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Welfare Experiences of Portuguese Angolan Miners: A Longitudinal Comparative Study, 1918-1974

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And until the ignoble and unhappy regimes
That hold our brothers in Angola
In Mozambique
South Africa
Sub-human bondage
Have been toppled
Utterly destroyed
Well, everywhere is war
Me say war
Bob Marley – War (1976)

(Lyrics derived from speech made to U.N General Assembly by Ethiopian Emperor Haile Selassie I in 1963)

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Abstract

This paper provides the first quantitative assessment of living standards in Angola during the colonial period, with a specific focus on the Companhia de Diamantes de Angola (Diamang), the largest and most profitable company in Portuguese colonial history. Employing the "barebones subsistence basket" deflation method to measure welfare ratios, the paper examines the progression of living standards from 1918 to 1974. The research findings illustrate a significant shift from below-subsistence wages to an unprecedented rise in welfare ratios after 1960, signifying a remarkable deviation from the welfare trajectory observed in other colonial empires. By presenting the first comprehensive and high-quality dataset covering an extensive time frame, exclusively dedicated to examining worker living standards in colonial Portuguese Africa, this study challenges conventional perspectives on the outcomes of extractive labour regimes. Furthermore, it establishes a precedent for the importance of further exploration into other neglected colonial contexts. Consequently, this research not only contributes to the discourse on economic history but also enhances our understanding of Africa's distinctive colonial experiences.

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1. Introduction

The past two decades have witnessed a revitalisation in African economic history, leading to a data revolution in the field. The collection of economic data has expanded significantly, encompassing various areas such as fiscal capacity, health, education, and living standards. This extensive data collection has greatly enhanced our comprehension of the continent's history. Notably, researchers have started to uncover the fundamental factors that account for both the achievements and setbacks experienced by African nations in recent times.

However, despite these advancements, African countries that were colonised by the Portuguese Empire have largely been overlooked. Only recently has a growing body of research emerged to illuminate this understudied yet significant aspect of Africa's colonial narrative (Havik, 2015; Alexopoulou & Juif, 2017; Jones & Gibbons, 2022; Fernandez Cebrian, 2022), primarily focusing on the case of Mozambique. Thus, to the best of the author's knowledge, no comprehensive long-term quantitative study examining the living standards in Portuguese Africa has been conducted. Consequently, certain important questions remain unanswered, particularly regarding Portugal's specific colonial history and its resulting institutions, as to the extent of their influence on the welfare levels of African workers during this era.

This paper aims to answer this question by being the first quantitative historical study of a corporation operating in colonial Angola – The Companhia de Diamantes de Angola (Diamang). Therefore, this will be the first attempt to measure the evolution of living standards over an extended period of time for this understudied country. This company was the longest-running and most profitable company in Portuguese colonial history and was estimated to have employed at least 250,000 different workers during its existence (Cleveland, 2015; Ribeiro da Silva & Alexopoulou, 2022). A lack of quantitative analysis means that currently there is no clear consensus on how workers fared at this mine relative to workers labouring in other colonial empires. Diamang has been described as a business that evolved into being model of paternalistic capitalism, due to its high levels of investment in health and the diets of workers, compared to neighbouring mines in Africa (Cleveland, 2015). However, this is not reflected in the words of Bob Marley and Haile Selassie, which are just a sample of the international condemnation heaped upon the labour model Diamang and other Portuguese colonial companies used. Condemnation, which continued through the 1960s until the end of the Portuguese African empire in the mid-1970s, resulted from the coercive and controversial forced labour 'shibalo' system. Although forced labour systems are well-documented in other African countries during the colonial period (Bowden et al., 2008; Green, 2012 Alexopoulou & Juif, 2017; Van Waijenburg, 2018; Archibong & Obikili, 2020) , the Portuguese African model of labour coercion was unique, not only in the methods it employed, but also in its incredible longevity, persevering in some form officially until the 1960.

Africa is renowned both in the past and today for unsatisfactory or non-existent national and local economic data collection (Jerven, 2013; Albers, 2020). Thankfully due to the impressive corporate professionalism of the company Diamang's records are of a high enough quality to carry out the chosen methodology for analysing worker's welfare over time which will be the 'barebones subsistence basket' deflation method to calculate welfare ratios. This method, created and popularised by Allen (2001), and modified by Frankema and Van Waijenburg (2012) for African workers, and recently revised upwards by Allen (2013) allows comparison across time and space of the welfare obtained by workers from the prevailing wage received for labour services.

Constructing welfare ratios, although seemingly straightforward, entails gathering substantial data on nominal wages, worker compensation, and diverse price indices over extended historical periods. This process involves reorganizing information from archival sources and subsequently engaging in reconstruction efforts. Due to the predominantly disorganized state of the Diamang archives, the task of generating these welfare ratios for both the groups of workers who 'volunteered' their labour as well as those who were coerced or forcefully contracted to work at Diamang between 1918 and 1974 has proven to be arduous.

The reconstruction of welfare ratios using data from the Diamang Company represents a unique study in the collection of African workers' welfare over time. During the late colonial period, volunteers, and forcefully contracted workers at Diamang, experienced the lowest compensation among manual workers. However, a significant transformation occurred in workers' living standards during the post-1960 Luso-African extended colonial period, with welfare ratios increasing more than fourfold within 15 years.

This as far as the author is aware first quantitative case study of the living standard in Angola and thus of the Portuguese African empire more generally. Therefore, by drawing on a data-rich and original historical source of a diamond mine operating in this period makes several contributions to the literature and should thus be of interest not just to those studying African history but also to those working in the wider field of economic history.

Besides taking a new quantitative approach towards better understanding how living standards in the Portuguese empire compared to other colonial powers the study of Angolan miners will make other important additions to the literature. Diamang has a particular importance in history given that it is the last known example of forced labour being used for extended periods of time, by a modern capitalistic firm, on an industrial scale. Also, whilst any reports will naturally encompass the bias of those writing them, and Diamang is no exception to this (de Alencastro, 2014), Portuguese tardiness and hesitancy to reform, combined with the sudden disorganised withdrawal from Africa relative to other colonisers, may give a truer insight into the lives of those living through colonisation, as those in charge had very little incentive to re-write or water down descriptions of the worst of the coercive measures carried out on their colonial subjects.

Secondly, this study provides insight into a significant example of institutional transformation, primarily shaped by a private corporation rather than a state. It contributes to the scholarly exploration of coercive labour regimes, particularly in the developing world. This research aligns with the growing realisation that many historical employer-labour relationships were not characterized by freedom.[1] It aligns with the broader persistence literature, which highlights the role of institutional legacies from extractive labour regimes in explaining divergent economic fortunes across regions (Acemoglu et al., 2012; Dell, 2010; Dell & Olken, 2019; Lowes & Montero, 2021).

The latter research adopts a cross-country or spatial regression approach, commonly used in examining causal relationships between historical variables and contemporary outcomes (Nunn 2009; Alexopoulou, 2018; Fourie & Obikili, 2019; Cioni et al., 2021; Frankema, 2021). These studies find a causal relationship between their chosen variables and modern outcomes (Abad & Maurer, 2021). However, this method has limitations, particularly in terms of missing data between the chosen historical point and modern outcome variables (Austin, 2008). The inclusion of a continuous time series dataset allows for a comprehensive analysis of historical developments, enabling a detailed and better understanding of changes over time.

This study's long-term approach to studying coercive labour relationships challenges the prevailing view in many persistence studies that extractive industries will always lead to poor outcomes for local labour. Instead, it contributes to the recent literature looking across place and time and to show coercive labour institutions evolving into more inclusive arrangements between workers and corporates (Juif & Frankema, 2018; Abad & Maurer, 2019; Méndez-Chacón & Van Patten, 2022).

Instead, a major finding of this paper is how it highlights the Luso-African colonial phenomenon in which upon entering the 1960s a long-lasting low-welfare coercive labour institution rapidly gave away to one where workers were well-compensated by contemporary standards of the time. This was driven predominantly by the fact a colonial power with no plans to leave, suddenly and unexpectedly became

[1] Or as highlighted by Acemoglu & Wolitzky (2011) "The majority of labor transactions throughout much of history and a significant fraction of such transactions in many developing countries today are "coercive" that this is also not a phenomenon resigned to history.

surrounded by newly independent countries, governed by and for African citizens, rather than distant European metropoles[2].

The present paper is organized as follows: Section 2 offers a corporate history of Diamang, with an emphasis on the dynamic relationship between diamonds and the state across colonial and post-colonial periods. Section 3 delves into the historical determinants and the evolution of the labour institutional setup at Diamang since 1918, with a focus on its unique and extraordinarily coercive system in the African context. Section 4 outlines the data sources and methodological approach used to compute the welfare ratios, concurrently addressing prevalent concerns with the measure. Section 5 delineates and interprets the findings obtained from the data analysis and includes a sensitivity analysis to confirm the robustness of the results. In Section 6, alternative approaches to quantifying worker welfare are deliberated. Section 7 presents a comparative international analysis of living standards in the mining sector during this epoch of the colonial period. Finally, the paper is concluded in Section 8.

2. A Corporate History of Diamang

A once-contested topic among scholars of Angolan colonial history revolved around the primary impetus—economic or political—that motivated the Portuguese to transition from a loosely structured trading relationship to formal colonization during the 19th century (Hammond, 1966). The prevailing consensus now firmly attributes this shift to economic motivations, mirroring the patterns observed in the behaviour of other European powers. In the case of Angola, the driving force behind this transition was the aspiration to establish large-scale exports of the country's abundant natural resources. With the demise of the southern hemisphere slave trade, due to effective anti-slavery measures, which rendered slaves an unviable and unprofitable revenue source, Portugal sought alternative means of revenue generation in Angola (Clarence-Smith, 1979).[3]

Naturally, no such debate exists for the motivations for entry into Angola in partnership with the Portuguese government of the concession company, known from 1917 as Diamang. What is patently clear is that its creation was driven by the singular targeted and specific goal of generating profits for its shareholders and the Portuguese government coffers. Unlike most of the colonial companies operating in Africa (particularly Portuguese Africa) over this period, it was incredibly successful in achieving this goal (Newitt, 1981; Vail, 1976). It was able to replicate the success, already witnessed in the Southern African Diamond mines as well as the geographically closer mines of the African Copperbelt, for its colonial overseers and foreign financial backers. By the end of its 55-year colonial history, it had grown to become by far the largest, most profitable and most powerful company within the Portuguese empire (Cleveland, 2015).

This empire was one with an incomparably long history in the extraction of precious metals and stones abroad for the benefit of the metropole. Such extraction started in Portuguese India (modern-day Goa) around the middle of the 16th century and included finds such as the Hope Diamond worn by King Louis XIV.[4] However, it was in Brazil that the Portuguese empire really began to raise impressive revenues from diamond mining, which at its peak in the mid-18th century saw them exporting on average close to 80,000 carats to Europe, per year (Hofmeester & de Zwart, 2018). As a result, Portuguese crown was the world's top diamond exporter during the 18th century. However, it was in Brazil where the metropole encountered the central challenge inherent in such a commodity. This challenge stems from its subjective value, which

[2] Republic of Congo (June, 1960) State of Katanga (July, 1960 – Jan, 1963) Republic of Zambia (October, 1964).

[3] According to Nunn, (2008), Angola is the modern political entity that had the highest amount of its population sold into slavery, with an estimated 3,607,020 of its people being enslaved. A horrific figure, given its indigenous population, was only estimated to be 5,386,523 by the mid-19th century (Colony of Angola Annual statistics, 1933).

[4] And also, fictionally, by Rose Dawson in the movie Titanic.

is significantly disproportionate to its weight. As history has shown, this disparity has contributed to the emergence of a thriving black market that persists even in modern times.[5]

This economic dynamic of diamond mining played a significant role in shaping the distinctive characteristics of Diamang and its unique relationship with the state. In an effort to prevent the repetition of uncontrolled illegal diamond trading in Angola, the Portuguese government granted Diamang extensive repressive powers from its inception, aimed at curbing diamond smuggling. These measures included the employment of undercover agents posing as illegal diamond buyers to apprehend indigenous workers attempting to sell diamonds.[6] Notably, Diamang was granted an exclusive operating zone with virtually sealed borders, a crucial factor in understanding its peculiar history within Angola. With the company making significant policy and administrative decisions independently of colonial government input, life within Diamang's sphere of influence diverged greatly from the rest of Angola (Cleveland, 2015). This led to Diamang being commonly referred to as a distinct corporate state within the Portuguese empire, making it an intriguing case for studying the development of worker welfare over time.

Diamang exhibited characteristics that set it apart from Portuguese colonial Angola. One factor contributing to this distinction was the diverse origin of its mostly European workforce, which initially resulted in major decisions within the district being made by individuals from various European countries, rather than Portuguese colonial officials. Portugal's limited industrialization led to a scarcity of technical skills within its own population, necessitating the cooperation and support of non-Portuguese individuals to acquire the necessary expertise for mineral extraction in its colonies. This is evident in the extensive correspondence, primarily in French or English, between mine management and offices in Brussels or London during the initial two decades of operations (Diamang mão-de-obra report, 1926).

Another reason for the detachment of Diamang from the affairs of Portuguese Angola was the involvement of international financiers scattered across the globe in making financial decisions for the mine. This can be attributed to the comparatively underdeveloped state of the Portuguese metropole at that time, resulting in a deficiency of robust domestic capital markets. Consequently, the Portuguese government had to seek external financing for such a substantial initial investment. As a result, upon its establishment, 80% of Diamang's shares were owned by non-Portuguese entities, primarily from Belgium, England, France, and South Africa (Cleveland, 2015; Newitt 1981).[7] This distribution of ownership underscores the actual power dynamics between the colonial government and Diamang, with the latter eventually becoming the largest creditor of the former. In the subsequent section, it will be elucidated how this initial power asymmetry shaped the distinctive relationship between the mine and its workforce.

A further reason for the separation of Diamang from the colonial government of Portuguese Angola was the absence of financial decision-making in Lisbon. Instead, an international group of financiers, located around the world, dictated Diamang's financial matters. This circumstance is linked to Portugal's comparatively underdeveloped state at the time, resulting in weak domestic capital markets. As a consequence, the Portuguese government had to seek financing from abroad for its significant initial investment, resulting in non-Portuguese entities, primarily from Belgium, England, France, and South Africa, holding 80% of Diamang's shares upon its establishment (Cleveland, 2015; Newitt, 1981), which left the Portuguese colonial government as a small shareholder. Moreover, Diamang eventually became the largest creditor of the colonial government, illustrating the true power dynamics in the relationship between the two entities.

