

THE EFFECTS OF LABOR CONDITIONS INHERITANCE, WAGE DIFFERENTIAL INCENTIVES, AND INDIVIDUAL CHARACTERISTICS ON THE PROBABILITY OF BEING AN INFORMAL WORKER IN MEXICO

Sylvia Beatriz Guillermo Peón y Liliana Estrada Quiroz^a

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Abstract. This research aims to estimate and analyze the influence of intergenerational transmission of informality, formal-informal wage differentials, and individual characteristics such as educational attainment, occupational category, sex, and age on the probability of being an informal worker. Using microdata from the National Survey of Occupation and Employment (ENOE) survey, we estimate a heteroskedastic Probit model with complex survey data. The estimation results show evidence that human capital and the intergenerational transmission of informality in labor conditions are the main factors affecting the probability of being an informal worker. Given the inefficiencies in labor regulation and social security provision, only when the wage-income difference is positive and large enough (benefits of formality outweigh the costs) does the change in the probability of being informal become negative. This relevant result contributes to understanding the persistence of labor informality in Mexico and provides valuable insights for public policy design.

Key Words: Probability of being an informal worker; informal labor condition; Probit model; inheritance on labor conditions; wage differentials.

EFFECTOS HERENCIA DE LAS CONDICIONES LABORALES, INCENTIVOS SALARIALES DIFERENCIALES Y CARACTERÍSTICAS INDIVIDUALES EN LA PROBABILIDAD DE SER TRABAJADOR INFORMAL EN MÉXICO

Resumen. Esta investigación tiene como objetivo estimar y analizar la influencia de la transmisión intergeneracional de la informalidad, los diferenciales salariales formal-informal y las características individuales como el nivel educativo, la categoría ocupacional, el sexo y la edad en la probabilidad de ser un trabajador informal. Utilizando microdatos de la Encuesta Nacional de Ocupación y Empleo (ENOE), estimamos un modelo Probit heterocedástico con datos complejos de la encuesta. Los resultados de la estimación muestran evidencia de que el capital humano y la transmisión intergeneracional de la informalidad en las condiciones laborales son los principales factores que afectan la probabilidad de ser un trabajador informal. Dadas las ineficiencias en la regulación laboral y la provisión de seguridad social, sólo cuando la diferencia salario-ingreso es positiva y suficientemente grande (los beneficios de la formalidad superan los costos) el cambio en la probabilidad de ser informal se vuelve negativo. Este resultado relevante contribuye a entender la persistencia de la informalidad laboral en México y aporta valiosas ideas para el diseño de políticas públicas.

Palabras clave: probabilidad de ser trabajador informal; condición de informalidad laboral; modelo Probit; herencia sobre condiciones laborales; diferenciales salariales.

Clasificación JEL: J46; O17; C35.

^a Benemérita Universidad Autónoma de Puebla, Facultad de Economía, México. Email addresses: silvia.guillermo@correo.buap.mx and liliana.estradaquiroz@correo.buap.mx, respectively.

1. INTRODUCTION

Labor markets play an essential role in determining economic development. In particular, employment is a key driver in exiting poverty and improving living standards as well as societal well-being (Cazes and Verick, 2013; European Commission, 2018). Economic development happens through work, and it does so basically through boosting living standards, raising productivity, and fostering social cohesion (World Bank, 2013). However, how work improves individual and social life depends on working conditions like having a decent, well-paid, and secure job. In Mexico, nearly 70% of the occupied population consists of employees, and unfortunately, a high percentage of employees do not have jobs that guarantee good working conditions, even when working in the formal labor market.

Informality is a structural condition of the labor market in Mexico. Despite implementing economic policies to reduce poverty, informal employment, which comprises employment in the informal sector and employment outside the informal sector, is a persistent phenomenon and continues to account for a significant proportion of total employment in the country. During the period 2008-2022, the average labor informality rate has been 57.5%. Approximately 32 million people worked under informal conditions in 2022. It could be said that Mexico's labor market is characterized by what Hussmanns (2004) calls the "informalization of employment" which is a consequence of informal employment in the informal sector and informal employment in the formal sector.

With these facts, Mexico faces the challenge of implementing the necessary policy and regulatory changes in order to reach goal 8 of the 2030 Agenda for Sustainable Development. Goal 8, among other things, seeks to promote decent job by protecting labor rights and promoting safe and secure working environments for all workers; this goal also encourages the formalization and growth of micro, small, and medium-sized enterprises (United Nations, 2015). Therefore, changes in labor regulation and policy-making efforts to promote decent work in Mexico must be based on a clear understanding of the factors that may influence the persistence of labor informality. Doing so will help design the correct incentives to reduce labor informality.

Macroeconomic factors such as physical and human capital scarcity, poor labor regulations, and corruption may increase labor informality rates. However, microeconomic factors and individual characteristics such as formal-informal wage difference, occupation, age, educational attainment, gender, and parents' labor conditions may influence the probability of being an informal worker.

The paper aims to estimate the effect of informality inheritance, the influence of wage incentives, and other individual characteristics on the probability of being an informal worker. Using microdata from the National Survey of Occupation and Employment (ENOE), we conduct a cross-sectional study; we first estimate formal-informal wage differentials for workers and a heteroskedastic Probit model afterward, under the context of complex survey data.

Understanding the factors that influence the probability of being an informal worker must shed light on the definition of policies targeting the improvement of labor conditions and creating decent jobs that improve living standards as proposed by the United Nations' 2030 Agenda. The estimated model allows us to analyze marginal effects of response of each variable on the probability of being an informal worker and using odds ratios, we compare probabilities for different individual characteristics.

Our main findings show that having a household head parent informally working increases the adult child's probability of being an informal worker; that is, children have a propensity to stay working under informal labor conditions as their parents, implying an inheritance effect. Human capital is important to reduce the probability of working informally since the higher the educational attainment and skill qualifications, the less likely it is to have an informal job. However, the effect of age on the probability of being an informal worker is also more prominent for non-manual occupational categories.

Given the sample characteristics, we found that women are slightly less likely to have an informal job. This result coincides with the observed time series behavior of employment rates in the informal sector, where female informal employment rates have been slightly below the corresponding rates for males since 2005.

Finally, our findings show that the formal-informal wage differential effect on the probability of being an informal worker is a function of the difference between formal and informal wages. Given the inefficiencies in labor regulation and social security provision, only when the wage-income difference is positive and large enough (benefits of formality outweigh the corresponding costs) is the probability of being informal reduced. This relevant result contributes to the understanding of labor informality's persistence.

The paper is organized as follows: the introduction has been provided as a brief motivation for the readers; section 2 presents the conceptual framework defining labor informality and decent work; additionally, a brief review of the factors influencing labor informality is presented. Section 3 shows the

data description, and the methodology used to estimate the Probit model; section 4 analyzes the model estimation results, marginal effects, and some predicted probabilities of being an informal worker. Finally, section 5 presents the concluding remarks of the study.

2. CONCEPTUAL FRAMEWORK

The concept of informal employment was defined at the 17th International Conference of Labour Statisticians. It refers to the total number of informal jobs, whether carried out in informal sector enterprises, formal sector enterprises, or households, during a given reference period (Husmanns, 2004). Hence, informal employment “[...] encompasses persons in employment who, by law or in practice, are not subject to national labor legislation and income tax or entitled to social protection and employment benefits. Informal employment can exist in both the informal and the formal sector of the economy” (ILO, 2013a, p. 4). But, regardless of labor informality being present in informal or formal businesses, working under informality is associated with precarity and the lack of decent work, two problems addressed in the international concerns.

Goal 8 of the United Nations’ 2030 Agenda for Sustainable Development aims to promote “sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”. But what does decent work mean? The International Labor Organization (ILO) defines decent work as “productive work for women and men in conditions of freedom, equity, security, and human dignity” (2013b, p. 190). Based on the ILO 2008 document, the European Commission summarizes the concept as follows:

Decent work involves opportunities for productive work that delivers a fair income; provides security in the workplace and social protection for workers and their families; offers prospects for personal development and encourages social integration; gives people the freedom to express their concerns, and to organise and to participate in decisions that affect their lives; and guarantees equal opportunities and equal treatment for all (2018, p. 1).

As stated in the ILO Declaration on Social Justice for a Fair Globalization, the decent work concept is based on four strategic objectives that are inseparable, interrelated, and mutually supportive, through which the ILO’s Decent

Work Agenda is expressed and which can be summarized as follows: *i)* promoting employment by creating a sustainable institutional and economic environment; *ii)* developing and enhancing measures of social protection –social security and labor protection– including healthy and safe working conditions; *iii)* promoting social dialogue for translating economic development into social progress; and *iv)* respecting, promoting and realizing the fundamental principles and rights at work (ILO, 2008).

