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The Determinants of Hysteresis in Unemployment: Evidence from Tunisia Estimate

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Abstract

This research examines the determinants of the unemployment rate in Tunisia. Unemployment hysteresis is a macroeconomic problem. The empirical methodology relies on the "ARDL" autoregressive distributed lag approach and shows that there is a hysteresis phenomenon from 1987 to 2021. The study showed that there is a long-term relationship between the different variables. The results suggest that a reduction in Tunisia's inflation, interest rates and consumer price index would be favorable to a reduction in the unemployment rate.

Keywords: *unemployment rate, inflation rate, short-term interest rate, long-term interest rate, consumer price index rate, ARDL, Tunisia.*

1. Introduction

Since the 1980s, Tunisia has experienced a high unemployment rate, decreasing from 15.7% in 2000 to 13.3% in 2009 and 15.5% in 2021. Such a rise in unemployment has led to political instability and increased poverty and inequality.

In Tunisia, as in other developing countries, the State is increasingly intervening in the economic sphere through a high unemployment rate. Indeed, the unemployment rate rose from 12.9% in 2005 to 15.3% in 2021.

Hysteresis in a time series is simply the long-term impact that remains in that series due to an endogenous or exogenous shock, i.e. a deviation due to economic and structural change (Trejo and Vengas, 2010). Unemployment hysteresis is a macroeconomic problem that dates back to Blanchard and Summers (1986, 1987) who argue that cyclical fluctuations have permanent effects on the level of unemployment, Meloni and al (2022)

The hysteresis hypothesis stipulates that unemployment rates can be characterized as non-stationary unit root processes that never return to equilibrium after a shock (Blanchard and Summers 1986, 1987; Cross 1987; Barro 1988). Consequently, the effect of a shock on unemployment would be very persistent and there would be no tendency to return to an equilibrium level (Cho, D., & Rho, S. (2019)). Some authors put forward the hysteresis theory which means that the unemployment rate remains at a very high level, while the causes of the accumulation of unemployment disappear (Phelps, E. (1972) ;

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Cotis, J-P& Mihoubi, F. (1990) ; Rodgers, W. M. (2008) ; Singleton, C. (2018) ; Zamanzadeh A & al. (2019)).

This is like a "ratchet effect" that prevents the return to full employment (Kienzler, D. (2012); Kolsrud, J. (2018); Landais, C (2018)). Indeed, we note that for more than two decades, the increase in wages everywhere, including in Tunisia, has not that much caused a drop in the level of unemployment (Baccouche, N (2016); Assaad, R., & Boughzala, M. (2018); El-Haddad, A (2020). In addition, the substantial increase in wages, at present, is not proportional to the staggering increase in commodity prices, which considerably reduces employment growth; Mekki, N. (2019);Stirati and Meloni (2021); Heguland and Taalbi (2022). In other words, hysteresis means that natural unemployment, as we have explained, increases prices but gradually tends towards observed unemployment. As a result, the unemployment of some workers becomes permanent and is added to the already existing unemployment. Under these conditions, unemployment becomes permanent, structural and long-term. The obvious importance of understanding the phenomenon of unemployment lies in characterizing the dynamics of this same phenomenon in front of the magnitude of the shocks undergone by the Tunisian economy at different stages of its economic cycle.

From an empirical point of view, recent studies generally approach the unemployment hysteresis hypothesis in two ways: the first approach relies on nonlinear unit root tests and the second approach relies on unit root tests with structural breaks. Studies using the first approach have shown that non-linear components of unemployment rates are present due to cyclical fluctuations in factors specific to the labor market (Peel and Speight, 2000; Cancelo, 2007; Caporale and Gil Alana, 2007, Chang, M.-J., & Su, C.-Y. (2014). Camarero et al. (2006) applied the stationary test panel with multiple structural breaks developed by Carrion-i-Silvestre et al. (2005) to test the effects of unemployment hysteresis for 19 OECD countries. They found strong support for the assumption of the natural unemployment rate for the majority of the countries analyzed (Chang, M.-J., & Su, C.-Y. (2014)). However, Mednik et al. (2012) used the stationarity of the test panel with multiple structural breaks developed by Carrion-i-Silvestre et al. (2005) to examine the hypothesis of unemployment hysteresis for 13 Latin-American countries. The provided results support those of Camarero et al. (2006).

The aim of this article is to make a quantitative assessment of the impact of the unemployment rate on growth using an endogenous growth model. The main issue is to study the impact of the unemployment rate on the interest rate, the inflation rate and the consumer price index rate in Tunisia while trying to understand how the effects of unemployment on growth have been realized and evolved over time. The empirical results show the existence of a long-term cointegration relationship between inflation and the long-term interest rate. In addition, all these variables are statistically significant and do influence unemployment.

The rest of the article is structured as follows: the second section is devoted to an overall analysis of the evolution of unemployment in Tunisia; the third section presents our empirical study on the effect of the inflation rate, the short- and long-term interest rates and the consumer price index on the unemployment rate in Tunisia. We conclude by providing the implications of our findings.

2. Overall unempmloyment analysis

Unemployment in Tunisia has taken on a worrying dimension with more than 700,000 unemployed - approximately one in 5 Tunisians is unemployed (INS 2021 and BCT 2021), which increased delinquency, theft and rape, and created a favorable climate for terrorism.

