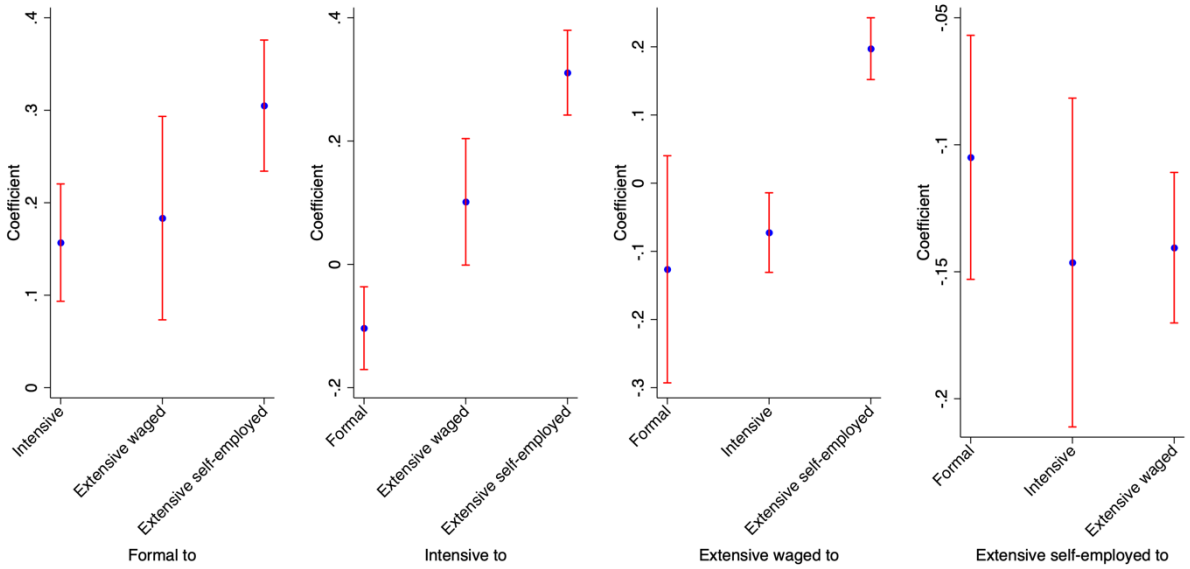
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Table 9. Formal Transition Model

		From formal jobs to				
Variable	Formal	Intensive	Extensive Waged	Extensive Self-employed	Unemployed	No labour force
Female	-0.062***	0.002	-0.014***	0.018**	0.004	0.052***
	-0.009	-0.005	-0.003	-0.006	-0.003	-0.005
Age	0.023***	-0.005***	0.000	-0.004**	-0.002***	-0.011***
	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001
Experience	0.025***	-0.016***	-0.004***	0.000	-0.002***	-0.002**
	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Education level (years)	0.019***	-0.003***	-0.004***	-0.011***	0.001***	-0.003***
	-0.001	-0.001	0.000	-0.001	0.000	-0.001
Married	0.047***	-0.028***	-0.003	-0.025***	0.006	0.003
	-0.011	-0.007	-0.004	-0.007	-0.004	-0.006
Spanish	0.026*	-0.011	-0.014**	-0.016*	0.000	0.015*
	-0.013	-0.009	-0.004	-0.008	-0.005	-0.007
Urban	0.013	0.015**	-0.002	-0.040***	0.008**	0.005
	-0.01	-0.006	-0.004	-0.008	-0.003	-0.005
Observations	18034	18034	18034	18034	18034	18034

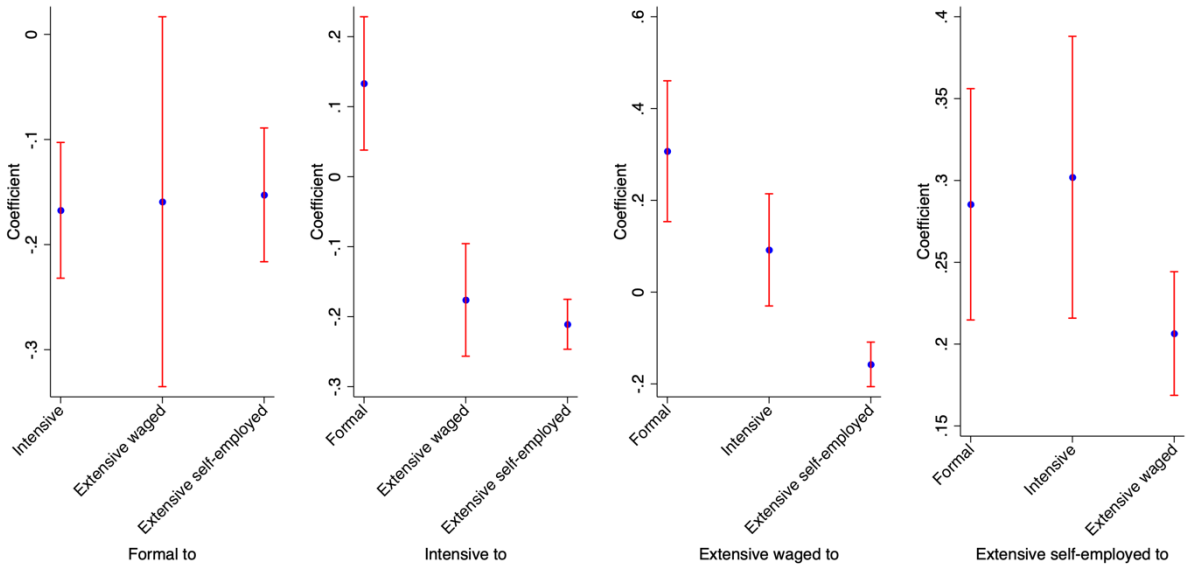
Note: Standard deviation in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001. Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 19. Absolute Income Mobility: Small Income Loss (Linear probability model)



