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Effect of Informal Employment on Overeducation in Developing Countries with a focus on the Democratic Republic of Congo (DRC)

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Abstract

The aim of this study is to assess the effect of informal employment on the occurrence of overeducation in developing countries, focusing on the specific case of the DRC. Using employment data, we determine the incidence of overeducation and we isolate the role of informal employment as a determinant of overeducation. To measure overeducation, we mainly use the normative (adequationist) approach. We find an incidence of overeducation in the order of 33.3% in the DRC labor market. The econometric results based on recursive bivariate Probit suggest a positive and significant effect of informal employment. The results found are robust even when using the statistical approach as an alternative measure of overeducation. These findings suggest a set of measures likely to reduce the incidence of overeducation on the labor market. These should focus on the formalization of informal sector employment and policies to improve labor market matches.

JEL Classification: E26; E24; I21; J24.
Key words: Skills mismatch, Overeducation, Undereducation, Informal employment

1. Introduction

For some years now, the issue of the link between overeducation and informal employment has been the subject of growing interest in a number of studies carried out in developing countries (Herrera-Idárraga et al, 2013, Herrera-Idárraga et al, 2015; Handel et al, 2016, ILO, 2019; Aleksynska and Kolev, 2021). From a strictly theoretical point of view, establishing the link between employment informality and overeducation seems complex and the debate on the issue is far from over for at least two reasons. The first reason is that, when comparing the extent of vertical mismatch observed between informal and formal employments, the informal sector seems to be characterized by employments with high rates of both overeducation and

undereducation, whereas in the formal sector the high incidence of vertical mismatch is often not observed for both overeducation and undereducation (Aleksynska and Kolev, 2021). The second reason, on the other hand, is that the individuals who hold informal employments are very heterogeneous. On the one hand, the informal sector is made up of the working poor who find their livelihoods in informal activities and traditional family businesses that have never been registered, and on the other hand, workers and businesses that voluntarily opt for the informal sector in order to compensate for taxes and competition (ILO, 2018a). Individuals in informal employments thus constitute a non-homogeneous group within which, on the one hand, highly skilled individuals who cannot find work in the formal sector are forced to accept low-skilled employments in the informal sector (Handel, 2019), and on the other hand, some highly skilled individuals voluntarily opt for informal employments requiring low-level and less specific skills, which leads to higher levels of overqualification in the informal sector (Bahl and Sharma, 2023).

Although there does not seem to be a uniform theory on how informality affects skills mismatches, and more specifically education-occupation mismatches, at the same time, some studies consider that the extent of informality in developing economies could influence the extent of mismatches between educational qualifications and employments held (Jütting and De Laiglesia, 2009; Herrera-Idárraga et al, 2013). Given that informal employment in developing countries exposes individuals to the risk of precariousness and vulnerability (Marin, 2013; Jamal and Abdallah, 2016), it seems relevant to assess its impact on overeducation. Indeed, in developing countries, informal employment accounts for a preponderant share of the economy and plays a major role in production, employment creation and income distribution (ILO, 2018b)[2]. Like many African countries where the informal sector employs the largest proportion of the working population (Sandefur et al, 2006; Teal, 2011; Fields, 2011, ILO 2018b), the DRC has a labor market which, as well as being characterized by the preponderance of informal employment (INS-RDC, 2016 ; Kiuma et al, 2020), it is one of the Sub-Saharan African countries with highly atypical situations in terms of the match between workers' qualifications and the employments they hold (Herrera and Merceron, 2013; Kamala et al, 2018). According to Herrera and Merceron (2013), around 23.2% of workers in the DRC are overeducated, whereas the overall incidence of this phenomenon in Sub-Saharan Africa is around 21%. Recently, Kamala et al (2018) have shown that the scale of overeducation has increased significantly to the point where it stands at 35% for secondary school and between 28% and 40% for university graduates.

[2] In its report entitled "Women and Men in the informal economy: A statistical picture" published in 2018, the ILO shows that 93% of informal employment worldwide is concentrated in developing countries. In Africa, it represents 85.8% and 68.2% in Asia.

While these studies have highlighted the incidence of overeducation in the DRC, they do not take into account the extent to which the level of overeducation can be explained in a context of high employment informality. These studies all use a statistical approach to measure overeducation. And yet, as is the case in the USA and Canada, which have a normative framework for matching levels of training and employment, in particular “The Dictionary of Occupational Tittles” in the USA and “The National Occupational Classification” in Canada, the DRC has the advantage of having an official framework that proposes a match between employments and qualifications. These are the " Larcier Codes of Labour and Social Security Law". Based on this framework, this study measures overeducation using a normative approach. The results show an incidence of overeducation of around 33.3% and suggest that individuals in informal employments have a high probability of being overeducated compared with individuals in the formal sector.

The remainder of this document is organized as follows. Section 2 discusses the literature more specific to this work, while Section 3 presents the methodology and data used to arrive at the results in Section 4. Section 5 concludes.

2. Related literature

The literature on the effect of informal employment on the occurrence of overeducation follows on from the essentially empirical work that has studied the link between access to education and labor market distortions in the presence of an informal sector (Gong and Van Soest, 2002; Maloney, 2004; Boeri and Garibaldi, 2007; Rebière, 2011). These studies have all sought to test the hypothesis that, on the labor market, individuals with no level of education are oriented towards the informal sector, whereas individuals with higher levels of education would opt for the formal sector (El Badaoui and Rebière, 2013). Very specifically, the aim of these studies was to show that the probability of being in the informal sector is higher the lower the level of education. However, there is a limitation to these previous studies. Indeed, despite the abundance of empirical literature on the link between education and access to the employment sector in a context of informality, none of this work has studied how access to informal employment affects the correspondence between workers' level of education and the employments held. These studies therefore do not allow us to draw any specific conclusions about the effect of informal employment on overeducation.

Over the past decade, the specific question of the role of employment informality in explaining overeducation has given rise to a number of studies, almost exclusively in developing countries (Herrera-Idárraga et al, 2013; Herrera-Idárraga et al, 2015; Handel et al, 2016; Handel, 2019). The results of empirical work generally suggest a negative effect of informal employment on

the probability of overeducation in developing countries. On the other hand, although a negative effect is often found in these studies, the extent of this effect remains open to debate. While some studies have shown that, compared with highly qualified individuals in formal employments, those in informal employments have a high probability of being overeducated (Herrera-Idárraga et al, 2013; Herrera-Idárraga et al, 2015; Palmer, 2017; Vivatsurakit and Vechbanyongratana, 2021), other studies put this effect into perspective and instead suggest a high probability of overeducation in formal employments (Aleksynska and Kolev, 2021; Bahl and Sharma, 2023).

