

Effects of Downgrading on Wages: The Case of Young Graduates in the Republic of Congo

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Abstract

The purpose of this paper is to analyze the effects of undereducation and overeducation on wages. To that end, we used data from the Transition to Employment Survey (ETVA-2015). With these data, we first proceeded to identify the downgraded individuals by the MCA. Then, knowing that the unemployed may have a reservation wage, which will bias our estimates, we proceeded to estimate a two-stage model to correct for this selection bias. Using this model, we found that downgrading determines workers' wages. Undereducation improves wages, while overeducation reduces them. Based on these results, we advocated that policymakers should promote more youth placement through employment agencies and improve the supply of training in order to effectively meet the needs of firms.

Keywords

Overeducation, Undereducation, Youths, Congo

1. Introduction

The labor market is the place where heterogeneous workers and heterogeneous jobs are matched so that worker's education level coincides with job requirements. However, it is often the case that education/job mismatches can occur. One such mismatch is downgrading. This phenomenon, which is ubiquitous in labor markets around the world (Pseiridis et al., 2018), is expected to increase due to, among other things, the coronavirus disease 2019 (COVID-19) pandemic, which has led to an increase in the number of unemployed individuals, a decrease in the quality of jobs, as reported by the International Labor Office (2022) and lower wages (Xue, 2022).

Downgrading, which reflects a mismatch between the knowledge acquired

and certified by a worker's diploma and that required to hold a job (Vultur, 2006; Leuven & Oosterbeek, 2011), raises the question of the external efficiency of the education system. Thus, any individual whose acquired level of education exceeds (overeducation) or falls below (undereducation) the level of education required for employment is considered downgraded (Ndinga & Mpoué, 2013). This phenomenon reflects the misallocation of human resources to different jobs in the labor market (Sattinger, 1993) and can have a negative impact on growth, productivity and, therefore, wages (Linsley, 2005; Ndinga, 2017).

In a downgrading situation, individuals with a lower level of education than that required for the job they hold receive a higher income than their occupational category. On the other hand, some people have a higher level of education than that required for the job they hold and receive a lower salary than that of their occupational category. Therefore, downgrading becomes not only a waste of human resources but also a penalty or a wage reward, which is the subject of much interest in the literature.

Indeed, from a theoretical point of view, several works have been devoted to the relationship between education and remuneration with various contributions testifying to the richness of the controversy. Human capital theorists (Becker, 1965; Schultz, 1961) maintain that investment in human capital is the only factor allowing individuals to access quality, well-paid jobs.

However, in a situation of informational imperfection in the labor market, it is possible, according to job search theorists (Stigler, 1962; McCall, 1970) and matching theorists (Jovanovic, 1979), that jobseekers with a high level of education can access low-paid jobs. Furthermore, job competition theory (Thurow, 1975) assumes that wages are determined solely by the characteristics of the job and that a worker's level of education determines only his or her position in the job queue. Thus, it is likely that better educated individuals may take low-paid jobs.

This lack of consensus at the theoretical level on the effects of downgrading on wages also appears at the empirical level, as two basic types of results emerge from the research. On the one hand, in its overeducation component, downgrading has negative effects on wages (Cultrera et al., 2022; De Santis et al., 2021; Ngassa, 2018a); on the other hand, undereducation positively affects wages (Duncan & Hoffman, 1981; Yin, 2016).

The theoretical and empirical controversies above show that the problem of the wage consequences of downgrading is still relevant, especially as the results do not concern all fields of investigation. Moreover, the extent and nature of the effects of the wage consequences of downgrading are not linear. There is therefore a pressing need for further investigation in both developed and developing countries, as young people represent a much larger share of the population experiencing labor market frictions. This research aims to contribute to the current literature by answering the following question: what are the effects of downgrading on wages among youths in the Republic of Congo?

The question of the effects of downgrading on wages is interesting in the Republic of Congo for at least four reasons. First, downgrading reflects a failure of the education system, which is unable to provide individuals with useful and marketable skills, and it calls for a reform of the Congolese education system. Indeed, in the Congolese education system, there is a problem with the quality of education and the adequacy of education-employment (Ministry of Planning, Statistics and Regional Integration, 2015). Additionally, this system gives much more priority to general education (87%) to the detriment of technical and vocational education (13%), the consequence of which is unbalanced production in relation to the needs of the labor market.

Second, Congolese youths are increasingly victims of unemployment. Indeed, the results of the Survey on Transition to Working Life (ETVA-2015) show that more than 40% of young people with a university degree are unemployed.