Remarkably, Diamang experienced extraordinary financial growth during its first two decades of operation, even amidst the turbulent events unfolding in Europe. Founded during the Portuguese First Republic, the

[5] Despite various attempts by the Portuguese Crown to control diamond producing areas, it has been estimated that there were as many Brazilian-mined diamonds sold illegally as were legally sold, during this period (Von Eschwege, 1833, as cited in Hofmeester, 2018).
[6] Ironically this method of entrapment was deemed to actually increase the supply of black-market diamonds smuggled out of mines by indigenous workers and was phased out over the late 1920s.
[7] Appendix A lists the major Western shareholders in Diamang.

company witnessed five presidential changes before the establishment of the Estado Novo dictatorship. However, these political upheavals did not result in any noticeable changes in Diamang's management or operations, with rare references to the Portuguese domestic political situation found in annual shareholder reports. This stability persisted even during the Great Depression and the subsequent volatility of the 1930s. In fact, this period witnessed significant company growth, as a pre-existing arrangement with DeBeers to purchase all of Diamang's output led to a 65% increase in the value of Angolan diamond exports between 1928 and 1933. Diamang's experience of stable or growing output makes it unique amongst other large mines on the African continent during that period. Section 3 of this paper will explain how this initial power dynamic shaped the unique labour relationship within the mine.

While the internationalization described above facilitated rapid capitalisation of the company, increasing its book value from £20,000 to £2,000,000 within a decade, it also raised concerns among the Portuguese government (Cleveland, 2015). Diamang found itself surrounded by the truly giant mining companies, Union Minière du Haut-Katanga and Forminière, as well as several smaller Belgian-backed concessions (Appendix B shows a map of the crowded neighbourhood surrounding Diamang's operations). Geographical proximity, substantial investment from Belgian financiers, and the prevalence of former Forminière employees in management positions fuelled unease among the Portuguese. There were concerns that Diamang was merely becoming an extension of Belgian industry in the region. These fears intensified under the Estado Novo, particularly after former colonial minister Salazar rose to prime minister in 1932. As a result, there was a push for increased Portuguese involvement in the company, culminating in a 1937 decree stipulating that 70% of the company's staff had to be Portuguese. This "Lusophonisation" of the company coincided with the onset of World War II and the subsequent occupation of Belgium, and thus, by the end of the war, what was a highly diverse European workforce had become one that was predominantly composed of Portuguese nationals.[8]

In the 1950s, the discovery of multiple new diamond deposits in the broader Lunda district led to significant increases in mineral exploitation. Interestingly, this expansion relied primarily on an ever-growing indigenous workforce and enhanced labour efficiency, this was different to the prevailing trend in other mines on the continent, where continuous deployment of labour-saving technological advancements through substantial capital investments was the norm (Juif and Frankema, 2018; Austen, 1987). Paradoxically, despite the scarcity of labour in the region, increasing output in the Lunda district depended entirely on expanding the labour supply. Consequently, the mining workforce grew to over 20,000 by the mid-1950s and continued to increase, reaching a peak of nearly 30,000 by the mid-1960s (see Figure 2 in the subsequent section). Even amidst notable growth in other exports like coffee and cotton during this period, diamonds remained Angola's most consistently profitable export due to their price stability resulting from industry cartelisation. This pattern persisted throughout most of the 20th century.

The beginning of the Angolan War of Independence in 1961, whilst changing drastically corporate labour relations, did not affect output or other corporate indicators of Diamang's health. These saw a relative continuation with steady growth that continued right up until independence in 1975 even under the increasing spread of the conflict. While violence never erupted in the Lunda province, the conflict originated, and indeed, most of the fighting took place just west of Lunda, along the Angolan/Congolese border, due to rebels being able to operate most securely from frontier regions, having both training areas and supply depots there (Newitt, 1981). Diamang company reports from the time show that this proximity to the border was something the company's management was very concerned about. (Figure 1 below shows most of its mining sites were close to the newly independent and politically unstable Republic of the Congo,

[8] "*Our 'colonialism' is the foreigners who reap the profits and we who pay for the improvements.*" This extract from a 1966 speech by Salazar highlights that whilst management of operations had been successfully taken into Portuguese hands it was felt that the returns from such operations were still predominantly flowing to other western countries. (O comércio, 1966, as referenced in Boavida 1972).

and in the case of its headquarters in the town of Dundo, was surrounded to the north, west and east by the new republic. The very first line of Diamang's 1960 Indigenous Report underlines their concerns:

"The most important event of the year, because of the impact it will certainly have on the behaviour of our workers, although it has hardly had any effect yet, was the independence granted to the neighbouring territory of the Congo, and the events that followed it, which are still evolving and far from reaching their conclusion."

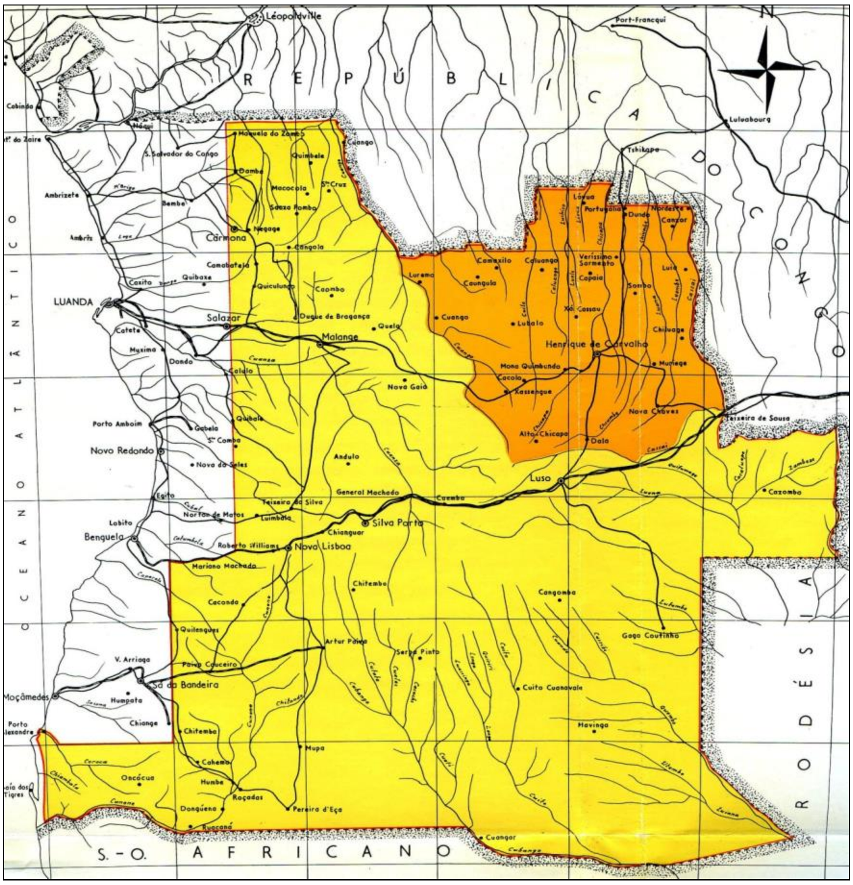

Figure 1 - Source: Diamond in the Rough, T. Cleveland (2015)

Diamang and the Portuguese government strongly opposed the idea of an independent Angola, considering it a disastrous prospect. The motto "PORTUGAL FICARÁ EM ANGOLA"[9] was widely embraced by the white establishment during this time. However, the leadership at Diamang were aware of the Republic of the Congo's hostility towards foreign colonial powers and its historical association with Angolan emigrants dissatisfied with Portuguese rule. They were also aware of instances where rebels from Tanzania had attacked white planters in Mozambique (Newitt, 1981).

Despite these challenges, Diamang experienced financial and output growth during the Angolan war of independence (1960-1974). This growth can be attributed, in part, to the presence of internal repressive institutions that arose from trading in a very valuable commodity. These institutions provided Diamang with the direct and indirect capabilities to suppress any potential acts of sedition. Additionally, the Congolese economy heavily relied on the Benguela railway, which was crucial for transporting their own mineral resources to the port of Lobito, to earn much-needed foreign revenues. This economic

[9] PORTUGAL WILL STAY IN ANGOLA.

interdependence undoubtedly deterred the Congolese authorities from allowing Angolan rebels to launch attacks on Diamang mines from their territory (Newitt, 1981).

Following Angolan independence, Diamang underwent a rapid decline and was aggressively nationalized by the Angolan government in 1977. It formally existed until 1986, when it was fully replaced by the state-controlled company Empresa de Diamantes de Angola (ENDIAMA) (Hodges, 2001).[10] This period was marked by a recurring pattern in newly-independent African states, as the fight for independence gave way to a civil war among rival factions competing for power in the post-colonial era, against a backdrop of Cold War geopolitical manoeuvring. The struggle for control over valuable territory and the resulting insecurity and violence posed significant challenges to diamond production, leading to a decline of diamond output to only 16% of its 1973 level by 1986.

Another contributing factor to this decline was the increasingly rapid departure of white Angolan staff from the company following independence. While there had been a policy of promoting white Angolans within the company since World War II, African Angolans faced a complete lack of promotion to positions beyond driver, foreman, or nurse roles. Thus, the sudden loss of the managerial class, and the engineers, with their technical expertise in running a mining operation of this scale played a crucial role in the collapse of mining activities. [11]

Diamang and the mining of diamonds have played a central role in the economic history of colonial Angola. However, diamonds also became a catalyst for the civil war in post-colonial Angola. The significant increase in diamond prices in the 1970s and 1980s directly contributed to Angola's unfortunate distinction of hosting Africa's longest and bloodiest war. [12] The main opposition to the MPLA government, backed by the USSR and Cuba, was UNITA, supported by the USA and South Africa. UNITA's control over the diamond-producing region enabled them to acquire arms and fund their increasingly violent campaign, earning diamonds the notorious label of "blood diamonds."[13] The war, fuelled by both sides' access to international backers and resources in exchange for natural resources, persisted until a fragile peace was eventually established in 2002. With its population and economy decimated, Angola, often referred to as a failed state, due to its position at the bottom of international income and other standard of living tables, had to embark on the arduous task of rebuilding, with diamonds and other natural resources once again playing a central role in its 21st-century narrative.[14]

3. "Slavery by any other name" – Forced Contracting of Labour in Colonial Angola.

[10] Currently it is unknown if such records on wages in the post-independence period exist but if they have been recorded and also survived I hope to locate them on an upcoming trip to various Archives in Angola.

[11] The author Ryszard Kapuściński, who saw this exodus with his own eyes, states that 95% of the white Angolan Portuguese population left the country by the end of 1975.

[12] In what can possibly be described as the most successful marketing campaign in history, DeBeers 'a diamond is for ever' hugely expanded the giving of a newly bought diamond ring when proposing marriage, and consequently pushed the price of diamonds ever higher. This campaign was most notably successful in the booming economy of Japan, which before these advertisements, had no culture of diamond-giving, but by 1981, over 60% of women marrying had received a diamond. (Epstein, 1982)

[13] See UN report S/2000/203, The 'Fowler report' (Fowler, 2000) for more on the trade in this specific conflict resource.

[14] Angolan courts are currently trying to recoup what they say is tens of millions of dollars siphoned off by those in power, post 2002, specifically, Isabel Dos Santos, the daughter of the then President and at one point the richest woman in African history (International Consortium of Investigative Journalists, Freedberg et al., 2020).

The previous section provided an overview of Diamang's corporate history, highlighting its success until Angolan independence in 1975. To understand this success, it is essential to consider the specific economic systems employed in Portuguese colonial territories during that period. These systems, characterized by forced labour arrangements, notably described by Eric Alinna (2012) as "slavery by any other name", played a central role in shaping the living standards of workers at Diamang in a heterodox manner compared to workers in other African mining concessions.

To facilitate the discussion of the findings in the results section, it is crucial to understand the Portuguese colonial policies towards indigenous labour, and to discuss these institutions in detail. This will involve presenting a hypothesis explaining why labour institutions developed in Angola which were such a contrast to other colonial powers' institutions that emerged during the late colonial period.

In the late 19th century, the Portuguese colonial economy faced a structural challenge of transitioning from a slavery-based system to one that no longer relied on such labour. While domestic slavery had been officially abolished in 1875, it remained prevalent in Portuguese Africa by the early 20th century (Vos, 2014). This contradiction between the justification for colonisation of Africa a being a way to eradicate slavery, and the persistence of the practice of enslaving populations, posed a significant challenge for the Portuguese, especially in the face of international condemnations and threats of punishment.

During this period, international demand for colonial exports experienced sustained growth. To meet this demand, the Portuguese sought a solution that would secure labour in a country with high land-to-labour ratios, due to the legacy of the slave trade while also appeasing other colonial powers. This was crucial for maintaining the success of their empire.

During the 20th-century colonial period, it is important to note that the Portuguese were not the sole state actors in Africa employing colonial labour market interventions to secure labour supply for public and private projects. Various strategies, including land alienation schemes, vagrancy laws, incarcerated labour, and mandatory labour periods on construction projects, were employed by different colonial powers (Van Waijenburg, 2012; Okia, 2012; Archibong & Obikili, 2020).

However, the Portuguese adopted a distinct approach that significantly influenced how concession companies like Diamang engaged and remunerated labour. Their solution to the labour question was bold yet remarkably simple. They established a contracted labour system that introduced a degree of formality to what had previously been a slavery-based system. By formalising labour through contracts, the Portuguese could refute criticisms of slavery by arguing that anyone being paid and signing a contract could not be there against their will. This crude response proved successful, not in eradicating slavery as trumpeted, but in facilitating the forceful capture of individuals for labour against their will on white-owned plantations and companies. It also maintained an appearance of legitimacy for the Portuguese regime's operations in Africa in the eyes of the international community.

Such a system, rooted in deception, naturally gave rise to farcical situations. Henry Nevinson, a prominent English social campaigner in the early 20th century, documented these situations vividly during his investigation of slavery in Angola and São Tomé in 1906. His report, titled 'A Modern Slavery,' reads like a harrowing tale at times. Nevinson discovered remnants of slave caravans attacked by lions as they travelled from the interior to ports. His account of the process of transforming a captured slave into a contracted worker is particularly damning and serves as a testament to the true nature of the institution that purportedly "replaced" slavery.

"A day or two before the steamer is due to depart a kind of ripple seems to pass over the stagnant town. Officials stir, clerks begin to crawl about with pens, the long, low building called the Tribunal opens a door or two, a window or two, and looks quite busy. Then, early one morning, the Curador arrives and takes his seat in the long, low room as representing the beneficent government of Portugal. Into his presence the slaves are herded in gangs by the official Agent. They are ranged up, and in accordance with the Decree of January 29, 1903, they are asked whether they go willingly as laborers to San Thome. No attention of any kind is paid to their answer. In most cases no answer is given. Not the slightest notice would be taken of a refusal. The legal contract for five years' labor on the island of San Thome or Principe is then drawn out, and, also in accordance

with the Decree, each slave receives a tin disk with his number, the initials of the Agent who secured him, and in some cases, though not usually at Benguela, the name of the island to which he is destined. He also receives in a tin cylinder a copy of his register, containing the year of contract, his number and name, his birthplace, his chief's name, the Agent's name, and "observations," of which last I have never seen any. Exactly the same ritual is observed for the women as for the men. The disks are hung round their necks, the cylinders are slung at their sides, and the natives, believing them to be some kind of fetich or "white man's Ju-ju," are rather pleased. All are then ranged up and marched out again, either to the compounds, where they are shut in, or straight to the pier where the lighters, which are to take them to the ship, lie tossing upon the waves.

