TESTING HYSTERESIS IN A PHILLIPS-TYPE AGGREGATE WAGE EQUATION: THE CASE OF GREECE (1960-1999)*

By

Yannis Panagopoulos
Athens Stock Exchange,Training Center &
Hellenic Telecommunications Organization (O.T.E.)

Abstract

The main aim of this paper is the examination of the existence of the hysteresis effect in the Greek labour market, for a prolonged period of time (1960-1999). Therefore, alternative specifications of the hysteresis effect have been implemented into a Phillips -type aggregate wage equation of the Greek economy. The results favour the assumption that, at least for the examined specifications, hysteresis finds no statistical support. However, outside the strict aggregate wage equation framework there is some evidence of hysteresis (J.E.L. Classification: *J 41).*

Keywords: *Hysteresis, Phillips curve.*

1. The Hysteresis Theoretical Framework

The hysteresis phenomenon, in aggregate or disaggregate labour markets, is considered a very crucial subject in the labour economics literature for more than 10 years. In this paper we try to examine its existence in the Greek economy using alternative specifications into a Phillips-type aggregate wage equation. In more detail, in this section, three different theoretical approaches regarding hysteresis are presented. In section 2, different speci- fications of hysteresis variables in a Phillips-type aggregate wage equation are incorporated. The evolution of the unemployment rate in Greece is discussed in section 3. The bargaining process in Greece is presented in

section 4 along with the two Incomes Policies which were implemented between 1975 and 1989. The empirical results of the different aggregate wage specifications are discussed in section 5. At the same section, alternative ways for testing hysteresis outside the aggregate wage equation framework are also presented. Concluding comments concerning the existence of hysteresis in the Greek economy are presented in section 6.

According to Friedman (1968), there is a unique level of unemployment (often called the "natural level of unemployment" - N.R.U.) which corresponds to a vertical long-run Phillips curve and is defined by some exogenous supply-side factors . The existence and the stability of this natural level of unemployment (and, as a consequence, the existence of a vertical long-run Phillips curve) is actually challenged when the level of unemployment is considered to be closely related to particular specifications of its past values. This phenomenon is often called "hysteresis" and when it exists it allows for active demand managed policies.

As Gordon (1988) reports, there are three different theories that can explain the hysteresis phenomenon: The "insiders - outsiders" theory , the "human capital" theory and the "physical capital" theory.

The *"insiders - outsiders"* theory was introduced by Blanchard and Summers (1986). According to this theory, insiders of trade unions play the main role in the bargaining process and no role is attributed to the outsiders. So, employment and wages are negotiated mainly for "insiders" with no strong intention to employ more "outsiders" when the economic situation would allow it. More specifically if, for example, an adverse shock appears *"which reduces employment, some workers lose their insider status and the new smaller group of insiders sets the wage so as to maintain this new lower level of employment. Employment and unemployment show no tendency to return to their pre-shock value, but are instead determined by the history of shocks"* (Blanchard and Summers,1986). Similar to this explanation of hysteresis Franz (1990) says: *"adverse shocks which raise unemployment reduce the number of insiders. The new, smaller group of insiders then forms the basis of the next wage negotiations. The new, larger group of outsiders has no influence on the bargaining process. Rather, wages are set so as to maintain the new, lower level of employment. "* In this sense employment/unemployment develops a random walk tendency which does not allow unemployment to return to its long-run equilibrium position.

Alternatively hysteresis can be linked with the " *human capital"* theory. According to this theory, workers who are unemployed for a long time, usually due to an economic recession, lose the opportunity to maintain and update their skills by working. The results are presented by Blanchard and Summers (1986) "... *the atrophy of skills may combine with disaffection from the labour force associated with the inability to find a job to reduce the effective supply of labour".* Moreover another effect is *"that in a high-unemployment environment, it will be difficult for reliable and able workers to signal their quality by holding jobs and being promoted. The resulting inefficiencies in sorting workers may reduce the overall demand of labour".* This last point is directly related with the efficiency - wage theory of Lindbeck and Snower (1987), where firms are not able to employ "outsiders" (unemployed people) since these people cannot "signal" their quality (in other words their productivity). In short, according to the " human capital" theory we have distorting effects in the overall demand and supply of labour.

Finally, another explanation for the existence of hysteresis can be the *"physical capital"* theory. In the previous two cases it was assumed that hysteresis was the product of some adverse supply shock. In this case the assumption is that hysteresis is the outcome of some adverse demand shock. More specifically, as Sachs (1986) says, if the aggregate demand of goods is substantially reduced, this will negatively affect investments and the capital stock used and consequently labour demand and employment. So as investment decreases, capital stock also gets reduced and therefore the economy ends up with an increased "natural" level of unemployment. As Franz (1990) adds, paraphrasing Klundert and van Schaik's (1989) inferences on the issue: *"This decrease of the capital stock gives rise to unemployment which may turn out to be persistent because firms cannot suddenly be reopened and begin production even product demand increases, i.e. the model exhibits hysteresis. "*

In the following section we incorporate different specifications of the hysteresis variable in a Phillips-type aggrerate wage equation.