Third, the phenomena of under- and overeducation have thus become very persistent among employees (Institut National des Statistiques, 2011; Ndinga & Mpoué, 2013; Ngassa, 2018a). The informal sector has become the main source of employment, accounting for 73.1% of population (Institut National des Statistiques, 2011). However, this sector offers jobs that do not match individuals' level of education.

Fourth, studies dealing with the downgrading-wage relationship are still rare in the Congolese context. The few existing studies (Ngassa, 2018a; Ndinga, 2017) use so-called classical measures of downgrading. As a result, one of the contributions of this article lies in its use of a new measure of downgrading in view of the limitations of classical measures.

In view of the above, the objective of this article is to analyze the effects of downgrading on the wages of young people in the Congo. It is argued that downgrading in its overeducation (undereducation) component negatively (positively) affects wages. In addition to the introduction and conclusion, this article is structured around three points. The first point presents the literature review, and the second presents the methodology. Finally, the third point presents the results of the model.

2. Theoretical Explanations and Brief Results of the Effects of Downgrading on Wages

In this section, we first present theoretical explanations of the relationship between downgrading and wages. Second, we provide a brief overview of some empirical results.

2.1. Theoretical Explanations

Several theories can be used to explain the effects of downgrading on wages. On the one hand, there is work that provides explanations from the labor supply side and those that provide explanations from the labor demand side.

The work explaining the effects of downgrading on wages from the labor supply

side includes human capital theory (Becker, 1965), job search theory (Stigler, 1962; McCall, 1970) and signaling theory (Spence, 1973).

In analysing the downgrading-wage relationship from the labor supply side, Human capital theory (Becker, 1965), is based on the assumption that productivity is an increasing function of the worker's level of human capital. Human capital includes not only formal education but also experience and on-the-job training. The worker is paid based his or her marginal productivity, so wages are determined by educated, experienced and trained workers. In other words, the more an individual invests in education, the better his or her chances of landing a well-paid job.

In the human capital framework, wages are positively correlated with a worker's level of education. Thus, the returns on the number of years of overeducation should be equal to the returns on the number of years of required education (Palczynska, 2021). A low wage in a situation of downgrading (from overeducation) would result from an exogenous shock affecting the balance between labor supply and demand.

On the other hand, in McCall's (1970) version of it, job search theory considers a situation of imperfect information to argue that a situation of prolonged unemployment has the effect of revising the calculations of the labor supplier on the wage offered on the labor market. In other words, the longer this offerer spends in unemployment, the more he is tempted to lower his reservation wage. Thus, he is inclined to accept a job where his acquired level of education (training) is higher (or lower) than the job. Consequently, he can expect a low wage in this job.

Acceptance of a downgraded job is seen in this framework as a deliberate choice by the individual in anticipation of better job opportunities. Consequently, downgrading is a strategy of professional insertion (Sicherman & Gallor, 1990), resulting in a low salary compared to the reservation wage (Ngassa, 2018a).

In the wake of job search theory, Spence's (1973) signaling theory, states that education, particularly the diploma, is a signal enabling employers to recruit the most suitable candidates for jobs. Therefore, there is no link between education and real productivity and, therefore, the wage of a job applicant. In this model, we can expect that a job candidate who is more educated but whose real productivity is low can be awarded a salary that is higher than or the same as that of another individual who is more educated but whose real productivity is high (Ngassa, 2018a).

Regarding explanations of the effects of downgrading on wages, job competition theory (Thurow, 1975) and job assignment theory (Sattinger, 1993) are theoretical foundations.

The theory of competition for employment (Thurow, 1975), which is close to signaling theory, provides another explanation of the downgrading-wage relationship but based on the labor demand side. For this theory, productivity is de-

terminated only by the characteristics of the job and not, as in human capital theory, by individual characteristics (Verhaest & Omey, 2002). Workers are placed in a queue based on their level of education, which is used by employers as an indicator of their ability to adapt quickly to jobs. Thus, highly educated people can take well-paid jobs (Thurow, 1975).

However, due to competition and an oversupply of better educated workers, some better educated workers move into the low-skilled, low-paid jobs previously held by less educated workers. The consequence is downgrading for the latter and more unemployment for less educated workers.

In general, the theories above overlook the interaction between individual and occupational characteristics in determining wages. Therefore, it is appropriate to mobilize assignment theory (Sattinger, 1993) to account for the wage consequences of downgrading.

Indeed, job allocation theory focuses on supply and demand where the productivity of an individual varies in each job and for the economy as a whole, while total output depends on how workers are allocated to their jobs. This theory therefore focuses on the problem of allocating workers to jobs where wages are determined by both occupational and individual characteristics and are the solution to this problem. In this framework, particular levels of human capital provide certain levels of productivity, indicating that individuals are allocated to jobs based on their skills. This allocation is optimal when workers are allocated in a top-down manner based on their skills, where the least skilled are given the simplest jobs and the most skilled are placed in the most complex jobs (Allen & Velden, 2001).