The climax of the farce has now been reached. The deed of pitiless hypocrisy has been consummated. The requirements of legalized slavery have been satisfied. The government has "redeemed" the slaves which its own Agents have so diligently and so profitably collected. They went into the Tribunal as slaves, they have come out as "contracted laborers." No one in heaven or on earth can see the smallest difference, but by the change of name Portugal stifles the enfeebled protests of nations like the English, and by the excuse of law she smooths her conscience and whitens over one of the blackest crimes which even Africa can show." (Nevinson, 1906, p172-173).

This "solution to slavery" laid the groundwork for the establishment of the 'Shibalo' system, which was formally legalized in 1907 (Ball, 2015). Under these policies, individuals deemed idle or not working could be forcefully contracted. The enforcement of this system was left entirely to the discretion of state administrators and policemen, creating a labour pool that could be used with few constraints typically present in a free labour market.

It is worth noting that forced conscription of labour was not limited to Portuguese Africa; it was prevalent in other African colonies during the early 20th century, as extensively documented. However, what distinguished the Portuguese 'Shibalo' institution and allowed it to endure for three decades after forced labour ceased in other colonies can be attributed to the unique relationship between Portugal and the large companies operating within its empire.

I hypothesize that the absence of a free labour market in colonial Angola can be attributed to a combination of Portuguese domestic and colonial fragility, particularly during the first half of the 1920s, and the relative economic size of large corporate actors. The instability and limited economic capacity of Portugal allowed large firms, such as Diamang, to play a significant role in ensuring the financial stability of colonial Angola. This unique state-corporate relationship involved Diamang guaranteeing 40% of profits and providing a cheap and reliable credit line to the state (Diamang annual shareholder reports 1917-1919).

Access to credit was crucial for the colony, as it had accumulated substantial debt in the 1910s, due to efforts to pacify the interior of the country. However, international lenders were increasingly sceptical of Lisbon's ability to repay these mounting and compounding debts. The sister colony of Mozambique faced similar challenges and was excluded from international credit markets during this period (Vail and White, 1978). Financial pressure intensified following the appointment of Governor Norton de Matos as High Commissioner in 1921, as his perceived lack of budgetary responsibility led to a spike in interest rates on debt (Alexopoulou, 2018). I believe the heavy indebtedness and resulting desperation played a significant role in Governor Norton's decision to grant extensive powers to Diamang, ensuring that labour shortages would not hinder the rapid expansion of diamond output.

While Diamang's financial influence averted an immediate collapse of the colonial economy, it also created a long-term predicament for the government. The significant revenues and access to cheap loans provided by foreign concession companies were vital for the survival of the colony. However, the Portuguese authorities feared that these companies, which relied heavily on foreign staff and capital, might shift their allegiance to other colonial powers, particularly neighbouring Belgian colonies. Consequently, the Portuguese sought to tightly regulate the factor of production they did control—the indigenous labour supply—in order to maintain their relevance and importance to Diamang's production process. This willingness, or perhaps even eagerness, to allow large corporations to use forced labour distinguished Portugal from other colonisers of the time (Orde-Browne, 1930; Mosley, 2018; Van Waijenburg, 2018;

Channing, 2020). Forced labour soon became the prevailing mode of employment at Diamang and other concessionary companies in the colony.

The desire to remain essential to Diamang's production led to the normalisation of a forced labour workforce not only at Diamang but also at other concessionary companies in the colony. Consequently, indigenous labour became akin to a public utility, comparable to water or electricity, provided by the state at the lowest possible cost. The rationale behind this approach was that affordable labour provision would contribute to corporate success and, subsequently, foster economic growth in the interest of society at large. I hypothesise that this belief in labour provision as a means of ensuring the survival of the colony formed the core of this enduring institution.

Diamang and other large corporates enthusiastically embraced this new system. In fact, an economic point underappreciated in the literature needs to be highlighted: firms will respond positively to a government-aided employment system which unlike the previous institutional labour set-up of owning labour, did not require large up-front costs or long commitment from the employer, whilst still being easily scalable and as reliable (Mancini, 1996). This reduction of risk on the balance sheet of such firms was actually preferable, from an economic perspective, to slavery, particularly for newly established firms operating in an industry characterised by risk in remote foreign territories.

The prevalence and persistence of this system at Diamang is evident, as forced labour continued to be openly employed by the company until 1962, long after it had been eradicated in other colonies. It is crucial to note that following World War II, the firm's utilisation of forced labour increased as a result of its growing success, driven by rising commodity prices in the post-war period.

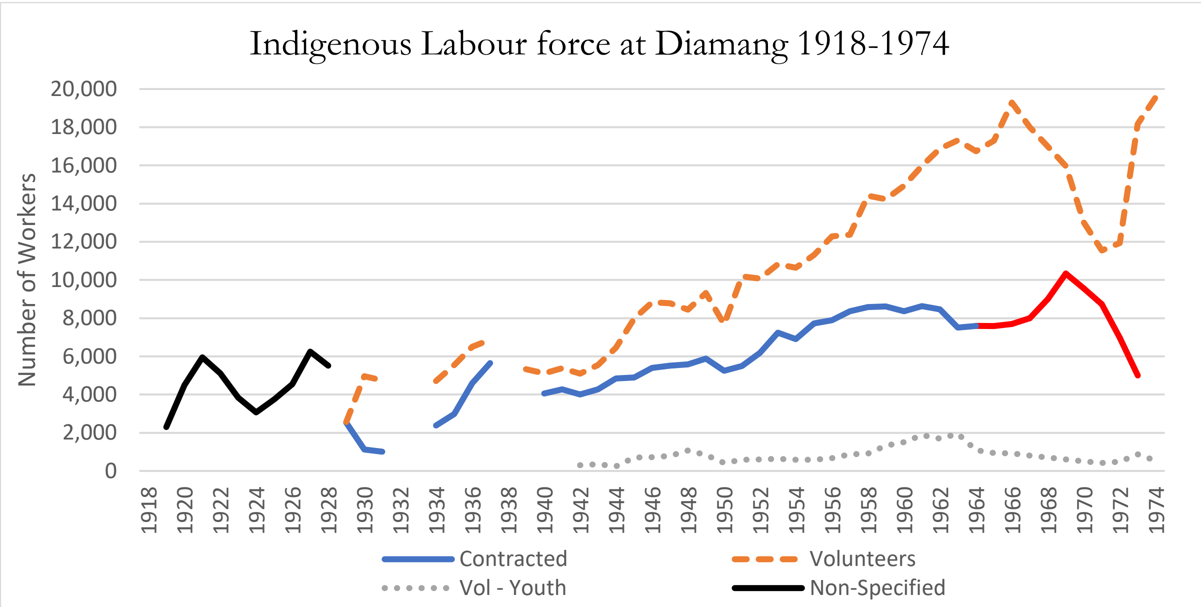

Figure 2 - Note from 1964 onwards those previously categorised as 'contracted' are now referred to as 'Externals' this is shown by corresponding labour force line turning red.

Figure 3 below demonstrates a parallel trend on the macro level. Throughout the 20th century, the economic expansion in Angola spurred a growing demand for indigenous labour, both from the public and private sectors. Whilst not always recorded in national statistics, years when records are included indicate the extent of this demand for forced labour. The figure also demonstrates that the colony's demand for indigenous labour, both in the public and private sectors, heavily relied on coercive labour contracts. The endorsement of forced contracted labour by the state, along with the tolerance of such practices in the private sector, hindered the establishment of a formal and voluntary labour market within this economy. This starkly contrasted with other colonial powers, which had shifted away from forced labour in the 1930s and progressively integrated their indigenous populations into free labour forces and societies after World War II. As a result, the mines of Diamang and the broader colonial Angolan economy witnessed a notable divergence in this aspect.

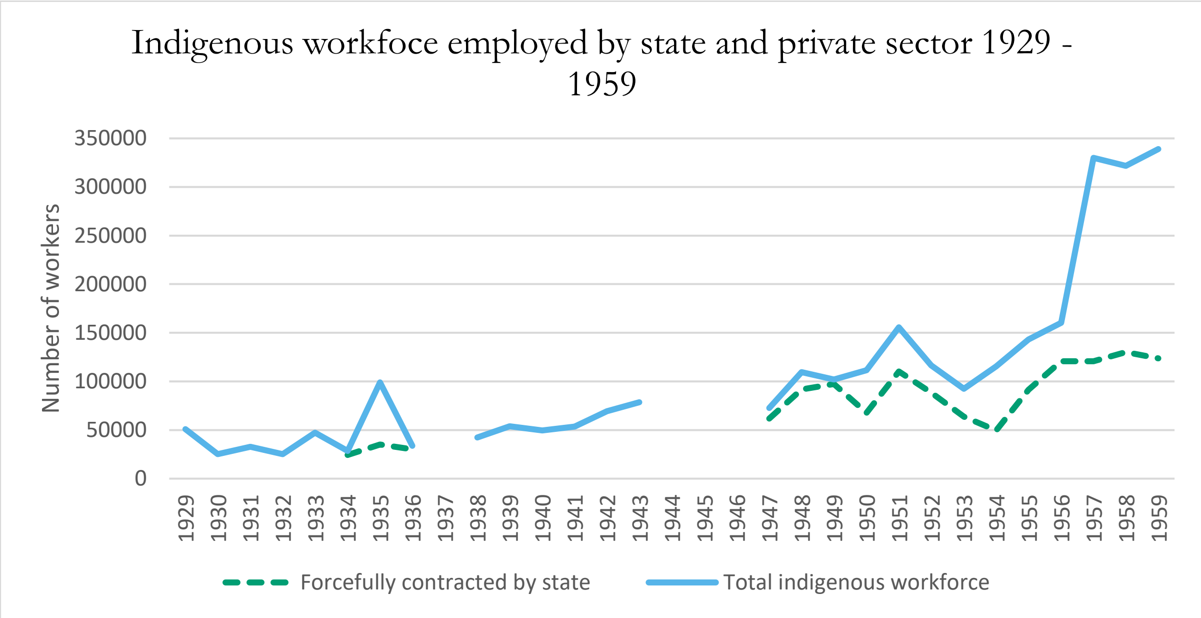

Figure 3 - Colony of Angola annual statistics 1929 – 1959[15]

In summary, the interaction of Portugal's domestic economic and political challenges with the power dynamics between the country and the concessionary companies operating in Angola resulted in a deviation between the labour institutions of colonial Portugal, and the rest of colonial Africa. This deviation became especially evident from the late 1920s onward when new, significantly stricter International Labour Organisation (ILO) regulations prohibited the forced recruitment of labour, particularly for private enterprise. This historical context is crucial as it helps us understand why, even 50 years later, Bob Marley still referred to Angola as a regime characterised by "sub-human bondage." In the results section, I will further demonstrate how these unique circumstances at Diamang gave rise to distinctive welfare developments.

4. Sources, Data & Method

4.1. The Diamang company records

[15] Other sources suggest wide differences in the amount contract labour used. For example, Boavida (1972) quotes a report from the 1954 department of labour affairs as saying that the total number of 'contract laborers' was no less than 379,000 which would have been 1/10th of the entire Angolan population. Thus, figures before 1956 seem unaccountably low and in reality there was not a sudden increase in 1956 but this was instead likely the extent that forced labour being used in the colony had been for decades before this date.

When the terms "Africa" and "corporate" are mentioned together, it is common for negative perceptions to arise. This can explain the challenges researchers face when attempting to access archives for studying corporates and their treatment of workforces in Africa. For instance, the colonial section of the extensive De Beers company archives remains largely inaccessible to researchers (Austin, 2016). Even when data are shared by De Beers, they are often selective, focusing on specific files or time periods, potentially skewing interpretations of the company's past behaviour (Decker, 2013). The dissolution of Diamang soon after Angolan independence created a unique situation for a large diamond mining concession in the colonial period. While the company ceased to exist, its archive remained intact. This presents an exceptional opportunity for researchers, as high-quality records exist without limitations on access for the sake of protecting company reputation.

Furthermore, the Diamang archives hold particular significance for researchers studying Africa due to the circumstances that unfolded from approximately 1960 onward. During the early post-colonial years, many large enterprises were nationalised or operating amidst intense civil conflicts. As a result, numerous corporate records were either reduced or completely destroyed (Austin, 2016). However, Portugal retained its colony in Angola until 1975, longer than other colonial powers, and the country remained relatively stable in an otherwise volatile region. Even in the final years of Portuguese rule, the Portuguese colonists departed rapidly. Thus, the Diamang archives are a rarity, providing unedited and continuous accounts of the largest Portuguese colonial company and one of the major companies in African colonial history.

Of particular interest within these archives are the qualitative comments from senior management, offering insights into the changing landscape of a continent undergoing massive transformation. Ghana achieved independence in 1957, making it the first Sub-Saharan African country since South Africa to do so, and was rapidly followed by an additional 37 countries becoming independent states, before Portugal finally and abruptly relinquished its colonies in 1975. This substantial timeframe of data offers valuable insights into how the last remaining European power in Africa perceived its position on the continent during this unprecedented period of upheaval.

While this paper draws on a wide range of data sources to construct its narrative, I will specifically discuss the main sources that I have digitised and extracted data from, to estimate worker welfare and other indicators, which will be presented in the following section.

The main source used in this paper was the Diamang company reports, particularly the Indigenous Labour Section Annual Report, which played a central role in calculating mineworkers' compensation throughout Diamang's presence in Lunda.[16] These reports showcase a growing amount of data collected on the indigenous workforce over the decades. Regarding wages, consistent data is presented throughout the years, indicating the total cost incurred by the company for employing a worker for a month, broken down into various categories. Apart from wage costs, additional categories include the estimated expenses for rations, transportation to and from the mines, hospital costs, and occasionally construction amortization and repatriation. The reports also provide brief commentary on the reasons behind fluctuations in specific cost categories throughout the year.

There is a phenomenal wealth of other information in these reports so focusing solely on wage and monetary data would be an oversight. Therefore, I have digitized and incorporated other quantitative and qualitative measures of welfare into my analysis. This broader range of data allows for a more comprehensive understanding of the evolving labour institutions and working conditions at Diamang throughout its history. These additional measures encompass the number of employed workers, their voluntary or forced contractual status, the migration of workers to Diamang's newly established mining villages, the presence of workers' spouses, the involvement of women and adolescents in mining, the length of contractual agreements, the diet of workers, the rate of desertion by workers, rates of rejection of workers on health grounds and finally, accident and mortality rates.

[16] In Portuguese: Relatório Anual Secção de Trabalho Indígena.

Working with comprehensive corporate data like that of Diamang offers various benefits. Most notably, as the firm's primary motivation is profit rather than politics, it is less prone to bias. As highlighted by other researchers, African historical primary datasets created by Europeans often suffer from significant selection bias or other issues, such as unexplained data omissions in certain years (Frankema and De Haas, 2018; Van Waijenburg, 2018; Fourie & Obikili, 2019). However, within the Diamang archives, I have observed a remarkable absence of such biases, instead encountering highly detailed, consistent, and candid records concerning the daily operations and challenges faced by the mine.

