International Journal of Asian Social Science
ISSN(e): 2224-4441
ISSN(p): 2226-5139
DOI: 10.55493/5007.v16i4.5982
Vol. 16, No. 4, 254-266

URL: www.aessweb.com

Socio-economic dimensions of the wage treatment of workers in the Democratic Republic of Congo: A multivariate analysis based on data from the 1-2-3 survey

Taylor Mabula Pongo[1,4+]
Michel Kasuwa Dikadila[2]
Floribert Mungaba Mukinsa Mbumba[3]
Gregoire Ngalamulume Tshiebue[4]

[1]*University of Liege, Gembloux Agro-Bio Tech, Laboratory of Economics and Rural Development. Axis: Modelling and Development, Passage du Transport 2, 5030 Gembloux, Belgium.*
[1]*Email: taylormabula@gmail.com*
[2]*University of Kwango, Faculty of Economic and Management Sciences, City of Kenge and Protestant University in Congo, Faculty of Business Administration and Economic Sciences, Intersection of Liberation Avenues and Boulevard Triomphal, Congo-Kinshasa, Congo.*
[2]*Email: kasuwamichel@gmail.com*
[3]*University of Kikwit, Faculty of Economic and Management Sciences, No. 1, King Kester Avenue, Lukolela Commune, City of Kikwit, Congo.*
[3]*Email: floribertmungaba@gmail.com*
[4]*Catholic University of Congo (UCC), Faculty of Economics and Development, 2 University Avenue, Kinshasa, Congo.*
[4]*Email: gregoirengalamulume@gmail.com*

(+ Corresponding author)

Article History
Received: 6 February 2026
Revised: 10 April 2026
Accepted: 16 April 2026
Published: 24 April 2026

Keywords
Human capital theories
Labour market segmentation
Needs and family structure theory
Wage equity/discrimination theory
Wage treatment.

ABSTRACT

This research analyzes the socio-economic dimensions of the wage treatment of workers in the Democratic Republic of Congo. Based on data from the 1-2-3 Survey, which reveals long-term wage structures, a multivariate analysis was conducted using a combination of Principal Component Analysis and Multiple Correspondence Analysis. This analysis aims to verify the behavior of the factors determining the wage treatment of workers in the DRC. Conducted in two phases, the first highlighted the quantitative characteristics of the remuneration of Congolese workers based on Principal Component Analysis (PCA), while the second analyzed the qualitative characteristics. The results relating to the quantitative characteristics of the remuneration of Congolese workers through Principal Component Analysis (PCA) suggest that wage treatment in the Democratic Republic of Congo is linked to seniority, age, annual income, number of dependents, and housing and electricity allowances. These variables display positive correlations with wage treatment. Conversely, the qualitative characteristics of remuneration, observed on the basis of Multiple Correspondence Analysis (MCA), indicate that wage treatment in the Democratic Republic of Congo is characterized by three main predictors: registration with the CNSS, socio-professional category, and gender. In other words, workers benefiting from good protection and belonging to socio-professional categories benefit from relatively optimal wage treatment.

Contribution/ Originality: This study contributes to the literature by providing a multivariate analysis of wage treatment in the Democratic Republic of Congo. It highlights an estimation methodology based on data from the national 1-2-3 survey and is among the few studies examining the socio-economic determinants of wage disparities.

1. INTRODUCTION

The perception of the concept of "work" in the world has undergone a gradual evolution from antiquity to the contemporary era (Lhomme, 1960). In antiquity, work was associated with suffering and slavery. Despite its progressive revaluation through thinkers and economic upheavals, in the Middle Ages it was influenced by the rise of the economy and subsequently by the industrial revolution from the sixteenth century (with its extreme conditions), as well as by the emergence of trade unions and social legislation in the twentieth century. In the contemporary era, it is influenced by the technological and digital revolution, employment flexibility, the recomposition of professional identities, etc. Work occupies a predominant place, as it constitutes one of the determinants of the dynamics of national economies (Royer, 2002). Consequently, it is considered a primary source of income fostering consumption and social integration. Moreover, work structures professional categories and collective practices, thus justifying the intervention of the state in social regulation and public policies supporting employment (Steinbacher, 2024).

As a creator of a sense of self-fulfillment and generator of goods and services useful for life, work must be remunerated (Masanga & Mvioki, 2015). This remuneration is determined by an exchange relationship between the quantity of money or goods given in payment and the quantity of work provided. Gaston and Bertrand (1947) consider that wages are the product of two factors: the remuneration of the unit of work, measured by its duration or by its output (time-based or task-based work), and the number of units of work provided during the considered period. Furthermore, human capital theory in the economic landscape suggests that education and training increase individual productivity, which justifies the diversity of wage categories. In this perspective, individuals rationalize a cost-benefit calculation to invest in their human capital, and wage differences are explained by these variations in investment and the acquired skills (Becker, 1993). In other words, human capital, defined as the set of productive capacities of an individual, remains a key factor determining the wage level (Rochford, 2016).

However, while wages are considered remuneration in exchange for the quantity of work, Marxists indicate that it is not the price of work itself, but rather of the worker's labor power, thus making labor power a commodity. Consequently, as with any other commodity, the value of labor power is understood through the quantity of socially necessary work for its production (De Vroey, 1985). It also depends on the cost of the means of subsistence necessary for the worker to live and renew their labor power: food, housing, education, etc. Therefore, capitalism purchases this labor power for a day and exploits it by making the worker work beyond the time necessary to produce the value of their own wage, generating surplus value, which constitutes a source of profit. After this fundamental exposition of wages, this analytical framework is illustrated in the context of the Democratic Republic of Congo.