As a result, highly qualified people are more likely to be matched to vacancies requiring higher-level skills. However, the matching process is not always perfect due to competition between workers for a specific job. This imperfection may lead to some people being given hierarchically lower positions. In this case, workers may be overeducated, while others are found to be undereducated. Thus, a low wage in a downgrading situation would then result from the misallocation of workers to different jobs.

2.2. Brief Results

In the empirical literature, the effects of downgrading on wages remain highly controversial. Thus, in the first decade of the 2000s, the work of Hartog (2000) and Voon and Miller (2005) can be singled out. The work of Hartog (2000) is interesting in that it reviews the empirical results of the effects of downgrading on wages while distinguishing between the effects of over- and undereducation. In this respect, the author identifies four key results from this literature. Specifically, 1) the returns on the number of required years of education are higher than those obtained from the standard Mincer wage equation; 2) the returns on the number of years of overeducation are positive but lower than those of the number of required years of education; and 3) the returns on the number of years of

undereducation are negative but still lower in absolute terms than the returns on the number of required years of education. As a result, undereducated workers receive higher wages than their counterparts with the same level of education but in correctly matched occupations.

The work of [Voon and Miller \(2005\)](#) is of interest to us in that it considers both aspects of downgrading in a developed country, Australia, where most of the literature remains focused on overeducation. They find that 15.8% of men and 13.6% of women are overeducated, while approximately 18.5% of women and 13.7% of men are undereducated. Regarding the consequences of this downgrading, the authors find that overeducated workers receive modest earnings for the number of years of overeducation. In contrast, undereducated workers earn less than those who are just educated. Finally, downgrading does not explain the gender wage gap.

In the 2010s, the work of [Zakariya \(2014\)](#), [Ndinga \(2017\)](#) and [Ngassa \(2018a\)](#) gives an idea of the debate, particularly in American and African countries. In this regard, using Brazilian data and OLS regression, [Marioni \(2017\)](#) finds that undereducation increases wages by 4.31%. Similarly, using data from the Congo Employment and Informal Sector Survey and the two-step Heckman method, [Ndinga \(2017\)](#) shows that factors such as age, work experience and firm size explain the wages of overeducated and undereducated workers. From these results, it appears that overeducation increases wages when people are experienced.

Furthermore, working on Congolese data from the Labor Force Transition Survey, [Ngassa \(2018a\)](#) shows from the two-stage Heckman model that downgrading negatively affects wages when associated with gender. In other words, overeducated women experience a 53.3% wage penalty. Finally, using a random-effects model, [Zakariya \(2014\)](#) shows with Malaysian data from the 2007 Investment Climate and Productivity Survey that overeducation negatively affects wages.

More recently, in 2022, the work of [Jacobs et al. \(2022\)](#) and [Cultrera \(2022\)](#) illustrates that this topic remains a major concern in the economics literature. The study by [Jacobs et al. \(2022\)](#), carried out using Belgian data covering the period 1999-2016, shows from ordinary least squares (OLS) regression that overeducation has a positive effect on wages. More specifically, an additional year of overeducation increases hourly wages by 8.1% and 5.1% on average for workers who are nationals and immigrants, respectively.

Finally, using data from the European Skills and Employment Survey, [Cultrera et al. \(2022\)](#) first show from OLS regression that overeducation negatively affects wages. Indeed, an additional year of overeducation leads to a wage penalty of 6.67% compared to workers who have the same level of education but are well matched in employment. Then, using two-stage least squares regression, they find that the wage penalty is associated with overeducation. Specifically, an additional year of overeducation leads to an 18% reduction in wages compared to similarly educated individuals working in a matched situation.

2.3. Some Lessons Learned

Three lessons can be drawn from this literature. First, the theories used differently explain the wage consequences of downgrading. This lack of consensus makes it possible to pursue investigations into the capacity of the theories to explain the relationship between downgrading and wages in developing countries, particularly in the Congo. Second, the effects of downgrading on workers' wages are controversial. They are positive or negative, in both developed and developing countries and across decades. Thus, any generalization of empirical results is prohibited. This gives a specific character to each field of research, which needs to refine its work on this major concern and further justifies our work. Finally, from a methodological point of view, the majority of the works cited use so-called classical measures of downgrading, although these measures have limitations that may affect the quality of the results. Thus, this work aims to contribute literature on the effects of downgrading on wages by proposing an alternative measure of downgrading.

