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Micro-analysis of earnings and its determinants in eastern cape province of South Africa

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Abstract: Earnings disparities in South Africa, and specifically the Eastern Cape region are influenced by a complex interplay of historical, socio-economic, and demographic factors. Despite significant progress since the end of apartheid, persistent disparities in earnings continue to raise questions about the effectiveness of policies aimed at reducing inequality and promoting equitable social system. Individual-level dataset from the 2021 South African general household survey were subjected to exploratory analysis, while Heckman selection model was used to investigate the determinants of earnings disparities in the study area. The results showed that majority of the population are not working for a wage, commission or salary, which also pointed to the gravity of unemployment situation in the area of study. Most of the working population (both male and female) are lowest earners ($R \leq 10,000$), and this also cuts across all age-group categories. Majority of working population have no formal education, are drop out, or have less than grade-12 certificate, and very few working populations with higher education status were found in the moderate and relatively high earnings categories. While many of the working population are engaged in the informal sector, those in the formal sector are in the lowest earners group. Compared to any other race, the Black African group constituted the majority of non-wage earners, and most in this group were found in the lowest earners group. Some of the working population who were beneficiaries of social grants and medical aids scheme were found in the lowest, low, and moderate earnings categories. The findings significantly isolated the earnings-effect of age, marital status, gender, race, education, geographic indicators, employment sector, and index of health conditions and disabilities. The study recommends interventions addressing racial, gender, and geographic wage gaps, while also emphasizing the importance of equitable access to education, health infrastructure, and skills development.

Keywords: earnings disparity; exploratory analysis; employment; Eastern Cape; South Africa; Heckman selection model

1. Introduction

The variations in earnings among individuals or groups in the labor market is a topical issue in development economics and other related fields of research. Differences in earnings can arise from a multitude of factors, including education, experience, gender, race, occupation, and geographic location (Casale and Posel, 2020; Hill, 2020; Mosomi, 2019). Understanding disparities in earnings is essential for grasping the differences of income distribution and inequality within a society. It also plays a crucial role in the development of labor market policies aimed at promoting fairness and economic growth and development which is in line with the Sustainable Development Goals (SDGs). One of the SDGs (Goal 10) is to reduce inequalities within a society, and among countries. This can be achieved through sustained

promotion of social, economic and political inclusion of all, irrespective of gender, age, health/disability status, ethnic group, race, religious inclination and/or economic or other status (United Nations (UN), 2015).

Earnings differentials has emerged as a critical issue in global economic discourse, with an increasing focus on understanding the pattern of earnings differentials within and across regions (Milanovic, 2016). Within the complex and diverse continent of Africa, wide disparities in earnings levels persist, necessitating a thorough examination of the factors contributing to these variations. And, given the intricate landscape of earnings differentials in African countries, offering insights into the socio-economic determinants and implications for sustainable development becomes necessary. Africa's socio-economic landscape is marked by a mosaic of cultures, histories, and economic structures, while urbanization and economic growth also coexist with persistent challenges in various regions (Fields, 2004). The diverse nature of African nations demands a nuanced exploration of earnings dynamics, considering the rural-urban divide, sectoral disparities, and the impact of historical legacies on income opportunities. This study acknowledges this diversity and aims to uncover patterns of earnings differentials within the unique contexts of South African environment. The motivation for investigating earnings differentials in African countries stems from the pursuit of inclusive and sustainable development. Despite the continent's considerable economic potential, income inequalities often impede equitable growth (Ncube et al., 2014).

The wide earnings gaps in African countries are influenced by a complex interplay of factors, including race and geographical location. As the continent experiences economic growth and societal changes, it becomes imperative to understand the nuances that contribute to income disparities within and across diverse populations. Race plays a significant role in shaping earnings differentials in African countries. Historical and systemic factors, such as colonial legacies and social structures, contribute to disparities among racial groups (Kerr, 2021; Moyo et al., 2022). Recent studies highlight persistent inequalities, with racial minorities often facing discrimination in education, employment, and access to opportunities (Mtapuri and Tinarwo, 2021; Moyo et al., 2022). The impact of race on earnings is multifaceted, encompassing issues of social inclusion, historical disadvantage, and the need for targeted policy interventions. Urban-rural divides, regional economic disparities, and access to resources create varying economic landscapes. Individuals domiciled in urban centers may benefit from higher-paying job opportunities, better infrastructure, and improved access to education and healthcare, contributing to income/earnings advantages (Arndt et al., 2019).

On the other hand, those in rural areas may face challenges related to limited economic opportunities and infrastructure. The intersectionality of race, geographical location, health status and other factors could further complicate earnings differentials. For instance, racial minorities residing in economically disadvantaged regions may experience compounded disadvantages, exacerbating income gaps. Understanding the interconnected nature of these factors is crucial for devising targeted policies that address the unique challenges faced by specific demographic groups in specific geographical contexts. Recent trends underscore the need for ongoing research into earnings differentials, and the needs for developing targeted policies aimed at reducing

the wide disparities in earnings and fostering inclusive economic growth.

Promoting a reduction in inequality is not only imperative for fostering more sustainable and equitable development, growth, and integration but is also linked to several positive outcomes, including lower crime rates, enhanced trust and social cohesion, and improved population health. These advantages play a crucial role in maintaining stability, attracting investments, and ensuring the effective functioning of government institutions. The significance of reducing inequality is paramount in comprehending and addressing poverty (Ivins, 2013). While jobs not regulated by the state (informal employment) constitutes employment hubs for most of the economically disadvantaged households, research indicates its association with deepening inequality, particularly in BRICS countries. In these nations, large labor pools often face involuntary differentials in earnings, job instability, and limitations to socio-economic mobility. In many of the in global south countries, informal employment is pronounced and this disproportionately affects marginalized groups with limited access to formal education and skills training.