The Democratic Republic of Congo constitutes a relevant example for the study concerning the socio-economic dimension of wage treatment of workers. This country has an economy whose labor market is profoundly unbalanced (Ibale, 2024). Moreover, in view of the growing population, labor supply continues to increase while demand remains almost constant. Since 1990, labor demand from enterprises in the DRC has sharply declined following looting, wars, and other economic shocks. These constraining facts, combined with exacerbated poverty, estimated at 72.9% (World Bank Group, 2025), high unemployment, and a lack of public unemployment insurance mechanisms, have led to the attractiveness of jobs in the public ecosystem and favored the expansion of the informal sector, dominated by self-employment.

Furthermore, while the study of employability in the Democratic Republic of Congo highlights a highly unbalanced labor market, with a strong anchoring of the informal sector and a high rate of underemployment, wage concerns appear equally decisive. As a result, wage dynamics present not only sectoral disparities but also productivity inequalities within the labor force. In the formal sector, wages are negotiated in a context marked by strong job demand relative to limited offers. In this regard, the World Bank Group (2025) suggests that 78.4% of formal enterprises are competed against by informal enterprises, which pushes them to reduce wage costs in order to remain competitive. Conversely, in the public sector, the wage bill represents the main expenditure of the state budget, a

corollary of the scarcity of private jobs and of economic and political instability, which increasingly encourages workers to seek security through public employment.

Indeed, the socio-economic literature has extensively addressed wage differences and determinants, given their influence on growth, poverty, and social inequalities. In this context, several authors have demonstrated these disparities through socio-demographic and economic factors: gender (Polachek & Xiang, 2009), level of education (Beaudry & Green, 2003), employment status as a wage earner or self-employed (Bernhardt, 1994), as well as public or private sector employment (Christofides & Pashardes, 2002). Moreover, positive wage gaps exist between the formal and informal sectors (Falco, Kerr, Rankin, Sandefur, & Teal, 2011), explained by individual characteristics and productivity (García, 2017). These socio-economic and demographic differences influence wage disparities, which vary depending on national contexts, making socio-economic analysis of the wage dimension particularly important in the Democratic Republic of Congo, considering structural labor market imbalances, high informality, and persistent disparities between sectors and social categories.

As noted above, in the Democratic Republic of Congo, the labor market remains precarious, which means that socio-economic inequalities in income or wages remain poorly known. Likewise, the national unemployment rate remains very high, at 73% (Matanda, Makalamba, Ntumba, Ngoma, & Lisombo, 2025). This is why job seekers turn to the civil service, which guarantees job stability and wages. Moreover, the United Nations Development Programme–DRC (2009) notes strong disparities in per capita consumption, with a Gini coefficient of 0.40 (Ngandu Mulotwa, 2015). These consumption differences align with differences in individual incomes. In practice and over time, few in-depth studies in the Democratic Republic of Congo focus on the socio-economic dimension of wage inequalities, which constitutes a challenge for formulating effective policies likely to promote equitable wages, resulting in a lack of multivariate approaches in wage policy analysis. Furthermore, despite the crucial importance of wages in economic and social spheres, the factors influencing wage treatment remain little studied empirically, hence the need for this study. Thus, a major concern underlies the research question of this work: what are the interactions between the main factors influencing wage treatment of workers in the Democratic Republic of Congo? This question leads to the postulate that wage treatment of workers in the Democratic Republic of Congo is closely linked to socio-economic and socio-demographic factors, as well as individual, professional, and institutional factors. This provisional answer aligns with human capital theory, the theory of needs and family structure, labor market segmentation, and institutional approaches. All these key concepts constitute the basis of the literature review of this analysis.

This article conducts a multivariate analysis of the socio-economic dimensions of wage treatment of workers in the DRC, highlighting the review of theoretical and empirical literature, data processing and analysis, analysis and discussion of results, and perspectives in a constantly changing international context.

2. MATERIALS AND METHODS

We analyze the review of theoretical and empirical literature related to work. Four theories drew our attention: human capital theories, labor market segmentation, needs and family structure theory, and wage equity/discrimination theory. We also describe the hypotheses underlying the methodology used.

2.1. Overview of the Theoretical and Empirical Literature Review: Human Capital Theories, Labor Market Segmentation, Needs and Family Structure Theory, Wage Equity/Discrimination Theory

The concept of human capital, first introduced in 1961 by development economist (Schultz, 1961), was formalized by Becker (1993), who was awarded the Nobel Prize in Economics in 1992 for this work. This concept suggests that skills acquired by an individual during their training contribute to distinguishing them and making them a rare resource. In this context, Marshall (1890) considers that this scarcity is remunerated in the form of a "quasi-rent," compensating the individual for their training effort and aiming to provide future labor suppliers with the necessary incentive to acquire and renew specific and valuable skills in production (Vignolles, 2012). Labor market segmentation

is the division of this market into two categories of jobs: the primary market, which comprises stable, protected jobs offering career prospects for employees, and the secondary market, where jobs are unstable and lower-paid (Hoang-Ngoc, 2021). Needs and family structure theory refers to the application of psychological concepts to the family, such as Maslow's theory of hierarchical needs and Bowen's family systems theory. These approaches aim to examine how individual needs are met within the family structure and how this interdependent structure influences the well-being of its members (Family Systems Theory, 2024). Wage equity, aiming to value employees, constitutes an important element of hiring and retention strategies applied by companies.

