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Factor Input Prices and Unemployment in Uganda

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Abstract: Examining the impact of input costs on unemployment in Uganda, this study employed an ARDL model based on the Efficiency Wage Theory. Analyzing annual data from 1987 to 2019 and controlling for economic size and currency value, the research found that lending interest rates, real exchange rates, and GDP have a short-term negative impact on unemployment, suggesting an initial rise. However, the study highlights a positive long-run relationship between these factors and unemployment, indicating their potential to contribute to lower unemployment over time. Interestingly, no significant short-run or long-run effect of global crude oil prices on Uganda's unemployment was identified. These findings suggest that while central bank policies promoting lower interest rates can encourage short-term investment and potentially lower unemployment, long-term economic growth is also crucial. Furthermore, the lack of impact from oil prices underscores the need for Ugandan policymakers to diversify the economy beyond oil dependence for sustainable unemployment reduction.

Keywords: *Unemployment, Input prices, Auto Regressive Distributive Lag (ARDL)*

1. Background to the study

Unemployment in a country has profound and complex effects on its economy. It not only hampers productivity by underutilizing the available labor force but also leads to a reduction in consumer spending due to lower income levels among the unemployed (Feng, Lagakos & Rauch, 2024). Moreover, high unemployment rates often result in social unrest and political instability, posing challenges to the overall governance and stability of a nation (Azzollini, 2023). The strain on government resources is another significant consequence, as increased spending on unemployment benefits and social welfare programs puts pressure on public finances (Feng, Lagakos, & Rauch, 2024). Furthermore, persistent unemployment hinders economic growth by limiting the potential for expansion and innovation, as well as hampering investment and entrepreneurship (Uddin & Rahman, 2023). Thus, managing unemployment levels is crucial for fostering economic stability, promoting social well-being, reducing poverty, enhancing human capital development through employment opportunities, and ultimately achieving inclusive growth (Feng, Lagakos, & Rauch, 2024). According to the International Labour Organization (ILO) report titled World Employment and Social Outlook Trends: 2024 (WESO Trends), global unemployment witnessed a modest decline from 5.3% to 5.1% in 2023 (ILO, 2024). However, the situation remains challenging, particularly in Africa, where unemployment rates have been persistently high (World Bank, 2023). Since 2020, unemployment rates in Africa have hovered around 7.1%, demonstrating the severity of the issue on the continent (World Bank, 2023). In 2022, the world's highest unemployment rates were observed in African countries and occupied Palestine, with South Africa leading at 29.8%, followed by Djibouti at 27.9%, West Bank and Gaza at 25.7%, Eswatini at 24.4%, and Republic of Congo at 21.8% (World Bank, 2023). The situation worsened in 2023, with countries like Sudan (45.96%), South Africa (32.8%), Ukraine (19.37%), and Georgia (18.4%) experiencing alarming unemployment rates (World Bank, 2023).

Factor input prices significantly impact unemployment levels within a country (Feng, Lagakos, & Rauch, 2024). Various economic factors, such as international oil prices, lending interest rates, fluctuations in the real effective exchange rate, and GDP growth, possess significant impacts on the labor market dynamics (Adeosun et al., 2023). For instance, international oil prices have far-reaching implications on production costs, transportation expenses, and overall business operations (Adeosun et al., 2023). Fluctuations in oil prices directly affect industries reliant on oil-based inputs, leading to adjustments in employment levels (Adeosun et al., 2023). Lending interest rates also exert a considerable influence on unemployment levels, as they affect borrowing costs for businesses and individuals (Adeosun et al., 2023). Higher interest rates discourage borrowing for investment purposes, leading to reduced business expansion and job creation (Adeosun et al., 2023). Conversely, lower interest rates stimulate economic activity, resulting in increased investment and employment opportunities (Adeosun et al., 2023). Variations in the actual effective exchange rate affect a

nation's export and import competitiveness, which in turn affects employment levels in export-oriented industries (Umoru et al., 2023). Additionally, growth in gross domestic product (GDP) is a good indicator of the state of the economy and is strongly related to employment patterns (Feng, Lagakos, & Rauch, 2024). In Uganda, these factor input prices have had significant impacts on unemployment levels (James, Eria, & Ibrahim, 2023). For instance, international oil prices fluctuated between $65.32 per barrel in 2021 and $79.40 per barrel in 2023, influencing transportation costs and production expenses across various sectors (Adeosun et al., 2023). Lending interest rates averaged 15.7% in 2021, increasing to 16.5% in 2023, affecting borrowing costs for businesses and individuals (Adeosun et al., 2023). The dynamics of employment have also been impacted by fluctuations in the real effective exchange rate, with the Ugandan Shilling falling from 3,700 UGX per US dollar in 2020 to 3,850 UGX per US dollar in 2022 (Umoru et al., 2023). Additionally, GDP growth in Uganda, which stood at $114 billion in 2023, has been characterized by fluctuations, highlighting the intricate relationship between economic growth and unemployment (James, Eria, & Ibrahim, 2023). Managing these factor input prices is crucial for mitigating unemployment and fostering sustainable economic development in Uganda (James, Eria, & Ibrahim, 2023).