Moreover, the apolitical nature of these archives, in contrast to government reports and contemporaneous accounts, provides additional advantages. The language employed is akin to modern company reports or prospectuses, which, considering the subject matter, can occasionally make for uncomfortable reading as individuals are sometimes reduced to mere inputs. Notably, many reports contained paper notes which have been clipped on after the publication of the report, and which contain comments from other members of management, expressing agreement or, more frequently, disagreement with the report's author's original analysis. Lastly, it is worth noting that the methodology and presentation of the reports have changed very little over the decades, facilitating easy comprehension and trend analysis for unfamiliar readers.

4.2. Welfare Ratios

In line with prevailing practices in economic history, I adopt Allen's (2001) "Barebones Subsistence Basket" deflation method to convert domestic nominal wages into internationally comparable real wages (Frankema & Van Waijenburg, 2012; Rönnbäck, 2014; Bolt & Hillbom, 2016; De Haas, 2017; Pereira, 2020; Fibaek, 2021; Chankrajang & Vechbanyongratana, 2021; Klocke, 2021).[17] Although not all-encompassing, this method offers two significant advantages: it allows for cross-temporal and cross-geographical comparisons, enabling welfare assessments, and provides a more representative measure of "ordinary African workers" than other indicators like GDP/Income per capita.

The "Basket" represents a selection of basic necessities assumed to be essential for a family to maintain a standard of living above subsistence (refer to Table 1 below for the included items). By dividing a male adult's wage by the price of the basket, one can calculate the welfare ratio. A ratio below 1 indicates a living standard below subsistence, while a ratio of 1 signifies a Barebones Subsistence or the absolute poverty line. Therefore, an increase in this ratio, surpassing 1, corresponds to an improvement in living standards above subsistence.

Criticism has been raised against the barebones subsistence basket and the values used by Allen, which formed the basis of his argument regarding the uniqueness of pre-industrial Britain's relatively high-wage economy (Humphries, 2013; Humphries & Weisdorf, 2019). Much of the criticism revolves around the inaccuracies in the wage calculation method, resulting in an overestimation of wages in pre-industrial Britain. However, there has been limited debate regarding the composition of the basket, with only some discussion on regional variations in the most consumed staples and food sources in the past. In 2013, Allen updated the basket to reflect a more calorific intake (increasing from 1940 to 2100 calories per day), aiming to better capture the physically demanding and energy intensive nature of manual labour prevalent in an era where human muscle constituted the primary driving force behind economic activities.

This alteration poses a challenge as it prevents direct comparisons with previous studies that used the lower-calorie basket, such as the works of Frankema & Van Waijenburg or Bolt & Hillbom. To address this, I have decided to include welfare ratio measurements over time using both the original and updated higher-

[17] The world banks measure of \$2.15 PPP follows a similar logic, with those earning below this level considered to be below the absolute poverty line. Whilst the rate of poverty has been declining due to rapid population growth on the continent more people live below the absolute poverty line in Africa than ever before in its history. This trend has accelerated due to the recent Covid pandemic (Frankema, 2021, World Bank, Gerszon et al., 2021). Extreme caution has also been urged when using such national PPP figures for African countries even in recent decades (Jerven, 2013)

calorie baskets. The updated basket results will be presented in the main body of the paper, while the estimates using the original baskets are provided in Appendix C, facilitating easy comparisons across different periods and locations.

Now turning to a more detailed examination of the barebones subsistence basket in the African context. As mentioned earlier, Frankema and Van Waijenburg have adapted the basket to better reflect the dietary patterns of workers in sub-Saharan Africa throughout the year. For one worker, the subsistence basket consists of a minimum daily calorie intake of 2,100. Assuming a family comprising a man, his wife, and two or three children, this is thus multiplied by four to account for these members so that it provides 2,100 calories on average per person in the four-headed household. The total calories in the family basket will thus amount to 8,400. The husband is assumed to consume significantly more than the average calories per person and the other family members are thus assumed to require less for survival. This implies a total annual consumption of 800 kg of maize, 20 kg of beef, 8 kg of sugar, 12 litres of palm oil, 12 metres of cotton, 4.2 kg of soap, 4.2 litres of kerosene, 4.2 kg of candles, and 8 MBTU of charcoal for one year.

The table below summarises the observations used to construct the barebones subsistence basket for this period in Angola. It is evident that maize, the core cereal, accounts for the majority of household expenses throughout the year, comprising approximately three-quarters of the total basket cost on average. Food expenses, on average, represent over 90% of the basket's total. This contrasts significantly with Rowntree's estimation of family maintenance costs in late Victorian England, where food accounted for only 59% of expenditures, with clothing, rent, and fuel being significant budgetary components. However, the African basket developed by Frankema and Van Waijenburg appears to accurately represent the primary expenses faced by non-urbanized workers and their families due to the availability of affordable sources and low demand for fuel and clothing, and the absence of rent during this period.

Table 1 - Summary table of main components of one 'barebones' basket, average cost and average weighting over 1918 - 1974.

	maize **(200kg)**	meat (beef) **(5kg)**	Palm oil **(3-litres)**	sugar **(2kg)**	cotton **(3 metres)**	soap **(1.3 kg)**	kerosine **(1.3 kg)**	candles **(1.3 kg)**	firewood **(2mbtu)**
Observations	57	57	57	57	57	57	57	57	57
Average cost	$325.53	$43.89	$17.04	$8.70	$11.87	$5.70	$5.42	$10.10	$0.22
Average Basket Weight	76.0%	10.2%	4.0%	2.0%	2.8%	1.3%	1.3%	2.4%	0.1%

Source: Annual statistics of Angola, Central office of General Statistics. (1933 – 1973) & Report of the Indigenous labour Section. Companhia de Diamantes de Angola. (1930 – 1974)

Other scholars, such as Bolt and Hillbom (2018), have substituted similar items when cheaper options were available, for example, pork instead of beef or mutton. In contrast, I seldom encountered the need to make such substitutions for the items listed above, as they consistently represented the most affordable choices within their respective food categories, namely cereals and meat. Since the price of kerosene was not reported in the available statistical sources, I used the price of gasoline as a substitute, as it was the least expensive fuel indicated in the historical data. Regarding soap, the price was initially reported in kilograms and then switched to price per bar in 1940. Since there was no noticeable price change in that year, I assume that the bars also weighed 1 kilogram. As no data on charcoal was available, I replaced it with firewood, for which data was recorded for all years until 1967.

Unlike other authors who encountered challenges in obtaining price data for every item in the basket, I was fortunate to find price information for nearly all goods included. To address the lack of data on candle prices, I followed the approach of adding 2.5% to the final total cost of the consumption basket, as done by Frankema and van Waijenburg (2012) and Bolt and Hillbom (2016). Consequently, out of the 503 data points collected for the products comprising the welfare basket, fewer than 70 required estimation.

4.3 Methodological considerations

4.3.1. Wages

Estimating historical wages has faced recent criticism due to perceived inaccuracies, particularly regarding 18th century labour wages. Critics argue that calculated wages often exceeded actual worker earnings (Humphries & Schneider, 2019; Stephenson, 2019). One concern is the assumption of that workers were in full-time work. Fortunately, the data sets I employ are more recent and meticulously recorded, following modern accounting standards and practices. Consequently, I can determine the average duration of work, which was initially a 3-month contract for 6 days a week, before being extended to a 6-month contract in 1928, and then to 12 months in 1938. Subsequently, contract lengths increased further in the 1950s.

Using monthly wages, I calculate daily wages based on a 6-day working week. I then multiply this by 312 days per year, as done by researchers studying African historical labour markets, to derive yearly wages. Some argue that this approach overestimates welfare ratios when contracts were shorter than 12 months. However, it provides insight into the welfare afforded by a salary relative to the work performed to earn that salary. Consequently, it allows for welfare comparisons across different time periods at Diamang, as well as with workers in other times and locations.

Nonetheless, it is essential to acknowledge potential inaccuracies in the average wage rates calculated over the years. I will now outline some of these issues and explain why they should not bias the results.

Firstly, since a significant amount of labour was contracted against the will of workers, Diamang implemented a system where half of the owed pay was withheld until the contract's completion. This served as a disincentive for workers attempting to run away or breach their contracts. A portion of their pay would be sent to the worker's local "Chefe de Posto" and handed over upon their return to the village.[18] Company reports indicate that, in earlier years, corrupt local officials embezzled a portion of these wages before delivering them to the contracted workers. Thus, the workers may have received less than my calculated amounts. However, later company correspondence suggests that intense pressure from Diamang compelled the colonial government to eliminate this corruption by the 1930s.

Secondly, the annual reports document the total amount of "uncollected wages." It is challenging to determine why some workers did not claim their hard-earned wages. Perhaps this was due to the unavailability of fiat money in certain rural areas of Lunda or other unknown factors. Exploring this further in future research projects is a goal, but currently, the reasons for uncollected wages remain a mystery. Nevertheless, these reported uncollected wages constituted only approximately 1% of the total wage bill, thus having minimal impact on the accuracy of the actual wages paid to workers.

Thirdly, when calculating total wage income, it is crucial to consider not only monetary compensation but also other non-monetary benefits provided by the employer. For Diamang, this includes the significant cost of ration provision. However, certain worker expenses, such as recruitment and repatriation costs, hospitalisation, housing, and clothing/equipment expenses, will not be included in the total monetary compensation. While some workers may have received benefits like hospitalisation for pre-existing conditions or work clothing used after their contract ended, I have chosen not to incorporate these in-kind payments into the overall compensation received by workers. These benefits were primarily provided to

[18] A Chefe de Posto was a local administrator who had certain powers bestowed by the colonial government, and carried out tasks on their behalf. Various sources highlight the heterogeneity of the powers of such administrators, with some having limited powers, but others seemingly having the power of feudal lords over their indigenous 'subjects'.

offset the costs incurred by working at Diamang, and therefore, they did not result in additional net utility for the workers.

Fourthly, a more recent criticism regarding the accuracy of historical wage calculations is the adoption of a northern, 20th-century, male breadwinner perspective. While such an approach may be appropriate for industrialised countries in Europe and North America, it fails to accurately capture the reality of household labour in the global south, where multiple income earners were common (Channing and Everill, 2020). Archival sources provide ample evidence that indigenous workers' wives actively participated in income-earning activities within the Diamang mines. Furthermore, this trend extended beyond spouses, as evidence shows that adolescents were also wage earners during the later decades of Diamang's existence. Considering the involvement of the entire family in labour means that relying solely on a single male breadwinner for calculating welfare ratios may underestimate a family's actual income. I have computed the average number of baskets of goods a family could purchase, taking into account potential additional income from non-male breadwinner wages. However, archival data suggest that such situations were relatively uncommon. Thus, I believe that calculating incomes based on a single male breadwinner provides an accurate representation of most families whose husbands or fathers were employed by Diamang. Additionally, adopting this approach enables internationally comparable ratios. Comparing welfare ratios between single-earner and multiple-earner families is deemed valuable, and my results section will include a table demonstrating this variation.

4.3.2 The consumption basket

Criticism has been raised regarding the composition of the subsistence basket used to calculate welfare ratios. Indigenous reports indicate that miners' daily diets, as observed in a 1959 Diamang report, included items such as dried fish, rice, beans, ground nuts, and sweet potatoes, in addition to maize, beef, and palm oil. Therefore, relying heavily on maize in the basket might underestimate the welfare of workers and their families, as they may have had similarly inexpensive but more diverse diets.

This is a valid criticism, but it is important to remember why the term barebones is used before subsistence basket. This is a basket of items designed for someone whose consumption decisions may determine survival or death. As the Rowntree basket is accurately described by Hobsbawm "[it] was deliberately less generous than the diet prescribed for able-bodied paupers. This was an indeed a bare subsistence standard" (Hobsbawn, 2010). Understanding the cost of such a basket enables us to gauge the welfare of workers in relation to this essential threshold. It also facilitates the replication of baseline estimates across various locations and time periods.

Rigidity in the composition of the subsistence basket's goods has also been criticized. Critics argue that the selection and consumption of very cheap food sources, prevalent among those living at subsistence levels, will vary by location. Thus, a product that is inexpensive in one region would lead to an affordable basket and higher calculated real wages, whereas the same product's inclusion in the basket elsewhere would result in an expensive basket and lower calculated real wages. An example of this is highlighted by Traveiso, (2020). In 19th century Buenos Aires, the inclusion of beef in the subsistence basket, given its wide availability in Argentina, in place of more expensive pulses, dramatically inflated the calculated real wages for the region, giving it the highest real wages in the world for that historical period (Abad, L.A., et al, 2012, as cited in Travieso, 2020). [19] Such variations can significantly affect the welfare ratios.

The African-adapted Frankema and Van Waijenburg basket, which I have employed, shares many similarities with the ration slips of Diamang workers, as both rely for calories on cereal crops and meats for calories and protein. This similarity can be attributed to the predominantly agrarian economies of most

[19] A good discussion regarding the issues that can arise, when trying to choose suitable geographically specific consumption items, as well as a demonstration of how difference in choice can alter the 'barebones basket' results, can be found in Du Plessis and Du Plessis (2012).

African regions before and during colonisation, leading to relatively consistent food consumption patterns across the continent compared to industrializing Europe. However, it remains crucial to examine how welfare ratios vary based on staple goods, an aspect that will be further addressed in the results section of this paper.

Another concern related to the subsistence basket is that economic theory suggests there will be a shift in consumption from inferior to normal and luxury goods as wages surpass barebones subsistence levels[20]. This concern is of lesser significance for this study since welfare ratios remained consistently low for the majority of the studied period. The purpose of using the subsistence basket measure is to gain insights into the welfare changes of the specific population over time, resulting from variations in both wages and prices of goods. The measure does not claim that someone who can afford five times more maize and meat than 20 years prior is precisely five times better off. Instead, it provides an indication of how much better compensated someone is for their labour in relation to their purchasing power over time. Methodological concerns surrounding this metric are acknowledged, but as with any measure, trade-offs must be made. In this case, sacrificing accuracy in the calculation of real wages and changing consumption patterns allows for the creation of an internationally comparable dataset on the purchasing power of mining wages, facilitating comparisons over long time periods and across large geographical distances.

Another methodological concern is whether the prices of goods used in the basket correspond to the prices actually paid by workers at Diamang in rural Angola. While some authors have used export prices as a proxy for internally consumed goods, there is a possibility of divergence between external and internal prices. (Bowden et al, 2008). I obtained access to annual reports published by the Angolan National Statistics Agency, which provided market prices of commonly consumed goods. Price reports were available from the Angolan National Statistics Agency, initially limited to the capital Luanda until 1940, but later expanded to include district capitals. In this study, I used data from Villa Luso, the district capital nearest to the Dundo mining sites. These comprehensive price reports provided values for maize and meat, the items with the highest cost weighting in the basket, for every year of Diamang's existence during the colonial period, with the exception of one.