The first microeconomic study on the effect of employment informality on overeducation in developing countries can be attributed to Herrera-Idárraga et al (2013). The latter use a national sample of Colombian workers based on data from the 2008 Colombian Household Survey. They show that compared with workers in formal employments, those in the informal sector have a high probability of being overeducated. Although formal workers are also affected by overeducation, the extent of this remains relatively smaller than for informal workers. Their results also show that once the endogeneity of the sector of employment is taken into account, men in informal employments are more likely to overeducated, while for women, the probability of being overeducated does not seem to be closely linked to the choice of sector of employment. Recently, Vivatsurakit and Vechbanyongratana (2021) analyzed the incidence of overeducation in the Thai labor market over a period from 2011 to 2015 by comparing workers in formal employments with their counterparts in informal employments. They show that the most highly educated individuals, and young people in particular, gain access to a large proportion of low-skilled informal employments. Informal workers have a higher propensity to overeducation than workers in formal employments. In a study covering 15 countries in Africa and Latin America, Aleksynska and Kolev (2021) examined the link between training-employment mismatch and informal employment. Contrary to previous work which has highlighted the existence of a high probability of overeducation in informal employment, their study suggests instead that the probability of being overeducated concerns formal workers, conversely, informal workers have a high probability of being undereducated. Their result also holds when they compare women and men in the two employment sectors. Other studies reach the same conclusions as Aleksynska and Kolev (2021). In a recent study on India, Bahl and Sharma (2023) showed that education-occupation matching is a crucial problem for individuals in formal employments rather than those in informal employments. Their result therefore suggests that informal workers are less affected by overeducation compared to formal workers.

This review shows that the question of the role of employment informality in explaining overeducation remains a wide open debate for developing countries. From the studies

mentioned, it emerges that the literature has so far been documented mainly on Asian countries, Latin America and a few rare African countries, notably Zambia, Malawi, Liberia, Nigeria, Gambia and Namibia (Aleksynska and Kolev, 2021). Sub-Saharan African countries offer a very specific context for analysis, combining both an informal sector that employs the largest fringe of the working population (ILO, 2018a) and a high incidence of overeducation (Herrera and Merceron, 2013, Palmer, 2017; Morsy and Mukasa, 2019). In such an environment, research into the factors that explain overeducation is important and remains largely unexplored.

3. Methodology

- **Measuring overeducation**

The literature on measuring overeducation generally takes three approaches. Firstly, the subjective approach, based on individual perceptions of the employment held (Duncan and Hofman 1981; Sicherman, 1991). The advantage of this approach is that it is likely to provide a measure of overeducation that can be adapted to a specific context, and can therefore adapt very quickly to technological developments or organizational changes. It does, however, have certain limitations due to its subjective nature. It is possible for two individuals with the same level of education and occupying the same employment position to have different opinions about their perception of overeducation. While one may appear pessimistic, it is not out of the question for the other to be optimistic, given that it is not the diploma that is in evidence but rather the worker's perceived feelings of competence in the employment held (Alba-Ramirez, 1993). Secondly, the normative or adequationist approach based on grids of correspondences between the individual's level of qualification or type of training and the employment held (Rumberger, 1981). While this measure has the advantage of being logical, in the sense that for each level of diploma or training there should be a certain category of employments to be filled, it does have certain limitations in its implementation. Two problems are generally highlighted as limitations of normative measurement (Giret and Hatot, 2001). The first problem concerns the empirical definition of the standard used. In fact, defining a standard amount to establishing hypotheses about the measurement and relevance of this standard, as well as the profile of the person who has to define the standard (Forgeot and Gautié, 1997; Fondeur, 1999). The second problem relates to the fact that assimilating overeducation to a level of training in excess of the needs of the employment means considering only part of the individual's skills and consequently neglecting the rest (Groot and Maassen Van den Brink, 2000). Finally, the statistical approach based on the definition of correspondences between diploma and employment with reference to the situations most often observed among workers

(Verdugo and Verdugo 1989). The advantage of this approach is that it is easy to determine a statistical threshold, which is defined by an analysis of the deviations from independence between diploma and socio-professional category. It does, however, have a number of limitations, notably the fact that it is based on matches observed between the vast majority of individuals and the employments they hold. In addition, it simply corresponds to an ex-post adjustment between a demand and a supply of graduates considered to be homogeneous (Dolton and Vignolles, 2000).

As a result, the literature is by no means unanimous in highlighting these different measures of overeducation, especially as to date there is no consensus on which of the three proposed measures is best suited to explaining overeducation (Duru-Bellat, 2009; Capsada-Munsech, 2019). Ultimately, to measure the level of overeducation, several studies compare the different approaches provided in the literature, and the results they arrive at suggest that there is no uniform conclusion (Hartog, 2000; Branche-Seigeot, 2013). However, the availability of data providing information on the different measures of overeducation severely limits the use of the three approaches proposed in the literature. In developing countries in particular, this limitation still applies insofar as few studies simultaneously use the three approaches proposed in the literature (Issofou, 2013; Alattas, 2023).

In the context of this study, and as mentioned above, the DRC has the advantage of having an official reference framework on the organization and operation of the labor market and social security. Based on the Labor Code and the Constitution of the Republic, the "Larcier Codes of Labour and Social Security Law" are a compendium of the various legal and regulatory texts relating to labour and social security in the DRC. In Articles 89, 90 and 91, these Codes propose a classification and nomenclature of employments ranging from the lowest level (operational employments) to the highest level of social legislation (executives). This nomenclature of employments is understood in terms of socio-professional categories, and the employees who occupy these employments are technically classified with reference to their level of diploma according to the legislation in force in the DRC (Codes Larcier de la RDC, 2003). The employment classification therefore establishes a nomenclature of six[3] socio-professional categories, as follows: labourers; semi-skilled workers or employees; skilled employees;

[3] It should be noted that the DRC's education system, particularly its formal education component, operates with two institutional responsibilities. On the one hand, the Ministry of Primary, Secondary and Technical Education (EPST) organizes primary education in a six-year cycle (although since 2019, a reform has been in place to extend primary education to 8 years, as basic education, however, no study to date can provide data on a possible correspondence to be established) culminating in a primary school leaving certificate. Secondary education lasts 6 years and leads to a state diploma. On the other hand, the Ministry of Higher and University Education (ESU) is organized into 3 cycles: the first cycle lasts three years (the graduat), the second cycle two or three years depending on the field (the licence) and the third cycle (Postgraduate) leading to the DEA/DES diploma and the doctorate (2 years and 3 years respectively). However, the third cycle remains optional, given that the legislation recognizes the licence diploma as the highest diploma in the administration (EPST-RESEN I and II, 2005 and 2014).

supervisors; supervisory staff and management staff. Based on this description, it is then possible to define the extent of overeducation. In the light of this information, the measure applicable here is the normative approach, which makes it possible to establish a correspondence between two observed situations: the different socio-professional categories and the different diplomas. Table 1 provides information on the correspondences between diplomas and socio-professional categories based on the normative approach of overeducation.

The information contained in table 1 highlights two forms of correspondence: the so-called "normal" correspondence and the so-called "atypical" correspondence. The normal correspondence is that which is established when the worker is in the socio-professional category corresponding to his diploma, while the atypical correspondence is that which is established in the opposite case. It can be seen that a worker with no qualifications at all, or with only a primary school certificate, will be assigned to the employment normally required. A worker with only a certificate of primary education also finds his normal match in the semi-skilled employee category. A worker with a secondary school diploma observes his normal correspondence when employed as a qualified employee. Two levels of normal correspondence concern the worker with the diploma of graduat, it is about the category agent of control and executive of collaboration. As for a worker with a bachelor's degree, his normal correspondence is observed when he is either a collaboration manager or a manager. For a worker with a post-graduate diploma, however, his or her normal position is that of manager only.