2. Literature review and hypothesis development

Theoretical literature review

The efficiency wage hypothesis, which states that unemployment arises from businesses paying wages above the level of the market-clearing wage such that labor supply exceeds labor demand, serves as the foundation for this investigation. According to the hypothesis, worker effort and firm success are positively connected, making it beneficial for enterprises to pay wages beyond the market-clearing wage. Because of the potential negative impact on firm performance from the corresponding decline in productivity, businesses are often hesitant to lower salaries in the face of surplus supply. The goal of paying above-market wages is to encourage high output by discouraging worker shirking, lowering employee turnover, and lessening the negative selection behavior of workers. The efficiency wage theory has several variations, which may be traced back to at least four different models: the sociological, turnover, adverse selection, and shirking models. Higher wage payments, in accordance with the shirking model, diminish shirking by raising the penalty of losing one's employment (Shapiro & Stiglitz, 1984; Solow, 1979). According to the turnover model, companies are compelled to offer efficiency salaries to prevent labor turnover, which might be expensive for them (Salop, 1979). A higher salary can encourage employee loyalty, which in turn encourages workers to put in more effort, according to the efficiency wage sociological model (Akerlof, 1988). The models imply a causal connection between pay levels and an employee's productivity while they are working. As a result, workers with comparable observable traits—such as education and occupation—may have compensation disparities as a result of these productivity variations.

This research employs the shirking model of the efficiency wage theory, as expounded by Carruth (1998), in compliance with the methodology employed by Doğrul and Soytas (2010) to examine the correlation between Turkey's unemployment rate, interest rates, and oil price.

Conceptual literature review

International Oil Prices: International oil prices denote the price of crude oil in the worldwide market, usually expressed in US dollars per barrel (Zhao, Cui, Liu, & Zhang, 2023). Numerous factors influence these prices, such as the dynamics of supply and demand, geopolitical developments, the decisions made by oil-producing nations about their production, and macroeconomic situations (Gil-Alana & Monge, 2020). Because oil is a vital component of many industries, including manufacturing, energy generation, and transportation, changes in the price of the commodity have a substantial impact on economies all over the world (Zhao, Cui, Liu, & Zhang, 2023). Higher oil prices can lead to increased production costs for businesses, higher transportation costs for consumers, and inflationary pressures on the overall economy (Zhao, Cui, Liu, & Zhang, 2023; Beckmann, Czudaj, & Arora, 2020). Conversely, lower oil prices can stimulate economic growth by reducing input costs for businesses and lowering inflationary pressures, thus affecting the balance of trade and fiscal policies of oil-importing countries (Gil-Alana & Monge, 2020).

Lending Interest Rate: Lending interest rates represent the cost of borrowing funds from financial institutions, such as banks or credit unions, typically expressed as an annual percentage of the principal loan amount (Molyneux, Reghezza, Thornton, & Xie, 2020). These rates are influenced by central bank policies, inflation expectations, credit risk, and market conditions (Molyneux, Reghezza, Thornton, & Xie, 2020; Hofmann et al., 2021). Lending interest rates have a significant impact on how businesses and individuals borrow money and make investments, which in turn shapes economic activity (Molyneux, Reghezza, Thornton, & Xie, 2020). Increased loan interest rates often deter borrowing and investment, which in turn inhibits the growth of businesses, consumer spending, and the economy as a whole (Molyneux, Reghezza, Thornton, & Xie, 2020; Hofmann et al., 2021). Conversely, reduced lending interest rates encourage investment and borrowing, boosting the creation of jobs and the economy (Molyneux, Reghezza, Thornton, & Xie, 2020). The economy's patterns of wealth accumulation and consumption can be impacted by changes in lending interest rates, which can also have an impact on the pricing of assets like stocks and real estate (Hofmann et al., 2021).

Real Effective Exchange Rates: The real effective exchange rate, or REER, accounts for inflation differences between the home and foreign economies when determining the value of a country's currency relative to a basket of other currencies (Darvas, 2021). It reflects the competitiveness of a country's goods and services in international markets (Kassouri & Altıntaş, 2020). A higher REER implies that the country's exports become relatively more expensive compared to its trading partners, while a lower REER implies increased competitiveness (Darvas, 2021; Kassouri & Altıntaş, 2020). Fluctuations in the REER can impact a country's trade balance, as well as its domestic production, employment, and inflation levels (Darvas, 2021; Kassouri & Altıntaş, 2020). For instance, whereas a depreciation can increase export competitiveness and spur economic activity and job creation, an appreciation of the REER can lower export competitiveness and impact export-oriented industries and employment levels (Darvas, 2021; Kassouri & Altıntaş, 2020).

Gross Domestic Product (GDP) Growth: GDP growth, which is typically stated as a percentage, is a measure of the rate of change in the total value of goods and services produced within a nation's borders over a given period of time (Dynan & Sheiner, 2018). An economy's general health and expansion are reflected in its GDP growth, which is a crucial measure of economic performance (Dynan & Sheiner, 2018). Positive GDP growth indicates that an economy is expanding, while negative growth indicates contraction or recession (Dynan & Sheiner, 2018). Consumer spending, company investment, government spending, net exports, and inventory changes are some of the factors that affect GDP growth (Ge & Tang, 2020). In contrast, lower growth rates can result in job losses, income stagnation, and financial hardship for people and businesses. Higher GDP growth rates are linked to more employment opportunities, higher incomes, and improved living standards (Ge & Tang, 2020).

Unemployment: Unemployment denotes the state in which individuals who are both willing and capable of working cannot secure appropriate job opportunities (Kiley, 2022). It is commonly expressed as the portion of the labor force that is actively looking for work but is having trouble finding positions (Kiley, 2022). Many causes can lead to unemployment, including labor market rigidities, technological improvements, industry structural changes, cyclical oscillations in the business cycle, and mismatches between skill requirements and job requirements. (Feng, Lagakos, & Rauch, 2024). Negative economic and social outcomes, such as decreased consumer spending, income disparity, poverty, social unrest, and lost human capital, are linked to high unemployment rates (Feng, Lagakos, & Rauch, 2024). Policymakers often use unemployment rates as a gauge of labor market health and implement measures such as fiscal and monetary policies, labor market reforms, and education and training programs to address unemployment challenges and promote full employment (Feng, Lagakos, & Rauch, 2024).