In summary, it is worth noting that the theoretical analysis of the effects of downgrading on wages points to the behavior of labor suppliers (Becker, 1965; Stigler, 1962; McCall, 1970; Spence, 1973) and labor applicants (Thurow, 1975) in determining wages. On the other hand, wage determination results from the combination of individual and occupational characteristics (Sattinger, 1993). While this theoretical literature remains controversial, empirical evaluations point to several divergent results. On the one hand, downgrading, in its overeducation component, has a positive impact on wages (Jacobs et al., 2022; Voon & Miller, 2005). On the other hand, undereducation leads to a wage penalty (Voon & Miller, 2005). However, the results become more interesting and challenge the predictions of human capital theory when overeducation leads to a wage penalty (Cultrera et al., 2022; Zakariya, 2014). Finally, the majority of the convened works use classical measures of downgrading despite their limitations that may alter the quality of the results.

3. Methodology

In this section we present, first, the data sources and the measurement of downgrading and, second, the modeling of the determinants of ranking and the variables selected for this purpose.

3.1. Presentation of the Data and Measurement of Downgrading

Due to the unavailability of data tracing the current situation of young Congolese graduates on the labor market, this study uses data from the Survey on Transition to Working Life (ETVA) carried out in 2015 in the Congo. The choice of this database is justified by the fact that it provides us with the possibility of analyzing and developing downgrading profiles through the information it contains on the relationship between education and the process of professional integration of congolese youths.

As a prelude to the description of the different analytical variables retained in this database, there is an urgent need to construct an alternative indicator of downgrading.

For the measurement of downgrading, three methods are often used in the literature, namely, the subjective, statistical (or realized matching) and job evaluation methods. It should be noted that the statistical method is carried out in two ways: matching between education and socio-professional categories and matching between education and salary.

However, while having advantages, the different methods of measuring downgrading have some limitations, including the problem of subjective bias, sensitivity to labor market conditions and the cost of subjective measurement, completed matching and job evaluation (for further discussion of the limitations, see [Capsada-Munsech, 2019](#); [Ndinga & Mpoué, 2013](#)). In view of these limitations, we propose an alternative indicator of downgrading based on the idea that each measure of downgrading represents a dimension of the phenomenon.

Thus, the subjective measure reflects the psychological dimension, the education/socio-professional category matching method and the job evaluation method represent the dimension related to the exercise of the job ([Ndinga & Mpoué, 2013](#)) and the remuneration dimension is captured by the education/salary matching method. Therefore, our alternative indicator is a composite indicator of downgrading that reconciles the different approaches to downgrading. This indicator takes into account three dimensions: the psychological dimension, the dimension linked to the exercise of the job and the remuneration dimension. However, due to the lack of a job reference system in the Congo, it is difficult to implement the job evaluation measure. Thus, in the composite indicator of downgrading (DCI), the dimension related to the exercise of the job is captured only by the matching measure.

The construction of this indicator is based on the inertia approach using multiple component analysis (MCA). The functional form used is that of [Asselin \(2002\)](#).

According to [Asselin \(2002\)](#), the functional form of the DCI (measured through its value C_m) is defined as follows: by considering m the index of a given individual (or youth) and c_m its eigenvalue:

$$C_m = \frac{\sum_{k=1}^K \sum_{j_k} W_{j_k}^K V_{j_k}^K}{K} \quad (1)$$

where k is the number of categorical indicators, J_k is the number of modalities of indicator k , and $W_{j_k}^K$ is the weight of category J_k (or the standardized score on the first axis, $\frac{\text{score}}{\sqrt{\lambda_1}}$, with λ_1 being the first eigenvalue). In the same way, $V_{j_k}^K$ is a binary variable that takes the value of 1 when the individual has the category J_k and 0 otherwise.

The weights obtained by MCA correspond to the standardized scores on the first factorial axis. The value of the DCI for any individual is simply the average

of the standardized scores of the categorical variables. The weight of a category is the average of the standardized scores of the individuals belonging to that category (Ndinga & Mpoué, 2013).

As all the modalities of the variables are transformed into binary indicators coded as 0 or 1, giving a total of P binary indicators, the DCI for a given individual m can be written as follows:

$$DCI_i = \frac{1}{K} (W_1 I_{i1} + W_2 I_{i2} + \dots + W_p I_{ip}) \quad (2)$$

where W_p is the weight (normalized first axis score, $\frac{\text{score}}{\sqrt{\lambda_1}}$), of category P , λ_1 is the eigenvalue; $I_{p,p=1 \rightarrow P}$ is a 0/1 taking the value 1 dichotomous indicator that takes the value of 1 when the individual has modality P and 0 otherwise. The DCI is a numerical variable measuring the level of downgrading of individuals on the labor market; thus, it can be negative, particularly for the most downgraded individuals, i.e., undereducated individuals. We therefore proceed to a translation along the real axis of the DCI to obtain a positive indicator. Once the index has been constructed, we proceed to determine the downgrading threshold. This threshold is based on a non arbitrary method by dividing the individuals in the labor market into two classes following the inertia approach. To do so, a hierarchical ascending classification (HAC) is performed that describes and divides the population into two classes. After distribution, the downgrading threshold is determined by the K-means algorithm to categorize the individuals into homogeneous groups.