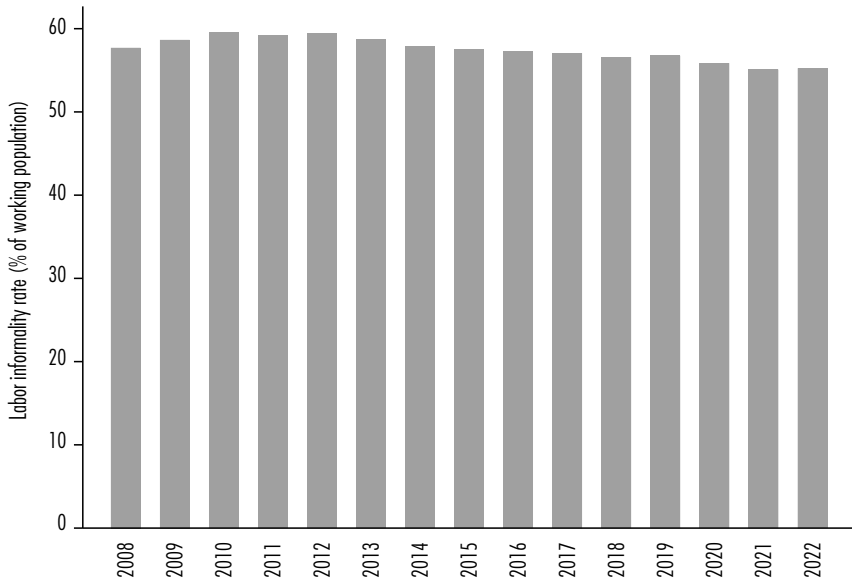
Given this context of international goals and objectives, Mexico, with labor informality rates above 57%, is far from achieving decent work and social protection conditions. Decent work is practically absent in the informal economy, particularly in the informal sector. Knowing that informal employment involves “[...] activities by workers that are –in law or in practice– not covered or insufficiently covered by formal arrangements” (ILO, 2002, p. 2), it is clear that working under labor informality conditions does not guarantee the provision of social security and labor protection, fundamental rights at work, social dialogue, nor even guarantees to have employment. Workers under labor informality are, fully or partially, not recognized, registered, regulated, or protected by labor legislation and cannot enjoy their fundamental rights; they frequently work in unsafe and unhealthy conditions, with low training and skill development levels, and with unregular and low-income (ILO, 2002). In other words, working under labor informality conditions is characterized by vulnerability and precarity. Informal workers are more vulnerable than formal workers because “the existing legal and regulatory frameworks tend to be irrelevant for –or punitive towards–them and their livelihood activities” (Bonnet *et al.*, 2019, p. 7).

High rates of labor informality have been a persistent phenomenon in Mexico, as can be observed in figure 1, where the average rate during these last three lustra has been 57.5%. The scarcity of physical and human capital is one of the main factors explaining Mexico’s high labor informality rates (Guillermo and Estrada, 2022). However, a poor labor regulation system, lack of law enforcement, and general corruption are prevailing conditions in Mexico that incentivize informal jobs (*ibid*).

So far, the background has been at the macro level. In order to move the analysis at the micro level, it is necessary to identify the factors influencing the individuals’ propensity to have an informal job. In particular, we are interested in finding evidence on how parents’ labor conditions (informal *vs.* formal) and their occupation affect their adult children’s probability of being informal workers. Such effects could be identified as intergenerational persistence

since they give information on the “association between the socio-economic outcomes of parents and their children as adults” (Blanden *et al.*, 2007, p. 4), which we call inheritance effects in this paper.

Figures 1. Labor informality rate in Mexico



Note: rates are calculated as the share of the total working population.

Source: own elaboration with ENOE data. INEGI, Strategic Indicators 2008-2022 (Q1).

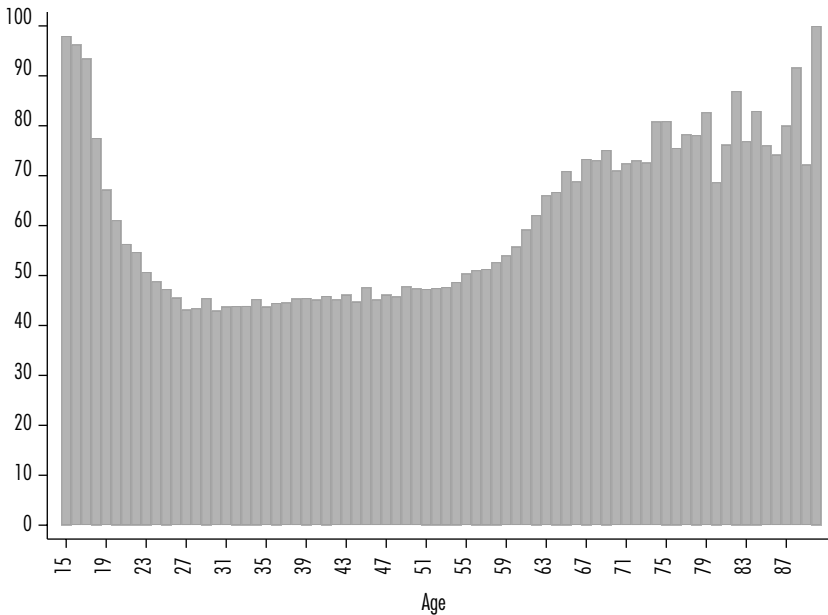
Factors affecting the propensity to be an informal worker

The age of the individuals is a factor influencing the probability of being an informal worker. In Mexico, around 12.5% of informal workers are between 15 and 21 years old, and around 11% are 60 or older. It is reasonable to think that young workers, especially if they go to school, are most likely to have an informal job because of their low human capital level (low experience) and frequently because of the schedule flexibility needed to combine employment and schooling. On the other hand, hiring older workers becomes less likely in the formal labor market because of their human capital depreciation; that

is, updated technological skills are required to work in a competitive market. Also, older workers may have a shorter healthy life expectancy (the survival rates of people with chronic illness are rising, ILO-OECD, 2019), reducing the possibility of being formally hired. These arguments may explain why workers under 20 and over 60 are more likely to have an informal job, as shown in figure 2. Other studies have also found the U-shaped relationship between informality rates and age (Galvis, 2012).

In regard to gender, female labor force participation has been rising worldwide during recent decades, closing the gender gap in this regard (OECD-ILO, 2019a and 2019b). Even though the covid-19 crisis halted the upward trend in women's labour force participation (OECD-ILO, 2021), after the crisis, the labor force participation rate has gone back or above pre-crisis levels for both women and men (OECD-ILO, 2022). However, according to some studies (OECD-ILO, 2019a), the gender gap related to work characteristics and outcomes remains and could be widening in developing countries. In particular, women are more likely to participate in the informal labor market. The flexi-

Figure 2. Fraction of informal workers by age



Source: own elaboration with ENOE 2022 Q1 microdata and considering the survey's complex sampling design.

bility of working-times and the lack of programs to support families with young children make informal jobs a working alternative for many women.

The share of women in informal employment exceeds that of men in many countries (OECD-ILO, 2019a). In developing countries, for example, 92% of women workers are informally employed, while 87% of men workers are employed under this condition (Bonnet *et al.*, 2019). However, in Mexico, according to data from the ENOE (2022, QI), the percentage of women and men who are informally working is almost the same (55 *vs.* 55.6%, respectively).¹ Given this characteristic of the Mexican labor market, this paper explores the effect of gender on the probability of having an informal job.

Education level is another variable that influences labor informality. An empirical work by Levy (2016) finds that, in Latin America, generations of workers with more schooling have lower informality rates; however, the author also finds that in the case of Mexico, more years of schooling has not translated into lower labor informality rates due to adverse labor market characteristics (*e.g.*, contributive *vs.* non-contributive social security, fiscal and labor regulations, and credit access for small businesses). Other empirical studies have found that human capital is negatively related to labor informality. In particular, individuals with more human capital assign higher relative importance to non-wage benefits, hence preferring formal jobs, while individuals with less human capital value more monetary rewards associated with informal jobs; in this sense, comparative advantage in human capital drives participation in the informal labor market (López, 2015). On the other hand, at the country level, increasing human capital (measured as the percentage of the population 25+ years old that at least completed short-cycle tertiary education) will reduce the informal employment rate (Guillermo and Estrada, 2022).