According to Li and Zhang (2023), workers' choices between sectors and the resulting differential in earnings result to wide differences in social classes. Moreover, for low- and middle-income employees, education, occupation and gender have the largest role in the characteristic effect. Gender gaps favoring male individuals in education, health, personal autonomy, and more, are indeed systematically larger in developing countries than the developed nations (Jayachandran, 2015). Regional disparities within BRICS countries manifest in distinct ways. Notably, in South Africa, India, and China, real per capita incomes for urban residents have risen more substantially than for their rural counterparts; especially, South Africa exhibits a unique pattern where income inequalities have decreased in rural areas but risen in urban areas (Ivins, 2013). In contrast to Russia, South Africa stands out as the sole BRICS country grappling with a higher burden of infectious diseases than non-communicable diseases (NCDs), which significantly impact on job search, job productivity, earnings, and overall economic growth (Ivins, 2013).

In the context of South African labour market, disparities in earnings has been a pervasive issue, and the Eastern Cape Province is no exception. According to a report by Redders, the Eastern Cape has one of the highest level of income inequality in the country, steadily increasing over time, with a Gini coefficient of 0.65 (Redders, 2021). This means that there is a wide gap between the wages of earnings by individuals. South Africa has been grappling with high levels of wage inequality since the end of apartheid regime. While significant progress has been made in reducing income inequality since 1994, wage inequality remains a persistent challenge, with the top 10% of earners in the country receiving more than half of all wages paid (Kerr, 2021). The Eastern Cape Province in particular, is one of the poorest and most economically marginalized regions in the country, with high levels of unemployment and poverty. According to Statistics South Africa (Stats-SA), the unemployment rate in the province stood at 35.8% in the fourth quarter of 2020, the highest of any province in the country (Stats-SA, 2021), and this figure keeps growing every year. This high level of unemployment is one of the major contributors to wage inequality in the region, as job scarcity potentially drives down wages for those who are employed, and the possibility of many people engaged in menial jobs, and the informal sector is very high,

where the reward for labor is poor.

The province, one of the nine provinces in South Africa holds particular significance in the context of studying wage differentials. Situated in the southeastern part of the country, the Eastern Cape has a population of approximately 6.7 million people, with a predominantly rural population, and a unique economic potentials and demographic landscape (Stats-SA, 2019). It is also known for its agricultural engagements, particularly livestock production, and a growing number of manufacturing industries. The province encompasses urban and rural areas, a diverse labor force, and a history shaped by both apartheid policies and post-apartheid socio-economic changes; these factors combine to create a complex labor market environment where earnings disparities may be distinct from those observed in other regions of South Africa, making the province to struggle for many years, and still struggling with high levels of poverty and unemployment (Moyo et al., 2022). Therefore, conducting a focused micro-analysis of wage disparities in the Eastern Cape provides valuable insights into localized and micro labor market dynamics.

To understand and analyze the earnings differentials from a micro-analysis perspective, this research draws upon several theoretical frameworks, including: Human Capital Theory, Labor Market Segmentation, and Discrimination in the labor market (Beck et al., 1980; Sobel, 1982).

The central research problem addressed in this study is the existence and determinants of wage structure and disparities in the Eastern Cape labor market. Specifically, the study aims to:

- Assess the inter-sectionality of socio-demographic characteristics of the respondents and the wage structure in the Eastern Cape Province.
- Examine the role of people's health conditions and geographic indicator (regional factor) in shaping the wage gap within the study area.
- Investigate other key factors contributing to earnings disparities in the study area.
- Deduce if there are structural inequalities, discrimination, or labor market segmentation contributing to wage gaps.

The significance of this study lies in its potential to inform policy interventions aimed at reducing wide earnings inequity in the Eastern Cape and beyond. As noted by the International Labour Organization (ILO), reducing inequality in earnings and/or wage is critical for achieving sustainable economic growth, promoting social cohesion, and reducing poverty in Africa (ILO, 2020).

Overall, the persistent problem of earnings differences and income inequalities in the Eastern Cape has significant implications for economic development and social welfare in the region (Moyo et al., 2022). Addressing this issue requires a nuanced understanding of the factors that contribute to wage disparities, and developing policies that can promote more equitable growth and employment opportunities against the discriminatory public welfare under apartheid.

While this research endeavors to provide valuable insights into earnings wide gaps in the Eastern Cape, it is important to acknowledge certain limitations. The study's scope is primarily limited to the Eastern Cape region of South Africa, and generalizations to other regions should be made cautiously. Additionally, the nature of the dataset used also pose few constraints on the depth of analysis for certain factors; although, the dataset captures important information needed for this micro-analysis

study. Despite these limitations, the research aims to contribute substantially to the understanding of earnings disparities in the Eastern Cape from a micro-analysis perspective.

The remainder of this paper is organized as follows: In the literature review section, the study delved into existing research on wage/earnings differentials in South Africa, providing a foundation for this study. Data and methodology section outlines the data sources, variables, and statistical techniques employed in our analysis. The subsequent sections presented the findings, discussed the implications of the findings, and concluded the study.

2. Literature review

2.1. Concepts of earnings disparities and underpinning theories

Earnings disparities refer to the variations in earnings among individuals or groups in the labor market, and the variations are driven by multiplicity of factors as noted earlier. Understanding the intricacy of earnings differentials is essential for assessing the pervasive social inequality in the society and designing effective labor market policies. Literature highlighted the persistence of wage differentials in South Africa, and research by Burger and Fourie (2019) pointed in this direction where the study found substantial wage gaps, with racial disparities being a prominent feature. The study also noted that wage differentials are influenced by many other factors beyond human capital, such as discrimination (race and gender) and labor market segmentation.

The theoretical underpinnings are highlighted as follow:

Human Capital Theory: Human capital theory, developed by economists such as Gary Becker, posits that individuals' investments in education, training, skill development and health increase their productivity and earning potential. In the South African context, studies by Dunga and Mothibi (2019) emphasized the importance of education in wage earnings. They find that higher levels of education are associated with higher wages, but access to quality education remains unequal in today's contemporary society.

