Asian Journal of Economic Modelling
ISSN(e): 2312-3656
ISSN(p): 2313-2884
DOI: 10.55493/5009.v13i2.5370
Vol. 13, No. 2, 159-170.

URL: www.aessweb.com

Revisiting the Phillips curve: An empirical study of the relationship between inflation and unemployment in North Africa

Allal Zahir[1+]
Hassan Rehaimi[2]

[1,2]*Ibn Zohr University, UIZ, Faculty of Law, Economics and Social Sciences, Laboratory for Studies and Research in Economic Sciences and Management, Agadir, Morocco.*
[1]*Email: Zahirallal9@gmail.com*
[2]*Email: H.rehaimi@uiz.ac.ma*

(+ Corresponding author)

Article History
Received: 17 January 2025
Revised: 1 April 2025
Accepted: 15 April 2025
Published: 29 April 2025

Keywords
Economic policies
Inflation
North Africa
Phillips curve
Unemployment
VECM model.

JEL Classification:
C33; E24; E31; O55.

ABSTRACT

This study examines the empirical relevance of the Phillips curve in North African economies (Morocco, Algeria, Tunisia, Egypt, Libya, and Mauritania) over the period 1991–2023. Given the region's unique structural characteristics and socio-economic constraints, it investigates whether the theoretical negative relationship between inflation and unemployment holds. Using a Vector Error Correction Model (VECM), the analysis explores both short-term and long-term dynamics between these two variables, based on macroeconomic data from international financial institutions and national statistical agencies. The findings reveal a significant positive correlation in the long run, where a 1% increase in unemployment is associated with a 1.06% rise in inflation. These results challenge the conventional applicability of the Phillips curve in economies characterized by widespread labor informality, high exposure to external shocks, and inflationary pressures largely driven by external factors. The study highlights the need to reassess macroeconomic models to better reflect the structural realities of North African economies. It also underscores the importance of adapting monetary and fiscal policies to address inflationary pressures while fostering employment growth. From a policy perspective, structural reforms should be prioritized to enhance economic resilience and ensure more effective inflation and labor market management in the region.

Contribution/ Originality: This study provides an innovative contribution by empirically challenging the validity of the Phillips curve in North African economies using a panel VECM model. It highlights a positive relationship between inflation and unemployment, emphasizing the impact of structural rigidities, labor market informality, and external shocks.

1. INTRODUCTION

In a world marked by complex and interconnected macroeconomic challenges, national economies are faced with far-reaching political and economic trade-offs. Among these, the relationship between inflation and unemployment occupies a central place, fueling prolonged debate since the introduction of the Phillips curve. This theoretical model postulates an inverse relationship between these two economic variables: a reduction in unemployment would generally be accompanied by an acceleration in inflation, and conversely, a reduction in inflation would be achieved at the cost of an increase in unemployment. This paradigm has guided monetary and fiscal policies over the decades, shaping the economic strategies of many nations (Laffargue, 1971). Nevertheless, as the global economy has evolved, this model has met with increasing resistance, especially in emerging economies, where structural and cyclical

dynamics differ markedly from those of developed countries. As a result, the validity of the Phillips curve in this context becomes an issue of crucial importance. Indeed, the economic phenomena underlying inflation and unemployment are often multifactorial and cannot always be understood in terms of cyclical or monetary effects alone (Gómez & Irewole, 2023).

In the particular context of North African economies, including countries such as Morocco, Algeria, Tunisia, and Egypt, the relationship between inflation and unemployment is not necessarily reflected according to the principles of the Phillips curve. These nations share economic and social specificities such as heavy dependence on the export of raw materials, a largely informal labor market, as well as significant vulnerability to fluctuations in global prices, particularly those of energy and agricultural products (Adebowale, 2015). These factors make the traditional interpretation of inflation and unemployment more complex and often contradictory. In addition, political and social crises, which are frequent in this region, exacerbate these imbalances and make economic trajectories difficult to predict (Razia, Omarya, Razia, Awwad, & Ruzieh, 2023). Consequently, the dynamics between inflation and unemployment in North Africa go beyond a simple inverse relationship and reveal economic behaviors that are often more nuanced and contextual.

This discrepancy between North Africa's economic reality and conventional models calls for further reflection. While Phillips curve theory assumes a stable inverse relationship, recent empirical evidence shows that inflation and unemployment can evolve simultaneously in similar directions. For example, high unemployment can coexist with rising inflationary pressure, which runs counter to the traditional view of this relationship (Quévat & Vignolles, 2018). This evolution can be explained by several factors, not least the informal nature of labor markets, which escape the regulations and predictions of conventional models. In addition, external shocks, particularly those linked to global commodity prices, have direct impacts on inflation, independently of local labor market conditions. Finally, reactive economic policies, often implemented under immediate pressure, tend to exacerbate these dynamics rather than regulate them.