Based on several empirical studies that developed econometric and statistical models combining variables used by different approaches to describe wage determinants, this study highlights the socio-economic dimensions of the wage treatment of workers in the Democratic Republic of Congo through a multivariate analysis. The socio-demographic variables considered are the number of dependents, seniority, age, and gender. Socio-economic variables include monthly income, union membership, professional category, and allowances (housing, water, and electricity). In the analysis, these variables are considered as research hypotheses.

2.2. Table of Hypotheses

These hypotheses are expressed in terms of the expected mutual influence and are formulated based on the results of similar studies conducted in other contexts (see the bibliographic references in Table 1). The meaning of these expected signs is explained as follows:

- Negative (-) indicates that the category or modality considered does not influence the socio-economic dimension of workers' wage treatment relative to 0;
- Positive (+) indicates that the category or modality considered influences the socio-economic dimension of workers' wage treatment relative to 0;
- Variables without signs have not been referenced in previous studies. In this case, they are assumed to be positive, meaning that the category or modality considered influences the socio-economic dimension of workers' wage treatment relative to 0.

Table 1. Analysis of hypotheses.

Categories	Predictors	Description and Explanation of the Equation	Abbreviations/ Notation	Nature	Expected Signs	Bibliographic Reference
Socio-demographic and economic	Monthly income	1 = High income (≥ 200 USD/month); 0 = Low income (< 200 USD/month)	REVM	Active and quantitative	+	Bernheim and Meer (2008)
	Gender	1 = Female; 0 = Male	SEXE	Active and qualitative	+	Polachek and Xiang (2009)
	Age	1 = Older > 45 years; 0 = Young ≤ 45 years	AGE	Active and qualitative	+	Polachek and Xiang (2009)
	Union membership	1 = Member; 0 = Non-member	INSCSYND	Active and qualitative	+	Fang and Hartley (2022)
	Socio-professional category	1 = High/favored SPC (executives, liberal professions, entrepreneurs, skilled employees); 0 = Low/disadvantaged SPC (workers, small traders, farmers, unemployed, informal workers)	CSP	Qualitative and nominal	+	Bernhardt (1994)
	Number of dependents	1 = Household with many dependents (≥ 5); 0 = Household	PERSCHAR	Active and quantitative	-	Blundell and MaCurdy (1999)

Categories	Predictors	Description and Explanation of the Equation	Abbreviations/ Notation	Nature	Expected Signs	Bibliographic Reference
		with fewer dependents (≤ 5)				
	Housing, water, and electricity allowances	1 = Receives an allowance; 0 = Does not receive an allowance	INDLOGEE	Active and qualitative	-	Bloom and Van Reenen (2007)
	Seniority	1 = Long ≥ 10 years; 0 = Short ≤ 10 years	Experience	Active and qualitative	+	Zwick (1999)

Source: Based on the literature review of previous studies.

According to this table, the predictors monthly income, gender, age, union membership, socio-professional category, and seniority have expected positive signs, indicating they are likely to influence the socio-economic dimension of wage treatment. Conversely, the number of dependents and housing, water, and electricity allowances have expected negative signs, suggesting they negatively impact the socio-economic dimension of wage treatment. These hypotheses will be confirmed or refuted following the empirical analysis of this study.

3. METHODOLOGY OF THE SOCIO-ECONOMIC DIMENSIONS OF WORKERS' WAGE TREATMENT IN THE DEMOCRATIC REPUBLIC OF CONGO

We describe here the methodology used to analyze the socio-economic dimensions of workers' wage treatment in the DRC. First, we present the data collection process. Then, we describe the processing and analysis of the data. Finally, we analyze the data and discuss the results.

3.1. Data Collection

The data for this study mainly come from documentary sources, primarily the National Institute of Statistics, which provided a database derived from the 2012 edition of the 1-2-3 survey. Although relatively dated, interviews with resource persons from this institute suggest that this database remains the last comprehensive and harmonized national survey offering detailed information on employment, income, and the socio-economic characteristics of workers in the DRC. In the absence of an equivalent and rigorous update, this database constitutes the most complete statistical reference for conducting a multivariate analysis of this type.

3.2. Data Processing, Analysis, and Model Justification

The collected data were analyzed using R 0.4. After constructing a mixed database including both qualitative and quantitative variables, it was crucial to implement Principal Component Analysis (PCA) and Multiple Correspondence Analysis (MCA), respectively. Some univariate descriptive statistics were first produced to meet the conditions for applying PCA.