Labor Market Segmentation: Labor market segmentation theory suggests that labor markets can be divided into distinct segments characterized by different wage levels, job security, and working conditions. This segmentation can be based on factors such as education, occupation, and industry. Studies by Matotoka and Odeku (2022) as well as Friderichs et al. (2023) in South Africa indicated that labor market segmentation plays a role in gender-based wage differentials, with women often concentrated in lower-paying, less secure job segments.

Discrimination in the Labor Market: Discrimination in the labor market refers to unequal treatment of individuals based on characteristics such as race, gender, or age. Discrimination can lead to wage disparities. Research in South Africa, including the study by Gardin (2019) also highlighted persistent racial wage gaps, indicating that discrimination continues to be a significant factor in the labor market. This framework explores how bias and unequal treatment impact earnings.

2.2. Previous research studies on wage/earnings/income differentials in South Africa

Wage inequality is a longstanding and persistent problem in South Africa. It is rooted in the legacy of apartheid, which created deep-seated social and economic inequalities between rich and poor, and this continues to shape the country's labor market (Wittenberg and Kerr, 2019). Despite significant progress in reducing income inequality since the end of apartheid, wage inequality remains a major challenge in the country, and at the regional and local levels (Moyo et al., 2022). A number of studies have explored the causes and consequences of wage inequality in South Africa. Studies have consistently documented racial disparities in wages, with black Africans earning less than other population groups, especially the white South Africans for similar work. Research by Leibbrandt et al. (2010), Dennis (2014), Bhorat et al. (2015), Anand et al. (2016) have all provided a comprehensive analysis of wage and income inequality trends and their implications for South African society. One of the key drivers of wage inequality in South Africa is differences in education and skills. As noted by Burger and Fourie (2019), education is a critical determinant of wages in South Africa, with higher levels of education associated with higher wages. However, the relationship between education and wages is complex and varies across different demographic groups. For example, black African workers in South Africa earn less than white workers with similar levels of education and experience, suggesting an underlining discrimination based on race still plays a significant role in wage differentials (South African Labour and Development Research Unit (SALDRU), 2021).

Another important factor contributing to wage inequality in South Africa is discrimination based on gender. Research by SALDRU (2021) also found that women earn less than men on average, and are more likely to be employed in a low-wage sectors of the economy, and for menial jobs. This is partly due to occupational segregation, as women are more likely to be employed in traditionally female-dominated sectors such as care work and domestic work, which tend to pay lower wages than male-dominated sectors such as manufacturing and mining (Statistics South Africa (Stats-SA), 2018). The current structure of the labor market also plays its part in the wage disparities in South Africa. From the record, the country has a high degree of informal employment, which is characterized by low wages, poor working conditions, and limited access to social protections such as health insurance and retirement benefits (Bhorat and Kanbur, 2006). Informal workers are also more likely to be women and black African, exacerbating the gender and race-based wage disparities that exist in the formal sector (Statistics South Africa, 2018).

While South African labor market research has been extensive, studies specifically focused on the Eastern Cape region are limited but growing. The study conducted by Moyo et al. (2022) examined inequalities in the Eastern Cape in terms of human capital development, poverty and income, and the study emphasized on the importance of geography and sectorial investment and trade (industry) composition in shaping these disparities. The Eastern Cape, as a province in South Africa, has a distinctive economic and demographic profile, with agriculture, manufacturing, and services sectors that merits specific attention in labor market research, variations in

industry composition can significantly impact wage disparities within the province (Moyo et al., 2022). While the Eastern Cape's labor market has been historically influenced by the broader socio-economic factors shaping South Africa as a nation, it has its unique characteristics and challenges (Moyo et al., 2022). The province played a significant role in the struggle against apartheid, and its history is intertwined with the broader national narrative of racial segregation and discrimination. The end of apartheid ushered in a period of transformation, with new opportunities and challenges emerging in the Eastern Cape's labor market.

Studies conducted in South Africa and in particular, the Eastern Cape have all highlighted the national & the region's unique labor market outcomes. Researchers have examined factors such as unemployment rates, inequality, poverty, labor force participation, and underemployment (Dunga and Mothibi, 2019; Hill and Kohler, 2020; Redders, 2021; Olawuyi and Mushunje, 2023; Vaccaro et al., 2023; Wittenberg and Kerr, 2019). Understanding these outcomes is crucial for formulating policies that address the specific challenges faced by Eastern Cape residents in accessing quality employment opportunities. Access to education and skills development is a critical factor influencing labor market outcomes. Research on education in the Eastern Cape has examined issues such as school infrastructure, educational attainment, and the quality of education. These studies shed light on the relationship between education and wages within the region, emphasizing the need for equitable access to educational resources (Dunga and Mothibi, 2019). In addition, Eastern Cape experiences significant rural-urban migration, with individuals often seeking better economic opportunities in urban centers, and this migration pattern has implications for both rural and urban labor markets, including earnings differentials, employment prospects, and living conditions (Moyo et al., 2022). Overall, wage disparities in South Africa is a complex and multi-faceted problem that requires a nuanced understanding of the factors that contribute to wage differentials.

Understanding the nuances of the Eastern Cape labor market is essential for crafting effective local and regional policies aimed at reducing wage differentials, improving employment opportunities, and addressing economic disparities. Policy interventions should consider the province's unique challenges and opportunities, including its rural and urban divide, industry composition, education disparities, and especially residents' health status which is most often not considered in previous related studies.