Hysteresis occurs when the unemployment rate of the current period depends on its lagged values with a sum of coefficients on lags which, although not necessarily equal to 1, is close to unity. Blanchard and Summer (1986) estimated ARMA (1.1) processes of the unemployment rate for four countries: Germany, the United States, France and the United Kingdom. Only one of these four countries (the United States) does not seem to be affected by the hysteresis problem.

A.W. Philips (1958) found, after extensive empirical analysis, a negative relationship between the unemployment rate and the variation rate in nominal wages in the United Kingdom, relying on annual data covering the period 1861-1913 and 1867-1957. This relationship is known as the 'Philips Curve'. He explained this relationship as a simple effect of an adjustment between demand and supply on the labor market: whenever the unemployment rate falls, workers' bargaining power is strengthened and, as a result, nominal wages tend to rise.

Lipsey (1960) and Samuelson and Solow (1960) interpreted the Philips curve [Palumbo 2008]. They gave a theoretical analysis of the labor market in terms of supply and demand curves. In short, this approach is interpreted as an institutional theory of nominal wage determination, which is based on the bargaining power of the labor force [Palumbo, 2008]. They replaced the nominal wage rate with price inflation, giving the following representation:

$$\pi \equiv p_t - p_{t-1} = \alpha(\mu_n - \mu_t)$$

where μ_n is the equilibrium unemployment rate.

They estimated the relationship between the inflation rate and the unemployment rate over a 25- year period going from 1934 to 1958 in the United States. They interpreted this relationship as an inflation-unemployment trade-off based on the importance given to price stability and the revival of activity. Although they used price inflation instead of the nominal wage growth rate, they found results in accordance with those of Philips.

According to Samuelson and Solow (1960), the Philips relationship is stable, implying a short-term and long-term inflation-unemployment dilemma. Indeed, the unemployment rate at the stationary equilibrium corresponds to its level of full employment only if the money supply growth rate is null. From the Samuelson and Solow (1960) perspective, the currency is not neutral, even over the long term. In the long term, the monetary authorities have therefore the possibility of achieving an unemployment rate below its full employment level by increasing the money supply (a positive rate). As a result, the inflation-unemployment dilemma still exists: expansionary monetary policy could permanently reduce unemployment. This idea has been the subject of much criticism, resulting in the "Philips Augmented Curve".

3. Econometric Analysis

3.1. Data and sources

Our study consists of constructing an econometric model based on the hysteresis theory of the unemployment rate. We have integrated different explanatory variables with the aim of knowing the impact of macroeconomic variables on the labor market in Tunisia.

In addition to the statistical series of the evolution of the Tunisian unemployment rate from 1987 to 2020, noted "Unem", which is accessible from the database of the National Institute of Statistics (INS), we have used the inflation rate of Tunisia, noted "INFL", and the supply and demand for employment, noted respectively "Offre_T" and "DDE _T", which are taken from the database of the National Agency for Employment and Independent Work in Tunisia (ANETI). We have also retained the growth rate noted "GDP", the salary inequality noted "Gini_Index", poverty "POV" and vulnerable jobs

noted “EV” which are extracted from the World Bank database (WDI). The "ATTACKS" variable collected by the authors within the framework of a project, this index measures the number of attacks per year. And finally the wage inflation “PIW” and the presidential turnover rate “TRP” are calculated by the authors, and the political stability “SP” accessible from the Trading Economics database. This implies that the use of Cointegration's ARDL autoregressive staggered-delay model is appropriate for estimating the existence of a long-term relationship.

The use of this technique has the advantage of being more robust for our study, it applies to integrated series of order less than 2, contrary to the Cointegration tests of Engle Granger (1987), Johanson (1988) and Johansen and Juselius (1990).

3.2. Methodology

The study of time series econometrics shows the importance of stationarity tests. Regressions carried out on non-stationary data can be "spurious" (Granger and Newbord, 1974). They may indicate a relationship between the variables under study where none exists. In order to receive consistent and reliable results, non-stationary data must be transformed into stationary data.

To date, many econometric methods have been proposed for the study of cointegration between series. The seminal works of Engle and Granger (1987), Johansen (1988), Phillips and Hansen (1990) and Johansen and Juselius (1990) are some of the best known examples of the challenging research of the late 20th century. However, Engle and Granger's test is only applicable for two series that are integrated in the same order. Johansen's test is adapted over several series, but it also requires that all series be integrated of the same order. In addition, the Johansen test is based on "vector autoregressive error correction modeling" (VECM). To overcome this shortcoming, Pesaran et al (2001), Pesaran and Shin (1995) and Pesaran et al (2001) have developed a suitable test for variables that are integrated of different orders. It is known as the "Terminal Cointegration Test". The application of this test aims to verify the existence of one or more cointegrating relationships between the variables concerned.