3.2.1. Principal Component Analysis (PCA)

Principal Component Analysis (PCA) was applied to summarize the information carried by quantitative variables. This analysis highlights the decomposition of the correlation matrix and aims to identify factorial axes that maximize the explained variance. PCA is defined as a set of descriptive statistical methods for studying the variation of a large number of quantitative variables (generally more than two). The information to be extracted or described from this quantitative database corresponds to the total variation it contains. The objective of PCA is to identify the directions (the principal components) along which variation in these data is maximal. Given the order of importance of principal components in explaining the variation of the original variables, the primary concern is to obtain the coefficients of the linear combinations that define each principal component.

yi=ai1x1+ai2x2+⋯+aipxpwithaiT=(ai1,ai2,…,aip)y_i = a_{i1} x_1 + a_{i2} x_2 + \dots + a_{ip} x_p \quad \text{with} \quad a_i^T = (a_{i1}, a_{i2}, \dots, a_{ip})yi=ai1x1+ai2x2+⋯+aipxpwithaiT=(ai1,ai2,…,aip)

Such that aiTai=1a_i^T a_i = 1aiTai=1. These weights must ensure that each component is uncorrelated with the others.

As with all multivariate statistical techniques, PCA reduces the dimensionality of a database. The specificity of PCA is that.

- It describes the variation within a set of correlated variables XT=(X1,…,XP)X^T = (X_1, \dots, X_P)XT=(X1,…,XP) in terms of a new set of uncorrelated variables YT=(Y1,…,YP)Y^T = (Y_1, \dots, Y_P)YT=(Y1,…,YP), each being a linear combination of the original variables X;
- The variables Y (principal components) are constructed such that the first component (Y_1) accounts for the maximum variation in the original variables, the second component Y_2 accounts for the remaining variation after constructing Y_1, and so on.
- The variables y thus created are called principal components;
- A small number of these components can account for a substantial proportion of the variation contained in the original variables;
- This limited number of variables (principal components) can provide a reasonable low-dimensional summary of the original variables, useful for multiple purposes such as graphical representation or as input for other analyses, including multiple regression (Isaac, 2020).

3.2.2. Principles for Result Interpretation

- The variation contained in a principal component is represented by its eigenvalue.
- Any principal component with an eigenvalue greater than or equal to 1 should, in principle, be considered in the study of total variation.
- For practical reasons, one may accept a certain information loss by setting a priori a cumulative proportion of variance considered to contain a substantial part of the total information.

In PCA results, it is possible to determine the correlation between a variable and a principal component, and between individuals and the principal components.

3.2.3. Multiple Correspondence Analysis (MCA)

Multiple Correspondence Analysis (MCA) is the equivalent of PCA for qualitative variables. It is applied for multivariate descriptive analysis of a data table in which columns are qualitative variables, and rows represent individuals. The data table is characterized by xijx_{ij} xij corresponding to the modalities taken by individuals on the variables during the survey, and KjK_jKj representing the number of categories of variable j.

The objective is to analyze the database according to individuals, variables, or categories to establish similarities. It is therefore possible to classify individuals as similar or not.

Mathematically, the distance between individuals is calculated as:

$$di,i'2=C\sum k=1K(xik-xi'k)2Ikd_{i,i'}^2 = C \sum_{k=1}^{K} \frac{(x_{ik} - x_{i'k})^2}{I_k} \quad di,i'2=Ck=1\sum KIk(xik-xi'k)2$$

Where:

- di,i'2d_{i,i'}^2di,i'2 = distance between the first individual (i) and the second individual (i').
- xikx_{ik} xik and xi'kx_{i'k} xi'k = respective modalities of the two individuals.
- IkI_kIk = total number of individuals.

Since the modalities are qualitative, xikx_{ik} xik and xi'kx_{i'k} xi'k take the values 1 or 0 depending on whether the individual responds positively to the category or not. The k variables are dummy variables.

This distance is zero between two similar individuals. Any distance greater than 0 indicates that the two individuals have at least one different modality for a question or variable. Conversely, two individuals choosing a particular (rare) modality despite differences in other modalities are close. Individuals are compared category by category. MCA can also study the similarity between categories according to their association with a specific group of individuals. In this study, the objective is to identify trends in the socio-economic characteristics of wage remuneration to categorize workers according to whether they are in comfortable wage conditions or not.

4. DATA ANALYSIS AND DISCUSSION OF RESULTS

The results of this analysis comprise two sequences related to the nature of the variables and the objective pursued, which consist of implementing a multivariate analysis model combining Principal Component Analysis (PCA) and Multiple Correspondence Analysis (MCA).

4.1. Study of the Quantitative Characteristics of Congolese Workers' Remuneration

4.1.1. Exploratory Data Analysis

This analysis aims to illustrate the structuring of data, the various links between variables and observations, and to prepare the entire analysis process (PCA proper, typology, and clustering, etc.). Accordingly, the matrix presentation of variables, descriptive statistics, and the table related to the contribution of variables will be highlighted.

a) Matrix Plot of Variables

The result in Figure 1, the analysis suggests studying univariate distributions, indicating that age is skewed, ranging between 35 and 50 years, while INDLOGEE is bimodal, showing two distinct groups. Bivariate relationships suggest positive correlations between AGE, ANCTE, and PERSA, demonstrating that these variables evolve in the same direction, even if their distribution shows significant dispersion; INDLOGEE stands out with two peaks. The smoothed curves indicate non-linear trends, notably for ANCTE and INDLOGEE. Overall, correlations between certain variables justify dimensionality reduction through PCA, and the presence of distinct groups suggests that a combination of PCA and classification could better segment individuals before modeling.