Table 1. Diploma and Socio-professional category correspondence matrix in the DRC

	Socioprofessional category					
Diploma	Manœuvre	Semi-skilled employee	Skilled employee	Supervisor	Collaborative executive	Management executive
No diploma	X					
Primary	X	X				
Secondary			X			
Graduat				X	X	
Licence					X	X
Postgraduate						X

Note: the hatched boxes refer to "normal" correspondence. Source: Constructed from Codes Larcier RDC (2003).

On the other hand, when the match is atypical, the worker faces two mutually exclusive situations: in the first case, he is overqualified, while in the second, he is underqualified. Overqualified reflects an atypical relationship described as overeducation, while

underqualified reflects an atypical relationship described as undereducation. To define the extent to which an individual is overqualified or underqualified, the approach is to take the normal correspondence of the individual who constitutes the reference. On the basis of the normal match, we consider that all the matches between diploma and socio-professional category to the left of the normal match logically indicate overqualified (overeducation), and the matches to the right indicate underqualification (undereducation).

- **Empirical strategy**

The situation analyzed specifically here is that corresponding to overeducation as an atypical situation on the labor market. Thus, we consider the probit model estimating the probability of the individual being overeducation as:

$$Y_i^* = \beta' X_i + \alpha S_i + \varepsilon_i \qquad (1)$$

Where X_i is a vector of individual and employment characteristics. S_i is a dummy variable that captures the formality of the employment (informal or formal employment). ε_i is the error term of the equation in equation (1), $Y_i^*$is a latent variable (not observed), its dichotomous realization noted Y_i is observed such that: $Y_i = 1$ si $Y_i^* > 0$ if (the individual is downgraded) and 0 otherwise. Given the normality of the error term in equation (1), a probit specification is suggested as appropriate for estimating the effect of informal employment on the probability of being overeducated, conditional on the characteristics of the individual and his employment. The probability of a worker being overeducated can be rewritten as:

$$\mathrm{P}[Y_I = 1] = P[\beta' X_i + \alpha S_i + \varepsilon_i > 0] = \Phi[\beta' X_i + \alpha S_i] \qquad (2)$$

Where Φ is the distribution function of the reduced centered normal distribution. In the context of this first specification, if it is first assumed that the assignment of workers to formal or informal employment is exogenous to the chances of being overeducated, under such an assumption, the use of a univariate probit model provides consistent estimates of the effect of informal employment on the probability of overeducation. However, as soon as we assume that the assignment of workers to employment (informal or formal) is not random, given that certain unobservable characteristics that influence the probability of accessing a type of employment also influence the probability of being overeducated, the use of a univariate probit would require taking into account the selection bias to be corrected. Furthermore, given that it is possible that the same factors which influence the occurrence of overeducation may partly explain employment informality, it follows that the two phenomena are not independent, leading to a presumption of causality between the variables. According to Lollivier (2001), in such a situation, when the explained variable and the explanatory variables are qualitative, the recursive bivariate probit model is used in the case of cross-sectional data. In this case, the

model comprises two equations, one that estimates the determinants of overeducation and another that estimates the determinants of access to informal employment.

However, discrete variable models pose a problem of logical consistency, which makes it difficult to express the direct simultaneity of occurrence of two phenomena (Maddala, 1983). The difficulty lies in the fact that we cannot introduce both the overeducation variable as an explanatory variable in the employment informality equation and the informal employment variable as an explanatory variable in the overeducation equation. Thus, to facilitate specification, research favors one direction of the relationship (Beffy et al, 2009). Given the objective of this study, the approach adopted is to estimate a recursive bivariate probit that simultaneously models the probability of entering informal employment and its influence on the probability of being overeducated. The model adopted is recursive in the sense that informal employment is retained as the predominant element in the overeducation equation. To do this, we add to equation (1) the employment formality equation, which can be presented as follows:

$$S_i^* = \gamma' Z_i + \mu_i \qquad (3)$$

Where Z_i is a vector of individual characteristics and the error term μ_i. S_i^* is a latent variable, its dichotomous realization noted S_i is observed such that: $S_i = 1$ si $S_i > 0$ (the individual has informal employment) and 0 if it is formal employment. The probit specification associated with the probability of working in informal employment is given by the following equation (4):

$$P[S_i = 1] = P[\gamma' Z_i + \mu_i > 0] = \Phi[\gamma' Z_i] \qquad (4)$$

Combining equation (3) with equation (1), the formal framework of a recursive bivariate probit specification can be rewritten as follows:

$$\begin{cases} S_i^* = \gamma' Z_i + \mu_i \\ Y_i^* = \beta' X_i + \alpha S_i + \varepsilon_i \end{cases} \qquad (5)$$

The advantage of equation (5) is that it introduces a correlation between the error terms in the informal employment equation and the overeducation equation, thereby controlling for unobservable heterogeneity that could bias the estimated coefficients. In fact, certain unobservable factors that influence the decision to access employment may also partly influence overeducation, hence the potential correlation noted ρ between the error terms of the two variables. Equation (5) simultaneously models the fact that the individual is in informal employment ($S_i = 1$) and is overeducated ($Y_i = 1$). However, it is important to adopt a standard normalisation of the error variance for model identification purposes. Thus, we assume that the errors and follow a bivariate joint normal distribution such that:

$$\begin{pmatrix} \mu_i \\ \varepsilon_i \end{pmatrix} \rightarrow N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}\right) \quad (6)$$

While the problem of logical coherence that makes the expression of direct simultaneity between the informal employment equation and the overeducation equation complex can be resolved, another problem posed by the estimation of a bivariate probit model is that of finding valid instruments. A variable would be a valid instrument if it is a determinant in the equation of interest (in this case, the informal employment equation) and if, at the same time, it is not correlated with the error term in the outcome equation (in this case, the overeducation equation). However, as Herrera-Idárraga et al (2013) demonstrate, it is less easy to find the appropriate instrumental variables, as almost all regressors that explain the probability of being overeducated are likely to also explain the assignment of individuals to informal or formal employment. Thus, the choice of valid instruments most often depends on the researcher's intuition, but above all on knowledge of the economic theory related to the issue under study. Indeed, some studies of employment informality often control for household characteristics that are likely to influence access to informal employment, such as the type of household, the presence of young children, the presence of adults in the household or the income of household members (Goldberg and Pavcnik, 2003; Maloney, 2004). In the literature on overeducation especially in developing countries, few studies directly link informal employment and overeducation (Herrera-Idárraga et al, 2013; Aleksynska and Kolev, 2021; Bahl and Sharma, 2023).