The existence of a cointegrating relationship between the different variables can be determined by applying several tests within an econometric model. This method makes it possible to estimate short- and long-term dynamics in the same econometric model (Akpan and Al, 2012). The direct sensitivity of the labor market is tested using a model in which the unemployment rate has the dependent variable and the rest of the variables are explanatory variables. The relationship between our explanatory variables and our variable to be explained is given by the following equation (1) within an ARDL model:

$$\Delta(Unem)_t = \alpha_0 + \sum_{i=0}^{p} \alpha_{1i}\Delta(Unem)_{t-1} + \sum_{i=0}^{q} \alpha_{2i}\Delta(Offre\_T)_{t-1} + \sum_{i=0}^{q} \alpha_{3i}\Delta(DDE\_T)_{t-1} + \sum_{i=0}^{q} \alpha_{4i}\Delta(ATTACKS)_{t-1} +$$
$$\sum_{i=0}^{q} \alpha_{5i}\Delta(EV)_{t-1} + \sum_{i=0}^{q} \alpha_{6i}\Delta(GDP)_{t-1} + \sum_{i=0}^{q} \alpha_{7i}\Delta(Gini\_Index)_{t-1} + \sum_{i=0}^{q} \alpha_{8i}\Delta(POV)_{t-1} + \sum_{i=0}^{q} \alpha_{9i}\Delta(PIW)_{t-1} + \sum_{i=0}^{q} \alpha_{10i}\Delta(SP)_{t-1}$$
$$+ \sum_{i=0}^{q} \alpha_{11i}\Delta(TRP)_{t-1} + \sum_{i=0}^{q} \alpha_{12i}\Delta(INFL)_{t-1} + \beta_1(Unem)_{t-1} + \beta_2(Offre\_T)_{t-1} + \beta_3(DDE\_T)_{t-1} + \beta_4(ATTACKS)_{t-1} + \beta_5(EV)_{t-1}$$
$$+ \beta_6(GDP)_{t-1} + \beta_7(Gini\_Index)_{t-1} + \beta_8(POV)_{t-1} + \beta_9(PIW)_{t-1} + \beta_{10}(SP)_{t-1} + \beta_{11}(TRP)_{t-1} + \beta_{12}(INFL)_{t-1} + \varepsilon_t$$

With Δ: the first difference operator, α_0: constant, $\alpha_1 ... \alpha_9$: short-term effects, $\beta_1 ... \beta_9$: long-term dynamics of the model, $\varepsilon \sim iid(0, \sigma)$: error term.

Equation (1) leads us to determine the existence of a cointegrating relationship between our different variables in order to confirm the choice of using the staggered delay autoregressive model. Several cointegration tests have been provided in the econometric literature, such as Johannsen's (1988, 1991), Pesaran et al (1996) and Pasaran et al (2001). First, we will apply the unit root tests in order to know the order of integration of each variable. Thus, we are interested in the tests of Dickey Fuller (ADF) and Phillips Perron

(PP) to verify the order of integration of each series. When we find our variables of different order (I(0), I(1)), we can use the cointegration test entitled "cointegration test at the bounds" of Pesaran et al (2001) to verify in our ARDL model the existence of a cointegrating relationship between the different variables. First, we will determine the optimal lag (AIC, SIC), then we will use the Fisher test to test the hypotheses.

H0: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = \alpha_9 = \alpha_{10} = \alpha_{11} = \alpha_{12} = 0$ (existence of a Cointegration relationship)

H1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq 0$ (absence of a Cointegration relationship)

Finally, the last step consists in comparing the Fisher values obtained to the critical values for the different thresholds of Pesaran et al (2001) taking into account that the integrated variables of order 1 I(1) are included in the upper bound while the integrated variables of order 0 I(0) are concerned by the lower bound. Thus if Fisher is greater than the upper bound, a cointegrating relationship exists, whereas if the Fisher statistic is less than the lower bound, the hypothesis of the existence of a cointegrating relationship is rejected. And finally, if Fisher is between the lower and upper bound, a conclusive inference cannot be made without knowing the order of integration of the underlying regressors.

Thanks to this procedure, an error-correction model can confirm the existence or not of cointegration between our variables. In the framework of our study this model will have the form of the following equation 2:

$$\Delta(Unem)_t = \alpha_0 + \sum_{i=0}^{p} \alpha_{1i}\Delta(Unem)_{t-1} + \sum_{i=0}^{q} \alpha_{2i}\Delta(Offre\_T)_{t-1} + \sum_{i=0}^{q} \alpha_{3i}\Delta(DDE\_T)_{t-1} + \sum_{i=0}^{q} \alpha_{4i}\Delta(ATTACKS)_{t-1} +$$
$$\sum_{i=0}^{q} \alpha_{5i}\Delta(EV)_{t-1} + \sum_{i=0}^{q} \alpha_{6i}\Delta(GDP)_{t-1} + \sum_{i=0}^{q} \alpha_{7i}\Delta(Gini\_Index)_{t-1} + \sum_{i=0}^{q} \alpha_{8i}\Delta(POV)_{t-1} + \sum_{i=0}^{q} \alpha_{9i}\Delta(PIW)_{t-1} + \sum_{i=0}^{q} \alpha_{10i}\Delta(SP)_{t-1}$$
$$+ \sum_{i=0}^{q} \alpha_{11i}\Delta(TRP)_{t-1} + \sum_{i=0}^{q} \alpha_{12i}\Delta(INFL)_{t-1} + \theta\mu_{t-1} + \varepsilon_t$$

Equation (1), which specifies the relationship between the unemployment phenomenon and its macroeconomic determinants, and equation (2) of the error-correction model that is being estimated. But first we need to determine the order of integration of our variables using the Dickey Fuller Augmented “ADF”, Phillips Perron “PP” tests, and then test the existence of a cointegrating relationship using the bounded cointegration test, to finally move on to the short- and long-term relationship between our variables.