Living in a rural or urban area is a demographic characteristic that influences the probability of being an informal worker. Agricultural activities are the main source of occupation and employment in rural areas, and high levels of informality characterize these, given the poverty levels and lack of social protection, particularly in developing countries. In rural areas, public spending is often low, leading to poor infrastructure, low levels of social services, very limited industrial activities, weak labor market institutions, and social protection (ILO, 2019). This set of economic and institutional characteristics drives and exacerbates labor informality in rural areas. “Globally, 80 percent

¹ Labor informality rates calculated over the occupied population (TILI). ENOE 2022, QI, INEGI.

of rural employment compared to 44 percent of urban employment is informal” (Bonnet *et al.*, 2019, p. 7). In Mexico, those percentages are 66 and 44% for rural and urban areas, respectively. However, considering only non-agricultural workers, 60.2 *vs.* 39.8% in rural and urban areas² are informal, respectively. In order to capture the effect of living in urban or rural areas on the probability of being an informal worker, the proposed model includes a rural/urban categorical variable.

As part of our research, we are interested in analyzing the effects of wage income as an incentive to work under informality. The possibility of workers voluntarily choosing to have an informal job, given the incentives in the labor market, has been explored in the literature (Maloney, 1999; Alcaraz *et al.*, 2015; Duval-Hernández, 2022). Given the inefficiencies and low compliance with labor regulations of the formal labor market in developing countries, workers may find informal jobs more desirable (Maloney, 1999); that is, they may optimally choose an informal job given their individual characteristics (Duval-Hernández, 2022). For example, income taxes, low social security and medical benefits, and lower flexibility of work arrangements may deter workers from choosing formal employment (Maloney, 1999). In such a situation, the difference between formal and informal monetary wage incomes may capture the benefit of formal *vs.* informal jobs and may be relevant when choosing between formal and informal labor conditions.

Family labor background is another factor that may influence the probability of being an informal worker. Recent studies (García *et al.*, 2019; Cuecuecha, 2019; Pasquier-Doumer, 2012; Colombier and Masclet, 2008) have shown an intergenerational correlation in workers’ labor conditions, which suggests an inheritance effect or rigidity in intergenerational mobility of labor conditions. We include parents’ labor status (formal/informal) and occupation in our model to estimate the inheritance effect on the probability of being an informal worker. In the following section, we present the methodology used to identify the factors that affect the probability of being an informal worker based on the reviewed theoretical background.

² Own estimations using the ENOE 2022, QI microdata, and considering the complex sampling design.

3. METHODOLOGY: THE DATA AND THE MODEL

This section presents the methodology used to estimate a conditional probability model. As explained, our research aims to analyze the factors influencing the probability of being an informal worker by estimating a Probit model.

The data

We use the ENOE microdata. This survey is designed and applied by the National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía, INEGI) and is considered the main source and provider of information on the Mexican labor market. The survey is conducted and published quarterly; we perform a cross-sectional study using microdata from the first quarter of 2022, which provides sociodemographic information as well as data on the labor force. The ENOE database also provides the complex sampling design characteristics of the survey, such as the number of strata, primary sampling units, and expansion factors which must be considered in order to have a statistically appropriate estimation procedure. Ignoring the design elements can often lead to inaccurate point estimates and/or inaccurate standard errors (Stata, 2021); that is, omitting the sampling weights (expansion factors) from the analysis results in estimates that may be biased (Stata, 2021; Dargatz and Hill, 1996; Pfeffermann, 1993).

The population under study is defined as those individuals who are part of the employed population, between 15 and 60 years old. However, because one of the explanatory variables in the model is the parent's working condition (formal *vs.* informal), the sample was reduced to those individuals living with their working parents (father, mother, or both) in the same household; parents then, are also identified as the householders. Due to the ENOE's survey design, this restriction was necessary to have the parents' sociodemographic and employment information. Considering all variables in the model, the number of observations in the final sample used for estimation was 22 973³ representing a population of 7 454 744 individuals.

Based on the defined sample, the population under study is characterized by 55.21 and 44.79% of workers with informal and formal jobs, respectively;

³ This sample represents 49% of total working individuals between 15 and 60 years old, living with their parents and 13% of working individuals reported in the full survey ENOE 2022 Q1.

38% are female workers aged 25.8 years on average, and 62% are male workers aged 24.5 years on average (see table 1). Regarding educational level, the sample comprises 34.7% of workers having at most secondary School (basic education), 37.4% with at most High School or a Technical College degree, and 28% with a University degree. The percentage of working students in the sample is relatively small (16.3%), single workers are the most in the sample (81.7%), and workers from urban areas represent 48.6% of the sample.

Table 1. The sample description

		<i>Female</i> (%)	<i>Male</i> (%)	<i>Total</i> (%)
Children over 14	Labor condition			
	Informal	18.51	36.70	55.21
	Formal	19.38	25.41	44.79
	Sex	37.89	62.11	100.00
	Age Mean (years)	25.8	24.5	25
	Education			
	Basic education (primary/middle School)	10.10	24.60	34.70
	High School/Tech College	14.14	23.21	37.35
	University/Graduate	13.64	14.30	27.94
	Living area: Urban	19.58	29.06	48.64
	Working and Studying: Working Student	6.94	9.32	16.26
	Civil status: Single	50.49	31.21	81.70
	Occupation			
	Agriculture	7.48	1.16	8.64
	Low-skilled Manual	7.63	7.46	15.09
	High-skilled Manual	14.38	4.85	19.23
	Commerce	20.24	10.09	30.33
Low-skilled Non-Manual	8.97	11.18	20.15	

Continue

Table 1. The sample description (*continuation*)

		<i>Female</i> (%)	<i>Male</i> (%)	<i>Total</i> (%)
High-skilled Non-Manual		3.41	3.13	6.54
Parents	Labor condition_parents			
	Informal	17.07	40.32	57.39
	Formal	10.20	32.40	42.60
	Sex_parent	27.28	72.72	100.00
	Education_parents			
	Basic Education (middle school at most)	18.46	52.50	70.96
	High School at least	8.82	20.22	29.04
	Occupation_parents			
	Agriculture	1.05	12.79	13.84
	Low-skilled Manual	4.81	6.31	11.12
	High-skilled Manual	4.31	31.03	35.34
	Commerce	12.33	13.39	25.72
	Low-skilled Non-Manual	3.73	5.45	9.18
	High-skilled Non-Manual	1.05	3.75	4.80

Source: authors' calculations using the ENOE 2022 Q1 microdata; considering the survey's complex sampling design.

On the other hand, 34.3% of workers in the sample have manual occupations (15.1% low-skilled and 19% high-skilled workers) while 26.7 non-manual occupations (20.2 and 6.5% low and high-skilled, respectively); high percentage of workers (30.3%) are occupied in commerce, and only 8.7% in agriculture.

Concerning characteristics of the workers' parents (household heads), 57.4% are informally working, and 42.6% are under formal labor conditions. Table 2 shows the transition matrix representing the intergenerational mobility between parents and children in labor conditions. The matrix shows that 60.6% of workers whose parents were working under formal labor conditions (at the time of the interview) also have formal work. In comparison, 67% of workers whose parents reported working under labor informality are informal

workers. The percentage of workers working under the same labor conditions as their parents is larger, showing intergenerational persistence in labor conditions, particularly for parents with informal jobs.

Regarding parents' educational attainment, table 1 shows that 71% of parents in the sample attained no more than middle school and only 29% report having accomplished high school or more. We may also observe a higher percentage of parents dedicated to agriculture (14%) and having manual occupations (46.5%) than their children; these percentages provide some evidence of educational and occupational mobility.

Table 2. Intergenerational mobility in labor condition

Parent's labor condition	Children over 14 labor condition		
	Formal (%)	Informal (%)	Total (%)
Formal	60.59	39.41	100
Informal	33.06	66.94	100
Total	44.79	55.21	100

Source: authors' calculations using the ENOE 2022 Q1 microdata and considering the survey's complex sampling design.

The model

The model setup is based on a Random Utility approach that considers basic Economic Theory where individuals make choices that maximize their well-being or utility (Hill *et al.*, 2018). Let $U_{i_informal}$ the utility for individual i derived from working under labor informality and let U_{i_formal} the corresponding utility derived from formal work. Hence, under the Random Utility approach, working under labor informality will be chosen if $U_{i_informal} \geq U_{i_formal}$ or $U_{i_informal} - U_{i_formal} \geq 0$. However, the utility level of choices is unobservable; even so, the individual's choice is observed.