Empirical Literature Review

The relationship between international oil prices and unemployment: Researchers have studied the relationship between global oil prices and unemployment empirically, looking at the several ways that fluctuations in oil prices affect labor market dynamics (Raifu, Aminu, & Folawewo, 2020). Firstly, fluctuations in international oil prices have been found to affect consumer spending patterns, particularly in oil-importing countries, which can subsequently impact employment levels (Kocaarslan, Soytas, & Soytas, 2020). Consumers

pay more for fuel and energy-related products as oil prices rise, which reduces their disposable income for other goods and services (Wang et al., 2022). Because of this, companies in non-energy industries might see a decline in customer demand for their goods, which could result in reduced output and possibly job losses (Nusair, 2020). On the other hand, a decrease in oil prices may result in consumers having more discretionary income, which would encourage them to spend more on non-energy products and services. This would boost the economy and create jobs (Chan & Dong, 2022). For instance, research found that oil price shocks negatively affected employment levels in the United States during the 1970s oil crises, as higher energy costs led to reduced consumer spending and investment, leading to widespread job losses across various sectors of the economy (Almutairi, 2020). Similarly, studies provide evidence of a significant relationship between oil price shocks and employment fluctuations in both advanced and emerging economies, highlighting the global relevance of this relationship (Gupta, Pierdzioch, & Salisu, 2022). Additionally, the impact of international oil prices on unemployment is mediated by the response of businesses to changes in production costs and profitability (Daniel et al., 2021). Higher oil prices increase input costs for businesses, particularly those heavily reliant on energy-intensive production processes or transportation (Kocaaslan, 2019). To preserve profitability in response, businesses may use cost-cutting strategies, such as lowering labor costs through layoffs or hiring freezes (Ghosh, 2021). Furthermore, higher oil prices may prompt firms to invest in energy-saving technologies or alternative energy sources, which can lead to structural changes in the labor market, such as shifts in employment from energy-intensive industries to cleaner and more sustainable sectors (Ehikioya et al., 2020). Conversely, when oil prices decline, businesses may experience cost savings, which can translate into higher profit margins and increased investment in expansion and hiring (Elder & Payne, 2023). Empirical studies provide evidence of the impact of oil price fluctuations on firm-level employment decisions, suggesting that changes in oil prices can lead to significant adjustments in labor demand across industries, ultimately affecting overall unemployment rates (Ogede, George, & Adekunle, 2020).

Moreover, the link between international oil prices and unemployment is influenced by the response of monetary and fiscal policies to oil price shocks (Mathenge & Muturi, 2021). Increased production costs are transferred to customers in the form of higher pricing for products and services, which might result in inflationary pressures when oil prices rise (Raifu, Aminu, & Folawewo, 2020). Central banks may respond by hiking interest rates to reduce inflation, which could stifle the economy and drive up unemployment rates (Kocaarslan, Soytas, & Soytas, 2020). To counteract the detrimental effects of rising oil prices on budget deficits and inflation, governments may also enact contractionary fiscal measures, such as cutting back on public expenditure or raising taxes (Wang et al., 2022). However, a number of variables, such as the degree of wage and price flexibility, the responsiveness of monetary policy to changes in inflation expectations, and the legitimacy of fiscal policy commitments, affect how effective monetary and fiscal policies are in reducing the negative effects of oil price shocks on unemployment (Nusair, 2020). The transmission mechanism of oil price shocks to unemployment is shaped by macroeconomic policy responses, as evidenced by empirical research. Proactive policy interventions can potentially lessen the negative impact of oil price volatility on labor market outcomes (Chan & Dong, 2022). As a result, the relationship between global oil prices and unemployment is intricate and multidimensional, and empirical data indicates that shifts in oil prices may have a big impact on the dynamics of the labor market (Gupta, Pierdzioch, & Salisu, 2022). To mitigate the negative effects of oil price volatility on labor market outcomes and promote sustainable economic growth, policymakers and researchers must have a thorough understanding of the mechanisms through which shocks to the price of oil affect unemployment (Almutairi, 2020).

Effect of lending interest rate and unemployment

The correlation between lending interest rates and unemployment is intricate and multifaceted, carrying significant implications for macroeconomic stability and policy design (Panigrahi et al., 2020). Financial institutions and central banks determine lending rates, which heavily influence borrowing and investment decisions, thereby impacting employment and economic activity (Kaufmann, 2020). Increased lending rates raise borrowing costs for individuals and businesses, leading to decreased consumer borrowing, investment, and overall economic activity (Mansouri et al., 2021). This economic contraction can contribute to higher unemployment as companies reduce production and employment to adapt to lower demand and profitability (Shen et al., 2021). Conversely, lower lending rates make borrowing cheaper, stimulating investment,

consumer borrowing, and economic growth (Iddrisu & Alagidede, 2020). This expansionary effect may prompt businesses to increase production and hire more workers, potentially lowering unemployment rates (Obinna, 2020). Thus, fluctuations in lending rates directly impact overall economic activity, consequently affecting unemployment rates.