In this complex context, this study focuses on the applicability of the Phillips curve to North African countries. It questions the relevance of a theoretical model that was designed for structurally different economies. To what extent is the Phillips curve still applicable for analyzing inflation-unemployment dynamics in this region? This central research question seeks to empirically test the validity of the Phillips curve using macroeconomic data from North African economies to determine whether it still offers a useful framework for analysis. In addition, this research seeks to understand the extent to which contextual variables such as labor informalization, commodity dependence, or external shocks modify the nature of this relationship.

The implications of this analysis are not limited to pure academia but also touch on practical political issues. A misinterpretation of the inflation-unemployment relationship could lead to ineffective or even counterproductive economic policies. For example, an excessive focus on reducing unemployment could lead to higher inflation, while a policy aimed solely at controlling inflation could generate higher unemployment with serious social and economic consequences. The importance of this study, therefore, lies in its potential to inform policy choices and provide relevant recommendations for decision-makers in North Africa.

The ultimate aim of this research is to provide a rigorous and contextualized empirical analysis of the Phillips curve, in order to better guide economic policies in the region. Through this approach, it aims to play an active role in enriching the academic literature while proposing concrete solutions adapted to the economic challenges faced by North African countries.

In order to address this issue, the article follows a well-defined methodological structure: after outlining the theoretical foundations and criticisms of the Phillips curve, a review of the empirical literature on the inflation-unemployment relationship in various economic contexts is carried out. A section dedicated to econometric methodology presents specific choices of tools and approaches for analyzing data from North African countries. The results obtained are then analyzed in relation to current economic policies in the region. Finally, practical conclusions

and suggestions for future research conclude this study, with a view to broadening our understanding of the conditions of applicability of classical macroeconomic models in developing economies.

2. THEORETICAL LITERATURE REVIEW

The Phillips curve, introduced by Phillips (1958), describes an inverse relationship between nominal wage inflation and unemployment but was initially based on empirical observations with no solid theoretical foundation. Lipsey (1960) partially filled this gap by linking wage and price variations to employment, providing a complementary perspective. Samuelson and Solow (1960) adapted this curve to price inflation, suggesting that a reduction in unemployment was possible at the cost of increased inflation in the short term. However, the instability of this long-term relationship, exacerbated by the stagflation of the 1970s—caused by oil shocks and inefficient economic policies—has called into question the idea of a lasting trade-off between inflation and unemployment (Gruen, Pagan, & Thompson, 1999; Przekota & Szczepańska-Przekota, 2024; Sachsida, Divino, & Cajueiro, 2011).

Friedman (1977) transformed this perspective by introducing the concept of the "natural rate of unemployment" (NAIRU), postulating that, in the long term, any excessive economic stimulation results in accelerating inflation with no lasting employment gains. Supported by the rational expectations theories of Lucas (1972), this vision asserts that economic agents adjust their forecasts, neutralizing the impact of economic policies.

Neo-Keynesian macroeconomics then reformulated the Phillips curve to incorporate price rigidities and rational expectations. Studies such as those by Galı and Gertler (1999) or Clarida, Gali, and Gertler (1999) have demonstrated how these mechanisms influence inflation and economic stability, highlighting the central role of credible monetary policies and expectations in managing business cycles (Alisa, 2015; Parkin, 1998).

3. REVIEW OF EMPIRICAL LITERATURE

The relationship between inflation and unemployment, originally formalized by the Phillips curve, has been the subject of profound debate in economic literature over the decades. According to the traditional model, this relationship is inverse: a fall in unemployment generally leads to a rise in inflation and vice versa, due to macroeconomic mechanisms such as adjustments in aggregate demand, wage variations, as well as adjustments in investment and consumption. However, this relationship has been called into question by recent research, which, while confirming its validity in certain contexts, also reveals notable exceptions, particularly in emerging and developing countries.

Numerous empirical studies support the idea of an inverse relationship between inflation and unemployment in certain economies. The study conducted by Ahmed and Mohamed (2024) over the period 1982-2022 in Morocco, using Okun's law, reveals the existence of a negative and significant relationship between the unemployment gap and inflation. A study by Zhang (2024) on China showed that the causal relationship between unemployment and inflation is induced by rapid economic growth, high unemployment, and high inflation. This dynamic underlines the importance of taking measures to control inflation in order to effectively prevent unemployment, confirming a negative relationship between these two variables. Other studies, such as those by Bhattarai (2016) and Shaari, Abdullah, Razali, and Saleh (2018), confirm this trend in several OECD countries.