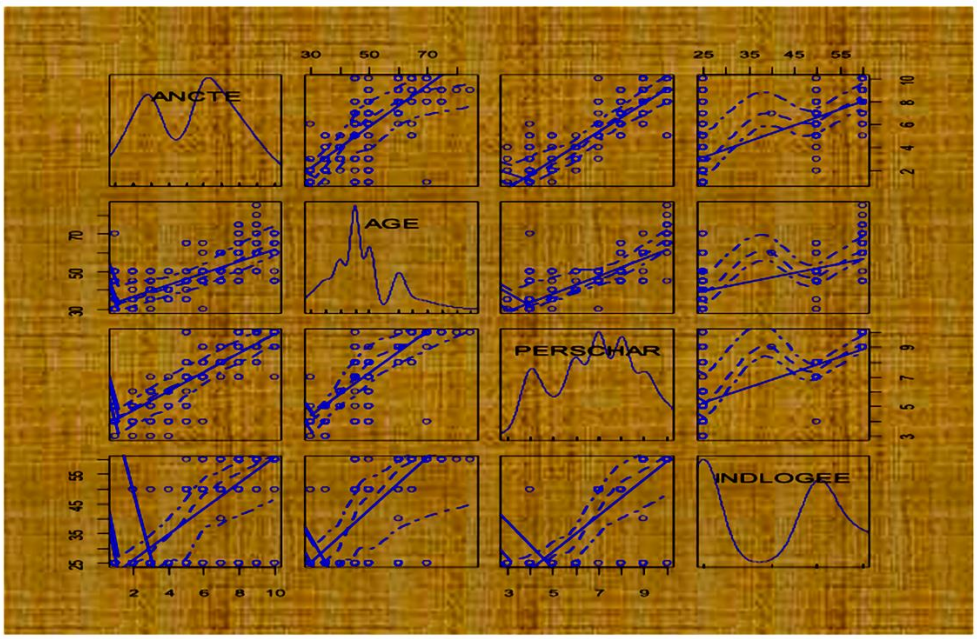

Figure 1. Graphical Presentation of the Correlation Matrix of Variables.

By observing this graph from the main diagonal, the trends of relationships between variables are all positive. This indicates that the variables are all positively correlated, which is the primary condition for applying PCA. After this matrix graph, which proves crucial for promoting methodological rigor and understanding the variability of our database, we proceed to the calculation of descriptive statistics, including the mean, standard deviation, and the correlation coefficient.

Table 2. Descriptive statistics.

Variables	Mean	Standard Deviation
REVM	122.000	65.009
ANCTE	5.333	2.591
AGE	47.383	10.838
PERSCHAR	6.900	1.874
INDLOGEE	40.667	14.552

b) Descriptive Statistics

The results of Table 2 suggest that the factors REVM and INDLOGEE have very large dispersions; ANCTE and PERSCHAR appear to be less dispersed, making them homogeneous among workers. Additionally, age shows moderate variability, leading to generational diversity among the workers.

Table 3. Calculation of the correlation coefficients of variables.

Variables	REVM	ANCTE	AGE	PERSCHAR	INDLOGEE
REVM	1.000	0.904	0.859	0.965	0.809
ANCTE	0.904	1.000	0.754	0.894	0.784
AGE	0.859	0.754	1.000	0.821	0.663
PERSCHAR	0.965	0.894	0.821	1.000	0.793
INDLOGEE	0.809	0.784	0.663	0.793	1.000

Table 3 highlights the calculation of the correlation coefficients of the variables. Overall, the results indicate strong correlations between the variables. The fact that all variables are strongly correlated suggests that the factors highlighting wage treatment inherently emerge together, which reinforces the dynamics of this PCA.

c) Principal Component Analysis of the Socioeconomic Dimensions of Workers' Wage Treatment in the Democratic Republic of Congo.

One of the necessary conditions is to verify the standardization of the data. The results related to this standardization suggest that the means of the different variables are essentially zero, confirming that the database is indeed standardized.

Table 4. Table of variables' contributions (%) to the components.

Variables	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
REVM	22.300	1.035	1.875	11.773	63.016
ANCTE	20.353	1.628	33.327	44.284	0.409
AGE	18.078	44.808	27.518	8.0109	1.585
PERSCHAR	21.688	0.355	7.436	35.709	34.811
INDLOGEE	17.579	52.175	29.844	0.222	0.179

These results can be graphically represented. The results in Figure 2 indicate that all variables are well represented, in accordance with the alignment of the respective arrows to the unit circle. However, it is crucial to note that the arrow for the variable seniority (ANCTE) is not as close to the unit circle as the others.