Moreover, various factors such as the responsiveness of households and businesses to interest rate changes, the structure of the financial system, and the credibility of monetary policy influence the relationship between lending rates and unemployment (Batrancea et al., 2022). Businesses may adjust investment and hiring decisions in response to lending rate changes, influenced by credit availability, capital costs, and economic outlook (Hayat et al., 2021). Similarly, households may alter borrowing and spending behaviors, affecting consumption patterns and overall demand (Dimitriou et al., 2024). Additionally, the structure of the financial system, including the prevalence of fixed-rate versus variable-rate loans, can impact how changes in lending rates affect the real economy (Panigrahi et al., 2020). In economies with a significant portion of variable-rate loans, lending rate changes may more immediately affect borrowing costs and economic activity, potentially influencing unemployment rates more significantly (Kaufmann, 2020). Furthermore, the credibility of monetary policy, reflected in central banks' ability to maintain price stability and anchor inflation expectations, can affect the effectiveness of lending rate changes in achieving macroeconomic goals, including full employment (Mansouri et al., 2021).

Additionally, other macroeconomic variables and structural features of the economy affect the relationship between lending rates and unemployment (Shen et al., 2021). Aggregate demand levels, influenced by factors like government spending, net exports, and household consumption, can affect the overall impact of lending rate changes on unemployment (Iddrisu & Alagidede, 2020). Even significant reductions in lending rates may not suffice to generate adequate job creation and economic activity in a situation of weak aggregate demand, as businesses remain cautious without strong consumer demand (Obinna, 2020). The responsiveness of unemployment to lending rate changes can also be influenced by structural features such as labor market flexibility, the presence of wage negotiation institutions, and the frequency of structural unemployment (Batrancea et al., 2022). In economies with rigid labor markets and high structural unemployment, lending rate changes may have a limited impact on employment levels due to other hiring constraints and production limitations (Hayat et al., 2021). Thus, while lending rate changes are pivotal in influencing unemployment, their effectiveness in reducing unemployment rates depends on the complex interaction of various macroeconomic factors and structural characteristics of the economy (Dimitriou et al., 2024).

Fluctuations in the real effective exchange rate and unemployment

The relationship between fluctuations in the real effective exchange rate (REER) and unemployment is a subject of extensive empirical research, with scholars exploring various channels through which changes in exchange rates influence labor market dynamics (Cacciatore & Ghironi, 2021). Firstly, fluctuations in the REER can significantly impact the competitiveness of a country's exports and imports, thereby affecting employment levels in export-oriented industries (Cahyadin & Ratwianingsih, 2020). When the REER appreciates, indicating a strengthening of the domestic currency relative to foreign currencies, exports become relatively more expensive for foreign buyers (Zahra et al., 2023). This can lead to a decline in export demand, resulting in potential job losses in sectors reliant on export markets (Bošnjak, 2021). Conversely, when the REER depreciates, exports become more competitive internationally, leading to increased demand for domestically produced goods and supporting employment in export-oriented industries (Bošnjak et al., 2021). Empirical studies provide evidence of a significant relationship between changes in the REER and employment fluctuations in countries such as China and Mexico, highlighting the importance of exchange rate movements in shaping labor market outcomes (Hegeland & Taalbi, 2019). Additionally, fluctuations in the REER can influence domestic production costs and profitability, thereby affecting firms' hiring and investment decisions (Bakhshi & Ebrahimi, 2016). A strengthening REER reduces the cost of imported inputs for domestic producers, leading to lower production costs and potentially higher profit margins (Jaffri et al., 2017). This may encourage firms to expand production and hire additional workers, thus reducing unemployment. Conversely, a depreciating REER increases the cost of imported inputs, leading to higher production costs and reduced profitability for domestic producers (Usman & Elsalih, 2018). In response, firms may cut back on production

and employment to maintain profitability, leading to higher unemployment rates (Ridhwan et al., 2024). Empirical research provides evidence of the impact of exchange rate movements on firm-level employment decisions, suggesting that changes in the REER can lead to significant adjustments in labor demand across industries, ultimately affecting overall unemployment rates (Ijirshar et al., 2022).

Moreover, the relationship between fluctuations in the REER and unemployment is influenced by the response of monetary and fiscal policies to exchange rate movements (Beckmann et al., 2020). Changes in the REER can lead to inflationary or deflationary pressures, depending on whether the currency appreciates or depreciates (Cacciatore & Ghironi, 2021). In response to inflationary pressures resulting from a depreciating REER, central banks may raise interest rates to curb inflation, which can dampen economic activity and lead to higher unemployment rates (Cahyadin & Ratwianingsih, 2020). Conversely, in the case of deflationary pressures resulting from an appreciating REER, central banks may lower interest rates to stimulate economic activity and reduce unemployment (Zahra et al., 2023). Additionally, governments may implement expansionary fiscal policies, such as increasing public spending or reducing taxes, to offset the negative impact of an appreciating REER on employment levels (Bošnjak, 2021). However, the effectiveness of monetary and fiscal policies in mitigating the adverse effects of exchange rate fluctuations on unemployment depends on various factors, including the degree of wage and price flexibility, the responsiveness of monetary policy to changes in inflation expectations, and the credibility of fiscal policy commitments (Hegeland & Taalbi, 2019). Empirical research highlights the importance of macroeconomic policy responses in shaping the transmission mechanism of exchange rate movements to unemployment, suggesting that proactive policy interventions can help mitigate the adverse effects of exchange rate volatility on labor market outcomes (Bakhshi & Ebrahimi, 2016).