Referring to the literature, MCA is based on the three indicators that make it possible to understand the dimensions (normative, statistical and subjective) of downgrading, as well as the variables (level of education and gender of the individual) available in the database and likely to have a direct influence on this phenomenon.

The MCA results show that the first factorial axis is indeed positioned as a downgrading axis. Indeed, downgrading evolves from left to right on this factorial axis. Moreover, we observe a deep drop between the cumulative inertia of this axis and the second factorial axis (from 53.59% to 1.57%). This drop between the first two factors illustrates the fact that we can limit our analysis to the first factorial plane (first factorial axis and second factorial axis). Moreover, the percentage of inertia explained by this factorial axis is 53.59%. From this result, we can qualify the quality of information returned by the first factorial axis as sufficient insofar as the explanatory power of the second axis remains relatively weak (1.57%). Consequently, we have good reason to believe that it is a good summary of the phenomenon of downgrading on the labor market, as it fulfils the COPA property. In other words, the first axis has a good discrimination quality compared to the second factorial axis.

In addition, the gross DCI, which has an average of 1.45^{-08} , varies from -1.283832 to 1.224037 . The scores of the categories that reflect the downgrading dimension

of individuals are negative while those that contribute to non declining have positive scores. This indicator, which has negative and positive values, has been translated to have positive values.

Finally, to determine the downgrading threshold, a hierarchical ascending classification (HAC) leads to the construction of a hierarchical tree, known as a classification dendrogram, showing the partition of the population into subgroups based on a succession of groupings. This partition into homogeneous classes is carried out using the K-means algorithm, where the number $K = 3$ of classes is determined based on the elbow criterion (Djogbenou et al., 2018). It emerges that the first class, which is composed of undereducated individuals, represents 42.34% of the population. The second class comprises just educated individuals, amounting to 47.61%. The third class contains the overeducated individuals, accounting for 10.05% of the population. It should be noted that the first and third classes are composed of individuals who appear to be downgraded in the labor market. The second class mainly consists of individuals who are not downgraded in the labor market.

Comparing the DCI with other measures of downgrading, notably the statistical measure (education-employment matching) and the subjective measure, **Table 1** shows that the DCI reflects only the statistical measure that crosses education with employment. This can be explained by the weight of the subjective measure in the construction of the DCI.

3.2. Modeling and Presentation of the Variables

The economic literature on modeling the effects of downgrading on wages generally highlights two types of models. On the one hand, authors use an ordinary least squares (OLS) regression (Marioni, 2017; Cultrera et al., 2022; Jacobs et al., 2022). The OLS method is used once it is assumed beforehand that downgraded individuals are already participating in the labor market, thus can reveal their wages. However, the authors ignore OLS estimates underestimate the real effect of downgrading on the labor market (Silles & Dolton, 2002). On the other hand, to correct for errors in the estimates with OLS, the authors use the maximum likelihood method (Ngassa, 2018a; Ndinga, 2017). The models that use this method have the particularity of selecting the sample, particularly the individuals

Table 1. Extent of downgrading according to measurements.

Components of downgrading	Subjective measure	Statistical measure	DCI
Undereducated		42.34	42.34
Just Educated		47.61	47.61
Overeducated		10.05	10.05
Downgraded	42.23		
Not Downgraded	57.77		

Source: authors based on ETVA-2015 data. Nb: the figures in the table are in percentages.

employed, because of the random nature of the samples. In this context, we opt for the maximum likelihood method where the two-stage model of Heckman (1979) will be used to correct the selection bias.

To do so, we start with a model of labor market participation. The formulation of the labor market participation model is based on the discrete choice structure where individual i chooses to participate in the labor market ($Y_i = 1$) or not ($Y_i = 0$). However, the choice of participation depends on the individual's status in the labor market. In the case of downgrading, the individual participates in the labor market by comparing the expected benefit of being downgraded with its cost. However, this difference is unobserved and refers to a variable Y^* such as

$$Y^* = \beta_i Z_i + \varepsilon_i, \quad (1)$$

where Z is the vector of explanatory variables, β is the vector of the parameters to be estimated, and ε is the error term. We note that Y is the observed variable if the individual has found a job.