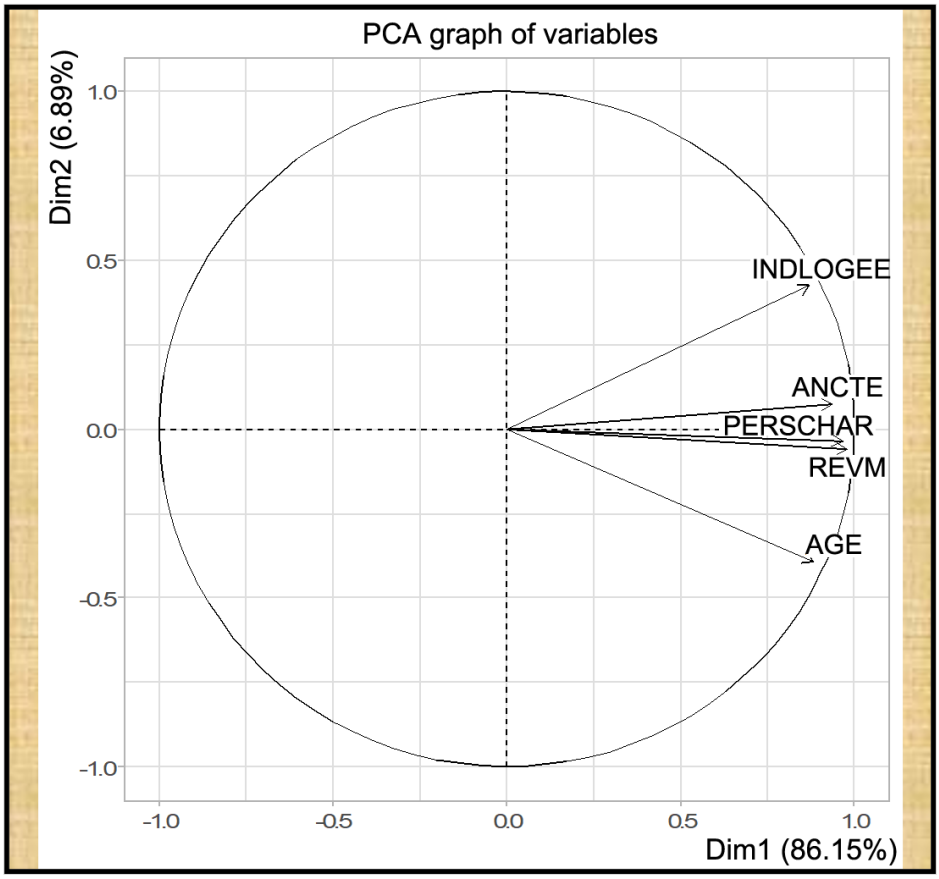

Figure 2. Contributions (%) of variables to the components.

Source: Based on the results of Table 4.

Moreover, it is necessary to verify the strength of the correlation between the variables and the principal components. First, it should be recalled that in statistics, correlation is distinct from significance. The results in Table 5 show the correlation of each variable with the principal components and also provide the significance level of this correlation for each variable.

Table 5. Table of variables' correlations with the components (with p-values).

Dimension 1		
Variables	**Correlation**	**p-value**
REVM	0.980	< 2e-200
PERSCHAR	0.967	< 4e-178
ANCTE	0.936	< 1e-137
AGE	0.882	< 1e-99
INDLOGEE	0.870	< 1e-93
Dimension 2		
Variable	**Correlation**	**p-value**
INDLOGEE	0.424	< 1e-14
AGE	-0.393	< 1e-12

It is observed that all variables are strongly correlated with the first principal component, with statistically significant correlations, given the different p-values; these factors are income, seniority, age, number of dependents, and housing and electricity allowances, indicating that they evolve coherently and suggest a wage treatment dimension in which well-paid, older workers with dependents stand out from others.

These results corroborate those of the wage determination analysis in the European Union (European Union, 2025). Based on data collected from over 500,000 companies and 20 million workers in the European Union, it was

shown that wage determination depends on all these factors: income, seniority, age, number of dependents, and housing and electricity allowances. The same observation was made in a study on wage determinants, indicating that positions of responsibility are often held by individuals of a certain age with many years of service in the company or administration.

Moreover, older or senior workers are generally well-positioned in the hierarchy, which means they generally receive higher remuneration than younger workers (Suzuki, 1976). The second component is less important but significant; it is dominated by age and housing allowances and suggests secondary differences not accounted for by the first dimension.

Referring to the hypotheses presented in Table 1, the results suggest that some are confirmed: wage treatment is related to seniority, age, and annual income, showing positive correlations and linked to the first dimension. In contrast, predictors for which negative effects were expected also show positive correlations with the same dimension, which means the hypothesis regarding their negative impact is refuted. They therefore align paradoxically in a positive socio-economic context.

The socio-economic factors of Congolese workers' wage treatment contained in the initial database are not limited to the first five quantitative variables used in this principal component analysis. Hence, it is necessary to add Multiple Correspondence Analysis (MCA) for the other qualitative factors.

4.2. Analysis of the Qualitative Characteristics of Workers' Remuneration

This subsection complements the previous analysis, which is incomplete since not all variables were considered. This second analysis focuses on qualitative factors such as union membership, socio-professional category, gender, and registration with the CNSS. Its objective is to address the socio-economic aspect of Congolese workers' wage treatment. Table 6 highlights the eigenvalues of this analysis.

Table 6. Presentation of eigenvalues.

Dimension	Eigenvalue	% variance	Cumulative percentage (%)
Dim 1	0.3605	20.60%	20.60%
Dim 2	0.2961	16.92%	37.52%
Dim 3	0.277	15.83%	53.35%
Dim 4	0.2411	13.78%	67.12%
Dim 5	0.2286	13.06%	80.19%
Dim 6	0.2107	12.04%	92.23%
Dim 7	0.136	7.77%	100%

The results indicate that dimension 1 alone explains 20.6% of the total variance. The first three dimensions thus represent approximately 53% of the total variance. Although there is a significant loss of information, we consider this proportion sufficient to summarize the essential information on total variation.