Let $Y_i^* = U_{i_informal} - U_{i_formal}$ denote a continuous latent (unobserved) random variable which is the difference in utilities. It can be said that $Y_i^* > 0$ if the individual has a propensity to be an informal worker and $Y_i^* \leq 0$ if he/ she has a propensity to be a formal worker. A linear Random Utility model suggests that Y_i^* is a linear function of a set of variables; in

particular, the difference in utilities has a systematic part and a random component:

$$Y_i^* = \mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma} + e_i \quad (1)$$

Where \mathbf{x}_{1i} is a $1 \times K$ row vector of sociodemographic characteristics and labor conditions of individual i including a constant term; \mathbf{x}_{2i} is a $1 \times L$ row vector of their parent's sociodemographic characteristics and labor conditions; $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ are $K \times 1$ and $L \times 1$ column vectors of parameters to be estimated. The propensity to be an informal worker is not observed for each individual; however, the working condition (informal or formal) is reported in the survey and, hence, is an observed variable.

Let Y_i be the observed work condition chosen by the individual i defined as a binary variable where:

$$Y_i = \begin{cases} 1 & \text{if informal} \\ 0 & \text{if formal} \end{cases} \quad (2)$$

The relationship between the unobserved propensity Y_i^* and the observed work condition Y_i is given by:

$$Y_i = \begin{cases} 1 & \text{if } Y_i^* > 0 \text{ (informal)} \\ 0 & \text{if } Y_i^* \leq 0 \text{ (formal)} \end{cases} \quad (3)$$

If e_i is normally distributed, then the probability of being an informal worker is given by:

$$\begin{aligned} \Pr(Y_i = 1 | \mathbf{X}) &= \Pr[(Y_i^* \geq 0 | \mathbf{X})] = \Pr(e_i < \mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma}) \\ &= \Phi(\mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma}) \end{aligned} \quad (4)$$

Where $\Phi(\cdot)$ is the cumulative distribution function (CDF) of the standard normal distribution. Expression (4) is a binary choice Probit model, which allows us to estimate the probability of being an informal worker.

The marginal effects are estimated to analyze the magnitude of the influence of each explanatory variable on the probability of being an informal worker. For continuous random variables, the marginal effect follows the expression:

$$\frac{\partial Pr(Y_i = 1|\mathbf{X})}{\partial x_{1ki}} = \frac{\partial \Phi(\mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma})}{\partial x_{1ki}} = [\phi(\mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma})]\beta_k \quad (5)$$

Where $\phi(\cdot)$ is the probability density function of the standard normal distribution. For discrete explanatory variables, the marginal effect is calculated as a discrete change from the base level or reference category; hence, if x_{1ki} is a binary variable, the marginal effect of this variable on the probability of being an informal worker is given by:

$$\begin{aligned} \frac{\Delta Pr(Y_i = 1|\mathbf{X})}{\Delta x_{1ki}} &= Pr(Y_i = 1|\mathbf{X}, x_{1ki} = 1) \\ &\quad - Pr(Y_i = 1|\mathbf{X}, x_{1ki} = 0) \end{aligned} \quad (6)$$

A heteroskedastic model

The homoscedastic Probit model expressed in equation (4) is modeled as a nonlinear function of the linear combination of the independent variables $(\mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma})$. The CDF is assumed to be standard normal with mean 0 and variance 1. However, if the constant variance assumption is not met, coefficients will be biased and inconsistent (Yatchew and Griliches, 1985); also, the standard errors will be biased, which may lead to incorrect conclusions regarding the coefficients' statistical significance. The heteroskedastic Probit model generalizes the CDF to a normal distribution, relaxing the constant variance assumption. As suggested by Harvey (1976), the variance can be specified as a multiplicative function of a set of P variables:

$$\sigma_i^2 = \exp(\mathbf{z}_i \boldsymbol{\alpha}) \quad (7)$$

Where \mathbf{z}_i is a $1 \times M$ vector of variables that may influence the variance, and $\boldsymbol{\alpha}$ is an $M \times 1$ vector of the corresponding parameters. Thus, the multiplicative heteroskedastic Probit model can be expressed as:

$$Pr(Y_i = 1|\mathbf{X}) = \Phi\left\{\frac{(\mathbf{x}_{1i}\boldsymbol{\beta} + \mathbf{x}_{2i}\boldsymbol{\gamma})}{\sqrt{\exp(\mathbf{z}_i \boldsymbol{\alpha})}}\right\} \quad (8)$$

A heteroskedasticity test will be necessary to find evidence of the variance function and decide if a heteroskedastic Probit model is appropriate. The Stata software provides the Likelihood Ratio test with the null hypothesis of homoskedasticity ($\sigma_i^2 = 1 \forall i$) and the alternative of a heteroskedastic function given by equation (7).

Considering the complex sampling design (survey design characteristics), the heteroskedastic Probit model is estimated using the maximum pseudolikelihood method (Stata, 2021), which takes into account the expansion factors (based on the primary sample units and sample stratification).

Wage-income difference as explanatory variable in the model

As explained in section 2 we are interested in analyzing the effects of wage differentials as an incentive to work under formality or informality. The difference between formal and informal monetary wage incomes may capture the benefit of formal *vs.* informal jobs and may be relevant when choosing between formal and informal labor conditions. Certainly, workers can compare their wage income under formality *vs.* informality for decision-making; however, we do not have both formal and informal wage income observations for the same worker. The survey only reports workers' wage income and labor condition (formal or informal) at the time of the interview. Since formal and informal wage incomes are not observed for the same individual, it is necessary to estimate the unobserved income. Hence, the first step of the methodology consists of estimating two wage income equations that allow us to predict what the informal wage would be for formal workers and what the formal wage would be for those workers having an informal job. The estimated wage difference for each worker is obtained once the two wages (one observed and the other predicted) are available; this difference is considered as explanatory variable in the Probit model. The formal and informal wage-income functions were estimated using (log-linear) Mincer equations defined as follows:

$$\ln(\text{wage_formal}_i) = \mathbf{x}_{3i}\boldsymbol{\delta}_{\text{formal}} + \mathbf{w}_i\boldsymbol{\theta}_{\text{formal}} + e_i^{\text{formal}} \quad (9)$$

$$\ln(\text{wage_informal}_i) = \mathbf{x}_{3i}\boldsymbol{\delta}_{\text{informal}} + \mathbf{w}_i\boldsymbol{\theta}_{\text{informal}} + e_i^{\text{informal}} \quad (10)$$

Where \mathbf{x}_{3i} is a $1 \times J$ vector of worker's sociodemographic characteristics and \mathbf{w}_i is a $1 \times P$ vector of the worker's job characteristics. Because \mathbf{x}_{3i} includes the worker's years of education, the possibility of endogeneity is considered; hence, the corresponding Hausman's exogeneity test is performed in order to choose the appropriate estimation procedure for each income-wage equation: Ordinary Least Squares (OLS) or Two Stage Least Squares/Instrumental Variables regression (2SLS/IV).

4. ANALYZING THE ESTIMATION RESULTS

Table 3 shows the estimation results of three proposed models considering the complex survey design. The models differ from each other in the set of covariates included to explain the probability of being an informal worker, which allows us to analyze how the inclusion of explanatory variables may change estimation results and allows us to compare the model assessment measures. The Likelihood Ratio test for heteroskedasticity was performed for each model; the explanatory variables for the variance function were the worker's educational level, age, and sex. Evidence of heteroskedasticity was found for the three models reported, where the P-values for a χ^2_4 test statistic were all zero (see table 3); hence, the estimated models were heteroskedastic Probit models. As shown in table 3, most of the coefficients are statistically significant at 0.01 significance level in the three proposed models. Nonetheless, civil status does not influence a worker's probability of being informal, nor the parent's sex, parent's education level, and, in models 2 and 3, parent's occupation related to high-skilled non-manual activities. Model 3, which includes the wage-income difference as explanatory variable, shows the highest Pseudo-R² and 75% of correctly classified predictions.⁴ Hence, our model estimation analysis relies on model specification 3.

Based on Hausman's test results, the estimation of log-wage equations was carried out using 2SLS/IV for the formal wage (equation 9) and OLS for the informal wage (equation 10).⁵ We estimated the log-wage function for formal workers using observations available only for workers with formal

⁴ The Pseudo-R² for each model is calculated using McFadden's expression $Pseudo_R^2 = 1 - \frac{L_u}{L_0}$ where L_u is the value of the pseudolog-likelihood of the estimated unrestricted model (using the survey design) and L_0 is the value of the pseudolog-likelihood of the restricted model (with a constant and no explanatory variables, using the survey design).