By contrast, in Turkey, Karahan, Çolak, and Bölükbaşı (2012) reveal that, although there is a negative relationship between unemployment and inflation in the short term, there is no long-term causality between the two. This finding highlights the complexity of the relationship between unemployment and inflation and its implications for the effectiveness of inflation-targeting policies implemented in Turkey.

Other empirical research, however, shows that this relationship can be mixed and sometimes positive, particularly in certain emerging countries. For example, Gulener (2024) revealed patterns of economic stability and turbulence throughout the period studied in Turkey, offering an important perspective on this country's economic development. These results have direct implications for economic decision-makers dealing with the complex interplay between

unemployment and inflation in developing economies. Ogbonna, Farag, Akintande, Yaya, and Olubusoye (2024) in an analysis of 29 African economies, showed significant variability in this relationship. Where the Phillips curve is valid, it does not appear in other countries, notably due to external shocks such as the volatility of world commodity prices (particularly oil), which interfere with classic labor market adjustments.

In the case of Algeria, Messaoud and Ali (2024) demonstrated the existence of a direct one-way relationship between the inflation rate and the unemployment rate, where a 1% increase in the inflation rate leads to a 1.98% rise in the unemployment rate. This result highlights the singularity of Algeria's economic dynamics, while Dimitri and Ntiga (2023), in their research on sub-Saharan Africa, validated the Phillips curve by advocating contractionary policies to stimulate employment, while stressing the need to take institutional quality into account. In contrast, Bahloul (2021) found no significant relationship between inflation and short-term unemployment in Tunisia, a phenomenon explained by the instability and incoherence of the country's economy. Other studies, such as those by Touny (2013) and Omran and Bilan (2021), found a positive relationship between changes in the inflation rate and the long-term unemployment gap in Egypt, a result that supports the locus critique, which asserts that an inflationary policy would not reduce long-term unemployment, as workers would adjust their inflation expectations accordingly. Finally, Kuştepeli (2005)'s study of the Turkish economy, covering the period 1980-2003, highlights the absence of a significant inverse relationship between inflation and unemployment, which can be attributed to the impact of inflationary expectations and the structural peculiarities of the Turkish economy.

These divergences underline the complexity and non-linearity of the relationship between inflation and unemployment, which varies according to numerous contextual factors, including the specific characteristics of each economy and external shocks. These results suggest that the Phillips curve cannot be seen as a universal model, but rather as a theoretical tool that needs to be adapted to local conditions. The effects of flexible labor markets, inflationary expectations, and external shocks all need to be taken into account.

Within this framework, this study focuses on the North African region, whose economic peculiarities and vulnerabilities to external shocks, particularly those linked to world oil prices, make it particularly relevant for the analysis of this relationship. In addition, North Africa faces internal socio-economic tensions that directly influence inflation and unemployment trends. Thus, the general hypothesis guiding this research is formulated as follows:

H_1: In North Africa, a change in the unemployment rate has the opposite effect on inflation, confirming the existence of a dynamic relationship in which lower unemployment leads to higher inflation, and vice versa.

This hypothesis is based on the idea that the dynamics between unemployment and inflation in the region could follow a pattern similar to that of the Phillips curve. However, contextual elements specific to the region (regional economic policies, external shocks) could induce significant variations in this relationship. The aim of this study is to test this hypothesis and verify the validity of the inverse relationship in an economic environment influenced by a complex combination of global and local factors.

The analysis of the Phillips curve in the specific context of North Africa aims not only to validate this theoretical relationship but also to highlight the adjustments needed in the model to better match the macroeconomic realities of the region. To this end, a quantitative approach will be adopted, using robust econometric methods such as time series models (notably ARDL) and Granger causality tests to empirically test the hypothesis and explore the model's relevance in the North African context.

4. RESEARCH METHODOLOGY

This study employs a rigorous method to explore the long-term relationship between inflation and unemployment in North African countries. The countries analyzed are Morocco, Mauritania, Algeria, Tunisia, Libya, and Egypt, using annual data from the World Bank database for the period 1991 to 2023. The selection of this period is based on the complete availability of reliable macroeconomic data for these two key variables, enabling a systematic analysis.

4.1. Variable Selection

The variables chosen for this study are inflation and unemployment, two crucial economic indicators that reflect major trends in the economy and play a central role in understanding macroeconomic interactions, according to the traditional Phillips curve model.