3.3. Empirical result

Table 1 of the ADF unit root test and the PP unit root test indicate that unemployment and the consumer price index are integrated at the l-order. The most important thing is that neither of the two variables is integrated of order greater than two. Inflation, the interest rate, and the money market interest rate are integrated of order zero. Specifications with a constant give mixed results. These results imply that the ARDL cointegration model is appropriate for estimating the existence of the long-run relationship. The cointegration technique of Johansen and Juselius (1990) is not appropriate in our case because some variables are not integrated of order one.

Table1: stationarity analysis

variables	ADF test		PP test	
	en niveau	en différence première	en niveau	en différence première
Unem	-2.003348 (0.2840)	-5.110681** (0.0002)	-2.107843 (0.2430)	-5.028687** (0.0003)

	-2.068642	-3.847525**	-1.600488	-3.611383**
Offre_T	(0.2579)	(0.0065)	(0.4704)	(0.0115)
	-0.878633	-3.449924**	-0.660973	-6.114312**
DDE_T	(0.7810)	(0.0200)	(0.8417)	(0.0000)
	-2.830600	-7.427156**	-2.807156	-9.634876**
ATTACKS	(0.0653)	(0.000)	(0.0685)	(0.0000)
	0.036482	-5.284112**	-0.005944	-5.293491**
EV	(0.9552)	(0.0001)	(0.9512)	(0.0001)
	-5.097826**	-9.591610**	-5.111702	-21.68017**
GDP	(0.0002)	(0.0000)	(0.0002)	(0.0001)
	-5.012605**	-9.252343**	-5.005070	-26.98299**
Gini_Index	(0.0003)	(0.0000)	(0.0003)	(0.0001)
	1.394570	-4.392025**	1.211274	-4.392025**
POV	(0.9985)	(0.0016)	(0.9975)	(0.0016)
	-3.622404**	-6.136560**	-3.625989**	-13.00159**
PIW	(0.0108)	(0.0000)	(0.0106)	(0.0000)
	-2.920575	-6.404084**	-2.878396	-16.67718**
SP	(0.0540)	(0.0000)	(0.0591)	(0.0001)
	0.111962	-5.477226**	0.111962	-5.477226**
TRP	(0.7111)	(0.0000)	(0.7111)	(0.0000)
	-2.905864	-8.408098**	-2.805050	-8.533471**
INFL	(0.0558)	(0.0000)	(0.0688)	(0.0000)

*, **, and **denotes significance at 1%, 5%, and 10% respectively. The optimal delay number for the ADF test is chosen using AIC while "Bandwidh" for the PP tests. Critical values for the ADF and PP tests are obtained from MacKinnon (1996). Note that only the constant is included in the tests

ARDL modeling is used to explain the unemployment rate in terms of the past values of the unemployment rate, as well as the current and past values of the explanatory variables. Eviews 10 offers the possibility to perform ARDL modeling in an automatic way. For the choice of the number of lags, we used the Schwarz information criterion (SIC). At this stage, we are interested in the application of cointegration tests related to the ARDL model, in order to study the relationship between our variables. We will select the appropriate degree of delay (Feridun and Shahbaz 2010) required by the bounded test. The AIC selection criterion is used in our case. The results of the terminal cointegration test are presented in Table 2 below

Table 2: Bounds test

Dependant variable	lag selection	F-statistic	Decision
Unem	(1, 0, 0, 1, 0, 0, 1, 0, 1, 1, 1, 1)	24.5159511	co integration

Significance	I0 Bound	I1 Bound	
10%	1.76	2.77	
5%	1.98	3.04	
2.5%	2.18	3.28	
1%	2.41	3.61	

Our results showed that the calculated statistical F is of the order of 24.5159511 which is higher than the critical value of Pesaran et al (2001) at the 1% threshold, confirming the existence of a long term relationship between our different variables during the period 1987 to 2018. Thus we can move on to the estimation of equation (1) using the ARDL approach. Table 3 shows the estimation results.