⁵ Estimated log-wage equations are shown in table A2 in the appendix (available under request).

jobs. The estimated equation for formal wages was used to predict the formal wage for those workers under informal labor conditions. Prediction of formal wage was also extended to those workers with formal jobs who did not report their wages. The natural log of income wage was regressed on the worker's sociodemographic characteristics and a set of worker's job characteristics; the external instruments for the worker's years of schooling were three variables related to the household head parent characteristics: years of schooling, sex, and labor condition (formal or informal). The corresponding tests for instruments' strength and validity were applied, concluding that they are strong and valid.⁶ On the other hand, the log-wage function for informal workers was estimated with OLS using observations available for workers with informal jobs. We predicted informal wages for those workers with formal jobs and for those informal workers who did not report their corresponding informal wage income.⁷

The estimation results are analyzed by calculating marginal effects; estimated average marginal effects are shown in table 4. All marginal effects are statistically significant at 0.01 and 0.05 significance levels, except for the worker's civil status, the head of household parent's sex, and parents' high-skilled non-manual occupation effects. The insignificance of civil status and parents' high-skilled non-manual occupation marginal effects may be explained by a very low percentage of non-single workers⁸ and parents with the highest occupational category in the sample.

⁶ F-test for instruments strength $F(3, 12705) = 406.12$, $\text{Prob} > F = 0.0000$ (F-test is valid when instrumenting one endogenous variable). Sargan test for overidentifying restrictions: Score $\chi^2(2) = 0.577314$; ($p = 0.7493$)

⁷ Given the log-linear functional form used to estimate both formal and informal wages, an additional step was necessary to obtain the corrected prediction of wage income levels:

$$\widehat{wage_formal}_i = \exp(\mathbf{x}_{3i}\widehat{\boldsymbol{\delta}}_{formal} + \mathbf{w}_i\widehat{\boldsymbol{\theta}}_{formal}) \exp(\widehat{\boldsymbol{\sigma}}_{formal})$$

$$\widehat{wage_informal}_i = \exp(\mathbf{x}_{3i}\widehat{\boldsymbol{\delta}}_{informal} + \mathbf{w}_i\widehat{\boldsymbol{\theta}}_{informal}) \exp(\widehat{\boldsymbol{\sigma}}_{informal})$$

⁸ As explained in section 3 (subsection 'The data'), it should be noted that, because of the survey's characteristics, the sample includes only workers living with their working parents (father, mother) in the same household. The high proportion of single (low proportion of non-single) workers in our sample is related to this restriction.

Table 3. Estimated heteroskedastic Probit models

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
High School/Tech College	-0.5565238*** (.0796611)	-0.4044533*** (.0659493)	-0.6669826*** (.0957355)
University/Graduate	-1.0616996*** (.1287023)	-0.5883594*** (.0949679)	-0.9299903*** (.1293339)
Age	-0.3052913*** (.0492379)	-0.241009*** (.036745)	-0.2247102*** (.0405368)
Age squared	0.004514*** (.0007998)	0.0035822*** (.0006067)	0.0033323*** (.0006773)
Working Student	0.7113965*** (.1053263)	0.5935602*** (.0890329)	0.4842276*** (.0852803)
Urban	-0.5316608*** (.0747727)	-0.3958352*** (.0603161)	-0.3728579*** (.064196)
Female	-0.158154*** (.0493805)	-0.111185** (.0474949)	-0.1629031*** (.0499865)
Single	-0.0620693 (.0607259)	-0.066933 (.0576685)	-0.0667577 (.0614351)
Wage-income difference			0.1727663*** (.0221113)
Wage-income difference squared			-0.016511*** (.0026551)
Low-skilled Manual		-0.7592045*** (.1484524)	-0.6904543*** (.1645808)
High-skilled Manual		-1.5106327*** (.1942463)	-1.5277926*** (.223418)
Commerce		-0.522847*** (.1353146)	-0.4604759*** (.1504892)
Low-skilled Non-Manual		-1.7079844*** (.2048935)	-1.5638707*** (.2175653)

Continue

Table 3. Estimated heteroskedastic Probit models (*continuation*)

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
High-skilled Non-Manual		-1.9471988*** (.2571096)	-1.7010892*** (.2558354)
Female Parent (household head)	-0.0271291 (.0556732)	-0.0043522 (.0529015)	0.0004602 (.053438)
Parent Informal Worker	0.8523214*** (.1108381)	0.7533278*** (.0899263)	0.7379346*** (.0996594)
Parent Basic education	-0.0203261 (.0616704)		
Parent Low-skilled Manual	-0.563782*** (.1270881)	-0.2779145** (.113701)	-0.2702019** (.1169804)
Parent High-skilled Manual	-0.8148499*** (.130229)	-0.4345053*** (.1006209)	-0.4280405*** (.1064527)
Parent Commerce	-0.6429424*** (.1192464)	-0.3564615*** (.1014119)	-0.3614844*** (.107024)
Parent Low-skilled Non-Manual	-0.8277009*** (.1515308)	-0.4039645*** (.1218987)	-0.4088476*** (.125795)
Parent High-skilled Non-Manual	-0.6035372*** (.1616113)	-0.1744778 (.1396614)	-0.1673623 (.1315726)
Intercept	5.69164*** (.8087896)	5.2412481*** (.6592549)	5.2216027*** (.7492485)
<i>Insigma</i>			
High School/Tech College	0.1306099* (.0707441)	0.094006 (.0658669)	-0.1160977 (.0730642)
University/Graduate	0.2820481*** (.0931087)	0.3593583*** (.0919789)	-0.040787 (.0956415)
Age	0.0108664** (.0045556)	0.0102562*** (.0037781)	0.0180478*** (.0045198)
Female	0.1259824** (.0519266)	-0.0320599 (.052099)	-0.0562749 (.0548854)

Continue

Table 3. Estimated heteroskedastic Probit models (*continuation*)

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
LR test of Insigma=0: chi2(4)	31 279.51***	30 973.89***	24 301.59***
Number of observations	23 667	23 390	22 973
Pseudo-R2	0.1851	0.2329	0.2574
Correctly Classified Predictions (%)	68.79	72.1	73.45

Notes: *** p<.01; ** p<.05; * p<.1 standar errors in parenthesis.

Source: estimation results.

Unlike Levy's (2016) findings for the case of Mexico, our results show evidence that more years of schooling reduce the probability of being an informal worker. Having at most a high school or a technical college degree reduces the probability of being an informal worker by 13 percentage points (with respect to those workers having no more than middle school, which is the base category), while having some or completed university degree reduces the probability by 19.4 percentage points. As found in other empirical studies, our results show that human capital is negatively related to labor informality (López, 2015; García *et al.*, 2019; Guillermo and Estrada, 2022), and it is the factor that most influences the probability of being an informal worker (as also found by García *et al.*, 2019); on average, individuals with higher educational level are less likely to end up working under informal labor conditions.

On average, the probability of being an informal worker reduces by 1.2 percentage points as the worker becomes one year older. However, the effect of aging depends on the worker's age. The estimated model predicts a U-shape behavior of the probability of being an informal worker as a function of age. Figure 3 shows, as expected, that young and elderly workers are more likely to be informal. As explained in section 2, the lack of human capital in young workers and human capital depreciation in older workers explains this behavior. The predicted probabilities also replicate the behavior of the fraction of informal workers by age, shown in figure 2. But the age-probability profile of being an informal worker also changes by occupational category.

Table 4. Estimated average marginal effects

<i>Variable</i>	<i>Delta-method</i>					
	<i>dy/dx</i>	<i>std. Err.</i>	<i>t</i>	<i>P > t</i>	<i>[95% conf. Interval]</i>	
High School/Tech College	-0.128836	0.013643	-9.44	0.0000	-0.155578 -0.102095	
University/Graduate	-0.194201	0.019341	-10.04	0.0000	-0.232111 -0.156292	
Age	-0.011879	0.000984	-12.07	0.0000	-0.013808 -0.009951	
Working student	0.095398	0.012278	7.77	0.0000	0.071332 0.119463	
Urban	-0.075815	0.010175	-7.45	0.0000	-0.095758 -0.055872	
Female	-0.031646	0.009453	-3.35	0.0010	-0.050174 -0.013118	
Single	-0.013225	0.011972	-1.10	0.2690	-0.036691 0.010241	
Wage-income-difference	0.028321	0.001924	14.72	0.0000	0.024549 0.032093	
<i>Occupation</i>						
Low-skilled Manual	-0.136329	0.027710	-4.92	0.0000	-0.190644 -0.082014	
High-skilled Manual	-0.325683	0.028482	-11.43	0.0000	-0.381511 -0.269855	
Commerce	-0.087798	0.025757	-3.41	0.0010	-0.138284 -0.037312	
Low-skilled Non-Manual	-0.333865	0.028177	-11.85	0.0000	-0.389094 -0.278637	
High-skilled Non-Manual	-0.364697	0.034167	-10.67	0.0000	-0.431668 -0.297727	
Female Parent (household head)	0.000091	0.010604	0.01	0.9930	-0.020692 0.020875	
Parent Informal Worker	0.153561	0.010662	14.40	0.0000	0.132663 0.174459	
<i>Occupation Parent</i>						
Low-skilled Manual	-0.053180	0.021948	-2.42	0.0150	-0.096200 -0.010161	
High-skilled Manual	-0.084895	0.018375	-4.62	0.0000	-0.120911 -0.048878	
Commerce	-0.071481	0.019313	-3.70	0.0000	-0.109336 -0.033626	
Low-skilled Non-Manual	-0.081022	0.022929	-3.53	0.0000	-0.125964 -0.036080	
High-skilled Non-Manual	-0.032739	0.025385	-1.29	0.1970	-0.082495 0.017018	