- Inflation: · Measured by the Consumer Price Index (CPI), a key indicator for tracking changes in the prices of goods and services. This variable is essential for assessing inflationary pressures in the economies studied. High inflation indicates an economy under pressure, influencing consumption, savings, and investment.
- Unemployment: Refers to the proportion of the working population who are unemployed but actively seeking work. This variable is central to the analysis of labor market imbalances and an economy's ability to fully utilize its human resources. A high unemployment rate is generally associated with inefficient use of manpower, which can lead to economic and social tensions.

The choice of inflation and unemployment as the main variables is based on the theoretical and empirical relevance of these indicators to the macroeconomic relationship under study. Limiting the analysis to two variables allows us to focus on the central elements of the Phillips curve, without introducing unnecessary complexity, especially given the data available. In addition, this restriction ensures that the analysis is statistically robust and well-focused on the fundamental assumptions of the chosen economic model (Al-Zeaud & Al-Hosban, 2015; Lasarte-Navamuel, Pérez-Rivero, & Montaña, 2025).

4.2. Study Objective and Methodological Model

The main objective of this research is to examine the long-term relationship between inflation and unemployment in North African economies. To this end, a Vector Error Correction Model (VECM) Panel is used. This model enables us to test for co-integration relationships between time series while incorporating both short-term dynamics and adjustments towards a long-term equilibrium. Confirmation of the co-integration between inflation and unemployment justifies the use of this approach.

4.3. Stationery and Co-Integration Tests

Before applying the VECM model, it is essential to check the stationarity of the time series. This is done using the ADF-Fisher Chi-Square test, which identifies the presence of unit roots in the series. The results confirmed that both series (inflation and unemployment) are integrated of order one (I (1)), meaning that they become stationary after a first-difference transformation. This condition is essential for applying the co-integration model.

To test for the existence of a long-term relationship between these two variables, the Johansen-Fisher test is applied. This test determines whether there is a stable link between inflation and unemployment, thus justifying the application of the VECM model.

4.4. Modeling with VECM

Once cointegration has been validated, a vector error correction model (VECM) is applied to estimate the parameters of the long-term relationship between inflation and unemployment. This framework simultaneously models short-term adjustments and long-term equilibrium trends. The econometric relationship is formulated by the following equation.

$$\Delta \text{Inflation}_{\text{it}} = \alpha\,(\text{Inflation}_{\text{it}-1} - \beta \text{Unemployment}_{\text{it}-1}) + \sum_{j=1}^{p-1} \gamma_j \Delta \text{Inflation}_{it-j} + \sum_{j=1}^{p-1} \delta_j \Delta \text{Unemployment}_{it-j} + \varepsilon_{\text{it}}$$

With: i : The cross-sectional unit, i.e. the country; t: The time dimension; Δ: The first difference, representing variations in a variable from one period to the next; α: The error correction coefficients, indicating the intensity with which the variables adjust their values to return to a long-term equilibrium; β: The co-integration coefficient, defining the long-term relationship between the variables in the model; γ_{ij} *and* δ_{ij} : The coefficients of the co-integration

terms, specifying the long-term relationship between different variables in the model; *P*: The optimal number of lags and ε_t : The specification error.

5. RESULTS

This section is dedicated to the results obtained from the econometric analysis on the software, which are intended to test the research hypotheses posed above and draw appropriate conclusions.

5.1. Descriptive Statistics

Table 1 presents the descriptive statistics for the two model variables, inflation and unemployment, for the six countries in the region.

Table 1. Descriptive statistics.

Variables	Inflation	Unemployment
Mean	7.647	12.497
Median	5.167	11.025
Maximum	33.885	31.67
Minimum	-9.798	0.339
Std. dev.	7.514	5.443
Skewness	1.417	0.417
Kurtosis	5.083	3.468
Jarque-Bera	102.094	7.55
Probability	0.000	0.023
Sum	1514.164	2474.392
Sum sq. dev.	11122.24	5837.551
Comments	198	198

Preliminary analysis of the above table reveals low dispersion of inflation and unemployment around their means, accompanied by low values of standard deviations. Moreover, the kurtosis coefficients indicate that the distributions of both variables deviate slightly from normality, being somewhat flatter with less pronounced tails. Finally, the Jarque-Bera test confirms that the two variables do not follow a normal distribution, thus validating the observation made from the kurtosis coefficients.

5.2. Correlation Matrix

Table 2 presents the correlation matrix between the two variables (inflation and unemployment) to clarify the strength and direction of this correlation.

Table 2. Correlation matrix.