Table 3: Long-term relationship

	Dependent variable D(Unem)		
variable	Coefficient	T-Ratio	Prob.
TRP	2.677536	1.947623	0.0774
SP	0.166511	0.457020	0.6566
POV	0.367468	4.360478	0.0011
PIW	3.510598	2.427508	0.0336
OFFRE_T	-2.32	-4.092553	0.0018
INFL	0.200154	3.614568	0.0041
Gini-Index	0.029070	4.153690	0.0016
GDP	-0.163005	-3.998499	0.0021
EV	-0.733975	-7.052634	0.0000
DDE_T	-3.84	-4.370605	0.0011
ATTACKS	0.069484	-3.008860	0.0119
C	26.52765	9.358620	0.0000

This table provides the estimated long-term coefficients. The above coefficients show that a 1% increase in poverty would increase the unemployment rate by 0.36 points, a 1% increase in wage inflation would increase the unemployment rate by 3.51 points, an increase of (1%) in the total number of jobs available would decrease the unemployment rate by (2.32%), and an increase of (1%) in inflation would increase the unemployment rate by (0.20%). According to our results, terrorist attacks and wage inequality also have a positive and significant effect on unemployment at the 5% threshold, while vulnerable jobs and employment demand have a negative and significant impact. What is unexpected, from a normative point of view, the fragility of jobs facilitates the spread of the unemployment phenomenon. In addition, economic growth negatively affects unemployment. However, any 1% increase in the level of GDP suffers a 0.16% decrease in the level of unemployment. These results suggest that any country with a high growth rate can combat the unemployment phenomenon and increase job opportunities. It remains to be mentioned that most of the signs of the variables respected the theoretical framework except for the demand for employment and vulnerable jobs. After representing the long-run relationship between our different variables, the error-correction model must be estimated. The estimators of the ECM are presented in Table 4 below:

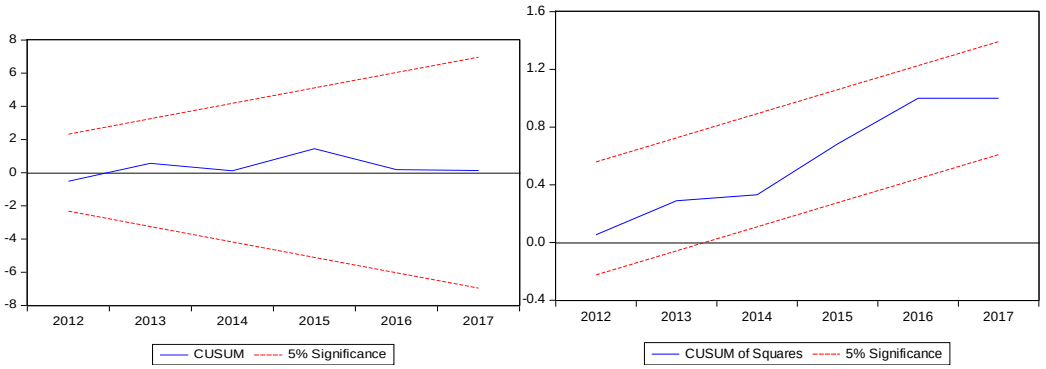
Table 4: Short-term relationship

	Dependent variable D(Unem)		
variable	Coefficient	T-Ratio	Prob.
Unem(-1)	-1.049254	-6.491621	0.0000
TRP	2.809414	2.220913	0.0483
SP	0.174712	0.431465	0.6745
POV(-1)	0.385567	5.120663	0.0003
PIW	3.683507	1.998499	0.0710
OFFRE_T	-2.44	-2.889747	0.0710
INFL(-1)	0.210012	3.258753	0.0076
Gini_Index	0.030502	3.245583	0.0078
GDP(-1)	-0.171034	-3.430620	0.0056
EV(-1)	-0.770126	-5.422186	0.0002
DDE_T(-1)	-4.03	-4.957825	0.0004
ATTACKS(-1)	-0.072907	-4.208887	0.0015
D(POV)	0.242337	2.228096	0.0477
D(INFL)	0.052300	1.139157	0.2788
D(GDP)	-0.071688	-1.886341	0.0859
D(EV)	-0.100186	-1.080957	0.3028
D(DDE_T)	9.77	0.717705	0.4879
D(ATTACKS)	-0.029355	-1.347342	0.2050
C	27.83423	4.879930	0.0005

The short-term results show that the presidential turnover variable has a positive and significant effect on the unemployment rate. Attacks directed against the state or with the aim of destabilizing political life can influence the labor market in the interest of investment strategies created and maintained by the governors in order to stabilize the Tunisian economy, taking into account that the embryonic state of the country's economic systems, coupled with political instability that does not provide the country with effective economic policies, would justify this result against long-term intuition, but the immediate and repetitive change of governors and presidents of the country brings us back to unfavorable conditions. In fact, the frequent change of presidents destabilizes the state, leading to high unemployment. Moreover, poverty is one of the main determinants of the phenomenon of short-term unemployment in Tunisia. Once the phenomenon of unemployment has appeared, the speed of poverty spread becomes increasingly rapid over time since we note that the delays in the poverty variable are strongly positive and significant. Moreover, inflation positively and significantly affects the labor market in Tunisia. In fact, a 1% increase in inflation of the unemployment rate accelerates the spread of this phenomenon by 0.21 point in the short term. The results also show that the growth rate has a negative and significant impact at the threshold of 1% on the unemployment rate.

Table 5: Diagnostic test

	Values (probability)
$\chi 2$ (serial correlation)[1]	2.664397[0.1234]
$\chi 2$ (functional form)[2]	0.118800[0.7375]
$\chi 2$ (normality)[3]	0.281626 [0.868652]
$\chi 2$ (heteroscedasticity)[4]	2.333068[0.1383]



1. 1 The Breusch–Godfrey LM test statistic for no serial correlation.
2. 2 The White′s test statistic for homoscedasticity.
3. 3 The Jarque–Bera statistic for normality.
4. 4 The Ramsey′s Reset test statistic for regression specification error.