2.3. Brief overview of Heckman selection model

Heckman selection model is a good analytical technique that is suitable to correct for sample selection bias and produce more reliable estimates of parameters in the presence of non-random selection. This technique has found widespread use in various fields where the issue of sample selection bias is prevalent. Heckman model is typically estimated using maximum likelihood estimation (MLE). The estimation involves simultaneously estimating the parameters in both the selection and outcome equations. The mathematical representation of Heckman model is expressed as follow:

For Selection equation: The selection equation models the probability of being selected into the sample. It is typically estimated using a probit or logit regression

model. Such that:

$$Pr(D_i = 1|X_i) = \Phi(\alpha + \gamma'Z_i + \varepsilon_{1i})$$

where:

D_i = Binary indicator variable for selection (1 if observed/selected, 0 if not observed/selected)

X_i = Vector of observed characteristics influencing selection

Z_i = Vector of additional observed characteristics that influence selection

$\Phi(.)$ = Cumulative distribution function of the standard normal distribution

α = Intercept

γ = Vector of coefficients for observed characteristics

ε_{1i} = Error term capturing unobserved characteristics affecting selection.

For Outcome equation: The outcome equation models the relationship between the outcome variable of interest and various factors, including the inverse Mills ratio derived from the selection equation. This is expressed as:

$$Y_i = \beta'X_i + \lambda \cdot \frac{\Phi(\alpha + \gamma'Z_i + \varepsilon_{1i})}{\Phi(\alpha + \gamma'Z_i + \varepsilon_{1i})} + \varepsilon_{2i}$$

where:

Y_i = Outcome variable (earnings)

X_i = Vector of observed characteristics influencing the outcome

Z_i = Vector of additional observed characteristics influencing selection

β = Vector of coefficients for observed characteristics

λ = Coefficient for the inverse Mills ratio, correcting for selection bias

$\Phi(.)$ = Probability density function of the standard normal distribution

ε_{2i} = Error term capturing unobserved characteristics affecting the outcome.

For Correlation between error terms (rho): The correlation between the error terms in the two equations is denoted by rho (ρ). This is given by:

$$Cov \times (\varepsilon_{1i}, \varepsilon_{2i}) = \rho \cdot \sigma_1 \cdot \sigma_2$$

where:

ρ = Correlation between error terms.

σ_1, σ_2 = Standard deviations of the error terms in the selection and outcome equations, respectively.

In sum, the heckman selection model estimates these parameters ($\gamma, \alpha, \beta, \lambda, \rho$) by maximizing the likelihood function, taking into account both the selection and outcome equations simultaneously. The estimated coefficients provide insights into the factors influencing selection and the relationship between observed and unobserved factors in the outcome equation while correcting for selection bias.

2.4. Gaps in the literature

Despite the wealth of research on the differences in earnings structure in South Africa, there are still few gaps in the literature. Some of these include:

- Limited research specifically focused on wage/earnings differentials in the Eastern Cape, which is a region with its unique economic and demographic characteristics.
- A need for more studies addressing the earnings structure and the impact of policy interventions on narrowing disparities, given various interventions by the

government.

- An exploration of the intersectionality of individuals' socio-economic characteristics and wage disparity structure, including race, gender, education, geographic factor, and health status, and how they interact to influence people's earnings. It is worthy of note that health factor has not been given adequate attention in relation to wage disparities in many of the previous similar literature in the study area.

These gaps highlight the importance of conducting a focused micro-analysis on wage disparities in the Eastern Cape, South Africa, so as to address the complexities of the labor market, and the welfare of the inhabitants, especially the vulnerable population.

3. Data and methodology

3.1. Description of the dataset and sampling

This study utilized individual-level data from the 2021 South African General Household Survey (SA-GHS) (Stats-SA, 2022). The SA-GHS is a nationally representative survey conducted by Statistics South Africa (Stats-SA) to collect information on a range of topics, including employment and income (Stats-SA, 2022). The survey employed a multistage stratified sampling design, with primary sampling units (PSUs) consisting of enumeration areas (EAs) from the 2011 Population and Housing Census (Stats-SA, 2022). The survey sample was drawn from these PSUs using systematic sampling with probability proportional to size (PPS) sampling. The sample selection process was done to ensure that only individuals with complete information on relevant variables were included in the analysis.

3.2. Estimation strategies and techniques

The primary variable (dependent variable) of interest in this study is earnings expressed in the natural logarithm form. As captured in the GHS data (individual dataset), this is the self-reported monthly rate (note: weekly rate of pay was converted to monthly rate) of pay (salary, commission or any payment in kind (including paid domestic work)) by individuals. The analyses made use of a range of explanatory variables which include: personal, socio-economic and demographic variables as well as other important variables that may influence wages, including gender, age, level of education, sector of employment, status of occupation, health status (including several health conditions, and disability status), race, and geographic indicators (to capture urban/rural divide/variations (metropolitan status)), etc. The data were subjected to exploratory analysis through contingency table method to explore the intersectionality of personal, socio-demographic characteristics and the wage structure, and to get a general idea of the situation in the study area. Principal component analysis was used to aggregate several observed indicators of health status to generate an index of health conditions and disabilities. Furthermore, Heckman selection/correction model was also applied to investigate the key factors contributing to the disparities in earnings in the study area. The use of Heckman selection model was driven by its ability to signal the presence of selection bias and to correct for it, so as to enhance the

reliability and applicability of the estimated coefficients, and supports more accurate inferences and decision-making. The findings will permit to further establish the situation of structural inequalities, discrimination, or labor market segmentation contributing the wage disparities in the Eastern Cape Province of South Africa, despite various government interventions.