Variables	Inflation	Unemployment
Inflation	1.000	-0.137 (-1.943)
Unemployment	-0.137 (-1.943)	1.000

The results in the above table show that the value of the correlation between inflation and unemployment is (-0.137), indicating a weak negative relationship between these two variables. Furthermore, the t-statistic associated with this correlation is (-1.943), which is below the critical value of 1.96 (at the 5% significance level). This means that the correlation is not statistically significant at the 5% level.

5.3. Stationary Test

Table 3 presents the stationary properties of the variables to avoid biases that could lead to spurious results. To this end, the Augmented Dickey-Fuller (ADF) test, based on a Fisher-type approach, has been applied.

Table 3. Unit root test results for variables.

Variables	Level			First difference			Order of integration
	Intercept	Intercept and trend	None	Intercept	Intercept and trend	None	
Inflation	20.913 (0.052)	14.259 (0.284)	21.317 (0.046)	79.217 (0.000)	67.553 (0.000)	118.502 (0.000)	I(1)
Unemployment	16.599 (0.165)	6.975 (0.859)	12.708 (0.391)	111.772 (0.000)	110.233 (0.000)	165.183 (0.000)	I(1)

The results presented in the tables above show that both variables are not stationary at level but become stationary after first differentiation. This indicates that they are integrated of order one (I (1)).

5.4. Co-Integration Test

The cointegration analysis was conducted to examine the existence of long-term relationships between the variables and to determine the most appropriate econometric model for estimation. This step first requires the identification of the optimal lag order, using selection criteria such as the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC). Once cointegration is confirmed, the Johansen cointegration test is applied through the Vector Autoregressive (VAR) model to identify the number of cointegrating vectors, thereby shedding light on the long-term relationships among the variables under study.

5.4.1. Optimum Delay Order

Table 4 illustrates the criteria for selecting the optimal delay order, including: Log-likelihood, Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ).

Table 4. Criteria for selecting the order of delay.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-940.601	NA	984.62	12.568	12.608	12.584
1	-679.04	512.658	31.757*	9.134*	9.254*	9.183*
2	-676.394	5.117	32.337	9.152	9.353	9.233
3	-675.1894	2.296	33.568	9.189	9.47	9.303
4	-668.093	13.342*	32.215	9.148	9.509	9.295
5	-664.286	7.054	32.306	9.15	9.592	9.33
6	-662.723	2.856	33.384	9.183	9.705	9.395
7	-660.194	4.552	34.062	9.202	9.805	9.447
8	-659.827	0.651	35.774	9.251	9.933	9.528

Note: * indicates lag order selected by the criterion.

The results in the table above reveal that a single co-integrating vector is suggested by four of the six criteria, such as FPE, AIC, SC, and HQ, reinforcing the validity of this configuration for the study.

5.4.2. Co-Integration Test

Table 5 presents the Johansen-Fisher panel co-integration test to confirm or refute the existence of a long-term relationship between the variables in the model.

Table 5. Co-integration test results.

Hypothesized No. of CE(s)	Fisher stat. (From trace test)	Prob.	Fisher stat. (From max-eigen test)	Prob.
None	34.24	0.001	26.59	0.009
At most 1	29.82	0.003	29.82	0.003

The results in the table above confirm the existence of a co-integrating relationship between the variables. As a result, the null hypothesis (H0) stipulating the absence of co-integration between variables was rejected. Consequently, the alternative hypothesis that there is cointegration between the variables has been accepted.

5.5. Estimation of the VECM Model

Table 6 summarizes the results of the VECM model estimation in order to understand the complex interactions between inflation and unemployment, with reference to both short- and long-term dynamics.

Table 6. Estimation results using the VECM model.

Co-integrating	**CointEq1**	
Inflation (-1)	1.000	
Unemployment (-1)	1.069	
	(0.251)	
	[4.265]	
C	-20.619	
Error correction	**D (Inflation)**	**D (Unemployment)**
CointEq1	-0.106	-0.094
	(0.036)	(0.017)
	[-2.952]	[-5.443]
D (Inflation (-1))	0.077	0.03
	(0.079)	(0.038)
	[0.968]	[0.801]
D (Unemployment (-1))	0.013	-0.0677
	(0.14)	(0.067)
	[0.092]	[-1.004]
C	0.006	-0.149
	(0.301)	(0.144)
	[0.02]	[-1.035]

The results of the above estimation show that the recall force, accentuated at (-0.106), is statistically significant and negative. This confirms the existence of an adjustment towards long-term equilibrium after an imbalance, indicating that the system converges towards equilibrium after a shock to the tune of 10.6% of the imbalance corrected each period. Furthermore, the estimates reveal that unemployment has a positive and statistically significant impact on inflation. Indeed, the t-statistic of (4.265) is above the normal distribution threshold (1.96), validating this relationship. In the long term, a 1% increase in unemployment leads to a 1.06% rise in inflation.