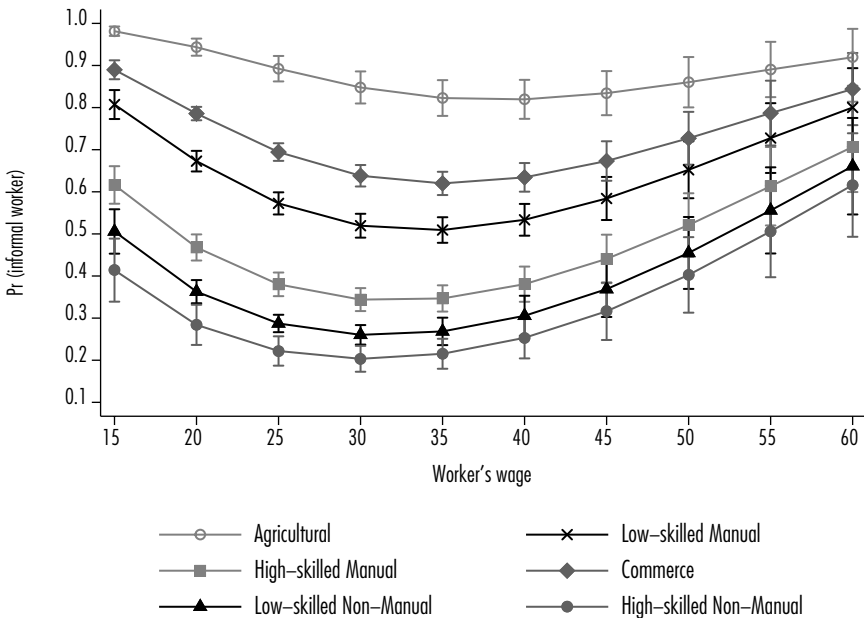
Note: dy/dx for factor levels is the discrete change from the base level.

Source: own elaboration using Model 3 estimation results.

Figure 3 shows that, for agricultural workers, the probability of being informal slightly changes through the worker's lifespan, which may be explained by no significant changes in human capital for these workers. In contrast, the probability profile for a worker with a high-skill and non-manual occupation drastically changes with age; at age 60, it is 2.8 times more likely for this worker to work under informal labor conditions than at age 25. Figure 3 also shows that, in general, workers having a non-manual occupation, human capital accumulation (lack of experience, for young workers), or human capital depreciation (lack of knowledge update, for older workers) may significantly change their probability of being an informal worker.

Including occupational categories as explanatory variable improved the model's accuracy and predictive power (see table 3). The estimated average marginal effects based on model 3 (see table 4) show that having a non-agricultural occupation reduces the probability of being an informal worker. In particular, workers with non-manual occupations are less likely to work under

Figures 3. Predicted probabilities and 95% confidence intervals of being an informal worker by age and occupational category



Source: own elaboration.

labor informality conditions. Compared to agricultural occupations (base category), having a Non-Manual occupation, low-skilled or high-skilled, reduces, on average, the probability of being an informal worker by 33.4 and 36.5 percentage points, respectively. This factor variable is the one that reduces the probability of being informal the most; jobs requiring intellectual human capital are more likely to be formal.

The odds ratio analysis in table 5 sheds light on understanding the relative probabilities by occupational category (all of them are statistically different from 1). At the age of 30, for example, it is 2.5 times more likely to be an informal worker if having an occupation in Commerce than a Low-skilled Non-Manual occupation, and these odds decrease as the worker ages. At 30, a worker is 1.5 times more likely to be informal if he/she has a Low-skilled occupation than a High-skilled Manual occupation and 1.3 times more likely if the comparison is between Low-skilled and High-skilled Non-Manual occupations. In all cases, the odds decrease with age.

Continuing with the analysis of average marginal effects (see table 4), we may observe that having a household head parent informally working increases the adult child's probability of being an informal worker by 15.3 percentage points on average. This means that there is an intergenerational transmission or inheritance effect of labor decisions as children have a propensity to stay working under informal labor conditions as their parents. Figure 4 shows predicted probabilities by age for workers with informal and formal household head parents. The average predicted probability of being an informal worker if the worker's parent is working under informality is 0.67, while if the worker's parent is a formal worker, the average probability is 0.4; that is, on average, it is 1.7 times more likely for a worker to be informal if his/her household head parent is also an informal worker. The estimated odds ratios change with the worker's age, reaching 1.8 at age 30.

Our results also show that, on average, the probability of being an informal worker is reduced by 3.2 percentage points for female workers. This result is reasonable given the sample used for the model estimation. Figure 5 shows the sample proportion of female and male workers by labor condition, which may be interpreted as conditional probability; in this sense, the probability of being informal, given that the worker is female, is 0.489, while if the worker is male, the probability goes to 0.591. In addition, this estimated marginal effect for female workers coincides with the observed times series behavior of employment rates in the informal sector; on average, female employment rates have been three percentage points below the corresponding rates for males

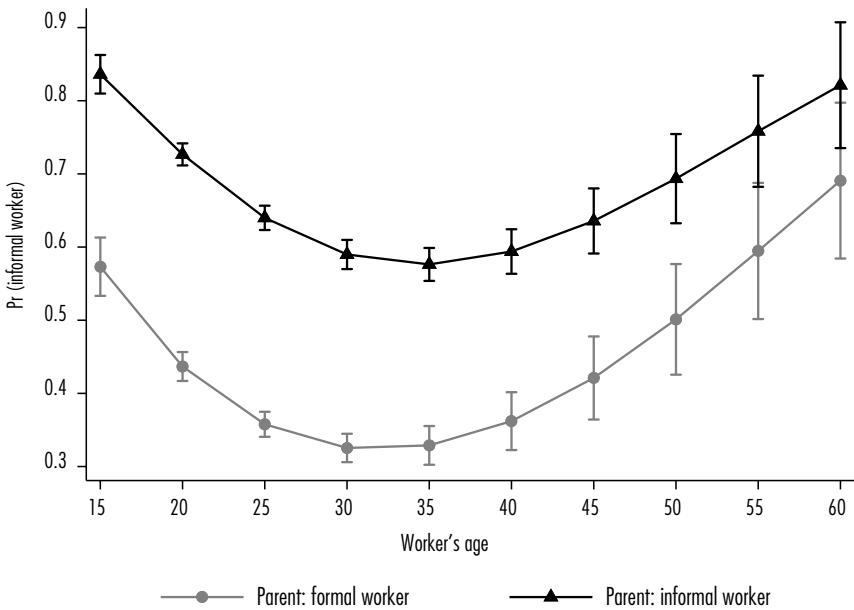
Table 5. Odds ratios: Comparing probabilities of being an informal worker by occupation and age

Odds-ratios	Age							
	25	30	35	40	45	50	55	60
Commerce / Low-skilled Manual	1.2***	1.2***	1.2***	1.2***	1.2***	1.1***	1.1***	1.1***
Commerce / Low-skilled Non-Manual	2.4***	2.5***	2.3***	2.1***	1.8***	1.6***	1.4***	1.3***
Low-skilled Manual / High-skilled Manual	1.5***	1.5***	1.5***	1.4***	1.3***	1.3***	1.2***	1.1***
Low-skilled Non-Manual / High-skilled Non-Manual	1.3***	1.3***	1.3***	1.2***	1.2***	1.1***	1.1***	1.1**

Notes: *** $p < .01$; ** $p < .05$; * $p < .1$

Source: own elaboration.