3.3. Description and measurement of variables

The dependent variable is Earnings (in log form for inferential statistics modeling) (continuous)

The explanatory variables are measured as follow:

Age (years-continuous)

Gender (Male = 1, 0, otherwise)

Marital status (married = 1, 0, otherwise)

Access to social grants (beneficiary = 1, 0, otherwise)

Metropolitan status (metro = 1, non-metro = 0)

Educational status (no formal education = 0, drop out/less than grade-12 = 1, grade-12 = 2, NQF-level 4 and equivalent = 3, NQF-level 5 and equivalent = 4, NQF-level 6 and equivalent = 5, NQF-level 7 and equivalent = 6, NQF-level 8-10 (Tertiary) = 7, and other forms of education = 8)

Population group (Black/African = 1, Coloured = 2, Indian/Asian = 3, White = 4)

Index of health conditions and disabilities (a derived variable) (continuous)

Geographic type (urban = 1, traditional settlement = 2, farms settlement = 3)

Sector of employment (informal sector = 1, formal sector = 2)

4. Results and discussion of findings

4.1. Inter-sectionality of respondents' socio-demographic characteristics and the wage structure

This section discusses the exploratory analysis showing the inter-sectionality of respondents' socio-demographic and economic features and the wage structure in the Eastern Cape Province. From gender perspective, the data in **Table 1** showed that both male and female individuals have a close proportion of population who are not working for a wage, commission or salary; this indeed points to the gravity of unemployment situation in the area of study. The structure of the earnings (be it, a wage, commission or salary) also revealed that majority of the male (8.3%) and female (7.4%) population who are working fall within the lowest earning category ($R \leq 10,000$), while insignificant proportion of both gender were also found in the low ($R10,001-R20,000$) and moderate ($R20,001-R30,000$) categories of earnings, respectively. The estimated average age of the respondents was approximately 31 years, suggesting the predominance of youth population in the study area. In a similar pattern, most of population who are working across all the age-group categories fall within the lowest earning category ($R \leq 10,000$), and very few proportion of these people also the fall into the low ($R20,001-R30,000$) category of earnings.

In term of formal education status or rating, majority of the population have lower education rating, while few proportion have higher education levels or rating as

operated in South Africa (in this case, National Qualifications Framework-NQF-levels 4, 5, 6, 7, 8, 9 and 10). Meanwhile, majority (22.3%) of the working population either have no formal education, or are drop out, and/or have less than grade 12 certificate, and the earnings of most of the people in this category are within the lowest earning group ($R \leq 10,000$). An important observation from the findings is that very few working population who have moderately high earnings (R20,001–R30,000) and (R30,001–R40,000) are among those with higher education levels. The results also indicated that most (65%) of the working population are found in the informal sector (unregistered organizations), while about 35 percent of the working population in the formal sector (registered organizations) earn the lowest ($R \leq 10,000$) earnings. Interestingly, those people who fall to the low and moderate category of earnings are those who work in the formal sector.

The results also indicated that some (14.4%) of the working population who are beneficiaries of one form of social grants or the other fall into the lowest, low, and moderate earnings categories, respectively. Although, the proportion of the working beneficiary individuals decreases as one transition up the wage categories. This is as expected since there are caveats bothering on income, which also governs access to social grants in South Africa. In term of medical aid scheme (health insurance), very few (8.3%) of the working population who are beneficiaries of medical aid scheme also fall within the lowest, low, and moderate earnings categories, respectively. In a like manner, the proportion of the working beneficiary individuals also decreases along the upper space of wage categories.

The Black African population constitute the majority of the non-wage earners, and most of this group of population or race are also found in the lowest category of earnings. While there are very few (0.3%) Black African population in the moderate category of earnings, the findings also indicated that there are more (1.6%) of the white working population in the moderate earning category. Given the geographic indicator, the results revealed that majority of the lowest earners are domiciled in the non-metro areas of the study area, while marginally higher proportion of the population in the metro areas are found moderate earning category, just as there are also few Black African population in this earning category.

In sum, the findings have showed the inter-sectionality of the respondents' socio-demographic, economic characteristics and wage structure in the Eastern Cape Province of South Africa.

Table 1. Contingency table: Inter-sectionality of socio-demographic and economic characteristics, and wage structure (N = 8855).

Wage structure (Rand)/Variables	None	≤10,000	10,001–20,000	20,001–30,000	30,001–40,000	Above 40,000	Total
<i>Gender</i>							
Female	4258 (91.8)	342 (7.4)	20 (0.4)	17 (0.36)	2 (0.04)	0 (0)	4639 (52.4)
Male	3833 (90.9)	351 (8.3)	20 (0.5)	10 (0.24)	1 (0.02)	1 (0.02)	4216 (47.6)
<i>Age-group (Mean = 30.8)</i>							
<20	3636 (99.8)	7 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	3643 (41.1)
20–29	1014 (87.9)	135 (11.6)	3 (0.3)	2 (0.2)	0 (0)	0 (0)	1154 (13.0)
30–39	895 (81.4)	188 (17.1)	11 (1.0)	6 (0.5)	0 (0)	0 (0)	1100 (12.4)
40–49	696 (77.1)	183 (20.3)	10 (1.1)	11 (1.2)	2 (0.2)	1 (0.1)	903 (10.2)
50–59	643 (79.2)	150 (18.5)	13 (1.6)	6 (0.7)	0 (0)	0 (0)	812 (9.2)
60–69	655 (95.6)	24 (3.5)	3 (0.4)	2 (0.3)	1 (0.2)	0 (0)	685 (7.7)
≥70	552 (98.9)	6 (1.1)	0 (0)	0 (0)	0 (0)	0 (0)	558 (6.3)
<i>Formal education</i>							
None	1274 (98.8)	14 (1.1)	1 (0.1)	0 (0)	0 (0)	0 (0)	1289 (14.6)
Drop out/Grade 12	5233 (91.6)	476 (8.3)	7 (0.1)	0 (0)	0 (0)	0 (0)	5716 (64.6)
Grade 12	1032 (85.4)	156 (12.9)	14 (1.2)	6 (0.5)	0 (0)	0 (0)	1208 (13.6)
NQF-level 4 and equivalent	17 (89.5)	2 (10.5)	0 (0)	0 (0)	0 (0)	0 (0)	19 (0.2)
NQF-level 5 and equivalent	93 (82.3)	15 (13.2)	2 (1.8)	2 (1.8)	0 (0)	1 (0.9)	113 (1.3)
NQF-level 6 and equivalent	227 (87.0)	13 (5.0)	10 (3.8)	10 (3.8)	1 (0.4)	0 (0)	261 (2.9)
NQF-level 7 and equivalent	142 (88.2)	9 (5.6)	5 (3.1)	5 (3.1)	0 (0)	0 (0)	161 (1.8)
NQF-level 8-10 (Tertiary)	47 (81.0)	4 (6.9)	1 (1.7)	4 (6.9)	2 (3.5)	0 (0)	58 (0.7)
Others forms of education	26 (86.7)	4 (13.3)	0 (0)	0 (0)	0 (0)	0 (0)	30 (0.3)
<i>Sector of employment</i>							
None	7286 (98.4)	113 (1.52)	3 (0.04)	3 (0.04)	0 (0)	0 (0)	7405 (83.6)
Informal	90 (35.0)	167 (65.0)	0 (0)	0 (0)	0 (0)	0 (0)	257 (2.9)
Formal	715 (60.0)	413 (34.6)	37 (3.1)	24 (2.0)	3 (0.3)	1 (0.01)	1193 (13.5)
<i>Access to social grants</i>							
Beneficiary	3602 (84.0)	616 (14.4)	40 (0.93)	27 (0.62)	3 (0.06)	1 (0.02)	4289 (48.4)
Non-Beneficiary	4489 (98.3)	77 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	4566 (51.6)
<i>Health-insurance/Medical-aid</i>							
Beneficiary	7343 (91.3)	671 (8.3)	21 (0.26)	3 (0.03)	0 (0)	1 (0.01)	8039 (90.8)
Non-Beneficiary	748 (91.7)	22 (2.7)	19 (2.3)	24 (2.9)	3 (0.4)	0 (0)	816 (9.2)