To assess the reliability of the price data, I compared the price series of the North Easterly Lunda area with both the capital Luanda and the nearest district with a continuous price series during the colonial period. This analysis aimed to determine if significant variations in agricultural prices existed across different locations in colonial Angola. If substantial differences were found, it would cast doubt on the representativeness of the price data from Villa Luso for the mining sites under study. On average, prices were 4% higher in Luanda and 7% higher in the nearby district of Henrique de Carvalho. While geographic price variance was evident, these small differences across large areas provide confidence that the prices in the closest district capital to Diamang closely resemble those in the actual mining areas surrounding Diamang.

When calculating welfare ratios for workers using this methodology, it is customary to include rations as a form of in-kind payment. However, a concern arises when considering the physically demanding nature of mining work. To sustain workers in these roles, larger rations are required compared to those consumed by an average active worker. Consequently, these in-kind payments represent unusually significant sums and do not accurately reflect the cost to workers of providing meals for themselves when not working. It is important to acknowledge the potential impact of these in-kind payments on welfare ratios, although it is unlikely to have a major effect since the cash component of the salary constituted a substantial percentage, especially from 1960. In fact, the notable increases in welfare during this period were primarily driven by the rise in the cash component rather than any ration adjustments (refer to Figures 4 & 5 for quantitative representations).

[20] An interesting example of this is a 1960's Diamang report, where the Head of Indigenous Labour writes about the 'wasteful' spending of the workers on such frivolous things as foreign vinyl records!

Furthermore, when not employed at Diamang, workers would likely engage in significant physical exertion to secure food through farming or hunting. Thus, the in-kind ration allowance is more likely to align with the necessary calorie consumption, even in the absence of mining activities. While deflating the rations to address this concern may be a potential strategy, it would compromise the international comparability of the resulting welfare ratios across different regions and time periods.

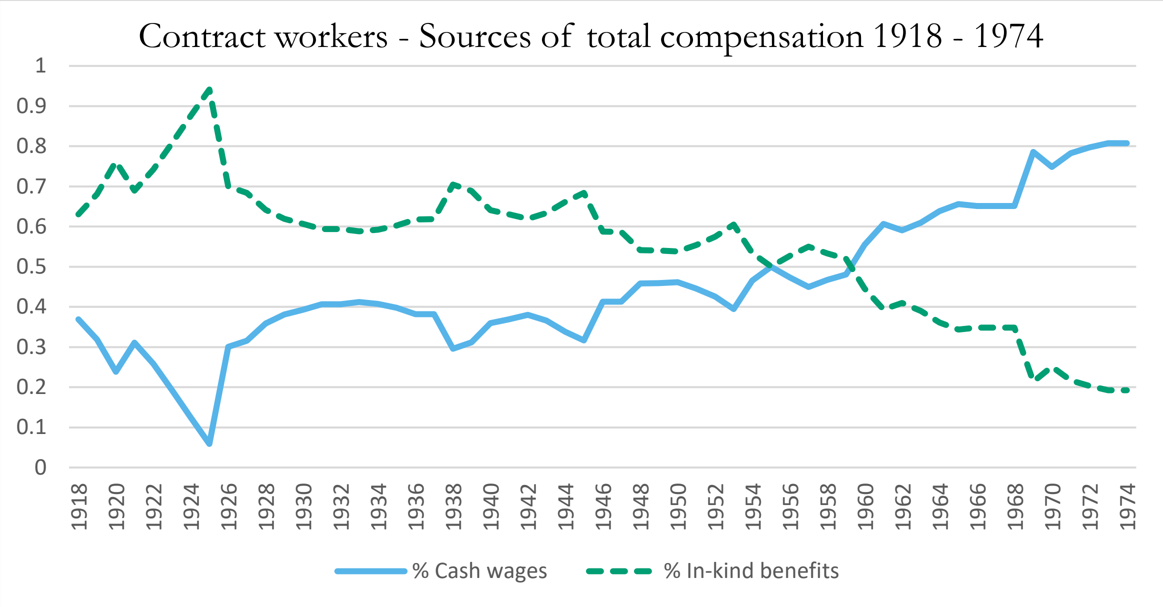

Figure 4 – Source: Report of the indigenous labour section (1930 – 1974) & Internal memos between indigenous labour section and general governor of Angolas office, Companhia de Diamantes de Angola. (1917-1974).

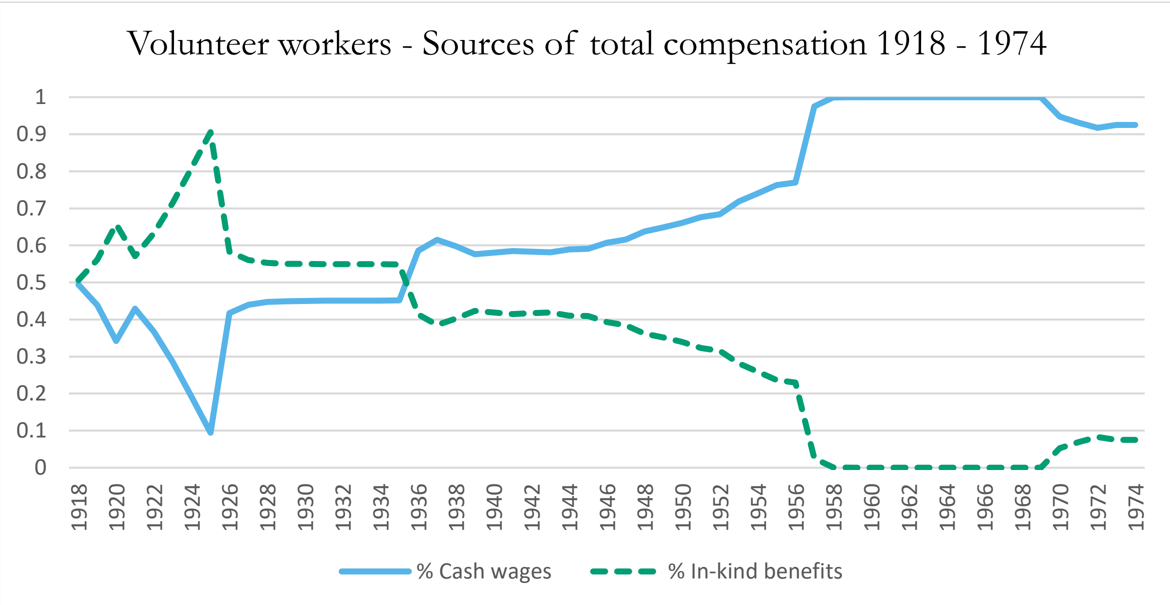

Figure 5 – Source: Report of the indigenous labour section (1930 – 1974) & Internal memos between indigenous labour section and general governor of Angolas office, Companhia de diamantes de Angola. (1917-1974).

4.3.3 Taxes

Establishing whether the reported wages were gross or net of tax has proven challenging despite thorough examination of numerous reports spanning multiple years. No explicit indication was found regarding whether the reported wages were "before" or "after" the application of indigenous taxes. If the reported figures were indeed gross wages, it would give rise to another issue: significant variations in indigenous worker tax rates both within and between regions.[21] Consequently, if the reported wages were gross, it would mean that some workers received a considerably smaller net salary than others due to differences in tax rates within their respective regions.

However, there are indirect pieces of evidence that suggest the wages reported were net of tax. Diamang's company reports discussing indigenous taxes reveal substantial amounts of money that the company paid on behalf of the workers to local government or chiefs de posto. This suggests that Diamang assumed responsibility for paying this tax on behalf of the workers, implying that the recorded wages represent the net amount received by the workers during and upon completion of their contracts. Additionally, the separation of the payment of indigenous tax in a distinct section of the indigenous reports, apart from the wages, further supports the notion that most workers did not directly receive the money allocated to cover their indigenous tax obligations.

To ensure that the wages paid corresponded to the actual amount received by the workers and consequently used to calculate welfare ratios, an additional verification step involved examining reports of indigenous salaries in government documents. The Annual National Statistics Reports contained a section providing data on government-employed workers and their corresponding salaries, conveniently categorised at the district level. By calculating the average salaries of government workers engaged in projects within or near the Lunda district, I observed that these salaries were similar to those reported by Diamang. Therefore, I can confidently assert that the salaries paid by Diamang, while low, were not further reduced due to mandatory indigenous tax contributions.

4.3.4 Contract length

When converting daily or monthly wages into annual salaries, a challenge arises in determining the number of days or months a miner worked in a year. For contracted workers, this issue is less prominent as their employment duration was explicitly specified by Diamang at the start of their contracts. By examining the average length of employment, I found that workers typically worked six days a week. Initially, contracts were for three months, which were later extended to six months in 1928, and further extended to 12 months in 1938. Contracts underwent additional extensions twice in the 1950s (Indigenous Labour Section Annual Reports, 1938, 1952, 1956).

In contrast, volunteer workers had a more irregular work routine as they tried to balance their own subsistence agricultural work and village tasks with mining labour. Therefore, there is greater uncertainty regarding the annual income of volunteer workers. However, it is known that over time, an increasing number of volunteers transitioned from seasonal work to permanent labour contracts, aligning their work patterns with contracted workers (Cleveland, 2015). This shift was driven by the growth of Diamang and the modernisation of the local Lunda economy, which increased the opportunity cost of dedicating time to farming instead of working in the industrial sector.

In all cases, I have obtained monthly wage data for each type of worker, allowing me to calculate a daily wage based on a six-day working week. To ensure the creation of internationally comparable real wage and welfare data, I have adhered to the common methodology outlined by Frankema and van Waijenburg (2012), which assumes that a worker completes 312 shifts in a year. While some may argue that this

[21] The variances in tax level can probably be attributed to historic differences in governmental labour requirements. As Seibert (2011) notes "the head tax itself was valued not only as a revenue source, but also because it forced people to work for wages, especially men, who were the main targets of labor recruiters. Indeed, tax increases were frequently and directly connected to local labor requirements".

approach overestimates welfare ratios for contracts shorter than 12 months, it effectively demonstrates the utility provided by a salary relative to the amount of work undertaken to earn that salary. Although an alternative measure could have been developed based on daily earnings relative to the cost of a daily basket, it is customary in the literature to express this equation in yearly terms. By following this approach, I enable welfare comparisons between different types of workers across various time periods at Diamang and also facilitate comparisons between Diamang employees and workers in different regions or timeframes.

Unfortunately, it is not possible to determine the disutility experienced by individuals who were forced to work compared to those who had some degree of choice in their employment. Accident and death rates remained high for contracted workers, while such incidents were not even reported in the volunteer work section. Although desertion rates had significantly declined, desertion remained prevalent among those forcefully conscripted. Labour reports indicate an average of 64 desertions per year between the end of World War II and 1960. In the early years of Diamang, desertion rates were even higher, even reaching the very high level of one thousand per year (Indigenous Labour Section Annual Reports, 1930 – 1974).

The aforementioned statistics highlight the significant hardships faced by forcefully contracted workers due to coercive labour practices. Regrettably, it is impossible to quantify the disutility or utility of being coerced into a job far from one's tribal village compared to those who volunteered and continued to live in their ancestral lands with their families. Consequently, these considerations cannot be formally included in the welfare measures of contracted and volunteer labour, although they should be taken into account when observing the often relatively similar welfare ratio values of forcefully contracted workers and volunteer workers.

4.3.4 Summary

As discussed earlier, when using historical data, particularly from Sub-Saharan Africa, estimations are prone to various measurement issues. However, the Diamang data are reliable, especially when compared to wage estimations based on sources that may have significant biases regarding population (Frankema & van Waijenburg, 2012) or the labour force (Van Waijenburg, 2018).

Colonial Angola faced similar challenges of inaccurate data reporting (Keese, 2012). However, Diamang's relatively professional and well-funded statistical section, coupled with the fact that the data was for internal use, reduced the incentives for misreporting figures compared to some colonial authorities. Therefore, these extensive and long-term historical data sets are less likely to suffer from accuracy or bias issues.

The existence of well-documented records describing large-scale coercive policies is remarkable, considering their shameful and inhumane nature by contemporary standards. Their historical significance lies in evaluating institutional practices against present-day norms, even though they were widely recognised as immoral during colonial Angola. Given this context, it is astonishing that these records, which could have easily been suppressed or destroyed, have been preserved in such good condition.

Lastly, the deployment of these coercive policies during a relatively recent period, coinciding with Bob Marley's first live TV performance on the BBC, provides a unique and valuable window into the lives of indigenous workers, many of whom may still be alive today. The dry and meticulously recorded figures serve as a precious record of the suffering endured by indigenous workers under Portuguese colonial rule, ensuring that it is neither forgotten nor erased.

5. Results

5.1. Charting Six Decades of Miners' Monetary Compensation

Figure 6 presents the fact that before 1960, there is a complete lack of any significant changes in labour conditions. In essence, the data on welfare ratios at Diamang prior to 1960 can be summarized concisely: workers experienced initial years of severe hardship, with welfare ratios remaining below the minimum subsistence level. Occasional marginal improvements in welfare brought them closer to this minimum threshold, but subsequent periods of deterioration often pushed workers back below the basic subsistence level.

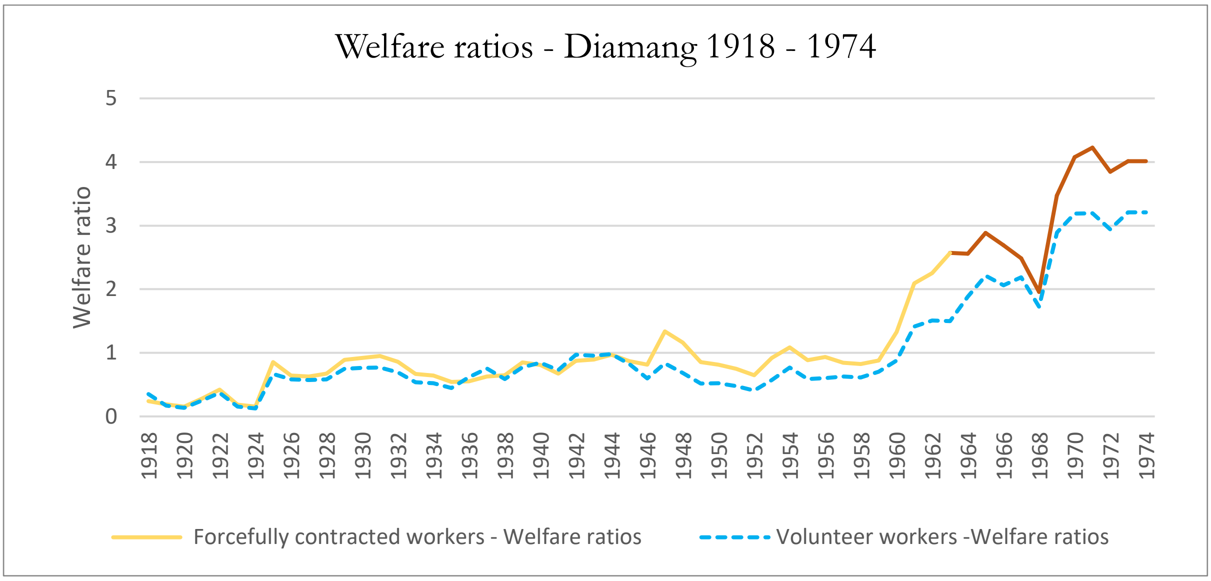

Figure 6 –Source: See Appendix D. Note: Note from 1964 onwards those previously categorised as 'contracted' are now referred to as 'Miners' this is shown by corresponding welfare ratio line turning red.