Y is as follows:

$$Y = \begin{cases} 1 & \text{si } Y_i^* > 0 \\ 0 & \text{si } Y_i^* < 0 \end{cases} \quad (2)$$

Thus, the model of selection or access to employment will take the following form:

$$\text{Or: } P_i = \begin{cases} 1 & \text{si } P_i^* > 0, \text{ the individual has found employment} \\ 0 & \text{si } P_i^* \leq 0, \text{ the individual is unemployed} \end{cases}$$

where

$$P_i^* = X_i \alpha + u_i, \quad (3)$$

X_i represents the vector of explanatory variables (age, gender, education level, department, marital status and field of study), α is the vector of the parameters to be estimated, P_i^* is the latent variable modeling the probability of individual i holding a job, and u_i is the error term, which is normally distributed, allowing us to opt for a probit model (Maddala, 1986).

Furthermore, when the individual participates in the labor market, he or she reveals information about the wage. Thus, the wage is a linear function of a vector of exogenous variables. The wage equation is as follows:

$$\ln \text{sal} = \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \alpha_8 X_8 + \varepsilon_i, \quad (4)$$

where $\ln \text{sal}$ is the logarithm of the wage, X_1 represents downgrading, X_2 is gender, X_3 is the level of education, X_4 is age, X_5 is age squared, and X_6 is the firm size.

As presented, the econometric model of the effects of downgrading on wages is a system of simultaneous equations. Due to selection bias¹, the estimation of

¹For example, there are individuals working on their own account in the informal sector and/or in agriculture who consider themselves unemployed because they are not employed in the formal sector.

this model is carried out by the two-step method of Heckman (1979). In the first step, the access to employment model is estimated. After estimation, the inverse Mills ratio is calculated, which is incorporated into the wage equation to correct for this bias. In the second step, the integrated wage equation of the Mills ratio is estimated. It should be noted that ordinary least squares regression can also be performed (Marioni, 2017), but the results obtained from this regression will be biased because it does not correct for selection bias.

The explanatory variables were chosen on the basis of the literature. Indeed, the downgrading variable is introduced in the models based on the predictions of human capital and job search theories. This variable was used by Ngassa (2018a) and Ndinga (2017). Based on labor market discrimination theory (Becker, 1971; Phelps, 1972), the gender variable is inserted into the model since employers do not treat men and women equally in the labor market (Yin, 2016; Ngassa, 2018a). Knowing that human capital improves the chances of accessing well-paying jobs (Becker, 1965), the variables level of education and field of study or training, which capture human capital, are introduced into the model to test this prediction. These variables were also used by Cultrera et al. (2022).

Furthermore, the age variable, which takes individuals from 15 to 29 years old, defines youth here. It is included in the model on the basis of theoretical predictions that young people experience difficulties in accessing employment due to their lack of qualifications and experience (Béduwé & Cahuzac, 1997; Giret, 2001; Ngassa, 2018a). Its square is introduced in order to take into account the “donkey’s back” effects reflecting that access to employment and/or wages is high at the beginning of a given age, before stabilizing at a threshold age and declining thereafter. This variable has been used by Yin (2016), Ngassa (2018a), and Cultrera et al. (2022). The marital status variable is inserted into the model, particularly in the employment access equation, based on the economic literature, which states that married individuals are more likely to access employment.

Knowing that jobs are unevenly distributed, we include in the model, especially in the job access equation, the variable department of residence in order to test whether different departments offer the same chances to access employment. This variable was used by Ngassa (2018a). Finally, the firm size variable is introduced into the model, particularly in the wage equation, based on the economic literature that states that due to tasks in medium and large firms, individuals should be paid more.

Therefore, the variables downgrading, gender, age, education, department, firm size, field of study, and marital status may affect job access and/or wages. We have job access and log wage as explained variables. **Table 2** provides the descriptive statistics for the variables selected for this analysis.

Table 2 shows that the majority of young people (65.23%) have difficulties accessing employment. Those who have gained access to employment are either just educated (47.61%), undereducated (42.34%) or overeducated (10.05%). The majority of the young people are women (51.56%). Their average age is 21 years,

Table 2. Description of variables.

Qualitative variables	Frequency	
Access to employment		
– Yes		34.77
– No		65.23
Downgrading		
– Just-educated		47.61
– Undereducated		42.34
– Overeducated		10.05
Level of education		
– Primary		27.59
– Secondary 1		45.60
– Secondary 2		14.04
– Higher education		12.76
Gender		
– Female		51.56
– Male		48.44
Marital status		
– Single		77.08
– Married		20.97
– Divorced/widowed		01.95
Field of study		
– Technical		10.68
– General		89.32
Department		
– Brazzaville		45.27
– Pointe-Noire		22.47
– Other		32.26
Firm size		
– Small		82.76
– Medium		09.23
– Large		08.00
Quantitative variables	Mean	Standard deviation
Age	21.49	04.47
Wage	129,019	151644.3

Source: authors based on ETVA-2015 data.