However, the few studies that have looked at this issue have also used household characteristics as instrumental variables. For example, Mavromas and McGuiness (2012) use the presence of young children as a control variable in the overqualification equation. Following them, Herrera-Idárraga et (2013) used in addition to the presence of young children in the household, the latter added another variable of the social status of the household which they capture through the educational level of the other members of the household. It therefore seems clear that certain household characteristics are likely to influence an individual's decision regarding the choice of informal or formal employment, but without affecting overeducation. The literature on labor market participation stresses the importance of recurring factors such as age, level of education, household income or household composition (Zamo-Akono, 2007) and other less recurring factors such as religion (Heineck, 2004). For the purposes of this study, two variables were selected as valid instruments: the household composition variable, captured here by the type of household, and the religion variable. The hypothesis here is that these two variables have a significant influence on the probability of accessing employment but do not influence the probability of being overeducated.

- **Data source**

The data used in this study come from the Survey on Employment, the Informal Sector and Household Consumption (Survey 1-2-3) conducted by the DRC's National Institute of Statistics between 2012 and 2013. In addition to the fact that this survey remains the main source of reference on employment in the DRC to this day, the use of these data has been of interest very recently in micro studies of the DRC labor market (Kankwanda et al. 2015; Makiese, 2017; Kamala et al, 2018; Kiuma et al, 2020). A sample of 88,600 individuals aged 10 and over was obtained at the end of the survey. Not all of them were eligible, because they were not part of the working-age population (aged 15 to 64) (approximately 44,034 individuals), and also because they were still at school and had not provided information on their employment status (approximately 32,897 individuals). Excluding these individuals from the analysis reduces the sample to 11,669 observations. Furthermore, considering only individuals in urban areas, around 8,889 individuals are included in the analysis, 48.86% of whom declared their level of education and socio-professional category. In total, the final sample for the analysis is 4,343 individuals, including 3,317 men (76.38%) and 1,026 women (23.62%).

In addition to the two instrumental variables mentioned above, the choice of other variables was dictated by their importance in the economic literature and their availability in the database used. Tables A.2 and A.3 in the appendix describe the various variables selected. These variables relate to recurring individual characteristics such as age and age squared, gender, education and vocational training. The literature still does not reach similar conclusions regarding the effect of individual characteristics on the probability of being overeducated (Morsy and Mukasa, 2019). Education is captured in terms of the number of years of study and the diploma. In addition, to capture information on vocational training, at the time of the survey workers were asked whether they had had to undergo vocational training financed by the company or by themselves while in employment (INS-RDC, 2016). This information is used to differentiate workers who, in addition to their level of training, have had the advantage of improving their human capital from those who have not undergone vocational training. It is possible that vocational training can provide individuals with skills that can be valued beyond their diploma, which could lead them to occupy a position where the required diploma would be higher than the one they hold but valued given the skills acquired through vocational training.

Employment-related characteristics are also taken into account. Among these, we consider the informality of employment, which is the variable of interest in this analysis. It is assumed that informal employment has a positive effect on the occurrence of overeducation (Herrera-Idárraga, 2013). Another variable that plays an important role in explaining overeducation is

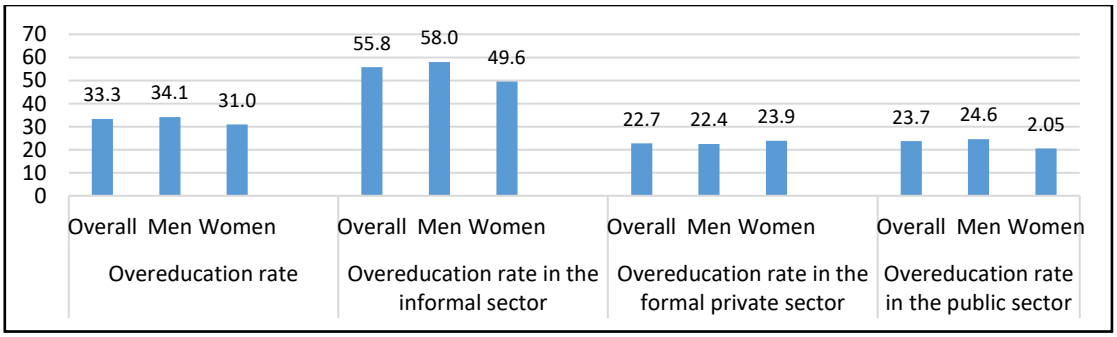
the nature of the employment contract. Previous studies have already shown that the nature of the contract affects overeducation (Forgeot and Gautié, 1997; Issofou, 2016). Some studies have also highlighted the importance of time spent with a company, which is a form of work experience but is much more explicit in that it allows us to see the possibilities open to the worker of accessing or not accessing a position that corresponds to his or her skills while remaining with the company (Barone and Ortiz, 2011). Other characteristics of employment are also taken into account, such as the regularity of employment, the industry in which the worker operates, working hours and another variable capturing the advantage offered by employment, measured here by employment promotion. The literature attests that there is an ambiguous relationship between working hours and overeducation in employment (Boll et al, 2016). However, most studies show that longer working hours reduce the risk of being overeducated (Groot and Van den Brink, 2003). The number of hours of work is used to capture the duration of work. Regularity of work also provides additional information on working hours. Finally, to control for regional characteristics and their heterogeneity, all the estimates also take account of the different provinces.

4. Results

- **Extent of overeducation**

Overall, the labor market in the DRC is characterized by a strong mismatch between the level of qualifications and the occupations held. The information provided in table A.6 (see appendix) shows that 55.6% of employees (51.9% of women and 56.9% of men) hold employment positions that do not correspond to their level of training or qualification. Within this atypical match, Figure 1 shows that 33.3% of workers are overeducated. The incidence of overeducation in the DRC is within the range generally observed in developing countries. Indeed, research carried out in these countries suggests that the incidence of overeducation is similar to that observed in developed countries (Herrera and Merceron, 2013; Zakariya, 2017; Morsy and Mukasa, 2019).

Figure 1: Incidence of overeducation



Note: values are expressed as a percentage.

Using data on Malaysian workers, Zakarya (2017) estimated the incidence of overeducation at 32%. In Mexico, Quinn and Rubb (2006) showed that the incidence of overeducation was between 17% and 40%. In Africa, the results all point to similar conclusions. In a study of ten African countries, Herrera and Merceron (2013) estimated the incidence of overeducation among workers aged 15 and over at between 20.7% and 21.3% for the years 2001 and 2005. Using a multidimensional approach based on fuzzy set theory, Issofou (2013) constructed a composite index of overeducation that can be broken down according to several factors. His results show an overeducation rate of around 51.9% among Cameroonian employees. Very recently, other studies have also highlighted the high prevalence of overeducation in African labour markets (Morsy and Mukasa, 2019; Aleksynska and Kolev, 2021). The incidence of overeducation is very high among employees in the informal sector. Overall, 5 out of 10 employees in informal employment are overeducated. Although the proportion of women overeducated in the informal sector is relatively close to that of women in the formal sector (49.57% compared with 50.43%), the incidence remains high. For men, on the other hand, 58.02% of those in the informal sector are overeducated. In the formal sector, the distinction between the public and private formal sectors shows that the public sector has a relatively high overeducation rate. In their study, Di Paola et al (2009) justify the high level of overeducation in the public sector compared to the formal private sector by the fact that access to employment in the public sector most often requires having passed competitive entrance exams, thus requiring a minimum level of education, which leads certain individuals, mainly young people, to make trade-offs between overeducation and employment stability. In DRC, a number of reforms[4] have been introduced since 2011, in particular as part of the drive to rejuvenate the public administration, which has made it compulsory to enter certain posts through competitive entrance examinations, which for a very long time hardly existed at all (Muambi, 2015).