Accordingly, Table 7 presents the different contributions of the variables to the dimensions.

Table 7. Contributions of variables to the dimensions (R^2 and significance).

First dimensions		
Variables	**R^2**	**p-value**
INSS	0.686	6.732
CSP	0.622	3.344
SEXE	0.129	1.541
Second dimension		
Variables	**R^2**	**p-value**
CSP	0.573	1.964
SEXE	0.408	9.036
INSCSYND	0.191	1.984

The results indicate that the predictors NSS and CSP are strongly correlated with the first dimension. Additionally, the gender factor contributes weakly but remains significant. Conversely, CSP and gender contribute strongly to the second dimension, while union membership has a moderate contribution. To adequately describe the behavior of qualitative factors, we proceed to the category analysis in Table 8.

Table 8. Main categories associated with the dimensions.

Dimension 1 – Categories		
Category	**Estimate**	**p-value**
INSS=OUI	0.497	6.737
CSP=A	0.283	1.929
CSP=B	0.361	7.116
CSP=D	-0.703	2.150
INSS=NON	-0.497	6.737
SEXE=F	-0.218	1.540
Dimension 2 – Categories		
Category	**Estimate**	**p-value**
SEXE=M	0.352	9.036
CSP=A	0.441	1.159
CSP=D	0.242	4.457
INSCSYND=OUI	-0.889	1.702
INSCSYND=NON	-0.469	5.151
SEXE=F	-0.352	9.036
CSP=C	-0.765	1.270

Table 8 highlights the main categories associated with the dimensions. In this context, it is observed that workers affiliated with the CNSS and belonging to CSP categories A and B are located on the positive side of the first dimension; CSP D and workers not registered with the CNSS are located on the negative side. The first dimension highlights a sort of opposition between optimally protected workers (CNSS and higher CSP) and others.

The second dimension shows a contrast between men (SEXE=M) and positive CSP A, versus women and negative CSP C. Union membership (INSCSYND) is on the negative side, indicating that unionized workers stand out compared to others. Therefore, the second dimension highlights differences in CSP, gender, and union membership.

Overall, the Multiple Correspondence Analysis associated with qualitative factors indicates that wage treatment in the DRC is significantly linked to three factors: CNSS registration, socio-professional category, and gender. In other words, workers benefiting from good protection and belonging to higher socio-professional categories receive optimal wage treatment.

These results corroborate those reported in *The Socio-Economic Impact of Social Security*, a study demonstrating that social security strongly influences socio-economic development through redistribution and income equality (International Social Security Association (ISSA), 2016). Moreover, taking examples from the United States, Fang and Hartley (2022) state in an analysis on the evolution of union wages and their determinants that unions, mainly through collective organization and negotiation, almost universally increase their members' wages, even after accounting for individual, professional, company, and other factors influencing remuneration (Kiester, 2021). In a study on a representative sample of Canadian white men examining the choice between self-employment and wage employment, Bernhardt (1994) makes the same observation, indicating that wage workers benefit from higher potential gains in both sectors, with a more marked advantage in wage employment.

In view of these results, the hypotheses stated in Table 1, affirming the positive contribution of union membership and socio-professional categories to wage treatment in the Democratic Republic of Congo, are confirmed.

5. CONCLUSION

This research analyzed the socio-economic dimensions of workers' wage treatment in the Democratic Republic of Congo, based on a multivariate analysis using data from the 1-2-3 survey, which reflects long-term wage structures. Accordingly, a major concern was raised: to describe the behavior of the main factors influencing workers' wage treatment in the DRC. This analysis was conducted in two phases: studying the quantitative characteristics of Congolese workers' remuneration based on Principal Component Analysis (PCA) and the qualitative characteristics based on Multiple Correspondence Analysis (MCA).

The results related to the quantitative characteristics of Congolese workers' remuneration obtained via PCA reveal that wage treatment in the Democratic Republic of Congo is strongly linked to seniority, age, annual income, number of dependents, and housing and electricity allowances. The qualitative characteristics, obtained through MCA, show that wage treatment in the Democratic Republic of Congo is influenced by three main factors: CNSS registration, socio-professional category, and gender. In other words, workers benefiting from good protection and belonging to higher socio-professional categories receive optimal wage treatment.

Funding: The authors declare that this study received no funding from any institution or university.
Institutional Review Board Statement: They confirm that this study did not require approval from an Institutional Review Board (IRB), as it does not involve experiments on humans or animals.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Beaudry, P., & Green, D. A. (2003). Wages and employment in the United States and Germany: What explains the differences? *American Economic Review, 93*(3), 573-602. https://doi.org/10.1257/000282803322156990

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). Chicago, IL: University of Chicago Press.

Bernhardt, I. (1994). Comparative advantage in self-employment and paid work. *The Canadian Journal of Economics / Revue Canadienne d'Economique, 27*(2), 273-289. https://doi.org/10.2307/135747

Bernheim, B. D., & Meer, J. (2008). *Do real estate brokers add value when listing services are unbundled?* NBER Working Paper No. 13796. Cambridge, MA: National Bureau of Economic Research.

Bloom, N., & Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. *The Quarterly Journal of Economics, 122*(4), 1351–1408. https://doi.org/10.1162/qjec.2007.122.4.1351

Blundell, R., & MaCurdy, T. (1999). Labor supply: A review of alternative approaches. In O. Ashenfelter & D. Card (Eds.), Handbook of labor economics. In (Vol. 3A, pp. 1559-1695). Amsterdam, Netherlands: Elsevier.