Table 1. (Continued).

Wage structure (Rand)/Variables	None	≤10,000	10,001–20,000	20,001–30,000	30,001–40,000	Above 40,000	Total
<i>Race/Population-group</i>							
Black African	7154 (91.1)	635 (8.1)	35 (0.45)	22 (0.3)	3 (0.03)	1 (0.01)	7850 (88.7)
Coloured	614 (92.0)	52 (7.7)	2 (0.3)	0 (0)	0 (0)	0 (0)	668 (7.5)
Indian/Asian	27 (93.1)	2 (6.9)	0 (0)	0 (0)	0 (0)	0 (0)	29 (0.3)
White	296 (96.1)	4 (1.3)	3 (1.0)	5 (1.6)	0 (0)	0 (0)	308 (3.5)
<i>Geographic indicator</i>							
Non-metro	5697 (90.6)	540 (8.6)	28 (0.45)	19 (0.3)	1 (0.02)	1 (0.02)	6286 (71)
Metro	2394 (93.2)	153 (5.9)	12 (0.5)	8 (0.3)	2 (0.1)	0 (0)	2569 (29)

Note: NQF—National Qualifications Framework, while the values in parentheses are percentages.

Source: Data analysis, 2023.

4.2. Heckman selection model: Factors influencing disparities in earnings in Eastern Cape

The results presented in **Table 2** revealed the output from the fitted Heckman selection model. The Heckman selection model consists of two equations: the selection equation (for the probability of being selected into the sample) and the outcome equation (for the dependent variable of interest, which is Earnings). The justification for the selection equation is to model the factors that influence whether an individual is included in the sample, addressing potential sample selection bias. From the output, the selection equation includes variables related to the probability of being selected into the sample. The coefficients in this equation therefore indicate how these variables affect the probability of selection.

The output revealed a log likelihood value of -3543.081 , Wald-chi-square test value of 551.61 with degree of freedom ($df-15$), and a $Prob>Chi^2$ value of 0.0000 which is statistically significant at 99 percent confidence interval ($p < 0.01$). The Wald- Chi^2 test assesses the overall joint significance of all the coefficients in the model, and the p -value indicates that at least one of the coefficients is significantly different from zero, and it thus suggests that at least one variable in the model significantly contributes to explaining the outcome, which further supports the overall statistical significance of the Heckman selection model.

For the outcome (earnings) equation as indicated in **Table 2**, the estimates revealed that age of individuals has a positive and statistically significant impact ($p < 0.05$) on earnings (0.0073 , p -value: 0.020). This implies that ageing is associated with a positive increase in earnings; that is, older people tend to have higher earnings. This further suggests a positive effect of accumulating work experience and skills with age. In support of this result, Dash et al. (2017) also noted from their study conducted in South Africa that employers of labour usually seek for experienced employees because work experience is an indication of a prospective employee's proven performance in a similar role or industry. This is to say that work experience is a major factor in determining an employee's salary, subsequent salary increments and promotions. The more work experience employees have under their belts, the more they can expect to be remunerated for their proven capabilities, which is in agreement with the Mincerian earnings function (Mincer, 1958). Also, consistent with Heywood and Parent (2017), marital status of the respondents has a positive and statistically significant ($p < 0.01$) impact on earnings (0.2188 , p -value: 0.002), suggesting that being married is associated with a positive increase in earnings, compared to being unmarried, which could be as a result of increased household responsibilities or stability.

Similarly, receiving social grants has an inverse and statistically significant impact ($p < 0.01$) on the earnings of individuals (-0.3084 , p -value: 0.006), suggesting that individuals receiving social assistance (in this case, social grants beneficiaries) are associated with lower earnings or market income. This is consistent with Stats-SA (2022) because only lower earnings population group are qualified to benefit from this social protection program. This may also have a long run implications for sustained poverty, and income disparity in the study area. The results also revealed that residing in a metropolitan area (a geographical indicator) has a negative and non-significant effect on earnings (0.0765 , p -value: 0.336), compared to those residing in a non-

metropolitan area (rural). This is with a mixed feeling because this revelation could perhaps be attributed to the high cost of living in the urban settlements which lowers the disposable earnings of individuals (an indication of regional disparities in the cost of living). This result is also supported by Mudiriza (2018), as well as Mudiriza and Edwards (2021) in their related studies conducted in South Africa, where it was established that higher earnings are to be expected in a metropolis location due to the increased access to markets.