Some important considerations should be noted regarding the aforementioned statement. Firstly, compared to the 1920s and early 1930s, certain aspects of the working environment witnessed significant improvements prior to the substantial changes that occurred after 1960. Notably, there were advancements in healthcare provisions and an increase in the supply of equipment and clothing for mineworkers. However, following World War II, there was a decline in welfare ratios, reversing the limited progress made before the war. Furthermore, post-war, Diamang became increasingly coercive, with intensified work schedules and a growing inclusion of women and adolescents in the labour force. These changes in working conditions will be discussed in greater detail later in this study.

Post-1960 exhibits a distinct transformation, with welfare ratios experiencing an almost fivefold increase within a span of 15 years, in comparison to the results observed in 1959. The subsequent section will provide a comprehensive comparative analysis of these changes. It is worth highlighting that such substantial growth in welfare ratios is typically expected to occur over an extended timeframe, rather than a brief one. Extensive research in the field of welfare ratios has yet to uncover similar magnitudes of change occurring within such a condensed period.

Furthermore, it is worth noting that the cost of a basic basket of goods remained relatively constant between 1960 and 1974. Consequently, it can be inferred that the primary driver behind this remarkable welfare growth was a fundamental shift in attitudes towards the existing labour institutions at Diamang. To illustrate this phenomenon, Figure 7 provides a breakdown of welfare ratios into their constituent components, highlighting that the predominant catalyst for this transformative change was the significant increase in salaries, contributing to the numerator of the ratio.

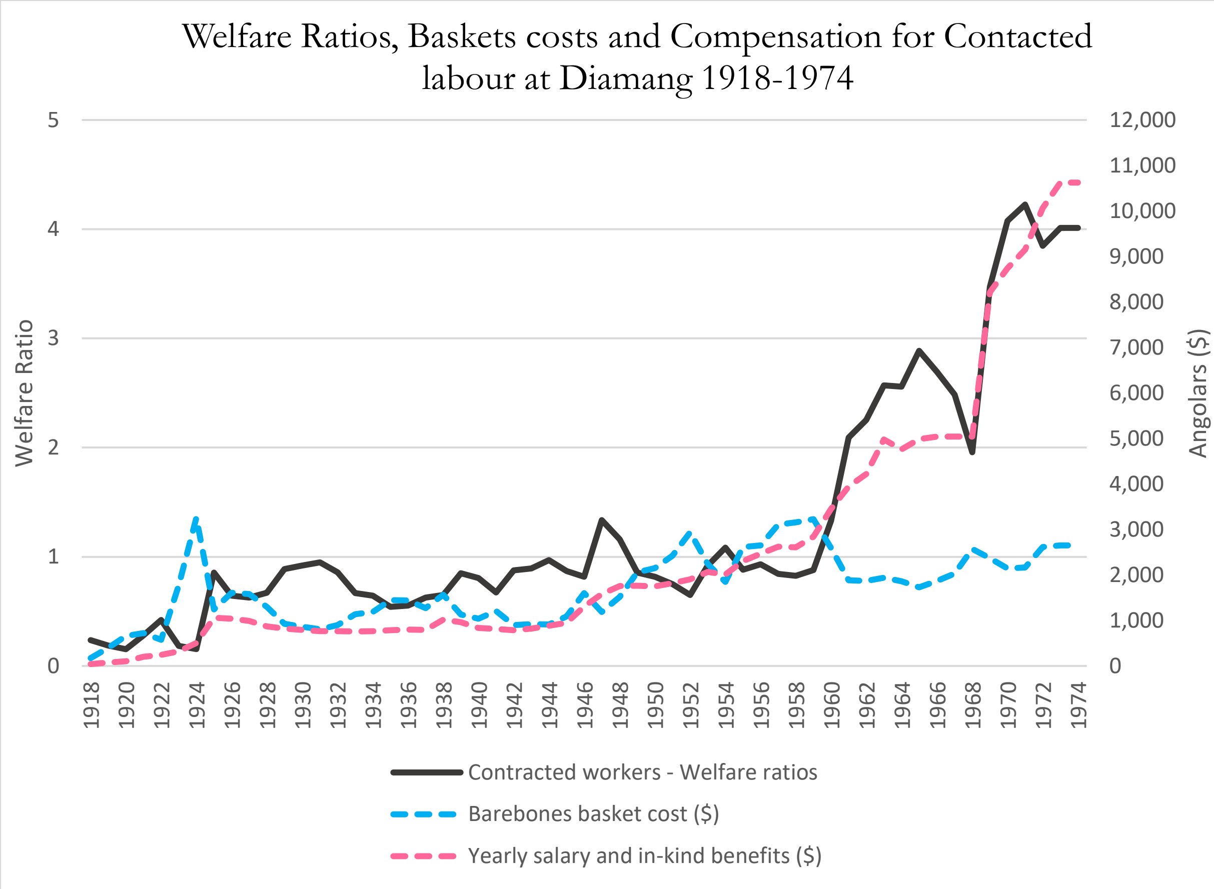

Figure 7 – Source see Appendix D

5.2. Sensitivity analysis

The welfare ratio in the pre-1960 period, averaging around 0.75, although not high, could still be an overestimate of the living standards experienced by Diamang workers. To gain a better understanding of the dynamics of these living standards during that time, I will conduct sensitivity analyses, which explore how welfare ratios change under a range of assumptions.

A key assumption of the welfare ratio is that there was strict adherence to a basic basket of goods consisting of the most affordable products available. While individuals with very low incomes likely economised as much as possible on food expenditure, it is challenging to believe that families exclusively consumed such a meagre diet primarily composed of maize for every meal, especially considering the availability of slightly more expensive staple crops in the region. Indigenous reports corroborate this notion, highlighting diverse ration provisions even in the early years of Diamang, when food supply to the mines posed difficulties for management (See Appendix D).

To obtain a more accurate estimation of welfare ratios reflecting a moderately diversified yet still modestly varied diet, it is helpful to consider the variations in welfare ratios resulting from different staple crops used as the main source of calories. Figure 8 illustrates a significant decline in welfare ratios over the years, if the strict assumption that workers and their families consumed only the cheapest cereals, namely maize, as their primary calorie source, is relaxed.

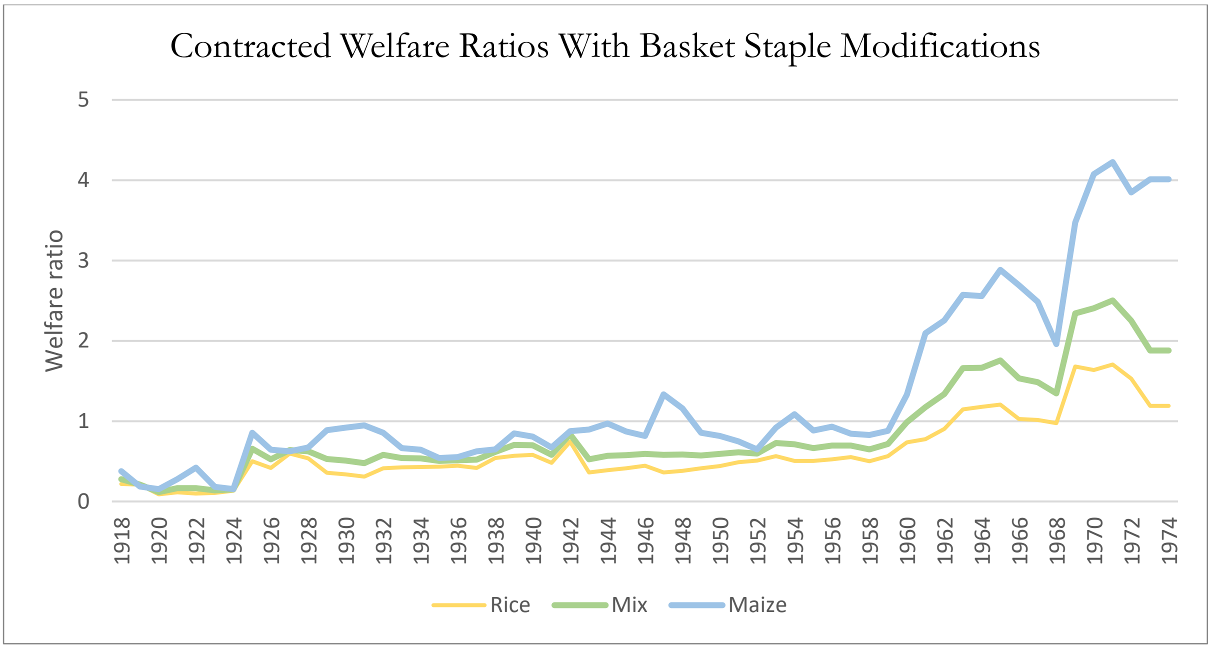

Figure 8 – Source: See Appendix D. Note (To avoid an over-crowded graph here only including data for contracted workers included)

Figure 8 (above) demonstrates that when the contents of the basket are altered to include other commonly consumed staple crops in the district, such as rice or a 50:50 combination of maize and rice, the welfare ratios experience a downward shift. Specifically, the average welfare ratios over this period are 0.41 and 0.54 respectively before gradually moving to above 1 from the early 1960s onwards. Dismal as they are, the welfare ratios presented in Figure 6, based on a subsistence basket comprising solely of maize, while probably representative of what was being consumed by miners (and as supported by ration reports from the period showing maize as the primary cereal consumed), may actually describe a more favourable picture than what was occurring on the ground for the mine workers at Diamang.

By adhering to the strict utilization of the cheapest available cereal, maize, comparability with welfare ratios calculated at different times and locations is preserved. Nevertheless, it is crucial to acknowledge that Figure 6 depicts a best-case scenario regarding worker welfare, considering the low compensation provided by Diamang.

Another assumption underlying welfare ratios is the equal sharing of all worker compensation with their family. This assumption would not be sensitive to underlying conditions if compensation were solely in the form of cash. However, Figures 4 and 5 highlight that during this period, a significant portion of worker compensation consisted of payments-in-kind, such as rations, which were likely consumed exclusively by the worker and provided no benefit to their family.

To understand the fluctuation in the true value of workers' family welfare over time, it is interesting to examine how far the varying cash component of Diamang's compensation covers their assumed basic sustenance needs. Using Allen's modified 2013 basket, the relative consumption of the worker's family accounts for three-quarters of the total basket consumption. Figure 9 below demonstrates that even if we assume that the entirety of cash wages is allocated solely to the worker's family (which would include periods when the worker himself was absent from the mine and required sustenance), the families of the workers would still be living significantly below the sustenance level.

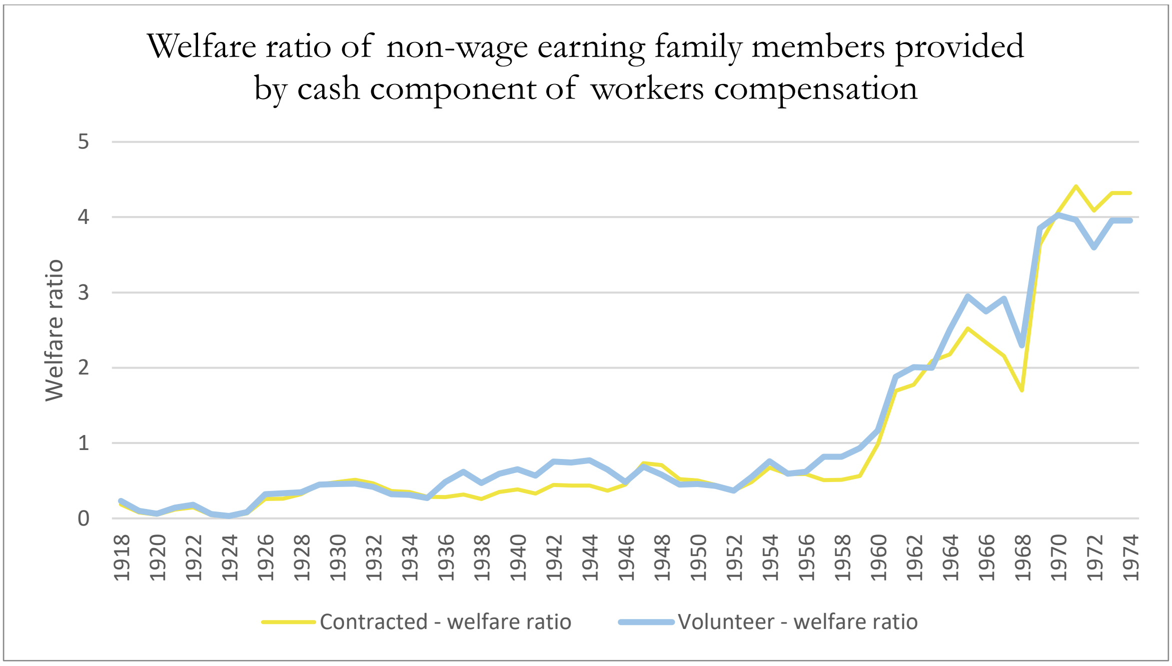

Figure 9 – Source: See Appendix D.

During the period prior to 1960, assuming that all earned cash was dedicated to supporting a worker's family, the average pay for contracted workers and for volunteer workers allowed their non-working family component welfare ratios of 0.37 and 0.46, respectively. Figure 9 illustrates that monetary compensation at Diamang was insufficient for a worker to fully sustain their family while being away for mine work in any given year before 1960[22]. This further emphasises that Figure 7, despite depicting low welfare ratios, should be regarded as the best-case scenario in terms of family welfare.

This aligns with historical accounts indicating that families of workers engaged in subsistence agriculture to contribute to the annual food requirements for their households throughout the year. Consequently, families were unable to accompany the husband/father to the mines and settle there. It also highlights that families who lost their husbands/fathers to mine work inevitably faced a heavier labour burden to meet the subsistence ratio compared to an alternative scenario where labour had not been depleted by the presence of mines. Further investigation is warranted once agricultural working patterns data for this period can be identified.

Thus far, I have addressed potential upward biases in this measure, but a downward bias may also exist, whereby it is assumed that only one family member is in receipt of a paid income. Starting from the early 1940s, an official youth category of volunteer workers was established, and in 1957, the first official mention of salaries being paid to women occurred[23]. With this data, it becomes possible to estimate a combined wage and subsequently calculate a welfare ratio based on the number of employed members in a volunteer family. However, it is important to note that the combined number of youth workers and women never

[22] It is hard to say exactly what percentage of workers were married but reports seem to suggest that around 30% of contracted recruits were accompanied by their wives. Other estimates say that of those workers married only half brought their wife with them. Therefore, it is possible to 'guesstimate' that at least 60% of those working on the mines had a spouse either accompanying them or back in their home villages.