Table 5 shows the results of the diagnostic tests for the selected ARDL model (1, 0, 0, 1, 0, 1, 0, 1, 1, 1, 1). The normality of the distributed residuals is noted by the Jarque-Bera test of normality. Applying the heteroskedasticity test, the results show that the statistical Fs reflect that the null hypothesis of the absence of correlation of the series cannot be rejected and also confirm the absence of heteroskedasticity of the residuals.

One of the econometric requirements of an ARDL model is to justify the stability of the parameters, of course after the analysis of the diagnostic tests. We apply the cumulative sum (CUSUM) and cumulative sum of squares (CUSUM Square) tests to test the stability of the short and long term coefficients by the ARDL model. These tests are applied to recursive residuals from the ARDL model estimated in this work (Brown et al. 1975).

Table 5 presents the results of these tests. It can clearly be seen that the CUSUM and CUSUM square plots are within the critical limits of 5%. Thus, we can justify the robustness and stability of our estimated coefficients of the ARDL Cointegration model (1, 0, 0, 1, 0, 0, 1, 1, 1, 1).

4. Conclusion

This study shows that there is a cointegration relationship between the unemployment rate and certain economic variables related to the economic reforms undertaken in Tunisia since the late 1980s. These variables include the level of growth, wage inequality, poverty, political stability, wage inflation, job demand and supply, and the number of terrorist attacks.

During this same period, the characteristics of the labor market in Tunisia have remained worrisome: the upward trend in the labor force since the early 1980s has caused strong pressure on labor supply. However, the labor force, which is growing faster than

population growth, is marked by a significant predominance of the youth fringe compared to other categories of the population.

In order to combat the phenomenon of unemployment and accelerate job creation, it is necessary to stabilize growth and create investment and, above all, to know how to respond to this phenomenon with innovative strategies. The objective of this research was to know the main determinants of long and short-term unemployment in order to verify the relationship in Tunisia. The estimated ARDL model is an innovative approach to address this issue in the case of Tunisia.

In this framework, the effect of socio-economic variables on the phenomenon of unemployment is captured by taking into account other control variables commonly used in the empirical literature whose influence improves the results.

In fact, in the short term, we have found that inflation, the presidential turnover rate, inflation, poverty and the Gini index have a positive and significant effect on the labor market. In addition, the increase in vulnerable jobs, terrorist attacks, job applications and the 1% growth in the unemployment rate accelerate the phenomenon of unemployment in the short and long term.

And in the long term, there is a significant relationship between unemployment and terrorism as a result of effective economic policies that would justify these results. From a normative point of view, terrorist attacks can influence the state to pursue growth stabilization investment strategies in order to increase the level of employment and reduce long-term unemployment in Tunisia.

Therefore, the country's growth level must be increased by stabilizing policy and controlling governance to show the effectiveness of the results of this study, the aim of which is to reduce the unemployment rate and improve the country's economic conditions.

Moreover, in view of the results found in this research, recommendations can be made to the country's political authorities. On the one hand, investments are a channel for transmitting the effects of job creation to the market. Thus, the labor market can be stabilized in the long term through investment by implementing realistic economic policies that are time-bound to encourage the state to create vacancies for the unemployed. On the other hand, fighting and monitoring the political stability of the country leads to effective economic policies over time that encourage economic openness by imposing good governance to fight corruption.

References

Abdelkafi.I., (2018). “The Relationship Between Public Debt, Economic Growth, and Monetary Policy: Empirical Evidence from Tunisia”. Journal of Knowledge Economy, 9 ,1154-1167.

Aghion. P., Howitt. P., (1994). “Growth and unemployement”. Review of economic studies in 61.

Aglietta. M., (1984). “Metamorphore et la société salariale”. Edition Calman Levy paris

Aglietta. M., (1978). “Recherche d’emploi et chômage volontaire” Revue économique n°1 Paris.

Akerlof, G.A., W.T. Dickens., Perry , G.L., (2000). “Near rational wage and price setting and the long-run Phillips curve”. Brookings Papers on Economic Activity (1), pp. 1-60

Alimi.k., Chakroun,M., Levieuge,G., (2019). “Diagnosis of Monetary Policy in Tunisia During the Last Decade: a DSGE Model Approach”. Journal of Knowledge Economy, 10,348-364.

Ambler, S., Phaneuf, L., (1989). “Aggregate Disturbances, Dynamic Propagation and the Persistence of Output and Unemployment Fluctuations”. Centre de Recherche sur les Politiques Économiques, cahier no. 3

Andres ,J., Domenech,R., Molinas, C.,(1996). “Macroeconomic Performance and Convergence in OCDE”. Countries European Economic Review 40 1683-1704.

Assaad, R., Boughzala, M., (2018). The Tunisian labor market in an era of transition”. Oxford, UK: Oxford University Press.

Baccouche, N., (2016). “Economic and social rights and the Tunisian Constitution. The constitution of Tunisia”. New York: United Nations Development Programme Arab States.

Baillie, R.T., Cho, D., (2014). “Time variation in the standard forward premium regression: Some new models and tests”. J. Empir. Financ. 29, 52–63.