Effect of GDP growth and unemployment

The relationship between GDP growth and unemployment is a fundamental aspect of macroeconomic analysis, reflecting the dynamics of economic expansion or contraction and its impact on labor market conditions (Feng et al., 2024). GDP growth, which measures the rate of change in the total value of goods and services produced within a country's borders, is closely linked to employment levels, as higher levels of economic activity typically translate into increased demand for labor and lower unemployment rates (Bartolucci et al., 2018). When GDP growth is robust, businesses expand production to meet growing demand, leading to increased hiring and job creation (Musara, 2020). This expansionary phase of the economic cycle is characterized by declining unemployment rates as more individuals find employment opportunities (Hashmi et al., 2021). Conversely, during periods of economic contraction or negative GDP growth, businesses may reduce production levels in response to weakening demand, leading to layoffs and higher unemployment rates (Pasara & Garidzirai, 2020). Therefore, changes in GDP growth have a direct impact on the overall level of economic activity and, consequently, on the level of unemployment within an economy.

Moreover, the relationship between GDP growth and unemployment is influenced by various factors, including the composition of GDP growth, labor market flexibility, and the effectiveness of macroeconomic policies (Anderton et al., 2014). The composition of GDP growth, reflecting the contribution of different sectors to overall economic activity, can influence its impact on employment levels (Sanchez & Liborio, 2012). For example, GDP growth driven by sectors such as manufacturing and construction, which are labor-intensive, may lead to greater job creation and lower unemployment rates compared to growth driven by sectors such as finance or information technology, which are less labor-intensive (Conteh, 2021). Additionally, labor market flexibility, including factors such as wage flexibility, ease of hiring and firing, and mobility of labor, can shape the responsiveness of unemployment to changes in GDP growth (Al-Sawaiea, 2020). In flexible labor markets, firms may adjust employment levels more quickly in response to changes in economic conditions, leading to smaller fluctuations in unemployment rates during economic downturns or recessions (Chuttoo, 2020). Conversely, in rigid labor markets with strict labor regulations and protections, adjustments in employment levels may be slower, leading to larger fluctuations in unemployment rates during economic downturns (Hjazeen et al., 2021). Furthermore, the effectiveness of macroeconomic policies, including monetary and fiscal policies, in supporting GDP growth and reducing unemployment rates depends on their timeliness, credibility, and coordination (Musara, 2020). Well-designed and coordinated macroeconomic policies can help stimulate economic activity during periods of weak GDP growth and mitigate the adverse effects of economic downturns

on unemployment levels. Additionally, the relationship between GDP growth and unemployment is subject to the presence of other macroeconomic factors and structural characteristics of the economy (Bartolucci et al., 2018). For example, the total effect of GDP growth on unemployment can depend on the amount of aggregate demand, which is defined by variables like consumption, investment, government spending, and net exports. (Feng et al., 2024). In an environment of strong aggregate demand, characterized by robust consumer spending, business investment, and government expenditure, Lower unemployment rates are probably going to follow GDP growth as companies increase production and hire more people to keep up with demand (Hashmi et al., 2021). Conversely, in an environment of weak aggregate demand, characterized by subdued consumer spending, business investment, and government expenditure, GDP growth may fail to translate into significant job creation, leading to higher unemployment rates (Pasara & Garidzirai, 2020). Similarly, structural characteristics of the economy, such as the prevalence of structural unemployment, demographic trends, and technological advancements, can shape the responsiveness of unemployment to changes in GDP growth (Anderton et al., 2014). In economies with high structural unemployment, characterized by mismatches between the skills of job seekers and the requirements of available jobs, GDP growth may have a limited impact on overall employment levels, as structural barriers prevent unemployed individuals from finding suitable employment opportunities. Therefore, while changes in GDP growth play a crucial role in influencing unemployment, their effectiveness in reducing unemployment rates depends on a complex interplay of various macroeconomic factors and structural characteristics of the economy.

3. Model specification, data and estimation procedures

Theoretical framework

An escalation in oil prices results in profit margin erosion, causing firms to incur losses and potentially face closure. To attain a zero-profit equilibrium, an adjustment in an economic variable is necessary. Labor costs must go down because labor and energy are the two main inputs, assuming that interest rates stay mostly steady. However, this adjustment can only be made if a no-shirking condition results in an inverse relationship between earnings and unemployment. Because equilibrium unemployment drives workers to accept lower pay scales dictated by the growing portion of real economic revenue that goes to oil owners, equilibrium unemployment must rise. A similar pattern emerges with every increase in the actual interest rate. As profits for capital owners soar, lower rewards for workers are required to create a new zero-profit equilibrium. If unemployment serves as a "discipline device," then rising real input costs lead to increased rates of unemployment and lower wages.

Thus, the unemployment function is given as;

$$UNEM = f(IOP, INT, REER, GDP) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Description of the variables and model estimation

Unemployment: Total Unemployment (UNEM), represents the dependent variable and was used to measure the level of unemployment in the study. Total Unemployment was used because its international definition enables it to present a more accurate picture of the labor market in Uganda. The variable is measured as a percentage of the total labor force in Uganda.

International Oil Price: International Oil Prices (IOP), represents the Price of a barrel of crude oil. Oil prices usually impact positively the level of unemployment in a given economy; as oil prices rise, unemployment as well and vice versa. International Oil prices are therefore expected to display a positive relationship with the unemployment level.

Lending Interest Rate: Lending Interest rate (INT) represents the amount charged by lenders for a certain period as a percentage of the amount lent. Interest rate is expected to display a positive significant relationship with unemployment.