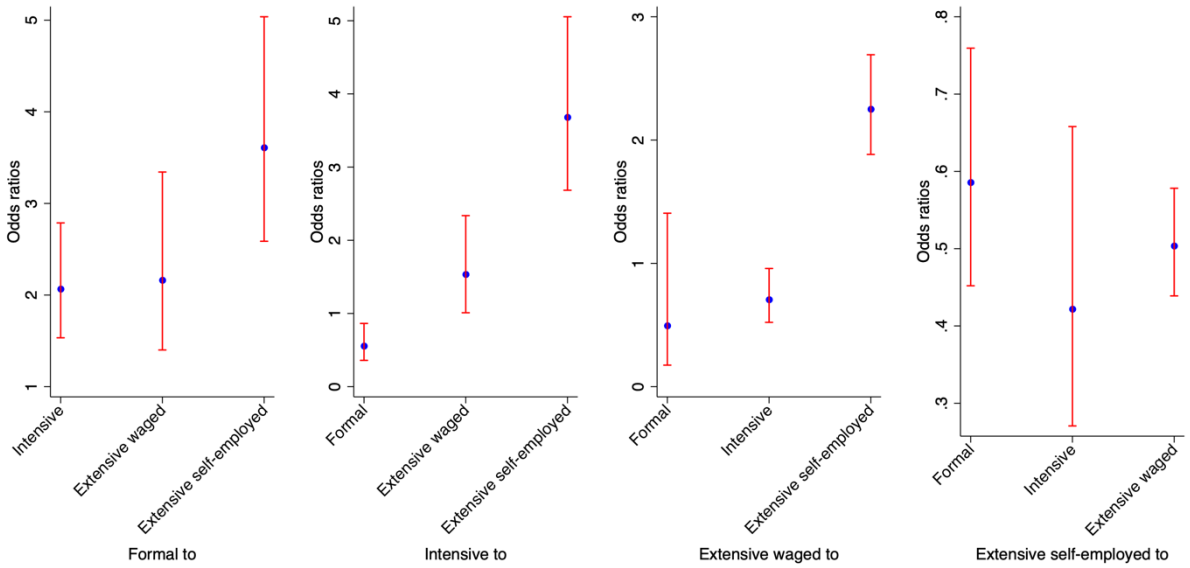
Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 20. Absolute Income Mobility: Small Income Gain (Linear probability model)



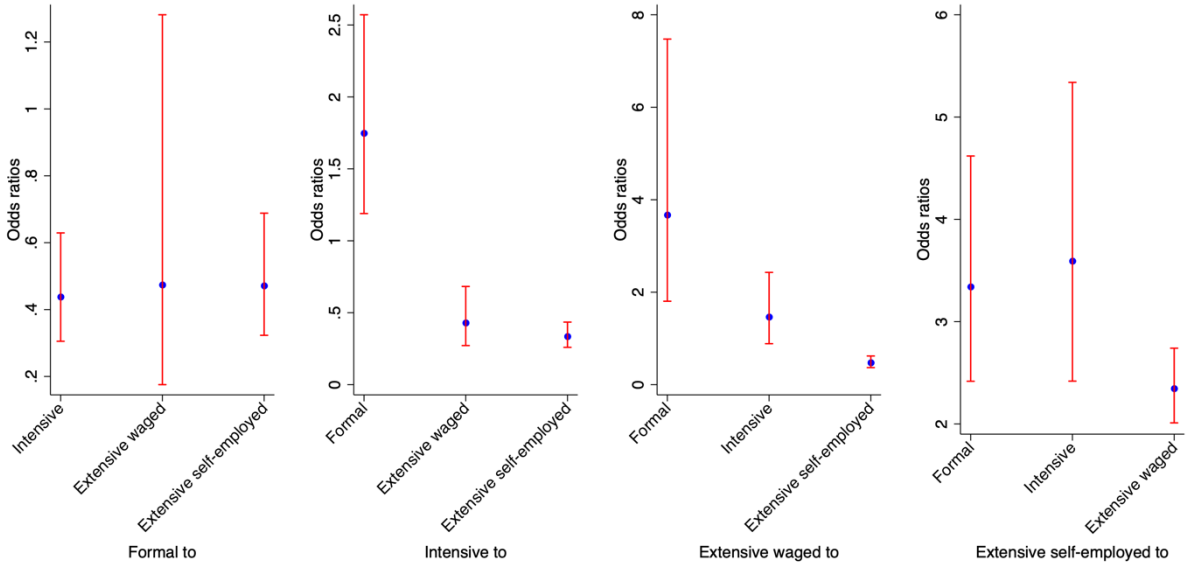
Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 21. Absolute Income Mobility: Big Income Loss (Odds ratios)



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

Figure 22. Absolute Income Mobility: Big Income Gain (Odds ratios)



Note: Informality represents those workers in the intensive and extensive margin of informality. Informal extensive represents those workers employed by firms that are not registered with the Tax collection authority. Informal intensive represents workers employed by registered firms, but the employment relationship does not comply with the labour regulation. The model includes all the variables from the informality determinants model, including area, industry, and year controls.
Source: Author's calculations based on the Peruvian National Household Survey (ENAHO), INEI.

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