- **Empirical results**

To capture the effect of informal employment on overeducation, the informal employment equation and the overeducation equation were estimated simultaneously in order to test and correct for the endogeneity bias between the two phenomena. The estimation results are presented in Tables 2 and 3. Table 2 reports the estimated coefficients, while Table 3 reports the marginal effects. The equations for informal employment and overeducation are estimated firstly for the sample as a whole, and secondly by distinguishing between men and women.

[4] For example, the Project to Strengthen and Rejuvenate the Public Administration (PRRAP), the Young Professionals Project (JPO) and the creation of the National School of Administration (ENA) are all programs that have helped to make access to certain employments and positions in the public administration compulsory following a competitive examination and with a required level of diploma.

The result in Table 2 suggests that informal employment and overeducation are not independent. The correlation coefficient in the regressions for the whole sample and for women and men is significant at the 1% level. The significant correlation coefficient between the error terms justifies the use of the bivariate probit model to analyze the effect of the informality of employment on overeducation. The results of the bivariate probit model are therefore preferable to those provided by the univariate probit model (see table A.4).

Table 2. Bivariate recursive Probit estimation of overeducation with endogeneity of informal employment

	Overall		Men		Women	
Variables	Informal	Overeducation	Informal	Overeducation	Informal	Overeducation
Age	-0.0214*	0.0161	-0.0226	0.0211	-0.0324	0.00908
	(0.0129)	(0.0130)	(0.0147)	(0.0147)	(0.0418)	(0.0343)
Age squared/100	0.000206	-0.00605	0.000218	-0.00532	0.000317	-0.0263
	(0.000160)	(0.0653)	(0.000177)	(0.0833)	(0.000548)	(0.107)
Woman	0.0183	-0.0122				
	(0.0564)	(0.0534)				
Years of study	-0.176***	0.181***	-0.169***	0.171***	-0.197***	0.234***
	(0.00666)	(0.00712)	(0.00725)	(0.00728)	(0.0169)	(0.0201)
Vocational training	-0.000829	-0.0501***	0.00906	-0.0254***	-0.171	-0.194***
	(0.0448)	(0.0438)	(0.0548)	(0.0513)	(0.166)	(0.118)
Informal employment		**2.568*** **		**2.611*** **		**2.383*** **
		(0.0602)		**(0.0662)**		**(0.164)**
Open-ended contract	-0.248***	-0.0880**	-0.226***	-0.146**	-0.393**	-0.188
	(0.0704)	(0.0608)	(0.0818)	(0.0688)	(0.190)	(0.156)
Fixed-term contract	-0.0573	0.0539	-0.113	0.109	0.105	-0.158
	(0.0802)	(0.0799)	(0.0877)	(0.0879)	(0.221)	(0.206)
Oral contract	0.159**	0.155**	0.127*	0.125*	0.288	0.246
	(0.0624)	(0.0621)	(0.0705)	(0.0710)	(0.182)	(0.170)
Time spent with the company	0.0131	0.0123	0.0132	0.00853	-0.00708	0.0495**
	(0.00865)	(0.00799)	(0.00942)	(0.00886)	(0.0264)	(0.0212)
Time with the company squared/100	-0.0607**	-0.0290	-0.0558*	-0.0164	-0.00950	-0.146**
	(0.0288)	(0.0237)	(0.0327)	(0.0262)	(0.0854)	(0.0631)
Industry sector	-0.0815	0.167	-0.209	0.238	1.219	4.456***
	(0.218)	(0.220)	(0.229)	(0.231)	(0.771)	(0.762)
Commerce sector	0.117	-0.00851	-0.0453	0.0704	1.132	4.662***
	(0.225)	(0.227)	(0.244)	(0.246)	(0.770)	(0.744)
Services sector	-0.277	0.289	-0.336	0.341	0.512	4.899***
	(0.213)	(0.215)	(0.227)	(0.227)	(0.746)	(0.711)
Number working hours	0.00209*	-0.00116	0.00212	-0.00182	0.00261	0.00294
	(0.00116)	(0.00116)	(0.00132)	(0.00134)	(0.00434)	(0.00332)
Regular employment	-0.00454	-0.00761**	-0.0282	0.0217	0.0266	-0.119**
	(0.0739)	(0.0731)	(0.0830)	(0.0831)	(0.229)	(0.212)
Promotion in employment	0.180	-0.340***	0.272	-0.306**	-0.996	-0.799**
	(0.161)	(0.123)	(0.175)	(0.133)	(0.606)	(0.356)
Religion		0.0191		0.00686		0.139
		(0.0221)		(0.0175)		(0.0905)
Type of household		-0.00639		-0.00279		-0.0316
		(0.0119)		(0.0204)		(0.0459)
Overeducation	**2.581*** **		**2.619*** **		**2.370*** **	
	(0.0581)		**(0.0575)**		**(0.158)**	
athrho		-2.230***		-1.873***		-1.281***
		(0.234)		(0.238)		(0.473)
Constant	1.255***	-3.794***	1.268***	-3.877***	1.049	-8.627
	(0.323)	(0.335)	(0.361)	(0.381)	(1.039)	(0.391)
N (Obs)	4 343	4 343	3 317	3 317	1 026	1 026
Wald chi2 (54)		3667.60		2925.80		3667.60
Prob>chi2		0.0000		0.0000		0.0000
LR test of rho=0: chi2 (1)		1578.76		1322.19		1578.76
Prob>chi2		0.000		0.000		0.000
Log likelihood		-556.48027		-2114.9271		-2702.368

***p<0.01; **p<0.05; *p<0.1. Robust standard errors in parentheses. Note. This estimate also includes the various provinces.

Furthermore, it emerges that the instruments as identification variables are valid insofar as they are significantly correlated with the endogenous explanatory variable, namely informal employment. The result of the recursive bivariate Probit estimation confirms that informal employment is an important determinant of overeducation even when the analysis is carried out by gender. The marginal effects suggest that access to informal employment increases the risk of overeducation by 29.1%. In their study on Colombia, Herrera-Idárraga et al (2013) also used a recursive bivariate probit model and arrived at the same result as found in this study. Contrary to these authors, who showed that when the endogeneity of informal employment was taken into account, the probability of overeducation was greater for men than for women, suggesting that overeducation was not closely linked to women's choice of sector of employment, this study suggests instead that the probability of overeducation at hiring is relatively high for women, although the effect is also significant at the 1% level for men. A comparative analysis of men and women shows an effect of 28.7% and 30.6% for men and women respectively. It therefore follows that women are almost 2 percentage points more likely to be affected by overeducation than men in informal employment.