5 months and 10 days. In addition, the majority (77.08%) of the young people are single, and only 20.97% live in a couple. Of these, 45.27% live in Brazzaville, compared with 22.47% in Pointe-Noire and 32.26% in the other departments of

the country.

Furthermore, 27.59% of the young people have primary education, 45.60% have secondary level 1 education, 14.04% have secondary level 2 education and 12.76% have higher education. The majority of the young people are in general education (89.32%) compared to 10.68% in technical education. Additionally, the majority are employees of small businesses (82.76%) and have an average salary of CFAF 129,019.

4. Presentation and Interpretation of the Model Results

This section is structured into two subsections. The first is the presentation of the results and the second is the interpretation of the results.

4.1. Presentation of the Results

Before interpreting the results, it is necessary to decide on the validity of the model. To do so, we use two tests, namely the Wald Chi2 test and the Wald test. The estimation of the model of the effects of downgrading on wages shows that the Wald Chi2 value is large (166.13) and that the associated probability is less than 0.001. These results means that the variables selected are significant overall and show the extent to which there is a good fit of the model to the data (Wald test associated with each variable). Based on these two tests of the model's validity, namely, the Wald Chi2 test and the Wald test, it can be concluded that the estimated model is of good quality and its results, presented in **Table 3**, are open to interpretation. Furthermore, it should be noted that the inverse Mills ratio, which corrects for the selection bias resulting from the selection equation between those who work and those who do not, is positive and significant at the 5% level. This means that the selection equation is linked to the wage equation and that the probability of working or not is positively correlated with the unobservable characteristics of individuals.

Table 3. Results of the model estimation of the effects of downgrading on wages.

Access to employment	Coefficients	Probability
Age	0.204*	0.081
Age squared	-0.300	0.230
Gender		
- Male		Ref
- Female	-0.380***	0.000
Marital status		
- Single		Ref
- Married	0.110	0.153
- Divorced/widowed	0.303	0.126
Level of education		
- Primary		Ref

Continued

– Secondary 1	0.0291	0.728
– Secondary 2	0.180*	0.096
– Higher education	0.0436	0.745
Departments		
– Others		Ref
– Brazzaville	–0.759***	0.000
– Pointe-Noire	–0.544***	0.000
Field of study		
– Technical		Ref
– General	–0.221*	0.076
Constant	–2.224*	0.096
Lnwage	Coefficients	Probability
Age	0.195	0.295
Age squared	–0.258	0.501
Gender		
– Male		Ref
– Female	–0.416***	0.000
Level of education		
– Primary		Ref
– Secondary 1	0.623***	0.000
– Secondary 2	0.717***	0.000
– Higher education	0.902***	0.000
Downgrading		
– Just-educated		Ref
– Undereducated	0.224*	0.052
– Overeducated	–0.571***	0.000
Firm size		
– Small		Ref
– Medium	0.319***	0.004
– Large	0.750***	0.000
Inverse Mills ratio	0.671***	0.011
Constance	7.080***	0.002
Number of observations		1427
Number of censored observations		1155
Number of observations not censored		272
Wald chi2		166.13
Prob > chi2		0.000

Source: authors based on ETVA-2015 data. Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3 above shows that there are two groups of determinants of access to employment. On the one hand, there are the factors that favor access to employment, i.e., age and the level of upper secondary education (high school). These variables, which have a positive sign, are statistically significant at the 10% level. These results mean that the probability of accessing employment increases with age and the level of education in upper secondary school.

On the other hand, there are factors that have a negative effect on access to employment. These are gender, department of residence, particularly Brazzaville and Pointe-Noire, and the nature of the studies pursued by the individuals. These variables have a negative sign and are statistically significant at the 10% level, which means that being a woman, living in Brazzaville and Pointe-Noire, and pursuing general studies reduce the probability of access to employment.

Regarding to the wage equation, this table shows that variables such as undereducation and education levels in lower secondary (middle school), upper secondary (high school) and tertiary education increase wages. These variables have a positive sign and are statistically significant at the 10% level. Similarly, the firm size variable, especially medium and large firms, increases wages since it has a positive sign and is statistically significant at the 10% level. On the other hand, the variables overeducation and gender decrease wages because of their negative effects on wages; there are statistically significant at the 10% level. The hypothesis formulated in this work is verified. Downgrading does not have neutral effects on wages. While its overeducation component affects wages negatively, its undereducation component affects them positively.