[23] Whilst there is evidence stating that the number of women in paid employment numbered around 250 in the late 1950's, supporting data on how much they were paid is rare. In the instances when salary is recorded it is always almost exactly 60% of a man's monthly wage, therefore a 60% value of a man's wage is estimated for years when data is not recorded.

exceeded 10% of the paid labour force, making it highly unlikely for a man to have both his wife and two children employed at Diamang.

Figure 10 below provides an indication of potentially higher welfare ratios for certain families in the volunteer category starting from 1940. Notably, welfare ratios reaching approximately 9 in the 1970s are observed for families in which every member was employed. However, a more likely and realistic scenario during this period would be where families had both a father and son working in the mines[24]. For such families, the welfare ratio remains slightly above 1 between 1940 and 1960 before experiencing a rapid increase to reach values between 5 and 6. It should be noted, though, that this analysis fails to account for the likely increase in calorie requirements for families with multiple working members, which would result in a simultaneous reduction in welfare ratios.

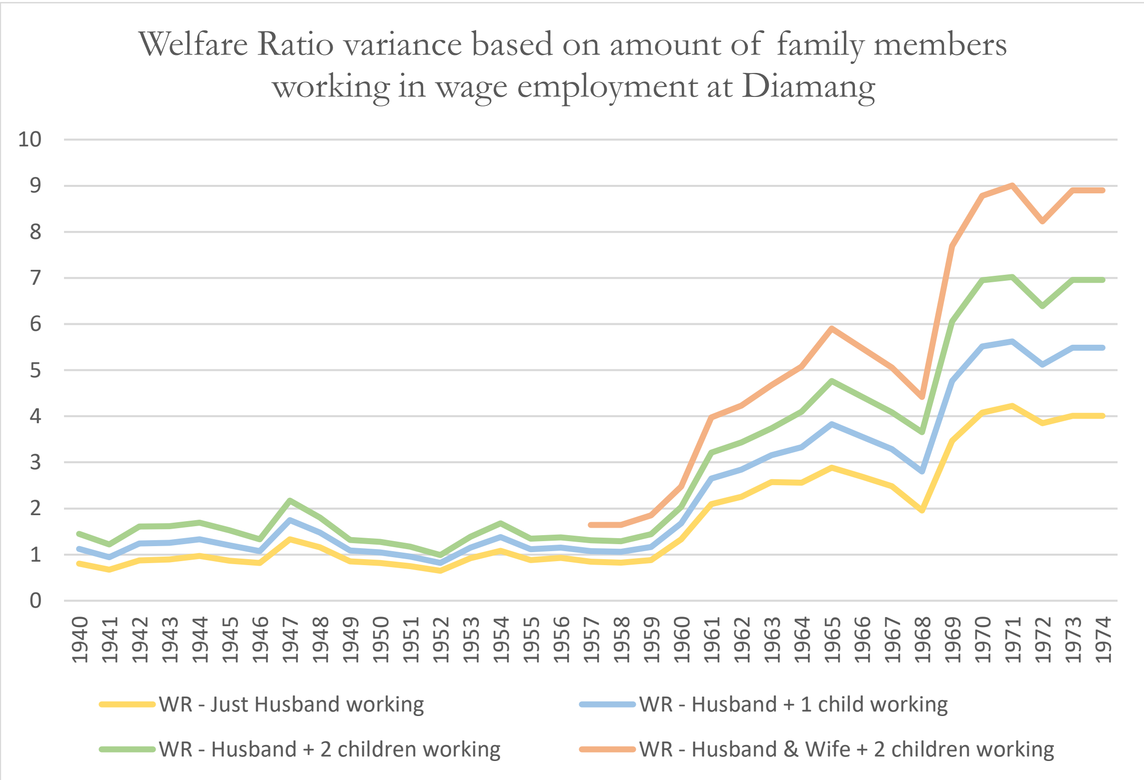

Figure 10 – Source: See Appendix D

One additional concern regarding Figure 6's depiction of welfare ratios for Diamang workers pertains to the potential inequality that could have existed among workers with varying incomes at the mine. While the average welfare ratio for all contracted workers throughout this period is, in my view, a strong representation of the living standards across different types of contracted workers, it is important to note that these workers received virtually identical wages until the early 1960s when the group was renamed as miners. Only then did Diamang introduce noticeable wage differentiation based on seniority.

Table 2 - Wages and welfare ratios of "miners" in 1972

[24] A common occupation for youth workers was the role of a 'picker'. This involved sorting through pre-refined soil to find uncut but still highly valuable diamonds. This important role was entrusted mainly to youth workers due to the belief by management that they were less likely to try and steal and smuggle stones onto the black market.

Worker category	Monthly Salary + in-kind benefits	Welfare ratio based on this monthly salary
Class 1	755	3.5
Class 2	820	3.8
Class 3	885	4.1
Class 4	950	4.4
		3.9 – average WR value taken from Fig 6 (1972)

Source: See Appendix D

Table 2 reveals that even in Diamang's final operational year, when pay distinctions among different categories of miners were significantly increased through the implementation of a bonus system, the variation in welfare ratios for each worker class is not substantial. Notably, the welfare ratio value of 3.9 obtained from Figure 6 appears to be highly representative of the average worker in this category. Thus, it is reasonable to conclude that in previous decades, when wage variation was minimal or non-existent within the contracted worker group, the calculated average welfare ratio adequately reflects the majority, if not all, of the contracted workers' situation.

In the volunteer worker category, wage variation is comparatively higher, especially after 1960. While this category initially consisted primarily of mine workers, it expanded to include non-technical roles such as drivers, clerks, sanitation workers, and cooks (predominantly women), leading to increased wage diversity. However, a significant majority (around 80-90%) of these workers fell into Class 1 or 2, receiving nearly identical wages. Therefore, the welfare ratios calculated based on the average wage provided by Diamang for this labour category are likely to be representative of both miners and non-miners who worked at Diamang.

In later years, a new group of workers known as specialised workers emerged alongside contracted workers/miners and volunteer workers. This development likely resulted from the gradual investment in human capital that began in the late 1950s and rapidly expanded after 1960. Although specialised workers constituted a small portion of the indigenous workforce (only 13.4% based on the last available recorded figures in 1972), their numbers were growing, up from 10% in 1969. These roles encompassed various positions, from nurses to metalworkers and machine operators, and workers in this category experienced significantly higher welfare ratios compared to volunteer workers and miners. In 1972, during a period of exceptionally high wages for mine workers, specialised workers earned, on average, 3.2 times more than volunteers and contracted workers/miners. The highest-paid specialised workers received between 6.5-7 times more than a miner at Diamang. While an exploration of the growing inequality among Diamang workers, particularly after 1960, would be valuable, it falls beyond the scope of this paper.

6. Alternative Approaches to Measuring Living Standard – A Discussion

The preceding discussion has addressed potential issues with the barebones basket deflation method for calculating welfare ratios, acknowledging that no statistical measure can fully capture the entire complexity of the subject under study. However, I believe it would be useful to highlight why this method has become increasingly favoured by economic historians wishing to analyse long-term historical living standards across diverse geographical regions.

An initial question may arise regarding why the barebones basket deflation method is used to assess living standards instead of more conventional measures such as real wages calculated using a different price deflator. National Statistical Agencies, including those in colonial Africa, and economic historians have produced price deflators, readily available for multiple purposes, including assessing living standards. These indices are advantageous as they eliminate the need to construct specific baskets of goods applicable to particular regions and time periods, a labour-intensive process. However, it is essential to acknowledge that all statistical measures are susceptible to bias. Constructing a yearly Consumer Price Index (CPI) figure to deflate wages for a specific group of interest is prone to errors, especially when reaching further back in time. Factors such as income fluctuations, regional and community variations, and substitution between consumption different baskets over time introduce biases and potential misleading outcomes.

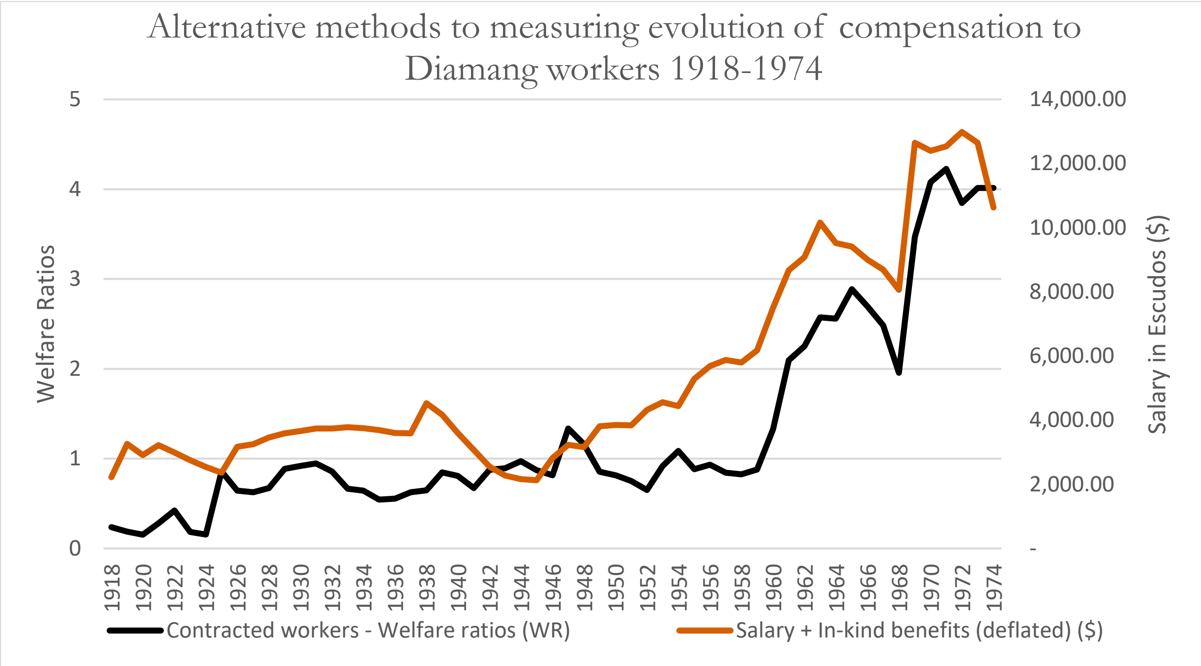

Figure 11 - Source: See Appendix D and CPI deflator from Valério and Tjipilica (2008)

Evidence of this is demonstrated in Figure 11 which shows a wage series deflated using Valério and Tjipilica (2008) with a base year of 1914. Looking at the evolution of real wages based on this CPI estimate depicts a very different picture of workers' living standards over the years, to that demonstrated by the welfare ratios series presented in Figure 6. This deflated wage series shows workers' real wages falling dramatically during World War 2, before beginning a progressive march onwards from 1945, doubling by 1952, and doubling again by 1961. However, the 1960s brings with it much more volatility in real incomes with large increases being cancelled out by equally large decreases, before a final upwards surge at the turn of 1970s is followed by a sudden drop in 1972. But this country CPI estimate does not in fact capture the dynamics of the situation in Diamang, and could result in misleading conclusions[25]. This disparity between real wages and welfare ratios reveals the contrasting experiences of the average worker in the Angolan economy compared to those employed at Diamang, earning low subsistence incomes, during the studied period[26]. Various factors contribute to this variance. In times of economic turmoil, such as World War 2, indigenous

[25] This naturally relies on the assumption that there was little or no substitution between goods that were experiencing price increases and those that were not. However, given that during this period, the price of rice and other cereals, per kg, was substantially higher than maize, whilst also less calorific, those living on subsistence wages would probably have been unable to alter their consumption baskets.

[26] In the colonial economy of Angola, which had a relatively small and rich white elite, a huge and overwhelmingly poor indigenous majority, and some other minority groups, such as 'mestizos' and 'assimilados', somewhere in-between, it is very hard to define what an 'average' person in this economy will have looked like.

workers were partially shielded from rising prices, as their essential goods were domestically produced and less affected by wartime trade disruptions. However, there are periods when increases in nominal and real wages coincide with declining welfare ratios. This occurs due to the faster growth in the prices of crucial staple goods that Diamang workers rely on, notably maize, which saw its price more than triple between 1947 and 1952. As maize accounts for approximately 78% of the average subsistence basket cost throughout the studied period, a tripling in maize prices results in a 228% increase in living costs within a few years. These rapid increases in the cost of living for individuals dependent on the most affordable means of acquiring sufficient calories for subsistence kept them close to the poverty line despite continuous nominal wage growth. Such dynamics are not captured by the use of a standard country CPI.

Thus, I argue that welfare ratios provide a more representative assessment of the lived experience of individuals with near-subsistence incomes, offering insights into welfare changes, as demonstrated by the Diamang labour force. By employing these measures, I was able to identify a significant shift in welfare ratios in 1960, a critical turning point that would have been overlooked if I had solely examined the evolution of real wages or other conventional indicators of living standards.

The change in compensation for low-income workers was not a gradual evolution, as indicated by the real wage series, but rather a significant departure from the established living standards. Understanding the historical context of these changes allowed the formulation of a hypothesis regarding the driving forces behind this departure from the norm. A detailed historical narrative of why worker living standards departed from a low equilibrium to a new trajectory of ever-increasing welfare ratios is outlined in the following section.

In brief, it proposes that a combination of external forces, rather than internal ones, unintentionally brought about the rapid dismantling of a long-standing coercive labour relationship, leading to the emergence of a new inclusive labour institution at Diamang. By paying due attention to the "history in the middle" and extensively examining qualitative sources, a greater understanding of this historically radical change in the capital-labour relationship is achieved. These novel results support a hypothesis built upon a dynamic conceptualization of colonial institutional development. This departure from binary categorizations of consistently extractive or inclusive corporations, commonly found in recent literature on coercive labour institutions, towards a fully-rounded understanding of the relationship between capital and labour is the cornerstone of my hypothesis.

In summary, although welfare ratios calculated based on a barebones consumption basket have their limitations, they offer remarkable insights into the daily lives of past societies. The arguments presented above emphasise the shortcomings of headline economic figures in accurately depicting the reality for individuals with very low incomes in an economy. Examining indicators like welfare ratios can provide a better explanation for popular uprisings even in seemingly prosperous economies. Rising prices of key products or inputs can fuel widespread discontent, protests, and revolutions. The "Arab Spring," for instance, is attributed, in part, to the unexpected surge in bread prices, despite the perceived success of Northern African economies before the protests.[27] Therefore, I advocate for greater utilisation of the barebones consumption basket measure by scholars in economic history, economics, political science, and other relevant disciplines seeking a deeper understanding of historical moments marked by significant societal and economic transformations.[28]

[27] There is a significant number of papers as well as books written across various academic disciplines on the underlying causes behind the Arab spring, such as Sternberg, in Applied Geography (2012).