5.6. Granger Causality Test

Table 7 presents the Granger causality test, which aims to explore the dynamics of the relationships between the two variables in the model.

Table 7. Granger causality test results.

Variables	Observation	F-statistic	Prob.
Unemployment does not Granger-cause inflation	186	0.194	0.824
Inflation does not Granger-cause unemployment		7.621	0.001

The above results show that the relationship between inflation and unemployment is not reciprocal. With a p-value of (0.824) above the 5% threshold, there is no statistically significant evidence to conclude that unemployment Granger-causes inflation. On the other hand, a significant Granger causality relationship is observed in the opposite direction: inflation influences unemployment, as indicated by a p-value of (0.001) below the critical 5% threshold. These results highlight an asymmetry in the dynamics between these two variables.

6. DISCUSSION

This study highlights a positive and statistically significant relationship between inflation and long-term unemployment in North African countries, which challenges the classic Phillips curve hypothesis, generally interpreted as an inverse relationship between these two variables. Contrary to this traditional theory, our results indicate that in North Africa, inflation and unemployment tend to move simultaneously in the same direction, i.e., to rise or fall together, rather than in opposite directions.

This finding is consistent with the results of previous studies, including those by Ogbonna et al. (2024) in Africa, Zahir, Oubahou, Rehaimi, and Elouafa (2025) in Morocco, Dimitri and Ntiga (2023) in sub-Saharan Africa, Bahloul (2021) in Tunisia, Touny (2013) and Omran and Bilan (2021) in Egypt, as well as Kuştepeli (2005) in Turkey. These studies, while applied to diverse geographical and economic contexts, confirm the existence of a direct, one-way relationship between inflation and unemployment. This phenomenon could be linked to structural factors specific to the countries studied, such as economic instability, dependence on certain strategic economic sectors, and ongoing external shocks, making it difficult to manage these variables independently and consistently. Our results reinforce this perspective, validating our hypothesis that inflation and unemployment dynamics are profoundly influenced by the contextual and structural specificities of each country.

However, our findings differ from those obtained by Ahmed and Mohamed (2024) in Morocco, Zhang (2024) in China, and Karahan et al. (2012) in Turkey, who observed a negative and significant relationship between the unemployment gap and inflation, supporting the idea of parallel management of unemployment and inflation. In the Moroccan context, for example, inflation is strongly influenced by external factors, such as fluctuations in the prices of imported goods, particularly energy and food products. This dependence on international factors increases the difficulty of simultaneously controlling inflation and unemployment. Similarly, on a regional scale, external shocks, such as global rises in commodity prices and the impact of volatility in economic sectors such as hydrocarbons and tourism, further complicate the resolution of these macroeconomic problems.

The results of our study underline the need for a review of economic strategies in North African countries. It is imperative that policymakers take into account the particular characteristics of their labor markets, such as the prevalence of a sizable informal sector, as well as the local causes of inflation, often linked to constraints on production costs. Unlike developed economies, where the Phillips curve may remain valid, wage rigidities, collective bargaining, and minimum wage policies make the relationship between inflation and unemployment far more complex and less predictable in the countries of this region.

The economic context in North Africa is also marked by specific vulnerabilities linked to political instability, dependence on sensitive economic sectors such as hydrocarbons, and the predominance of informal economies. These conditions create a feedback loop where economic shocks can simultaneously aggravate inflation and unemployment. The examples of Algeria, where dependence on hydrocarbons exposes the economy to fluctuations in world prices,

Tunisia, with post-revolution instability combined with fragility in the tourism sector, and Egypt, where structural reforms (such as subsidy cuts and currency devaluation) have increased inflationary pressures, illustrate this dynamic.

Tackling the interrelated challenges of inflation and unemployment in the region requires a multi-sectoral approach that takes into account both internal and external factors. Diversifying economies, improving the efficiency of labor markets, and reducing import dependency must be central to the economic strategies of the countries concerned. In addition, it is becoming crucial to build resilience to global economic shocks through targeted investment and prudent economic policies, with the aim of breaking the region's recurring inflation-unemployment cycle. Economic decisions must be based on in-depth analysis and policies tailored to local specificities, to enable sustainable growth and long-term economic stability.