Real effective Exchange rate: Real Effective Exchange rate (REER) represents the weighted average of Uganda's shilling in relation to the US dollar. The variable was used in the model as a control for the value of the local currency.

Gross Domestic Product: Gross Domestic Product (GDP) refers to the comprehensive monetary value of all finished goods and services generated within the borders of a country during a specified time frame. This variable was incorporated into the model as a control measure for assessing the magnitude of the economy.

Model estimation

The estimated model is adapted and changed as follows from the previous research conducted by Dogrul and Soytas (2010) and Frenkel and Ros (2006):

$UNEM_t = \beta_0 + \beta_1 IOP_t + \beta_2 INT_t + \beta_3 REER_t + \beta 4\ GDP_t + \mu_t$ …… (2)

Model 3.2 was estimated in ARDL form as

$\Delta UNEM_t = \beta_0 + \beta_1 UNEM_{t-1} + \beta_2 IOP_{t-1} + \beta_3 INT_{t-1} + \beta_4 REER_{t-1} + \beta_5 GDP_{t-1} + \sum_{P=0}^{n1} \theta 1\ \Delta UNEM_{t-p} + \sum_{P=1}^{n2} \theta 2\ \Delta IOP_{t-p} + \sum_{P=0}^{n3} \theta 3\ \Delta INT_{t-p} + \sum_{P=0}^{n4} \theta 4\ \Delta REER_{t-p} + \sum_{P=0}^{n5} \theta 5\ \Delta GDP_{t-p} + \varepsilon_1$ …… (3)

Data type and source

Time series analysis and a quantitative research design are used in this study. The analysis uses annual data for the years 1987 to 2018 from the World Bank (WB), Bank of Uganda (BOU), and Uganda Bureau of Statistics (UBOS).

Variables	Description	Data Source
Unemployment Rate	The share of the labor force that is without work but available for and seeking employment.	World Bank
International Oil Price	Price of a barrel of crude oil in US dollars	World Bank
Lending interest rate	Average rate (percentage of lent amount) charged by commercial banks annually	Bank of Uganda
Real Effective Exchange rate	A weighted average of Uganda's shilling in relation to the US dollar	Bank of Uganda
Gross Domestic Product (GDP)	The total monetary value of all finished goods and services produced inside a country's borders over a given period of time.	Uganda Bureau of Statistics

4. Empirical results and discussion

Descriptive analysis

Table 1 presents aggregate descriptive statistics regarding the determinants of interest rates. These statistics, which were calculated to provide an overview of the observed data, include means, standard deviations, minimums, and maximums. Determining whether the statistical means and standard deviations appropriately represented the observed data was the main goal of the descriptive analysis. The results show that the standard deviations are modest when compared to the mean values. Because the data and the means are so close together, the computed means provide a good depiction of the observed data and are, thus, realistic. Reviewing the mean, lowest, maximum, and standard deviation values reveals that the real effective exchange rate, oil price, and interest rate showed more variability than the other variables. On the other hand, there was some variation in the unemployment and GDP.

Table 1: Descriptive statistics of the input factors

Variable	Mean	Max	Min	Std. Dev.
UNEM	13.625	28	1	8.990138
IOP	45.70687	111.63	12.76	32.5927
INT	16.5	32	1	9.380832
REER	149.8781	507.1206	91.30151	104.2932
GDP	6.446335	11.52324	3.141907	2.166605

This is a reflection of the events during the research period. An increased degree of fluctuation in global oil prices and lending interest rates signals unstable input costs for employers. Volatile REER could be a result of volatile crude oil prices given that Uganda is a net oil importer. Modest variability in GDP could be an indication of slower expansion in economic activities stemming from the high and volatile input costs.

Unit Root Tests

The variables underwent unit root tests utilizing the Augmented Dickey-Fuller (ADF) test. The alternative hypothesis in the unit root test contends that the time series is stationary, in contrast, the null hypothesis states that the time series under study is non-stationary since it has a unit root (Greene, 2003). The level series of the variables' non-stationarity suggests that these variables' variances and means change over time. Every variable was subjected to the tests at both the level and first difference of the variables. Table 2 shows the outcomes of the unit root testing.

Table 2: Augmented Dickey-Fuller test results

Variables	Intercept		Trend and intercept		INT
	ADF		ADF		
	Levels	**First difference**	**Levels**	**First difference**	
logUNEM	-2.485	-5.279***	-0.643	-6.796***	I(1)
logIOP	-1.271	-4.817***	-2.165	-4.743***	I(1)
logINT	-2.469	-6.890***	-5.220***	-	I(1)
logREER	-5.032***	-	-5.853***	-	I(0)
logGDP	-4.832***	-	-4.980***	-	I(0)

While logUNEM, logIOP, and logINT are non-stationary and contain a unit root at the level, they are stationary at the first difference at the 1% significance level, according to Table 2's results. At the 1% significance level, the other variables, logREER and logGDP, are stationary at the level.

Regression results

Table 3 displays the findings of the ARDL model, which was used to ascertain how the independent variables affected the dependent variable. The results indicate that in the long run, only real effective exchange rate and GDP significantly positively affect unemployment. Interest rates and oil prices are not significant.