The result of this study is in line with the work previously mentioned and confirms the argument that highly skilled individuals who cannot find work in the formal sector are forced to accept low-skilled employments in the informal sector (Herrera-Idárraga et al, 2013; Handel, 2019; Bahl and Sharma, 2023). The other variables taken into account in the analyses are broadly in line with the results suggested in the literature on the determinants of overeducation. Considering, for example, the variables that measure human capital, it can be shown that the number of years of schooling increases the risk of overeducation. In developing countries, several studies have shown that the risk of overeducation is strongly linked to the length of schooling (Morsy and Mukasa, 2019; Adeji and Baah-Boateng, 2021). This result can be justified by the fact that certain employments, as well as being demanding in terms of skills and qualifications, are often rare and characterized by rationing. Under these conditions, and as demonstrated by the theory of competition for employments (Thurow, 1975), it seems obvious that highly qualified individuals do not always gain access to employments corresponding to their level of education, given the level of competition they face. While the duration of schooling increases the risk of overeducation, workers who have undergone vocational training are less exposed to this phenomenon[5]. It emerges that vocational training is a signal that workers' skills are improving, regardless of their school or academic qualifications. This result is similar to that found in Australia by Mavromaras et al (2013). The latter showed that workers who have completed vocational training in addition to their

[5] During the survey, employees were asked whether they had taken any employment-related vocational training, whether financed by the employer or by themselves (INS-RDC, 2016).

university qualifications experience overeducation to a lesser extent than workers with only higher education qualifications. This result therefore suggests a presumption of skills due to vocational training.

Table 3. A Bivariate Recursive Probit Estimation of Overeducation with Endogeneity of Informal Employment: Marginal Effects

Variables	Overall	Men	Women
Age	0,0038	0,00156	0,0006
	(0,01185)	(0,00256)	(0,0015)
Age squared/100	-0,00217	-0,00245	-0,00757
	(0,0257)	(0,0266)	(0,0365)
Woman	-0,0018		
	(0,00654)		
Years of study	0,0626***	0,0651***	0,0768***
	(0,00522)	(0,00457)	(0,00221)
Vocational training	-0,0021***	-0,0064***	-0,0762***
	(0,000271)	(0,000231)	(0,00214)
Informal employment	**0,2912*** **	**0,2870*** **	**0,3058*** **
	(0,0431)	**(0,0573)**	**(0,0624)**
Open-ended contract	-0,0286**	-0,0589**	-0,0682
	(0,0133)	(0,0221)	(0,0731)
Fixed-term contract	0,0059	0,0633	-0,0865
	(0,0456)	(0,0678)	(0,0574)
Oral contract	0,0359**	0,0452*	0,0752
	(0,0129)	(0,0266)	(0,0481)
Time spent with the company	0,00263	0,0006	0,016**
	(0,00283)	(0,00614)	(0,0159)
Time with the company squared/100	-0,00642	-0,00264	-0,0522**
	(0,0048)	(0,00241)	(0,0212)
Industry	0,0642	0,0762	0,9571***
	(0,0523)	(0,0734)	(0,3561)
Retail	-0,0056	0,02145	0,9893***
	(0,00418)	(0,01604)	(0,05431)
Services	0,2895	0,3416	0,9864***
	(0,1961)	(0,2324)	(0,02342)
Number working hours	-0,0421	-0,0317	0,0183
	(0,03156)	(0,0226)	(0,01356)
Regular employment	-0,0215**	0,0153	-0,0468**
	(0,0092)	(0,0142)	(0,0032)
Promotion in employment	-0,0877***	-0,0812**	-0,2566**
	(0,00468)	(0,00235)	(0,01208)
Religion	0,0268	0,0405	0,0642
	(0,0182)	(0,0284)	(0,0433)
Type of household	-0,00215	-0,00123	-0,00157
	(0,00152)	(0,00101)	(0,00131)
N (Obs)	4 343	3 317	1 026

***p<0.01; **p<0.05; *p<0.1. Robust standard errors in parentheses. Note. This estimate also includes the various provinces. (Pr informal employment=1; Pr Overeducation=1).

Although this observation is intuitive, the literature on the effect of individuals' skills on overeducation is very hybrid. Indeed, it is difficult to identify studies that propose an explicit measure of employees' skills on the labor market[6]. Many studies emphasize the fact that overeducation is linked to the heterogeneity of human capital rather than to a momentary imbalance between the demand for and supply of qualifications (Chevalier and Lindley, 2009; Sohn, 2010). While the level of employees' skills seems to be partly at the root of overeducation, Branche-Seigeot (2013) highlights the fact that the persistence of overeducation can be explained by heterogeneity in skill levels, particularly if no further training is taken, and the lack of promotion of the most highly educated for a given level of qualification.

- **Robustness check**

We explore the robustness of the results by changing the approach to measuring overeducation. We use the statistical measure, which is an empirical measure based on matches made. In the statistical measure, overeducation occurs when the level of the worker's qualification is higher than that most frequently observed for the socio-professional category occupied. We use the distribution of levels of education by socio-professional category to estimate an endogenous qualification threshold that enables us to distinguish between workers in terms of overeducation. The statistical measure of overeducation shows a difference in the incidence of overeducation when compared with the normative (adequationist) measure used previously. The statistical measure shows that the incidence of overeducation is 23.5% (24.2% and 21.3% for men and women respectively). These results show that there is no consensus between different measures of overeducation, as is the case in the empirical literature in both developed and developing countries (Capsada-Munsech, 2019; Alattas, 2023). However, although a significant difference is observed between the two measures, the results found with the statistical measure remain close to those found previously by Herrera and Merceron (2013) for the DRC (23.2%) using the empirical measure.

The result reported in Table 3 shows that the use of an alternative measure of overeducation does not significantly alter our main results. With regard to the variable of interest, we can show that the positive effect of informal employment on overeducation remains robust even when using a statistical measure. An interesting fact is observed with the variable that captures gender (Female). While no significant effect is observed with the first measure, the use of the

[6] In some studies, skill scores, particularly in literacy, numeracy and listening comprehension, are used to measure the heterogeneity of employees' human capital (Branche-Seigéot, 2013).

statistical measure suggests a negative and significant effect at the 10% threshold of the variable capturing gender on overeducation.

Table 3. Effect of informal employment on overeducation: robustness analysis

	Informal employment	Overeducation	Informal employment	Overeducation	Informal employment	Overeducation
	Overal		Men		Women	
Informal employment		**2.735*** **		**2.739*** **		**2.604*** **
		(0.0585)		**(0.0618)**		**(0.167)**
Years of study	-0.108***	0.108***	-0.0983***	0.0969***	-0.144***	0.140***
	(0.00608)	(0.00617)	(0.00721)	(0.00738)	(0.0153)	(0.0157)
Vocational training	0.0101	-0.0877	0.0421	-0.0731	-0.137	-0.236*
	(0.0654)	(0.0578)	(0.0733)	(0.0644)	(0.163)	(0.139)
Woman	0.0962*	-0.0981*				
	(0.0523)	(0.0523)				
Overeducation	**2.737*** **		**2.743*** **		**2.691*** **	
	(0.0535)		**(0.0592)**		**(0.158)**	
Constant	0.381	-3.110***	0.501	-3.247***	0.299	-7.249***
	(0.326)	(0.330)	(0.360)	(0.365)	(1.034)	(0.367)
N (Obs)	4 343	4 343	3 317	3 317	1 026	1 026
Wald chi2 (54)		4414.95		3541.39		24065.56
Prob>chi2		0.0000		0.0000		0.0000
LR test of rho=0: chi2 (1)		1556.9		1293.16		241.961
Prob>chi2		0.0000		0.0000		0.0000
Log likelihood		-2344.5451		-1850.1086		-466.89235

***p<0.01; **p<0.05; *p<0.1. Robust standard errors in brackets. We only use the household composition variable as an instrument, as the religion variable was no longer found to be valid. Note: the estimates take into account all the variables, but we only include a few of them.