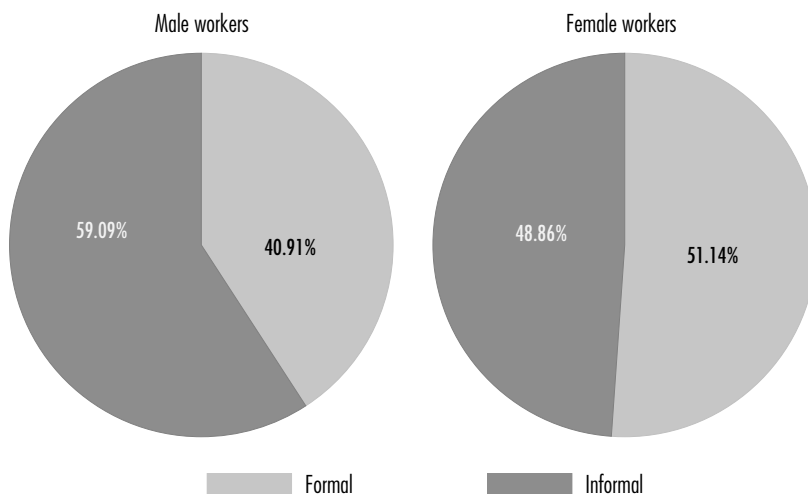
Figure 4. Predicted probabilities and 95% confidence intervals by age and worker's parent labor condition



Source: own elaboration using estimation results.

since 2005.⁹ On the other hand, workers living in an urban area reduce their probability of having an informal job by 7.5 percentage points. Additionally, we find that having parents with Non-Agricultural occupations significantly reduces the probability of working in an informal labor condition.

Figure 5. Percentage of formal and informal workers by sex



Source: own elaboration using the sample observations. Proportions are estimated considering the complex survey design.

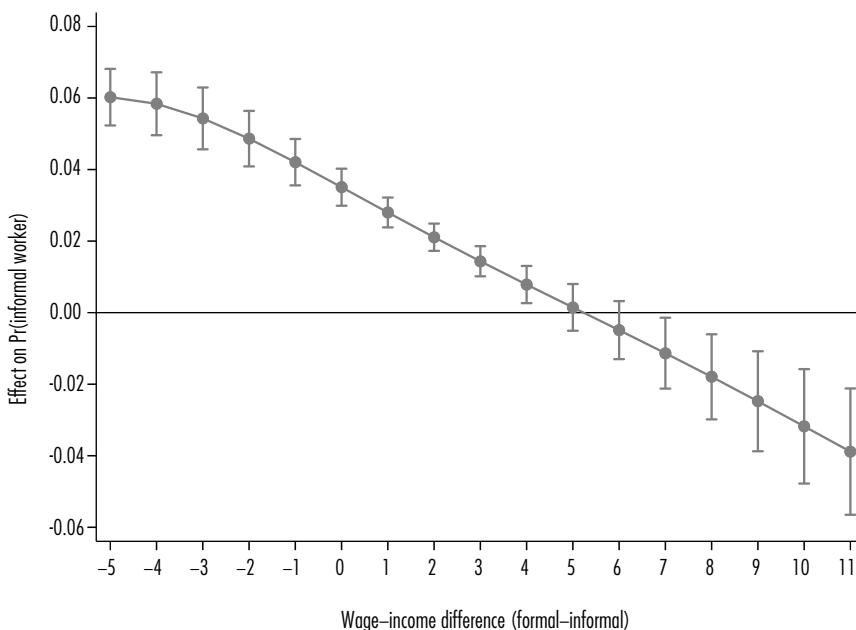
Concerning the effect of wage-income difference on the probability of being an informal worker, our findings show that such effect is a function of the difference between formal and informal wages.¹⁰ It must be mentioned that the formal wage may be lower than the informal wage for a worker. A negative formal-informal wage-income difference may occur because “[...] labor protection laws levy an implicit tax” on formal workers in such a way that “[...] the cost of nonwage benefits of formal work reduces monetary wages

⁹ Author’s calculations based on the ENOE data; Labor Informality Rates and Employment Rates in the Informal Sector by federal entity and sex (Tasas de informalidad laboral y ocupación en el sector informal por entidad federativa y sexo) (TIL2 and TOSI2).

¹⁰ Observations for which the estimated wage-income differentials with values smaller than the first percentile and larger than the 99 percentile of its distribution were excluded from the estimation sample (wage differentials distribution is shown in figure A1, appendix; available under request); we consider those values as outliers.

by an equivalent amount” (Maloney, 1999, p. 276). Based on their preferences (utilities) related to formal and informal jobs’ benefits, workers may be willing to accept a lower monetary wage to get a job in the formal sector (Cantillo *et al.*, 2022). This would be the case for a worker who values the relative stability of a formal labor condition and is willing to accept a formal job with a lower wage (Smith, 1979). Figure 6 shows the marginal effect of wage-income difference; we may observe that when the formal wage is lower than the informal (income difference is negative), the change in probability of being an informal worker is positive but decreasing as the difference between the wages reduces. Even though the difference becomes positive, the change in probability of being informal is still positive. Only when the wage-income difference is positive and large enough (based on estimation results, around five thousand pesos of 2022) the change in the probability of being informal becomes negative. This result is consistent with what theory explains regarding the possibility of workers voluntarily choosing to have an informal job, given the workers’ characteristics and incentives in the labor market. As previously explained in section 2, choosing between formal and informal jobs is a rational decision-making process where workers evaluate the costs and benefits of each alternative. Because of inefficiencies and low compliance with formal labor regulations, workers may find informal jobs more desirable (Maloney, 1999) and optimally choose an informal job given their characteristics (Duval-Hernández, 2022). For example, the change in the Mexican Health System implemented in 2019 significantly decreased the primary health care consultations, secondary care, and hospitalization services in public health institutions. A substantial percentage of the population was affected because of the reduction in the levels of healthcare coverage, which increased out-of-pocket expenditure on health (Serván-Mori *et al.*, 2023). Healthcare coverage has been one of the most important incentives for working in the formal labor market; however, the inefficiencies and decrease in service provision have reduced the benefits of choosing a formal job. Still, the benefits (social security provision) of working in the formal labor market must outweigh the costs (income taxes, lower flexibility of work arrangements) for a worker to choose a formal job. Estimated model 3 captures those benefits and costs through the difference between the formal and informal monetary wages, and we find that the probability of being an informal worker reduces if that difference is positive and large enough to compensate for the costs of formality.

Figure 6. Marginal effect of wage-income difference and 95% confidence intervals



Source: own elaboration. Wage-income differences expressed in thousand pesos (current pesos of 2022).

5. CONCLUDING REMARKS

Using the ENOE data, we have estimated the inheritance effect of labor informality. We found that workers whose parents are informally working are more likely to participate in the informal labor market, indicating an intergenerational transmission of labor decisions and conditions. Family background matters for the workers' propensity to have an informal job, as shown by the influence of parents' occupational category.

Results show that human capital is the most relevant factor in reducing the propensity to work under informal conditions; increasing educational attainment reduces the probability of being an informal worker. Because human capital is a key driver in reducing labor informality, public policy efforts must focus on improving access to higher and better-quality of education.

On the other hand, given the estimated age-probability profiles, our findings suggest the necessity of training programs focused on specific age groups. These programs may help young and elderly workers improve their skills and

human capital, reducing the probability of participating in the informal labor market and increasing their chances of getting a formal job.

Our findings also show that formal-informal wage differentials significantly influence the propensity to be an informal worker. However, the sign and magnitude of this influence depend on the sign and magnitude of the wage-income difference. The inefficiencies in labor regulation and social security provision in Mexico may explain that, only when the formal-informal wage-income difference is positive and large enough, the probability of being informal will be reduced. Only when the benefits associated with a formal labor condition outweigh its corresponding costs (captured by the wage differentials in our model) is the worker less likely to become informal.

This relevant result in our model sheds light on understanding the prevalence of labor informality in Mexico and may suggest arguments for the correct policy design on labor issues.

Individual choice of formal *vs.* informal labor condition is a rational decision based on an individual cost-benefit analysis. In Mexico, the basic benefits of a formal job established in labor regulations relate to access to healthcare services, childcare facilities, retirement funds, preferential mortgage credit, paid vacations, Christmas bonuses, and other mandated benefits that may result in job stability. Although written in the Labor Law, inefficiencies of social programs and lack of law enforcement may impede formal workers from receiving the benefits of the formal job. On the other hand, costs that may deter workers from choosing formal employment could be expressed as lower monetary wages to compensate for nonwage benefits, taxes (Maloney, 1999), less flexibility, and social security contributions (deductions) without receiving their benefits due to inefficient and/or restrictive public policies.

Policies focused on improving the quality and coverage of contributive social security are necessary to guarantee workers receive the benefits of formal jobs and reduce the cost of formality. These policies will increase the valuation of nonwage benefits of formal jobs; however, they must be accompanied by improved compliance with the law, which will reduce incentives for labor informality.