Higher education levels rating in South Africa (in this case, NQF-levels 4, 5, 6, 7, 9 and 10) in that order have positive and statistically significant effects ($p < 0.01$) on the earnings of individuals, compared to those with other form of education, no formal education and/or lower educational status. This finding signals that level of education attainment has varying effects on the earnings of individuals, and the higher the level of education, the higher and steeper the life-path of earnings. And, the result also underscores the economic importance of education for a sustained income generation and better welfare status of individuals in any society. To corroborate this result, Dash et al. (2017) also noted the effect of education on the earnings as their study established an incremental benefit of earnings with higher educational attainments.

Importantly, index of health status of individuals has a positive and statistically significant effect ($p < 0.1$) on individuals' earnings (0.0498, p -value: 0.081). This is an indication that an improvement in the health status of individuals is associated with a slightly higher earnings, all else equal. In South Africa, enjoying medical benefits is associated with having medical aids, and expectedly, individuals without medical aids affordability challenge are expected to have better health status and by extension, tend to earn more. This is a logical explanation as healthier individuals should be more productive and have lower absenteeism from work place. Furthermore, working in different labour sectors was also revealed to have varying effects on earnings by individuals. For instance, working in the formal sector has a direct (positive) and statistically significant impact ($p < 0.01$) on the wage of individuals (0.2975, p -value: 0.001), compared to those engaged in the informal sector with statistically significant ($p < 0.01$) lower earnings (0.5683, p -value: 0.000). As supported by Fourie (2018) in a related study conducted in South Africa, this result suggests that working in the informal sector is associated with lower earnings compared to those working in the formal sector (white-collar jobs) with better earnings. This further underscores that the choice of occupation or sector may significantly influence individuals' earnings.

In term of the selection equation, the result indicated a gender effect on earnings. As revealed, being a male has a positive and statistically significant effect on earnings (0.0764, p -value: 0.041). This suggests that being a male has a positive impact on the likelihood of being associated with a higher earnings. While this points to a clear evidence of gender-based earnings differentials with male individuals earning slightly more on average, this could have significant economic and societal implications, given the suspected gender-based earnings discrimination. This result is in agreement with Heywood and Parent (2017), Dunga and Mothibi (2019), Burger and Fourie (2019), as well as SALDRU (2021) where gender earnings gap was also reported in their separate studies in South Africa.

Being in different geographical locations was also found to have varying impacts on the likelihood of being associated with a lower or higher earnings. For instance, compared to those in the urban areas, being domiciled in traditional settlements is associated with a decrease in the likelihood of getting a higher earnings, while being domiciled in farm settlements is associated with an increase in the likelihood of getting a higher earnings. This finding is consistent with earlier submission on the relationship between earnings and being in metropolitan or non-metropolitan area because this could be an indication of regional disparities and inequalities in the cost of living, as also emphasized in a related study conducted by Redders (2021) in South Africa, where high cost of living is associated with the urban settlements and this lowers the disposable earnings of individuals domiciled in such area.

Table 2. Heckman selection model estimates: Factors influencing disparities in earnings.

Earnings	Coefficient	Std. error	z-value	$p > z $
Age	0.0073	0.0031	2.33**	0.020
Marital status (married)	0.2188	0.0700	3.12***	0.002
Access to social grants	-0.3084	0.1113	-2.77***	0.006
Metropolitan status (metro)	-0.0765	0.0796	-0.96	0.336
<i>Educational status (base = no formal education)</i>				
Drop out / Grade 12	-0.0892	0.2310	-0.39	0.699
Grade 12	0.5321	0.2408	2.21**	0.027
NQF-level 4 and equivalent	0.5065	0.6551	0.77	0.439
NQF-level 5 and equivalent	0.9718	0.3041	3.20***	0.001
NQF-level 6 and equivalent	1.6905	0.2757	6.13***	0.000
NQF-level 7 and equivalent	1.6103	0.3070	5.24***	0.000
NQF-level 8-10 (Tertiary)	2.0306	0.3490	5.82***	0.000
Others forms of education	0.0389	0.5017	0.08	0.938
Index of health conditions and disabilities	0.0498	0.0285	1.75*	0.081
<i>Sector of employment</i>				
Informal	-0.5683	0.1060	-5.36***	0.000
Formal	0.2975	0.0926	3.21***	0.001
Constant	8.1361	0.6591	12.34	0.000
<i>Selection</i>				
Gender (male)	0.0764	0.0374	2.04**	0.041
<i>Geographical type (base = urban)</i>				
Traditional settlement	-0.2154	0.0401	-5.36***	0.000
Farms settlement	0.6893	0.1382	4.99***	0.000
<i>Race/population-group (base = black)</i>				
Coloured	0.2176	0.0750	2.90***	0.004
India/Asian	0.1951	0.3414	0.57	0.568
White	0.4357	0.1557	2.80***	0.005
Constant	-1.2747	0.0354	-35.92	0.000
/athrho	-0.6566	0.3464	-1.90*	0.058
/insigma	0.0199	0.1527	0.13	0.896
rho	-0.5761	0.2314	-2.48**	
sigma	1.0201	0.1558	6.54***	
lambda	-0.5877	0.3249	-1.80*	

LR test of independence equations ($\rho = 0$): $\chi^2(1) = 3.45$; $Prob > \chi^2 = 0.0631$.

*, **, ***— $p < 0.1$, $p < 0.05$, and $p < 0.01$ respectively.

Source: Data analysis, 2023.

The results also showed that belonging to a population-group have varying effect on earnings. The estimates showed a racial-based effect on earnings. For Coloured and White population groups, the estimates indicated a direct and significant effects on earnings. This suggest that individuals belonging to Coloured and White population

groups have significantly ($p < 0.01$) higher earnings (0.2176, p -value: 0.004) and (0.4357, p -value: 0.005) respectively, compared to the Black African population group, which is associated with lower earnings. In tandem with what Burger and Fourie (2019) reported in their findings on a related study in South Africa, this result suggests a racially segregated earnings structure, given the disparities in earnings along racial lines or ethnic groups in the study area.