Christofides, L. N., & Pashardes, P. (2002). Self/paid-employment, public/private sector selection, and wage differentials. *Labour Economics, 9*(6), 737-762. https://doi.org/10.1016/S0927-5371(02)00103-3

De Vroey, M. (1985). Marx's theory of wages: A heterodox critique. *Revue Economique, 36*(3), 451-480. https://doi.org/10.3406/reco.1985.408851

European Union. (2025). *Wage determinants in the European Union: Updated results from Structure of Earnings Survey (SES 2022) data*. Luxembourg: Publications Office of the European Union.

Falco, P., Kerr, A., Rankin, N., Sandefur, J., & Teal, F. (2011). The returns to formality and informality in urban Africa. *Labour Economics, 18*(Suppl. 1), S23-S31. https://doi.org/10.1016/j.labeco.2011.09.002

Family Systems Theory. (2024). *EBSCO research starters*. Retrieved from https://www.ebsco.com/research-starters/health-and-medicine/family-systems-theory

Fang, T., & Hartley, J. (2022). Evolution of union wages and determinants. In Handbook of Labor, Human Resources and Population Economics. In (pp. 1-40). Cham: Springer International Publishing.

García, G. A. (2017). Labor informality: Choice or sign of segmentation? A quantile regression approach at the regional level for Colombia. *Review of Development Economics*, *21*(4), 985-1017. https://doi.org/10.1111/rode.12317

Gaston, B., & Bertrand, N. (1947). *The value of economic theories: The wage fund theory. In Human and Social Sciences*. Retrieved from https://shs.cairn.info/la-valeur-logique-des-theories-economiques--9782705902445-page-131?lang=fr&tab=sujets-proches

Hoang-Ngoc, L. (2021). Fact sheet 15. The segmentation of the labor market. In Economics Fact Sheets. In (pp. 95–99). Paris, France: Ellipses.

Ibale, D. A. (2024). Earning structure and heterogeneity of the labor market: Evidence from DR Congo. *Journal of African Economies*, *33*(4), 435-456. https://doi.org/10.1093/jae/ejad014

International Social Security Association (ISSA). (2016). *The socio-economic impact of social security*. Geneva, Switzerland: International Social Security Association.

Isaac, K. (2020). *Principal component analysis (TP document)*. Retrieved from https://fr.scribd.com/document/481788230/tp-kanyama-docx

Kiester, E. (2021). Gender discrimination in the labor market. In Gender Equality. In (pp. 431-438). Cham: Springer International Publishing.

Lhomme, J. (1960). Lefranc (Georges), history of work and workers. *Revue Economique*, *11*(3), 485–485.

Marshall, A. (1890). *Principles of economics*. London: Macmillan.

Masanga, J., & Mvioki, P. (2015). *Congolese labour law (Preface by Célestin Nguya-Ndila Malengana)*. Kinshasa: University Presses of Congo.

Matanda, A. K., Makalamba, P. M., Ntumba, A. K., Ngoma, G. L., & Lisombo, E. K. (2025). Combating unemployment in a makeshift economy in the Democratic Republic of Congo. *International Journal of the Researcher*, *6*(3), 1-26.

Ngandu Mulotwa, M. (2015). *Wage inequalities in public higher education in the Democratic Republic of Congo: Evidence of human capital accumulation. HAL Open Archives*. Retrieved from https://hal.science/hal-01260371

Polachek, S. W., & Xiang, J. (2009). *The gender pay gap across countries: A human capital approach*. SOEPpapers on Multidisciplinary Panel Data Research No. 227. Berlin: DIW Berlin.

Rochford, L. (2016). Counterpoint – Gary Becker and the notion of human capital. *Informations Sociales*, *192*(1), 65-65. https://doi.org/10.3917/inso.192.0065

Royer, D. (2002). What about the "value of work" in our contemporary society? *Empan*, *46*(2), 18-25. https://doi.org/10.3917/empa.046.0018

Schultz, T. W. (1961). Investment in human capital. *The American Economic Review*, *51*(1), 1–17.

Steinbacher, C. (2024). The pursuit of welfare efficiency: When institutional structures turn 'less' into 'more'. *Policy Sciences*, *57*(2), 353-378. https://doi.org/10.1007/s11077-024-09535-8

Suzuki, H. (1976). Age, seniority and salary. *Revue Internationale du Travail*, *113*(1), 101–121.

United Nations Development Programme–DRC. (2009). *Human Development Report 2009: Overcoming barriers: Human mobility and development*. Retrieved from https://www.undp.org/publications/human-development-report-2009

Vignolles, B. (2012). Human capital: From concept to theories. *Regards Croises Sur L'economie*, *12*(2), 37-41. https://doi.org/10.3917/rce.012.0037

World Bank Group. (2025). *Poverty & inequality update*. Retrieved from https://thedocs.worldbank.org/en/doc/229ff18129687a785f08af7cfb28e5e1-0350012025/original/WBG-Poverty-and-Inequality-Update-Fall-2025.pdf

Zwick, T. (1999). *Why pay seniority wages?* ZEW Discussion Papers (No. 99-33). Mannheim: Centre for European Economic Research (ZEW).