[28] A thought-provoking recent discussion on this has recently arisen focusing on 'Captain Samuel Vimes Boots' measure of socioeconomic fairness created not by an economist but fantasy author Terry Pratchett.

7. Diamang Welfare Ratios in an International Comparative Perspective

To emphasise the distinctive nature of the welfare evolution among workers in Diamang's corporate enclave, it is valuable to compare it to other mines operating on the African continent during the same period. Juif and Frankema (2018) conducted a study on mines in the Central African Copperbelt, located east of Angola in what was formerly known as the Belgian Congo (Democratic Republic of the Congo) and Northern Rhodesia (Zambia). These mines shared certain geographical proximity and characteristics with Diamang, such as being large industrial corporations financed by European capital for extracting valuable commodities. However, they pursued a different labour employment strategy due to varying institutional environments and economic realities, making Diamang's business model less attractive and eventually unfeasible. Although both mines had the option of coercion through forced labour, this practice declined in the 1920s and ceased entirely after 1930. Juif and Frankema (2018) explain that "After the depression, forced recruitment of labour had become unnecessary in the Rhodesian Copperbelt, since migrant workers came to the mines on their own initiative."

This shift was a response by colonial authorities in both countries to meet the expectations of the International Labour Organisation, established by the Treaty of Versailles after World War I, which aimed to reduce and eliminate forced labour. For instance, a 1918 decree in Belgium stipulated penalties for administrative officers employing forced labour for profit, instead emphasising public works that exclusively benefited the native population. In cases where a native failed to pay taxes, punishment through forced labour could only be imposed for public works like road construction or land clearance. The sentiment against involuntary native employment grew stronger throughout the 1920s. In 1928, a commission recommended that government employees should refrain from furthering labour supply in any form and focus on encouraging legitimate work (Orde-Browne, G.S.J.,1930).

Northern Rhodesia also had stringent regulations regarding the employment of forced labour. From 1929, anyone found to be forcefully employing able-bodied males for private work would face a fine of 5 pounds or imprisonment for 3 months. In contrast, the Portuguese colonial government claimed forced labour for profit to be illegal, but no penalties were ever enforced for such practices (Orde-Browne, 1930). However, the "Shibalo" system, which mandated economic activity through work for all citizens of the empire, provided a steady pool of workers that Diamang and other companies could rely on. This increasing divergence from the practices of other colonial governments meant that forced labour did not disappear during this period, remaining legally in place until 1960 and arguably continuing unofficially until the end of Portuguese rule in Angola (First, 1983).

Efforts to reduce reliance on forced labour after World War I in the Belgian Congo and Northern Rhodesia resulted in welfare ratios of above 1 on average when the 1929 depression struck, leading to a significant reduction in employment. However, these relatively high wages created an elastic labour supply curve for the mines. Consequently, when activities resumed in the early 1930s, a shift to a free labour market equilibrium occurred, which persisted at both mines in the Copperbelt until their closure.

Although salary coordination existed between these rival copper mines to mitigate wage pressure, the continuous rise in copper prices and growing labour demand from the 1930s onwards resulted in upward wage trends. This led to a remarkable and consistent increase in welfare ratios at the Copperbelt mines. As depicted in Figure 12, by the late 1950s, welfare ratios at the Copperbelt mines were between 6 and 8 times higher than those at Diamang.

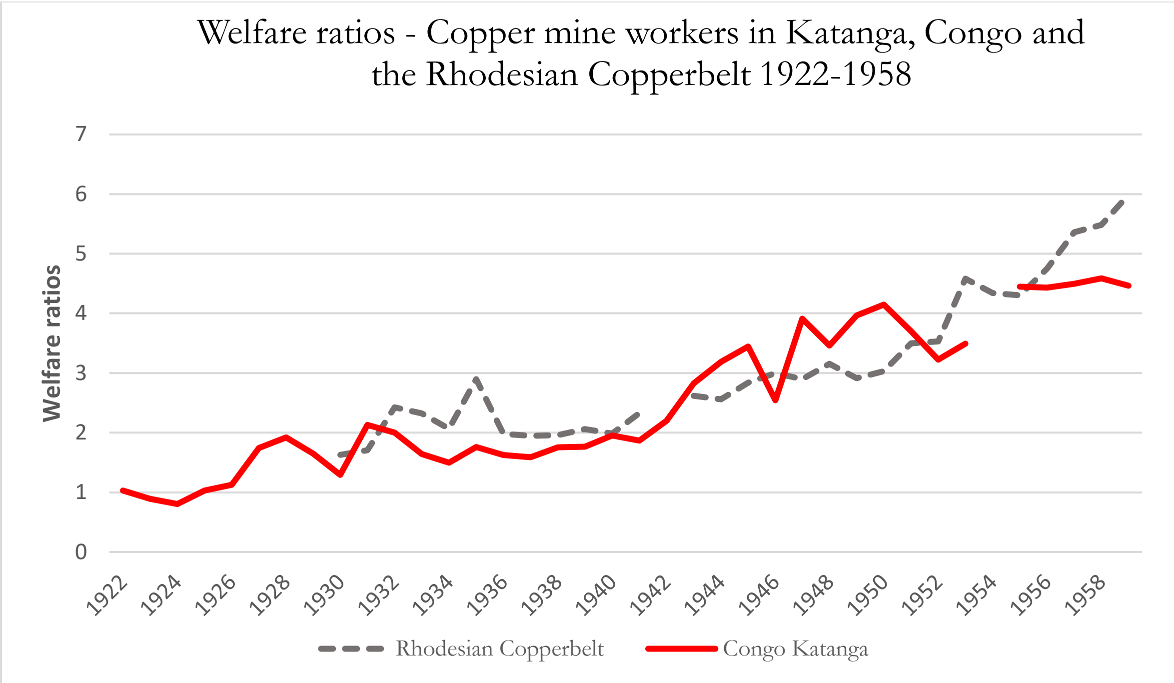

Figure 2 –Source: (Juif and Garrido 2023)

The contrasting welfare ratios can be attributed to two distinct labour employment environments at the mining sites. The Central African Copperbelt exemplified a state of double freedom. It was free in the sense that coercion was prohibited on both sides of the border, meaning workers were not compelled but rather made a voluntary choice. Moreover, it was economically free, resembling a labour market structure characterized by freedom and competition.

In contrast, Diamang in Angola operated in a doubly unfree environment. It was unfree due to a significant portion of the workforce being there involuntarily, as a result of persistent coercive policies that shaped Diamang's institutional framework. Economically, it was also unfree due to Diamang's lack of labour market competition and its remote location, effectively establishing a monopsony employer.

These companies operated in close proximity but represented opposite ends of the institutional and economic spectrum. These divergent worlds contributed to substantial and continuous disparities in living standards. By 1958, Copperbelt workers had become some of the highest-compensated manual labourers on the continent, while compensation at Diamang remained insufficient to adequately support even a worker and a relatively small family.

Having identified these extremes in labour employment relationships, the next step is to gather data on other mines during this period to compare their circumstances to these extremes. This endeavour, employing a long-term approach that delves into the historical intricacies of these companies, aims to enhance our understanding of coercive labour markets. Importantly, it seeks to explore the mechanisms behind stability and how they differ from the mechanisms that drive positive institutional change.

8. Conclusion

This paper aims to examine the impact of colonial history and institutions on the welfare levels of workers in Portuguese Africa. Specifically, it focuses on the case of Companhia de Diamantes de Angola (Diamang), the longest-running and most profitable company in Portuguese colonial history. Welfare ratios, calculated using the "barebones subsistence basket" deflation method, are utilised as a measure of workers' welfare over time and space.

The availability of comprehensive annual reports from Diamang on indigenous labour 1918 to 1974 allows for a thorough understanding of workers' household incomes, consumption practices, and overall welfare throughout its operation. The reconstruction of welfare ratios based on this information is a unique contribution to the literature, providing insights not only for the study of Africa but also for understanding historical living standards worldwide. Sensitivity analyses are conducted to address concerns regarding the use of welfare ratios as a measure of living standards.

The main finding of this study is that workers at Diamang, both voluntary and forcefully contracted, were the lowest compensated manual workers compared to their regional counterparts during the late colonial period. However, during the post-1960s period, known as the Luso-African extended colonial period, welfare ratios increased more than fourfold, resulting in a highly compensated workforce for that time in Africa. This unusual evolution of living standards is a key finding of this study and highlights the deviation between Portuguese colonial history and its labour institutions, compared to other colonial powers' behaviour in shaping workers' welfare.

This study's contribution to the literature is multi-faceted. Firstly, it provides the first long-period, high-quality dataset dedicated to studying worker living standards in colonial Portuguese Africa, addressing the scarcity of available data on this topic. Secondly, it extends beyond the 1960s, a period marked by post-independence turmoil in much of Africa. Finally, it enables quantitative comparisons between workers in Portuguese Africa and other colonial empires, shedding new light on the impact of colonial history on workers' welfare.

Implications for future research are also highlighted. The paper whilst being a very comprehensive study on welfare developments in Portuguese Africa has also shown how little we can still say about this geographical region from that of a quantitative historical perspective. Exploring welfare developments of other groups in Angola, as well as in other understudied former colonial Portuguese African territories, would contribute to a deeper comprehension of how the Lusophone form of colonization distinctly influenced the living standards of those who lived through this period of time.

Additionally, this paper emphasises the efficacy of the "barebones subsistence basket" deflation method and underscores its usefulness for future research about African workers' welfare in other historical contexts. Furthermore, the study emphasises the importance of investigating the persistence and evolution of forced labour systems and their impact on workers' welfare, not only in Portuguese Africa but also in other former colonial empires.

In summary, this study makes a valuable contribution to the literature on workers' welfare in colonial Portuguese Africa, offering insights into the impact of colonial history and institutions on workers' lives. It also provides a foundation for further analytical and comparative studies on the developmental trajectories of different populations' living standards throughout history.

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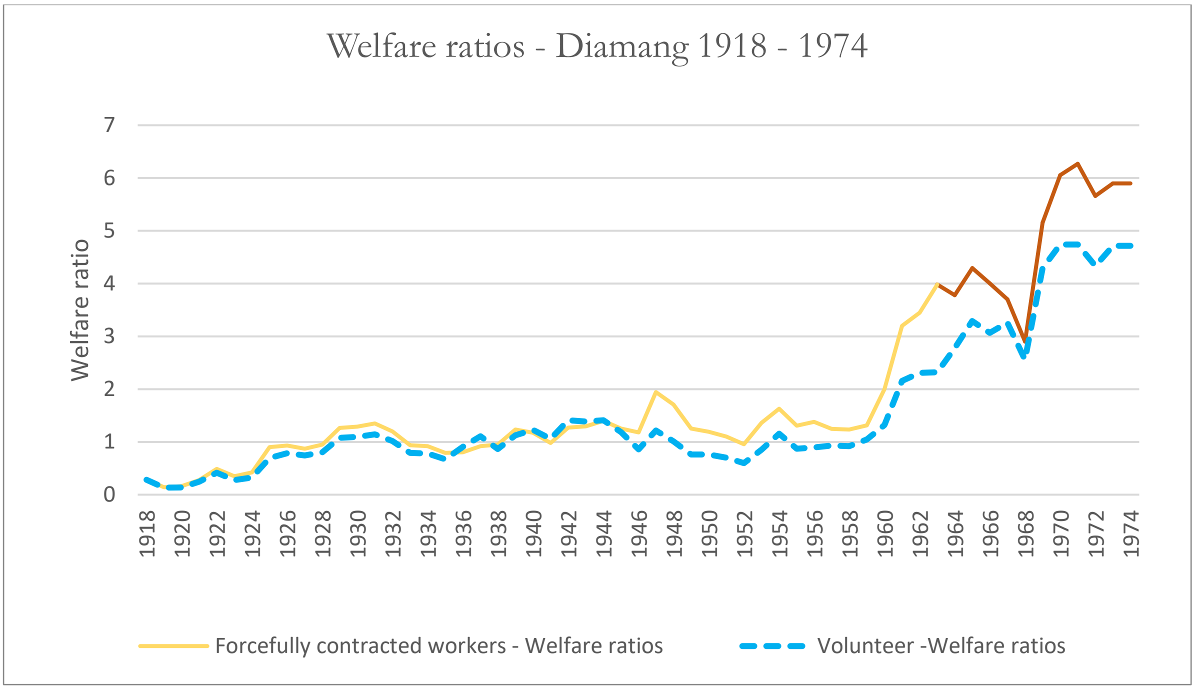
Appendix

Appendix A: Major Western Shareholders in Diamang

The United Sates of America	**The United Kingdom**	**Belgium**
Anglo-American Corporation.	The British South African Company	Forminiere.
The Oppenheimer Group.	The De Beers Investment Trust	Union Miniere de Haut Katanga
The Morgan Bank	The Anglo-American corporation.	
The Ryan-Guggenheim Group		

Appendix B: Map showing Diamang concession territory surrounded by other major concessions operating in West-Equatorial Africa during the late-colonial period.

Appendix C: Original Allen (2001) basket welfare ratios



Source: See appendix D. Note: Note from 1964 onwards those previously categorised as 'contracted' are now referred to as 'Miners' this is shown by corresponding welfare ratio line turning red.

Appendix D: Colonial Angolan Data Sources Used for Construction of Welfare Ratios

- <u>Wage Data</u>

Indigenous workforce legislation (86c2), Companhia de diamantes de Angola. (1914-1928)

Internal memos between indigenous labour section and general governor of Angolas office, Companhia de diamantes de Angola. (1917-1974)

Indigenous Labour Section Annual Report, Companhia de diamantes de Angola – General director of Lunda. (1930 – 1974)

- <u>Price Data</u>

Annual Statistics of Angola, Central Office of General Statistics. (1933 – 1973).

Reports and Accounts of the Bank of Angola. Bank of Angola. (1926 – 1974)

Appendix E: 1958 & 1959 Food rations report

Géneros	Quantidades diárias		Custo			
			Diário		Mensal	
	1958	1959	1958	1959	1958	1959
Fuba	-	700 gr.	-	$64	-	19$20
Fuba-mistura	700 gr.	-	$75	-	22$50	-
Milho	100 gr.	115 gr.	$20	$20	5$85	6$00
Carne	20 gr.	26 gr.	$30	$53	9$10	15$90
Peixe seco	180 gr.	174 gr.	1$17	1$18	35$00	35$40
Arroz	40 gr.	40 gr.	$11	$08	3$15	2$40
Feijão	60 gr.	50 gr.	$09	$10	2$75	3$00
Amendoim	50 gr.	50 gr.	$17	$13	5$10	3$90
Batata doce	100 gr.	70 gr.	$06	$04	1$90	1$20
Óleo de palma	30 gr.	30 gr.	$25	$25	7$60	7$50
Sal	30 gr.	30 gr.	$05	$04	1$40	1$20
Ervilha seca	-	10 gr.	-	$03	-	$90
Sabão	20 gr.	21 gr.	$13	$14	3$90	4$20
Totais			3$28	3$36	98$25	100$80