Barro, R., (1988). “The natural rate theory reconsidered: The persistence of unemployment.” American Economic Review 78: 32–37.

Barro, R-J., Sala-i-Martin, X., (1995). “Technological Diffusion, Convergence, and Growth” NBER Working Paper No. 5151 Issued in June.

Bellakhdhar, A., (2019). “L’accumulation du capital humain : modèle théorique et évaluation dans le cas de la Tunisie. Région et Développement n° 49-2019

Blanchard, O.J., Summers, L.H., (1986). “Hysteresis and the European unemployment problem”. In: NBER Macroeconomics Annual, Vol. 1. MIT Press, Cambridge, MA.

Blanchard, O-J., (1983). “Price Asynchronization and Price Level Inertia. dans R. Dornbusch et M.H. Simonsen (eds.) Inflation, Debt and Indexation”. Cambridge, MIT Press, 3-24

Blanchard, O.J., Summers, L.H., (1987). Hysteresis in unemployment”. Eur. Econ. Rev. 31, 288–295.

Bleaney, M., Gemmell, N., Kneller, R., (2001). “Testing the endogenous growth model: public expenditure, taxation, and growth over the long run”. Canadian Journal of economics, vol. 34, issue 1, 36-57

Cancelo, J.R., (2007). “Cyclical asymmetries in unemployment rates: international evidence”. Int. Adv. Econ. Res. 13, 334–346.

Caporale, G.M., Gil-Alana, L.A., (2007). “Nonlinearities and fractional integration in the US unemployment rate”. Oxf. Bull. Econ. Stat. 69, 521–544.

Carrion-i-Silvestre, J.L., Del Barrio-Castro, T., López-Bazo, E., (2005). “Breaking the panels: an application to the GDP per capita”. Econ. J. 8, 159–175.

Chang, M.-J., Su, C.-Y., (2014). “Hysteresis versus natural rate in Taiwan’s unemployment: Evidence from the educational attainment categories”. Economic Modelling, 43, 293–304.

Cho, D., Rho, S., (2019). “Time variation in the persistence of unemployment over the past century”. Economics Letters, 182, 19–22.

Coe, D.T., Gagliardi, F., (1985). “Nominal Wage Détermination in Ten OECD Economies”, OCDE, cahier no. 19

Cross, R., (1987). “Hysteresis and instability in the natural rate of unemployment”, Scandinavian Journal of Economics 89: 71–89.

Dami, H., (2015). “Marché de travail et hystéresis du chômage en Tunisie”. Centre de publication universitaire Tunis 2015.

El-Haddad, A., (2020). “Redefining the social contract in the wake of the Arab Spring: The experiences of Egypt, Morocco and Tunisia ”.World Development 127

Ellul, J., (2003). La Pensée marxiste.

Fischer, S., (1977). “Long-Term Contracts, Rational Expectations, and the Optimal Money Supply RuIe”. Journal of Political Economy, 85, 191-206

García ,J-C- T García., Hernández, E-C-R., Bolívar, H-R.,(2017). “Analysis of the hysteresis of unemployment in Mexico in the face of macroeconomic shocks”. Contaduria y Administracion. Volume 62, Issue 4October–December. Pages 1249-1269

Ghoshray, A., Stamatogiannis, M.P., (2015). “Centurial evidence of breaks in the persistence of unemployment”. Econom. Lett. 129, 74–76.

Giraitis, L., Kapetanios, G., Yates, T., (2014). “Inference on stochastic time-varying coefficient models.” J. Econometrics 179, 46–65.

Gordon, RJ., (1985). “Understanding Inflation in the 1980's”, Brookings Papers on Economie Activity, 1, 263-99

Grubb, D., Layard, R., Symons, J., (1984). “Wages, Unemployment and Incomes Policy” dans M. Emerson (éd.) Europe's Stagflation, Oxford University Pres

Hegelund,E., Taalbi,J., (2022). “What derterminesunemployment in the long run? Based spectrum regression on ten countries 1913-2016. Structural Change and Economic Dynamics. Volume 64.

Keynes, J-M., (1936). “Théorie générale de l'emploi, de l'intérêt et de la monnaie”. éd. Payot, 1998

Kienzler, D., (2012). “Cyclical Long-term Unemployment, Skill Loss, and Monetary Policy”. School of Finance Working Paper Series, 12/5.

Kolsrud, J., Landais, C., Nilsson, P., and Spinnewijn, J., (2018). “The Optimal Timing of Unemployment Benefits: Theory and Evidence from Sweden”. American Economic Review, 108(4–5), 985–1033.

Landais, C., Michaillat P., and Saez, E., (2018). “A Macroeconomic Approach to Optimal Unemployment Insurance: Theory,” American Economic Journal: Economic Policy, 10(2), 152– 181.

Lindbeck, A., D, Snower., (1989). “The Insider-Outsider Theory of Employment and Unemployment”, Cambridge, Mass., MIT Press

Lucas R-E., Rapping, L., (1969). “Real Wages, Employment, and Inflation”. Journal of Political Economy, vol. 77, 721-754.