7. CONCLUSION

The aim of this study was to examine the relevance of the Phillips curve in the context of North African countries as a traditional analytical model for analyzing the relationship between inflation and unemployment. Through an in-depth econometric analysis covering the period 1991-2023, our results call into question the validity of this curve in this region, highlighting distinct economic dynamics compared to the model's classical predictions.

The use of a panel VECM model revealed a positive and significant relationship between inflation and unemployment, both in the short and long term, in contrast to the negative relationship theorized by Phillips. This unexpected correlation underlines the fact that economic dynamics in North African countries do not necessarily follow the patterns observed in Western economies or other developing regions. Furthermore, the absence of Granger causality between these two variables highlights the inadequacy of a trade-off model between inflation and unemployment, a concept that often remains a staple of economic policies, particularly in Morocco.

The findings of this study call for a rethink of conventional approaches, often inspired by Western economic contexts, and reveal the importance of adopting economic strategies that are better adapted to local specificities. In particular, it is becoming crucial for decision-makers to steer their policies towards far-reaching structural reforms and macroeconomic flexibility that take into account the singularity of North Africa's economic realities. Such an approach would not only reduce inflation and unemployment but also promote sustainable, inclusive growth in these countries.

In addition, this study reveals the complexity of economic interactions in these countries, often influenced by global and local factors such as dependence on raw materials, external shocks, and structural vulnerabilities. These elements underline the need for the development of theoretical and methodological frameworks better adapted to the reality of North African countries. As such, future research should take into account the institutional, social, and structural dimensions specific to these economies, with the aim of enriching our understanding of the mechanisms underlying the joint evolution of inflation and unemployment. The ultimate aim remains to better understand and control these dynamics while promoting sustained economic growth that contributes to the well-being of the populations concerned.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: Upon a reasonable request, the supporting data of this study can be provided by the corresponding author.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

REFERENCES

Adebowale, K. B. (2015). *The relationship between inflation and unemployment in Nigeria.* [MasterThesis, Eastern Mediterranean University (EMU) - Doğu Akdeniz Üniversitesi (DAÜ)]. http://i-rep.emu.edu.tr:8080/xmlui/handle/11129/3230.

Ahmed, H., & Mohamed, C. (2024). Estimating potential output in Morocco and its effects on inflation and the unemployment gap. *African Scientific Journal*, *3*(23), 963-963. https://doi.org/10.15640/jibe.v3n2a7

Al-zeaud, H., & Al-hosban, S. (2015). Does Phillips curve really exist? An empirical evidence from Jordan. *European Scientific Journal*, *11*(10), 45-59.

Alisa, M. (2015). The Relationship between inflation and unemployment: a theoretical discussion about the Philips Curve. *Journal of International Business and Economics*, *3*(2), 89-97.

Bahloul, R. (2021). *Inflation and unemployment relationship within Phillips Curve in Tunisia.* Retrieved from https://arfjournals.com/image/61824_2_rim_bahloul.pdf

Bhattarai, K. (2016). Unemployment–inflation trade-offs in OECD countries. *Economic Modelling*, *58*, 93-103. https://doi.org/10.1016/j.econmod.2016.05.007

Clarida, R., Gali, J., & Gertler, M. (1999). The science of monetary policy: A new Keynesian perspective. *Journal of Economic Literature*, *37*(4), 1661-1707. https://www.nber.org/papers/w7147

Dimitri, M. P. V., & Ntiga, L. H. N. (2023). *The relationship between inflation and unemployment in sub-Saharan Africa.* Retrieved from https://shs.hal.science/halshs-04078028/

Friedman, M. (1977). Nobel lecture: Inflation and unemployment. *Journal of Political Economy*, *85*(3), 451-472. https://doi.org/10.1086/260579

Galı, J., & Gertler, M. (1999). Inflation dynamics: A structural econometric analysis. *Journal of monetary Economics*, *44*(2), 195-222. https://doi.org/10.1016/S0304-3932(99)00023-9

Gómez, M., & Irewole, O. E. (2023). Economic growth, inflation and unemployment in Africa: An autoregressive distributed lag bounds testing approach, 1991–2019. *African Journal of Economic and Management Studies*, *15*(2), 318-330. https://doi.org/10.1108/AJEMS-09-2022-0378

Gruen, D., Pagan, A., & Thompson, C. (1999). The phillips curve in Australia. *Journal of Monetary Economics*, *44*(2), 223-258. https://doi.org/10.1016/S0304-3932(99)00024-0

Gulener, K. (2024). *The relationship between unemployment and inflation in Turkey: A correlation analysis.* Retrieved from https://mpra.ub.uni-muenchen.de/121932/

Karahan, Ö., Çolak, O., & Bölükbaşı, Ö. F. (2012). *Tradeoff between inflation and unemployment in Turkey.* Retrieved from https://www.redalyc.org/journal/4795/479575487007/html/

Kuştepeli, Y. (2005). A comprehensive short-run analysis of a (possible) Turkish Phillips curve. *Applied Economics*, *37*(5), 581-591. https://doi.org/10.1080/0003684042000307 49

Laffargue, J.-P. (1971). The link between the inflation rate and the unemployment rate: Theoretical contribution and statistical verification for France. *Revue d'économie politique*, *81*(1), 49-79.