Table 3: Estimated Long-Run Coefficients for selected ARDL Model

Dependent Variable: logUNEM			
Independent Variables	Coefficient	Standard Error	P-Value
ADJ logUNEM L1.	-0.3493609**	0.1463129	0.033
logIOP	0.1347732	0.2077118	0.528
logINT	0.5820967	0.3818487	0.151
logREER	3.82357*	2.003837	0.079
logGDP	1.794063**	0.6966875	0.023

Notes: **,* Indicate significance at 5% and 10% significance levels respectively. Source: Calculation made by the author using survey data

Based on the coefficient of the error term (-0.3493609), Table 3 shows that the rate at which unemployment responds to changes in its equilibrium level is 35%. Consequently, the deviation of unemployment from equilibrium is corrected at a rate of 35% in a year as unemployment moves in the direction of restoring equilibrium. This rate of adjustment has a statistically significant p-value of 0.033. Uganda's respectable rate of adjustment in unemployment reflects the influence of additional factors affecting unemployment that are not taken into account by the model.

From Table 3, the long-run impact of internal oil prices and lending interest rate on unemployment can be shown using equation 4.0 below:

$$UNEM = -7.75 + 0.135IOP + 0.582INT + 3.824REER + 1.794GDP \quad \text{..... (4)}$$

Table 4: Estimated Short-run Coefficients for the Selected ARDL Model

	Coef.	Std. Err.	P>|t|
$D(logUNEM)_{t-1}$	0.0972176	0.2342674	0.685
$D(logUNEM)_{t-2}$	0.3908333	0.1972105	0.069
$D(logUNEM)_{t-3}$	0.4977496***	0.1574105	0.007
D(logINT)	-0.2402963	0.1529068	0.140
$D(logINT)_{t-1}$	-0.3388359**	0.1152923	0.012
$D(logINT)_{t-2}$	-0.0819042	0.0604354	0.198
D(logREER)	-1.568371***	0.44166	0.004
D(logGDP)	-0.2518129**	0.1129843	0.044
z	0.6264923**	0.2831702	0.045
Constant	-7.75403**	2.288558	0.05

Notes: D = first difference in variable. ***, ** Indicate significance at 1% and 5% significance levels respectively. ARDL regression (3, 2, 1, 1). Source: Calculation made by the author using survey data

Table 4, which depicts the short-run dynamics of the link between international oil prices, lending interest rates, real effective exchange rates, GDP, and unemployment, is an error correction representation of the long-run relationship in Table 4.

The error correction model in Table 4 establishes that the third lagged difference in unemployment, and the real effective exchange rate is significant at 1% while the first lagged difference in lending rates and the gross domestic product is significant at 5%. The model also established that the dummy variable for the structural break and the constant is significant at 5%.

Diagnostic tests

A crucial component of time series analysis for determining a model's robustness and spuriousness is the diagnostics test. The tests listed below were performed.

Normality test

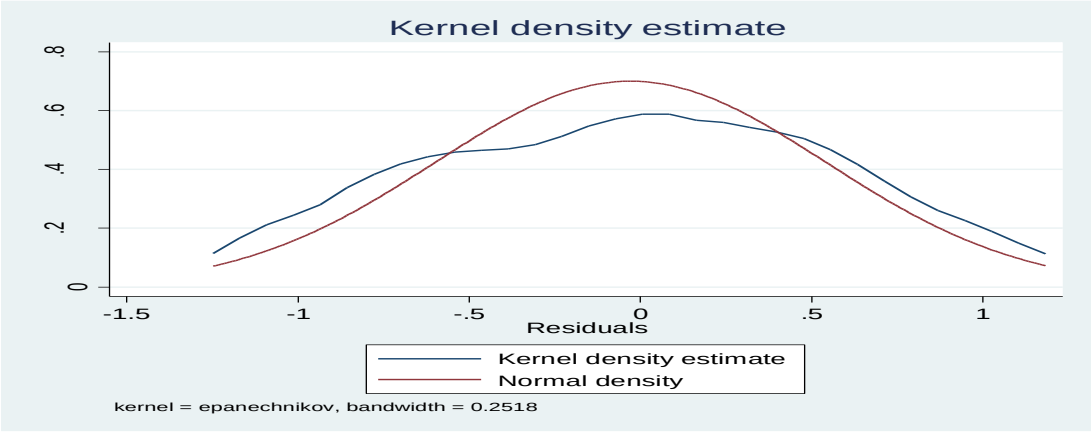
The study carried out the Jarque-Bera (JB) normality Test as shown in Table 4.3.1

Table 5: Jarque-Bera Normality test results

Chi(2)	Prob.
1.351	0.5088

Source: Author's computation based on survey data
H_0: Normality

Figure 1: Kernel Density estimate



Source: Calculation made by the author using survey data

Table 5 results demonstrate that the p-value (.5088) is more than the significance criterion of 5%. This suggests that, at a 5% significance level, the null hypothesis—that the error term is normally distributed—cannot be rejected. Hence, the error term is found to be normally distributed.

Heteroskedasticity test

Table 6: White Test results for Heteroscedasticity

Source	Chi2	df	P
Heteroskedasticity	24.57	14	0.0391
Skewness	0.69	4	0.9528
Kurtosis	2.67	1	0.1022
Total	27.93	19	0.0848

Ho: homoskedasticity. Source: Author's computation based on survey data

The econometric model exhibits homoscedasticity (no heteroscedasticity), according to Table 6's results. A positively skewed distribution with a longer right tail is shown by the skewness of 0.69. Apart from that, the kurtosis value of 2.67 is less than the typical kurtosis coefficient of three, indicating a positive kurtosis. The distribution is said to have thicker tails and a sharper peak if the kurtosis is positive.