In the literature, there does not seem to be a consensus on the effect of gender on the occurrence of overeducation (Joona et al, 2012; Capsada-Munsech, 2019). In developing countries, while the results of some studies suggest an ambiguous effect (Herrera-Idraga et al, 2013), others show an effect to the disadvantage of women (Boudabbous and Maalej, 2011, Kamala et al, 2018; Mukasa and Morsy, 2019). The choice of overeducation measure could, all other things being equal, partly explain the results observed.

5. Conclusion

In this study, we examine the effect of informal employment on the occurrence of overeducation. Using data from the DRC, we determine the incidence of overeducation according to the formality of employment, and we isolate the role of informal employment as a determinant of overeducation. The normative measure of overeducation constructed from the correspondences between the diploma and the socio-professional category of workers based on the " Larcier Codes of Labour and Social Security Law" led to the determination of

the extent of overeducation in the DRC labor market. The findings show that the labor market in the DRC is characterized by a strong mismatch between the level of education and the employment held. The results suggest that 55.6% of employees hold positions that do not correspond to their level of training or diploma. The incidence of overeducation is estimated at 33.3%. Econometric results based on recursive bivariate Probit estimation suggest a positive and significant effect of informal employment on overeducation. The robustness of the results highlighted is tested by using the statistical approach as an alternative measure of overeducation. While this measure results in a lower incidence of overeducation than previously found, we also show that informal employment has a positive and significant effect on overeducation even when the statistical measure is used. The findings of this study suggest a range of measures that could reduce the incidence of overeducation in the labor market. These should focus on the formalization of informal sector employment and policies to improve labor market matches.

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Appendices

Table A.1. Distribution of individuals in employment according to the match between qualifications and SPC in the DRC

Diplôme	(1)	(2)	(3)	(4)	(5)	(6)	Total Diploma (%)
Overall							
No diploma	2.6	1.7	0.9	0.2	0.2	0.0	5.6
Primary	4.0	2.3	2.4	0.0	0.0	0.0	8.7
Secondary	7.9	12.8	22.6	7.4	6.4	1.6	58.8
Graduat	0.5	1.4	4.3	4.2	4.0	1.5	15.9
Licence	0.5	0.3	3.1	2.4	2.9	1.7	10.9
Postgraduate	0.0	0.0	0.1	0.0	0.1	0.1	0.2
% total SPC	15.5	18.5	33.4	14.2	13.6	4.9	100.0
Men							
No diploma	1.8	1.4	0.7	0.1	0.1	0.0	4.0
Primary	4.2	2.0	2.6	0.0	0.0	0.0	8.7
Secondary	8.1	13.2	22.3	7.2	6.9	1.9	59.6
Graduat	0.3	1.5	4.0	3.7	4.2	1.9	15.6
Licence	0.6	0.4	2.9	2.9	3.1	2.0	11.8
Postgraduate	0.0	0.0	0.1	0.1	0.1	0.1	0.3
% total SPC	14.9	18.5	32.6	13.9	14.4	5.8	100.0
Women							
No diploma	5.3	2.6	1.5	0.5	0.4	0.1	10.4
Primary	3.6	3.2	2.0	0.0	0.0	0.0	8.8
Secondary	7.5	11.5	23.7	7.9	4.9	0.7	56.1
Graduat	1.2	1.1	5.2	5.6	3.5	0.4	16.9
Licence	0.0	0.0	3.6	0.9	2.3	1.0	7.8
Postgraduate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total SPC (%)	17.6	18.4	35.9	14.8	11.1	2.2	100.0

Computed by authors. Note: (1): Manœuvre, (2): Semi-skilled employee, (3): Skilled employee, (4): Supervisor, (5): Collaborative executive, (6): Management executive. SPC: Socio-professional Category.

Table A.2. Explanatory variables definition

Variables	Definition
Education	A set of variables providing information on the employee's human capital
Years of study	Continuous variable indicating the average number of years of study.
No diploma	1 if no qualifications; 0 otherwise
Primary	1 if Primary Certificate; 0 otherwise
Secondary	1 if secondary school diploma; 0 otherwise
Graduat	1 if Graduat Diploma; 0 otherwise
Licence	1 if Licence diploma; 0 otherwise
Postgraduate	1 if Postgraduate Diploma; 0 otherwise
Vocational training	1 if the employee has undergone vocational training; 0 otherwise
Employment and labor market characteristics	A set of variables providing information on the status of the employment held
Informal employment	1 si Informal employment; 0 otherwise
Without contract	if the employee does not have an employment contract; 0 otherwise
OPEN-Ended Contract	1 if the employee has a Open-ended contract; 0 otherwise
FTC	1 if the employee has a fixed-term contract; 0 otherwise
Oral contracl	1 if the employee has an Oral contract; 0 otherwise
Primary sector	1 if the individual works in the primary sector; 0 otherwise
Industry sector	1 if the individual works in industry; 0 otherwise
Commerce sector	1 if the individual works in the commerce sector; 0 otherwise
Services	1 if the individual works in the service sector; 0 otherwise
Regular employment	1 if the employment is permanent; 0 otherwise
Number working hours	Continuous variable indicating the number of hours worked per week
Promotion in employment	1 if the employee has been promoted; 0 otherwise
Time spent with the company	Number of years at the company
Time spent with the company squared	Number of years with the company squared
Other employee characteristics	
Age	Age (in completed years)
Age squared/100	Age (in completed years squared) divided by 100
Woman	1 if Woman; 0 if Man
Regional characteristics	
Kinshasa	1 if Kinshasa ; 0 otherwise
Bandundu	1 if Bandundu ; 0 otherwise
Bas-Congo	1 if Bas-Congo ; 0 otherwise
Katanga	1 if Katanga ; 0 otherwise
Kasaï-Oriental	1 if Kasaï-Oriental; 0 otherwise
Kasaï-Occidental	1 if Kasaï-Occidental; 0 otherwise
Equateur	1 if Equateur ; 0 otherwise
Nord Kivu	1 if Nord-Kivu ; 0 otherwise
Sud Kivu	1 if Sud-Kivu ; 0 otherwise
Maniema	1 if Maniema ; 0 otherwise
Province orientale	1 if Province orientale ; 0 otherwise

Source: Authors based on literature.