Given the impact of several factors and their magnitude on the earnings of individuals as revealed in the results, the findings significantly isolated important factors responsible for the disparities in the earnings of individuals in study area which require necessary policy actions to be directed in that direction.

Parameters for Heckman model and LR-Test of independence assumption

The key connection between the selection equation and the outcome equation lies in the error terms. The Heckman model assumes that there is an unobserved factor affecting both the selection into the sample and the outcome variable. This unobserved factor is captured by the error terms in both equations. Given the parameters in the third panel of **Table 2**, *athrho* (ρ) which points to the correlation between the error terms in the wage and selection equations has a value of -0.6566 with a significant p -value of 0.058, and this suggests that factors affecting selection are negatively related to factors affecting wages. For example, if individuals with unobserved characteristics that make them less likely to be selected (captured in the error term of the selection equation) also tend to have lower wages (captured in the error term of the outcome equation), this correlation would be negative. The *lnsigma* ($\ln(\sigma)$) (0.0199, p -value: 0.896) which points to the standard deviation of the disturbance term in the wage equation was not statistically significant, suggesting that the standard deviation of the disturbance term in the wage equation is not statistically different from zero. This suggests that most of the variability in wages is explained by the observed variables. Importantly, *lambda* (λ) which is the coefficient associated with the inverse Mills ratio has a value of -0.5877 which was found to be statistically significant ($p < 0.1$), and this captures the effect of selection on the outcome equation. The sign of the inverse Mills ratio (λ) provides insights into the impact of selection on the outcome. In this case, the negative sign suggests that the correction for selection bias is downward, implying that individuals with unobserved characteristics have lower earnings. Meanwhile, with a significant λ , the estimated coefficients in the outcome (earnings) equation has been adjusted (by default) to account for the selection bias. Suffice it to say that the significant λ underscores the importance of addressing sample selection bias in the analysis, and this has enhanced the validity of the Heckman selection model by indicating that the model successfully accounts for selection bias, and providing a more accurate representation of the relationships in the population, even when the outcome of majority of the population was not observed.

In conclusion, the LR test of independence assessed if there is a relationship between the equations governing selection and outcome. And, the test statistic returns a $\chi^2(1) = 3.45$ with a marginally significant ($p < 0.1$) p -value of 0.0631. This suggests that there is not enough evidence to reject the null hypothesis of independence, and the selection process does not significantly affect the outcome equation, providing support for the validity of the application of Heckman selection model.

5. Conclusion and policy recommendations

Disparity in earnings in South Africa with a specific focus on Eastern Cape region are influenced by a complex interplay of historical, socio-economic, and demographic factors. Despite the significant progress recorded since the end of apartheid, persistent disparities in wages continue to raise questions about the effectiveness of policies aimed at reducing inequality. Eastern Cape's labor market is part of the broader South African context, it possesses distinctive features that make it a compelling subject of study. Studies on the Eastern Cape have started to illuminate the complexities of its labor market, highlighting geographic and industry variations, education disparities, gender and racial discrimination, and the implications for policy interventions. This underscores the need for targeted interventions addressing racial, gender, and regional wage gaps while emphasizing the importance of equitable access to education, health infrastructure and skills development.

The following policy recommendations can be considered to address the economic and social implications, as well as the potential challenges associated with various highlighted factors affecting wage disparities in the study area:

- Promotion of education and skills development: Given the positive impact of education on wages, policymakers should prioritize investments in education and skills development programs. This could include improving access to quality education, vocational training, and lifelong learning opportunities to enhance the workforce's skills and productivity.
- Addressing gender discrimination in earnings: While the analysis found a gender-based earnings gap, it is important to intensify the existing efforts to address gender-based wage discrimination. Policies promoting pay equity, transparent salary structures, and gender-neutral hiring and promotion practices can help reduce wage disparities.
- Provision of support for family well-being: Recognizing the positive impact of marital status on wages, policies should aim to support family well-being and stability. Initiatives such as family leave policies, affordable childcare, and programs promoting work-life balance can help individuals balance family responsibilities with work.
- Reducing racial and ethnic disparities in earnings: Addressing earnings disparities among racial and ethnic groups is crucial for promoting economic equity. Policymakers should implement measures to reduce discrimination, improve access to education and training for underrepresented groups, and promote diversity and inclusion in the workforce.
- Enhancing social assistance programs: Given the negative impact of receiving a social grant on earnings, policymakers should assess the effectiveness of social assistance programs. Reforms could focus on transitioning recipients into the labour market by providing requisite trainings and supports to improve employability and income potential.
- Promotion of regional economic development: While residing in non-metropolitan areas had a reducing impact on earnings, policymakers should promote local and regional economic development to reduce the obvious disparities. Investments in infrastructure, job creation, and access to educational

and affordable healthcare services in rural areas can help improve economic opportunities for the residents. More so, inclusive economic policies should be designed with inclusivity in mind, ensuring that all segments of the population have equal access to economic opportunities. Inclusivity can be achieved through anti-discrimination measures, social safety nets, and programs that support vulnerable groups.

- Regular evaluation and adjustment: Regular evaluation of the impact of implemented policies on wages and income distribution is very necessary, and policies should be adjusted as needs arise to ensure they align with economic goals and promote fairness and equality.
- Improving health infrastructures: While there is a positive relationship between index of health conditions and disabilities and earnings in the study area, it is a pointer that better health is associated with higher earnings. Thus, investment in health promotion and disease prevention is needed by encouraging individuals to adopt healthier lifestyles, promoting physical activity, healthy diets, and regular medical check-ups. Implementation of public health campaigns to raise awareness about the importance of preventive care and early detection of health issues is very germane. Also, improvement in access to healthcare, workplace wellness programs, health and safety regulations, flexible work arrangements, mental health support, and seamless and affordable health care insurance and/or medical aids accessibility are highly recommended.

By implementing these policy recommendations, governments and development experts can aim to improve overall health and well-being, potentially leading to a healthier, more productive workforce.

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