In sum, the model showed that age and the level of education at the upper secondary level (high school) favored access to employment. On the other hand, gender, department of residence and the nature of the studies completed are obstacles to access to employment. On the other hand, wages increase when young people are undereducated, have lower secondary (middle school), upper secondary (high school) and higher education. Similarly, when they work in medium and large companies, their wages are increased. However, when young people are women and have a higher level of education than the job (overeducated), their wages decrease.

4.2. Interpretation of the Results

The above results are interpreted and discussed in this subsection. An important lesson from these results is that the effect of downgrading on wages is mixed, all other things being equal. There is a penalty for overeducation on the one hand and a premium for undereducation on the other. These lessons are discussed below.

4.2.1. Overeducation, a Disadvantageous Situation on the Labor Market

Based on the abovementioned results, the wage equation shows that an additional year of overeducation reduces wages by 57.1% compared to the wages of the just educated individuals, all else being equal. In other words, overeducation

leads to a 57.1% wage penalty relative to just education. This result is consistent with the results of [Jacobs et al. \(2022\)](#) but inconsistent with those of [Cultrera et al. \(2022\)](#) and [Ngassa \(2018a\)](#). It is explained by assignment theory ([Sattinger, 1993](#)). [Sattinger \(1993\)](#) suggests that the penalty suffered by overeducated workers results from their misallocation in jobs. The skills of these workers are misallocated for their jobs. Thus, these results show that in the Congo, the effect of overeducation on wages is detrimental. The reason is that mass unemployment affects young people (over 40%, according to ETVA-2015), which leads them to accept jobs that require a lower level of education and/or skills than their own.

This result can therefore be explained by the inadequate output of the Congolese education system in relation to the needs of the labor market. In fact, the education system gives much more priority to general education (87%) to the detriment of technical and vocational education (13%)². The consequence is an overproduction of young graduates without qualifications, especially as training leading to qualifications is still in its infancy in the Congo ([Konaté et al., 2015](#)). Under these conditions, there are more educated young people on the labor market without any qualifications.

Thus, due to their lack of qualifications, employers would assign them to low-paid jobs under the hypothesis of those *who can do more can do less*. It should also be noted that this effect may result from the predominance of the informal sector in the Congo, which is characterized by low-paid jobs. Furthermore, in the formal sector, this result can be explained by the fact that remuneration is strictly linked to the profession, qualifications and experience. As a result, overeducated young people working in either the informal or formal sector can only suffer a wage penalty.

4.2.2. Undereducation, a Beneficial Situation on the Labor Market

The results suggest that undereducation has beneficial effects on the labor market in the Republic of Congo. The reason is that an additional year of undereducation increases wages by 22.5% compared to the wages of just educated individuals. This result confirms those obtained by [Marioni \(2017\)](#), [Hartog \(2000\)](#) and [Voon and Miller \(2005\)](#) and can be explained by human capital theory. Undereducated individuals may have other components of human capital, such as informal education and social capital as formal education alone cannot lead to a well-paid job.

Indeed, social capital can influence access to well-paid jobs because of the trust that employers have in their employees. The idea is that employers trust their employees to recommend potential candidates for job vacancies. In addition, employees know that employers are looking for people with the same abilities as themselves.

Thus, once hired through the social capital channel, these individuals can take well-paid positions ([Marmaros & Sacerdote, 2002](#)). This shows that, in addition to being a factor that allows access to employment, social capital influences job

²Politique nationale pour l'emploi (2012).

characteristics such as wages (Marmaros & Sacerdote, 2002). This result is reinforced by a study by Ngassa (2018b) in the Republic of Congo, linking social capital and access to employment. Indeed, Ngassa (2018b) finds that social capital is a determinant of access to employment in the Republic of Congo, especially since the results of the ETVA-2015 show that nearly 50% of young people use social capital to access employment.

5. Conclusion

The theories of endogenous growth by raising human capital to the rank of a growth factor (Lucas, 1988), and its inclusion in development agendas (MDGs and SDGs) are two developments whose legion effects have been the increased education of populations. This increase in the number of educated individuals and the level of education of individuals has not kept pace with the demand for graduate, which has given rise to the phenomenon of downgrading. However, this phenomenon challenges the predictions of human capital theory. Therefore, this article aimed to analyze the effects of downgrading on wages.

Using Heckman's (1979) two-stage model with ETVA-2015 data, it was found that undereducation increases wages, while overeducation leads to a wage penalty. This finding validates the hypothesis formulated in this work that the effects of downgrading on wages are not neutral. Downgrading generates a penalty for the overeducated and a bonus for undereducated individuals. In view of these results, we recommend that public decision-makers encourage job placements for young people by employment agencies and improve the supply of training to effectively respond to the needs of companies.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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