Table A.3. Descriptive statistics

Variables	Mean	Minimum	Maximum
Education			
Years of study	11.178 (4.218)	0	21
No Diploma	0.055 (0.228)	0	1
Primary	0 .087 (0.282)	0	1
Secondary	0.587 (0.492)	0	1
Graduat	0 .158 (0.365)	0	1
Licence	0.108 (0.311)	0	1
Postgratuate	0.002 (0.048)	0	1
Vocational training	0.376 (0.484)	0	1
Employment and labor market characteristics			
Informal employment	0.305 (0.460)	0	1
Without contract	0.197 (0.398)	0	1
OPEN-Ended Contract	0.474 (0.499)	0	1
FTC	0.105 (0.306)	0	1
Oral contracl	0.222 (0.415)	0	1
Primary sector	0.011 (0.104)	0	1
Industry sector	0.130 (0.337)	0	1
Commerce sector	0.088 (0.283)	0	1
Services	0.770 (0.420)	0	1
Regular employment	0.881 (0.323)	0	1
Number working hours	43.046 (17.936)	1	48
Promotion in employment	0.050 (0.218)	0	1
Time spent with the company	8.234 (8.237)	0	49
Time spent with the company squared	1.356 (2.716)	0	24.01
Other employee characteristics			
Age	38.194 (11.215)	15	64
Age squared/100	15.845 (9.059)	2.25	40.96
Woman	0.240 (0.427)	0	1
Regional characteristics			
Kinshasa	0.294 (0.455)	0	1
Bandundu	0.091 (0.287)	0	1
Bas-Congo	0.064 (0.245)	0	1
Katanga	0.123 (0.328)	0	1
Kasaï-Oriental	0.032 (0.177)	0	1
Kasaï-Occidental	0.068 (0.252)	0	1
Equateur	0.065 (0.247)	0	1
Nord Kivu	0.073 (0.260)	0	1
Sud Kivu	0.060 (0.238)	0	1
Maniema	0.026 (0.160)	0	1
Province orientale	0.099 (0.299)	0	1

Computed by authors. Standard errors in parentheses.

Table A.4. Univariate Probit estimate of the effect of informal employment on overeducation

	Overall		Men		Women	
Variables	Coefficients	Marg.Eff	Coefficients	Marg.Eff	Coefficients	Marg. Eff
Age	0.0304*	0.0107*	0.0263*	0.00943*	0.0300*	0.00911*
	(0.0162)	(0.00566)	(0.0187)	(0.00668)	(0.0359)	(0.0110)
Age squared/100	-0.000270	-9.48e-05	-0.000257	-9.21e-05	-0.000129	-3.91e-05
	(0.000192)	(6.72e-05)	(0.000218)	(7.79e-05)	(0.000455)	(0.000138)
Woman	-0.0485	-0.0169				
	(0.0565)	(0.0195)				
Years of study	0.192***	0.0672***	0.181***	0.0649***	0.240***	0.0728***
	(0.00821)	(0.00280)	(0.00924)	(0.00325)	(0.0194)	(0.00552)
Vocational training	-0.207***	-0.0717***	-0.169***	-0.0598***	-0.388***	-0.113***
	(0.0493)	(0.0168)	(0.0552)	(0.0193)	(0.115)	(0.0319)
Informal employment	**1.385*** **	**0.501*** **	**1.405*** **	**0.512*** **	**1.301*** **	**0.437*** **
	(0.0648)	**(0.0213)**	**(0.0714)**	**(0.0231)**	**(0.160)**	**(0.0536)**
Open-ended contract	-0.223***	-0.0780***	-0.156**	-0.0558**	-0.510***	-0.154***
	(0.0637)	(0.0222)	(0.0714)	(0.0255)	(0.147)	(0.0436)
Fixed-term contract	-0.0904	-0.0311	-0.0188	-0.00672	-0.317	-0.0866*
	(0.0883)	(0.0297)	(0.0989)	(0.0352)	(0.206)	(0.0498)
Oral contract	-0.0398	-0.0139	-0.0172	-0.00616	-0.109	-0.0323
	(0.0708)	(0.0245)	(0.0802)	(0.0286)	(0.158)	(0.0460)
Time spent with the company	-0.0286***	-0.0100***	-0.0207**	-0.00742**	-0.0611***	-0.0186***
	(0.00886)	(0.00310)	(0.00988)	(0.00354)	(0.0215)	(0.00650)
Time with the company squared/100	0.0610**	0.0214**	0.0374	0.0134	0.164***	0.0499***
	(0.0258)	(0.00905)	(0.0288)	(0.0103)	(0.0636)	(0.0193)
Industry sector	0.969***	0.366***	0.969***	0.367***	3.924***	0.850***
	(0.327)	(0.121)	(0.331)	(0.122)	(158.0)	(0.0164)
Commerce sector	0.867***	0.332***	0.857**	0.330**	4.123***	0.918***
	(0.334)	(0.126)	(0.343)	(0.129)	(158.0)	(0.0170)
Services sector	0.767***	0.236***	0.723**	0.232**	4.116***	0.599***
	(0.324)	(0.0837)	(0.328)	(0.0911)	(158.0)	(0.0635)
Number working hours	0.00286**	0.00100**	0.00202	0.000722	0.00729**	0.00221**
	(0.00133)	(0.000468)	(0.00147)	(0.000527)	(0.00331)	(0.00101)
Regular employment	-0.256***	-0.0940***	-0.225**	-0.0834**	-0.473**	-0.162**
	(0.0847)	(0.0322)	(0.0933)	(0.0356)	(0.217)	(0.0815)
Promotion in employment	-0.486***	-0.148***	-0.435***	-0.139***	-0.957***	-0.193***
	(0.122)	(0.0308)	(0.130)	(0.0358)	(0.379)	(0.0411)
Inverse Mills Ratio	0.793***	0.278***	0.537**	0.192**	1.277***	0.388***
	(0.209)	(0.0733)	(0.253)	(0.0904)	(0.391)	(0.120)
Constant	-4.384***		-4.104***		-8.266	
	(0.481)		(0.529)		(158.0)	
N (Obs)	4 343	4 343	3 317	3 317	1 026	1 026
Wald chi2(27)	1385.78		1050.59		373.32	
Prob>chi2	0.0000		0.0000		0.000	
Pseudo R2	0.251		0.2432		0.3122	

***p<0.01; **p<0.05; *p<0.1. Robust standard errors in parentheses. Note. This estimate also includes the various provinces. Marg.Eff (Marginal effects).

Table A.5. Extent of mismatches in the DRC labor market

	Situation in the employment held								
	Overall			Men			Women		
SPC	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Manœuvre	0.0	6.6	8.9	0.0	5.9	9.0	0.0	8.9	8.7
Semi-skilled employee	1.7	2.3	14.5	1.4	2.0	15.1	2.6	3.2	12.6
Skilled employee	3.3	22.6	7.4	3.3	22.3	7.0	3.5	23.7	8.7
Supervisor	7.6	4.2	2.4	7.3	3.7	2.9	8.3	5.6	0.9
Collaborative executive	6.6	6.9	0.1	7.0	7.3	0.1	5.3	5.8	0.0
Management executive	3.1	1.8	0.0	3.8	2.1	0.0	1.2	1.0	0.0
Total	22.3	44.4	33.3	22.8	43.3	34.1	20.9	48.2	31.0

Computed by authors. Values are expressed in percentages. (1): Undereducated; (2): Matched; (3): Overeducated. SPC: Socio-professional Category.