Lasarte-Navamuel, E., Pérez-Rivero, J. L., & Montania, C. (2025). An empirical analysis of regional Phillips Curve with spatial dependence. *Regional Science Policy & Practice*, *17*(2), 100162. https://doi.org/10.1016/j.rspp.2024.100162

Lipsey, R. G. (1960). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1862-1957: A further analysis. *Economica*, *27*(5), 1-31. https://doi.org/10.2307/2551424

Lucas, R. E. (1972). Expectations and the neutrality of money. *Journal of Economic Theory*, *4*(2), 103-124. https://doi.org/10.1016/0022-0531(72)90142-1

Messaoud, L., & Ali, B. (2024). A standard study to determine the nature of the relationship between the inflation rate and the unemployment rate -in Algeria during the period (1970-2021) using the error correction model (ECM). *The Journal of Contemporary Issues in Business and Government*, *30*(1), Article 1.

Ogbonna, A. E., Farag, M., Akintande, O. J., Yaya, O. S., & Olubusoye, O. E. (2024). Re-validating the Phillips Curve hypothesis in Africa and the role of oil prices: A mixed-frequency approach. *Energy*, *303*, 131862. https://doi.org/10.1016/j.energy.2024.131862

Omran, E. A. M., & Bilan, Y. (2021). *The impact of inflation on the unemployment rate in Egypt: A VAR approach.* Paper presented at the In SHS Web of Conferences (Vol. 107, p. 06009). EDP Sciences. https://doi.org/10.1051/shsconf/202110706009.

Parkin, M. (1998). Unemployment, inflation, and monetary policy. *The Canadian Journal of Economics/Revue canadienne d'Economique*, *31*(5), 1003-1032. https://doi.org/10.2307/136457

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861-1957. *Economica*, *25*(100), 283-299. https://doi.org/10.2307/2550759

Przekota, G., & Szczepańska-Przekota, A. (2024). The significance of inflation volatility and level for the shape of the empirical Phillips Curve (Long-and short-term dependency model). *Procedia Computer Science*, *246*, 4796-4804. https://doi.org/10.1016/j.procs.2024.09.345

Quévat, B., & Vignolles, B. (2018). *The relationship between inflation, wages and unemployment has not disappeared – Strong investment, mixed consumption | Insee.* Retrieved from https://www.insee.fr/fr/statistiques/3372330?sommaire=3372391

Razia, A., Omarya, M., Razia, B., Awwad, B., & Ruzieh, A. (2023). Examining how unemployment, inflation and their related aspects affected economic growth in Palestine: The period from 1991 to 2020. *Heliyon*, *9*(11). https://doi.org/10.1016/j.heliyon.2023.e21081

Sachsida, A., Divino, J. A., & Cajueiro, D. O. (2011). Inflation, unemployment, and the time consistency of the US monetary policy. *Structural Change and Economic Dynamics*, *22*(2), 173-179. https://doi.org/10.1016/j.strueco.2010.12.002

Samuelson, P. A., & Solow, R. M. (1960). Analytical aspects of anti-inflation policy. *The American Economic Review*, *50*(2), 177-194.

Shaari, M. S., Abdullah, D. N. C., Razali, R., & Saleh, M. L. A. H. M. (2018). *Empirical analysis on the existence of the Phillips curve.* Paper presented at the In MATEC Web of Conferences, Vol. 150, p. 05063). EDP Sciences. https://doi.org/10.1051/matecconf/201815005063.

Touny, M. (2013). Investigate the long-run trade-off between inflation and unemployment in Egypt. https://doi.org/10.5539/ijef.v5n7p115

Zahir, A., Oubahou, Y., Rehaimi, H., & Elouafa, K. (2025). The validity of the phillips curve relationship: An econometric study on moroccan data. *Journal of Management*, *2*, 204-209. https://doi.org/10.53935/jomw.v2024i4.901

Zhang, Y. (2024). Analysis of inflation and unemployment in China. *Highlights in Business, Economics and Management*, *24*, 1923-1928. https://doi.org/10.54097/jzygkg05