Malinvaud E., (1977). “The Theory of Unemployment Reconsidered, New York, Basil Blackwell”.

Mcdonald, L-M., Solow, R-R. (1981). “Wage Bargaining and Employment”. American Economie Review, december, 896-908

Mednik, M., Rodriguez, C.M., Ruprah, I.J.,(2012). “Hysteresis in unemployment: evidence from Latin America”. J. Int. Dev. 24, 448–466.

Mekki, N., (2019). “The political crisis in Tunisia: Is it a consequence of the semipresidential arrangement? ” ConstitutionNet. Available online at: http://constitutionnet.org/news/political-crisis-tunisia-it-consequence-semipresidential-arrangement [Accessed 9 July 2019].

Meloni,W-P., Romaniello,D., Stirati,A., (2022). Inflation and the NAIRU : Assesing the rôle of long-term unemployment as a cause of hysteresis. Economic modelling, Volume 113.

Newell, A., Symons, J., (1985). “Wages and Unemployment in the OECD Countries”. LSE, cahier no. 215.

Paresh, K-N., (2005) “The saving and investment nexus for China: evidence from cointegration tests”.Applied Economics, 37:17, 1979-1990

Peel, D.A., Speight, A.E.H., (2000). “Threshold nonlinearities in unemployment rates: further evidence for the UK and G3 economies”. Appl. Econ. 32, 705–715.

Pesaran, M-H., Shin,Y., (1997). “Testing for Unit Roots in Heterogeneous Panels”. Journal of Econometrics 115 (revise version of 1997’s work), 53-74.

Pesaran, M-H., Shin, Y and Smith, R. J., (2001). “Bounds testing approaches to the analysis of level relationships”. Journal of Applied Econometrics, vol. 16, pp. 289–326, May.

Phaneuf, L., (1987a). “Can Contract-based Models Explain Business Cycles?. Centre de Recherche et Développement en Économique”, cahier no. 1987

Phelps, E.S., (1968). “Money-wage dynamics and labor-market equilibrium”. J. Political Econ. 76, 678–711.

Phelps, E., (1972). “Inflation Theory and Unemployment Policy”. Norton.

Phelps, E-S., (1967). “ Phillips Curves, Expectations of Inflation, and Optimal Unemployment Over Time”. Economica, août, 254-81

Phillips, A-W.,(1958). “The relationship between unemployment and the rate of change of money wages in the UK, 1861-1957”. Economica, Novembre, 283-299

Rodgers, W-M., (2008). “African American and White Differences in the Impacts of Monetary Policy on the Duration of Unemployment”. American Economic Review, 98 (2): 382-86.

Rueff, J. (1976). “La fin de l’ère keynésienne”. Le Monde, 19 et 20/21 février 1976.

Rueff, J. (1951). “Nouvelles discussions sur le chômage, les salaires et les prix”. Revue d’Économie Politique, 61, 761-91.

Rueff J., (1947). “Les Erreurs de la théorie générale de Lord Keynes”. Revue d'Économie Politique, 57, janvier-février, p. 5-33 ; version anglaise :The Fallacies of Lord KeynesGeneral Theory”. The Quarterly Journal of Economics, 61, mai, p. 353-367.

Rueff J., (1931). “L’Assurance-Chômage : Cause du chômage permanent”. Revue d’Économie Politique, 45, Mars-Avril, 211-251

Rueff J., (1925). “Les variations du chômage en Angleterre”, Revue Politique et Parlementaire, 32, Décembre 425-437.

Sauvy, A., (1984). “ Le travail noir et l'économie de demain” – Paris: Calmann-Lévy, 304 p.

Sauvy, A., (1980). “La machine et le chômage : les progrès techniques et l'emploi” – Paris : Dunod/Bordas, 320 p.

Sauvy, A., (1976). “L'Économie du diable. Chômage et inflation” – Paris : Calmann-Lévy, 247 p

Stirati, A., Melonie,W-P., (2021). “Unemployment and the wage share: a long-run exploration for major mature economies”. Structural Change and Economic Dynamics. Volume 56.

Singleton, C., (2018). “Long-Term Unemployment and the Great Recession: Evidence from UK Stocks and Flows”. Scottish Journal of Political Economy, Vol. 65, No. 2, pages 105-126.

Srinivasan, N., Mitra, P., (2012). “Hysteresis in unemployment: Fact or fiction? ” Econom. Lett. 115, 419–422.

Vital,T., Morais,D., De Souza,M and Faciroli,J, (2020) "Unemployment, poverty and police performance: an ARDL analysis of crime in São Paulo", Economics Bulletin, Vol. 40 No. 1 pp. 128-139

Vichet,S, (2018) "Unemployment duration and educational mismatches: An empirical investigation among graduates in Cambodia.", Economics Bulletin, Vol. 38 No. 3 pp. 1554-1565

Wulwick, N., Mack, P. (1990). “A Kernel regression of Phillips data”. The Jerome Levy Economic Institute, Working Paper 40.

Zamanzadeh, A., Chan, M-K., Ehsani, Ali., M., Ganjali..(2020). “Unemployment duration, Fiscal and monetary policies, and the output gap: How do the quantile relationships look like?”, Economic Modelling, volume 91, september2020, Pages 613-632