4.3.3 Autocorrelation test

Table 7: Breusch-Godfrey Serial Correlation LM Test results

Lags (p)	F	df	Prob > F
1	0.511	(1, 10)	0.4911

Ho: no serial correlation. Source: Calculation made by the author using survey data

Given that the p-value from Table 7 is 0.4911 and higher than the significance level of 0.05, it is not possible to reject the null hypothesis that there is no serial association. Consequently, it can be said that autocorrelation does not exist.

Multicollinearity test
Table 8: VIF results

Variable	VIF	1/VIF
logREER	1.99	0.50304
logINT	1.58	0.63127
logIOP	1.47	0.68008
logGDP	1.02	0.977577
Mean VIF	1.52	

Source: Calculation made by the author using survey data

Table 8's results showed that tolerance levels were supported by VIF values less than 10 and ranged from 0.978 and higher. Thus, the study variables did not exhibit multicollinearity.

Specification Error test
To check for specification errors in the variables included in the study, the Regression Specification Error Test (RESET) was used. Alema and Odongo (2016) claim that specification error is an all-inclusive phrase that

encompasses any deviation from the maintained model's underlying presumptions. Table 9 provides specifics about the Ramsey RESET test outcomes in this investigation.

Table 9: Ramsey RESET test results

Variable	Obs	F (3, 23)	Prob > F
logUNEM	58	0.80	0.5062

Ho: the model has no omitted variables. Source: Calculation made by the author using survey data

The F-statistic and P-value in Table 9 show that the specification error has been rejected at the five percent significant level. The theory that all of the coefficients on the power of the fitted values are zero is supported by this. The diagnostic tests conducted in this study are followed by an estimation of the impact of macroeconomic variables on unemployment in Uganda.

Discussion

The effect of International oil prices on the level of unemployment in Uganda: There is a positive but statistically insignificant relationship between international oil prices and unemployment in Uganda, indicating that a positive increase in international oil prices is associated with a rise in the level of unemployment. However, the lack of statistical significance suggests that this relationship cannot be conclusively attributed to international oil prices alone, as other factors such as oil import tariffs established by the Ugandan government play a significant role in influencing oil prices within the country. This obscures the direct effect of international oil prices on unemployment, leaving no credible indication that international oil prices affect unemployment in Uganda, but also no proof that they cannot. These findings align with Senzangakhona & Choga (2015), who found a similar positive long-run relationship between crude oil prices and unemployment in South Africa, emphasizing the complex interplay of economic variables and policy factors in shaping labor market dynamics and highlighting the need for further research to better understand these relationships.

The impact of lending interest rate on the level of unemployment in Uganda: According to the ARDL model's conclusions, lending interest rates have a favorable long-term impact on unemployment. Nonetheless, this effect is hardly noteworthy. But in the short term, unemployment is significantly impacted negatively by the lending interest rate's first lag. This implies that in the short run, an increase in lending interest rate leads to a reduction in unemployment, after one year. Such results indicate the presence of disguised unemployment. As lending interest rates rise, the cost of business operations rises and hence as some employees lose their jobs, those that remain employed retain less workload due to business downscales (Roberto & Jódiney, 2019)

The combined effect of international oil prices and Lending interest rate on the level of unemployment in Uganda: The findings under the regression analysis indicate that the model was able to explain about 72% of the variations in unemployment (R-squared = 0.7241). The value of the adjusted R-squared which is a stronger measure of the goodness of fit of a model since it penalizes for the inclusion of insignificant variables was 68%. Hence, the estimated model was able to explain the majority of the variations in the dependent variable (about 68%, based on the adjusted R-squared). However, the value of the adjusted R-squared also implies that the model does not explain about 32% of the variations in unemployment. Nonetheless, lending interest rates and international oil prices remain important predictors of Ugandan unemployment that should not be ignored. These findings concur with Shaaria, Hussain, & Rahima (2013) who established that international oil prices and lending interest rates impacted unemployment in Malaysia.

5. Conclusions, implications and suggestions

Conclusion: This study looked into the effects of loan interest rates and global oil prices, both separately and in combination, on Uganda's unemployment rate. The research examines the interrelationships among international oil prices, lending interest rates, real effective exchange rates, GDP growth rates, and unemployment. These factors are expected to have had a major effect on unemployment in the Ugandan economy between 1987 and 2018. Because it yields asymptotically normal estimates of the long-term

connection regardless of whether the underlying regressors are integrated at order 1 (I(1)) or order 0 (I(0)), the Autoregressive Distributive Lag technique has been used. The findings discussion reveals a positive and statistically significant relationship between lending interest rates and unemployment in Uganda, suggesting that an increase in lending interest rates leads to a rise in unemployment levels. However, there is a positive yet insignificant relationship between international oil prices and unemployment, indicating that although increases in international oil prices are associated with higher unemployment levels, the relevance of this relationship is not significant in Uganda's context.

Policy Implications: Policy recommendations for labor-intensive industries should be made to boost output and lower Uganda's unemployment rate. Only then does rising productivity lead to a decrease in unemployment. This study indicates that the central bank (BOU) should endeavor to maintain low lending interest rates throughout time as this will encourage investment and lower unemployment because there is a definite association between lending interest rates and unemployment. In the near term, though, lending interest rates must be left to the discretion of the money market.

To reduce dependence on oil's volatile prices and create new jobs, Uganda should diversify its economy by focusing on high-potential sectors like agriculture and tourism. This can be achieved by offering investment incentives, developing necessary infrastructure, equipping the workforce with relevant skills, and fostering innovation in these sectors. While successful implementation requires long-term commitment and addressing broader economic issues, diversification is a key strategy for a more stable and prosperous Uganda.

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