Considering the restrictions on the sample of this study, further research could be based on a survey that provides workers' retrospective information and family background, which may allow us to obtain information on labor conditions of parents without the restriction of living with their adult children.

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REFERENCES

- Alcaraz, C., Chiquiar, D. and Salcedo, A. (2015). Informality and segmentation in the Mexican labor market. Banco de México. *Working Paper 2015-25*. <https://www.banxico.org.mx/publicaciones-y-prensa/documentos-de-investigacion-del-banco-de-mexico/%7BEA76DFED-4A93-15C6-0049-F20CC556C5ED%7D.pdf>
- Blanden, J., Gregg, P. and Macmillan, L. (2007). Accounting for intergenerational income persistence: Noncognitive skills, ability and education. *IZA Discussion Papers Series*, No. 2554. <https://www.jstor.org/stable/4625498>
- Bonnet, F., Vanek, J. and Chen, M. (2019). Women and men in the informal economy – A statistical brief. WIEGO. <https://www.wiego.org/publications/women-and-men-informal-economy-statistical-brief>
- Cantillo, T., Cantillo, V., Cantillo-García, V. and García, L. (2022). Uncovering the wage differential between formal and informal jobs: Analysis from the Colombian Caribbean Region. *Latin American Economic Review*, 31(1). <https://doi.org/10.47872/laer.v31.24>
- Cazes, S. and Verick, S. (2013). *Perspectives on labour economics for development*. ILO. <https://www.ilo.org/media/458936/download>
- Colombier, N. and Masclot, D. (2008). Intergenerational correlation in self-employment: some further evidence from French ECHP data. *Small Business Economics*, 30(1). <https://www.jstor.org/stable/40650923>
- Cuecuecha, A. (2019). Origen socioeconómico, informalidad y la movilidad social intergeneracional. Centro de Estudios Espinosa Yglesias. Documento de trabajo 10/2019. <https://ceey.org.mx/wp-content/uploads/2020/03/10-Cuecuecha-2019.pdf>
- Dargatz, D. A. and Hill, G. W. (1996). Analysis of survey data. *Preventive Veterinary Medicine* 28. [https://doi.org/10.1016/0167-5877\(96\)01052-5](https://doi.org/10.1016/0167-5877(96)01052-5)
- Duval-Hernández, R. (2022). Choices and constraints: The nature of informal employment in urban Mexico. *The Journal of Development Studies*, 58(7). <https://doi.org/10.1080/00220388.2022.2061854>

- European Commission (2018). Promoting employment and decent work in development cooperation, vol. 1: Concepts and foundations. Tools and Methods Series, Concept Paper No. 6. https://capacity4dev.europa.eu/media/78995/download/d4311546-771b-4531-9a4c-3cfcf5241dce_en
- Galvis, L. A. (2012). Informalidad laboral en las áreas urbanas de Colombia. Documentos de Trabajo sobre Economía Regional, No. 164. Banco de la República. Centro de Estudios Económicos Regionales. https://www.banrep.gov.co/sites/default/files/publicaciones/archivos/DTSER-164_0.pdf
- García, A., Aguayo, E. and Martínez, J. (2019). Is informal employment sector hereditary? Determinants of formal/informal sector choice for male Mexican workers. *Estudios Económicos*, 34(1). <https://doi.org/10.24201/ee.v34i1.365>
- Guillermo, S. and Estrada, L. (2022). Theoretical reflections and empirical evidence on informal employment: An application using panel data with small within-country variation. In *Handbook T-XVII, CIERMMI Women in Science, Social Sciences and Humanities*. Ecorfan Publishing. https://www.ecorfan.org/handbooks/Handbooks_17/Handbooks_Women_in_Science_TXVII_3.pdf
- Harvey, A. C. (1976). Estimating regression models with multiplicative heteroscedasticity. *Econometrica* 44. <https://www.jstor.org/stable/1913974>
- Hill C., Griffiths, W. E. and Lim, G. (2018). *Principles of Econometrics*, 5th Edition. Wiley.
- Hussmanns, R. (2004). Measuring the informal economy: From employment in the informal sector to informal employment. Working Paper 53. ILO. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---integration/documents/publication/wcms_079142.pdf
- International Labour Organization (ILO) (2002). Resolution concerning decent work and the informal economy. The General Conference of the International Labour Organization, meeting in its 90th Session, 2002. https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/---reloff/documents/meetingdocument/wcms_080105.pdf
- _____ (2008). ILO Declaration on Social Justice for a Fair Globalization. ILO. https://www.ilo.org/global/about-the-ilo/mission-and-objectives/WCMS_099766/lang--en/index.htm
- _____ (2013a). Measuring Informality: A statistical manual on the informal sector and informal employment. https://www.ilo.org/global/publications/ilo-bookstore/order-online/books/WCMS_222979/lang--en/index.htm

- _____ (2013b). Decent Work Indicators: Concepts and Definitions. Second edition. ILO. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---integration/documents/publication/wcms_229374.pdf
- _____ (2019). Transitioning to formality in the rural informal economy. Decent Work in the Rural Economy. Policy Guidance Notes. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_437189.pdf
- ILO-OECD (2019). New job opportunities in an aging society. Co-authored paper prepared for the 1st Meeting of the G20 Employment Working Group under the Japanese G20 presidency (Tokyo, 25-27 February 2019). https://www.ilo.org/global/about-the-ilo/how-the-ilo-works/multilateral-system/g20/reports/WCMS_713372/lang--en/index.htm
- Levy, S. (2016). ¿Más escolaridad, menos informalidad? Un análisis de cohortes para México y América Latina. *El Trimestre Económico*, LXXXIII(332). <https://doi.org/10.20430/ete.v83i332.232>
- López, R. Í. (2015). Human capital and labor informality in Chile, a life-cycle approach. Rand Working Papers, WR-1087. https://www.rand.org/content/dam/rand/pubs/working_papers/WR1000/WR1087/RAND_WR1087.pdf
- Maloney, W. F. (1999). Does informality imply segmentation in urban labor markets? Evidence from sectoral transitions in Mexico. *The World Bank Economic Review*, 13(2). <https://www.jstor.org/stable/3990099>
- OECD-ILO (2019a). Addressing the Gender dimension of informality. In *Tackling Vulnerability in the Informal Economy*, Development Centre Studies, OECD Publishing, Paris. Chapter 5. <https://doi.org/10.1787/939b7bcd-en>
- _____ (2019b). Women at work in G20 countries: Progress and policies. Paper prepared under Japan's G20 Presidency (2019). https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@cabinet/documents/publication/wcms_713373.pdf
- _____ (2021). Women at work in G20 countries: Policy action since 2020. Paper prepared for the 2nd Meeting of the G20 Employment Working Group under Italy's Presidency 2021. https://www.oecd.org/content/dam/oecd/en/publications/reports/2021/09/women-at-work-in-g20-countries_bf363804/db32ba54-en.pdf
- _____ (2022). Women at work in G20 countries: Progress and policy action in 2021. Presentation at the 3rd Employment Working Group meeting under the Indonesian presidency. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40dgreports/%40dcomm/documents/publication/wcms_849141.pdf

- Pasquier-Doumer, L. (2012). Intergenerational transmission of self-employed status in the informal sector: A constrained choice or better income prospects? Evidence from seven west African countries. *Journal of African Economies*, 22(1). <https://doi.org/10.1093/jae/ejs017>
- Pfeffermann, D. (1993). The role of sampling weights When modeling survey data. *International Statistical Review/Revue Internationale de Statistique*, 61(2). International Statistical Institute (ISI). <https://www.jstor.org/stable/1403631>
- Serván-Mori, E., Gómez-Dantés, O., Contreras, D., Flamand, L., Cerecero-García, D., Arreola-Ornelas, H. and Knaul, F. M. (2023). Increase of catastrophic and impoverishing health expenditures in Mexico associated to policy changes and the Covid-19 pandemic. *Journal of Glob Health*. <https://pubmed.ncbi.nlm.nih.gov/37883200/>
- Smith, R. S. (1979). Compensating wage differentials and public policy: A review, ILR review, Cornell University, ILR School, 32(3). <https://doi.org/10.1177/001979397903200304>
- Stata (2021). Survey Data Reference Manual, Release 17. Stata Press. <https://www.stata.com/manuals17/svy.pdf>
- United Nations (2015). Transforming our world: the 2030 Agenda for Sustainable Development. A/RES/70/1. <https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
- World Bank (2013). World Development Report: Jobs. International Bank for Reconstruction and Development/The World Bank. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/263351468330025810/World-development-report-2013-jobs>
- Yatchew, A. and Griliches, Z. (1985). Specification error in Probit models. *Review of Economics and Statistics*, 67. <https://doi.org/10.2307/1928444>