2. Incorporating Alternative Hysteresis Specifications in a Phillips Curve

According to Coe (1985) analysis, a Phillips-type aggregate wage equation has the following form:

$$W_t = a_o + a_1P^e_t - a_2 (U - U^*)_t + a_3Z_t \qquad (1)$$

or

$$W_t = a_o + a_1P^e_t - a_{22}U_t + a_{23}U^*_t + a_3Z_t \qquad (1a)$$

with $a_{23} = a_{22} = a_2$

where: W stands for the nominal wage changes, P^e stands for the expected price changes, U and U* stand for the actual and natural unemployment respectively and Z stands for the productivity growth and/or other exogenous variables.

The first way of testing the existence of hysteresis in an aggregate wage model was presented in Coe's (1988) paper. Applying Coe's methodology, unemployment can be decomposed into two parts, the long-term and the short-term one and expressed as follows:

$$U_t = UL + US \qquad (2)$$

where, UL stands for the long-term unemployment and US stands for the short-term unemployment.

In addition Coe sets $U^*t = UL$ (defining indirectly UL as a kind of effective natural level of unemployment). Substituting U*t and Ut in equation (1a) we derive the following model:

$$W_t = a_o + a_1P^e_t + a_4UL - a_{22}US + a_3Z_t \qquad (3)$$

with $a_4 = a_{23} - a_{22}$

"If long-term and short-term unemployment have the same impact on wage growth then the relevant coefficients will be the same". On the other hand *"If the long-term unemployed have no impact on wage growth, as in the insider-outsider model, then the coefficient on UL would be zero "* (Coe, 1988). In our view, the first case describes an unemployment persistence effect and the second an hysteresis effect. Moreover, if the second case is verified then the indirect hypothesis of a vertical long-run Phillips curve is also rejected.

An alternative way for testing the existence of hysteresis effect is given by Setterfield (1993) *"...hysteresis exists if U^*_t depends on the past history of unemployment, as well as other microeconomic variables captured by the vector Z_{t}-"*- Hence, we can set that:

$$U^*_t = \eta \ U_{t-i} + Z \ , \tag{4}$$

Substituting equation (4) into the initial aggregate wage equation (1) we end up with the following equation:

$$W_t = a_0 + a_1 P^e_t - b_1 U_t + b_2 \Delta U_t + b_3 Z_t \tag{5}$$

with $b_1 = a_2 (1 - \eta)$

$\quad b_2 = a_2 \eta$

$\quad b_3 = a_3 + a_2$

Full hysteresis exists when $\eta = 1$ (and therefore $b_1 = 0$), whereas in the case where $\eta < 1$ we talk about "unemployment persistence". As a consequence, the first case implies that the hypothesis of a vertical long-run Phillips curve is rejected and the second "allows" for the opposite. In econometric terms, if hysteresis exists then U_t variable will be statistically insignificant and only ΔU_t will be significant.

The other alternative way of testing the existence of hysteresis is by adopting the Blanchard and Summers (1986) methodology. According to this, we have the following aggregate wage and employment equations:

$$W_t = EP_t + \alpha \ [-(1-\gamma) \ N_t{}^* + (s-\gamma) \ N_{t-1} + Ee_t] + u_t \tag{6a}$$

$$N_t = (1-\gamma) \ N_t{}^* + \gamma \ N_{t-1} + [e - Ee_t + (1 - s) \ b \ (P_t - EP_t - u_t)] \tag{6b}$$

$[\text{with } \alpha = 1/(b \ (1 - s))]$

where: W stands for the nominal wage level, N and N* stand for the actual and the desired employment level respectively, EP stands for the expected price level and Ee stands for expected productivity.

Following Blanchard and Summers arguments, equation 6a cannot be estimated as it stands, because expected productivity (Ee) is likely to be

correlated with past productivity and thus with past employment. Therefore they derive a reduced form wage equation by assuming that e follows a random walk (Ee = e - 1) and moreover, by lagging and expressing their labour demand equation as a function of e - 1. Substituting it in 6a yields:

$$W_t - W_{t-1} = A + (EP_t - P_{t-1}) + \alpha [(1 + s-\gamma) N_{t-1} - s N_{t-2}] + u_t \qquad (6c)$$

$$(\text{with } A = -\alpha (1-\gamma) N_t^*)$$

In a simplified algebraic form, we can express the reduced wage equation 6c with the following alternative model (often called insiders - outsiders/ hysteresis wage model):

$$W_t = a_0 + a_1 P_t^e + \beta_1 N_{t-1} + \beta_2 N_{t-2} + a_3 Z_t \qquad (7)$$

expecting $\beta_1 > 0$ and $\beta_2 < 0$.

If $\beta_1 = -\beta_2$ in equation 7, then hysteresis exists in the examined economy and therefore the consequential hypothesis of a vertical long-run Phillips curve is also rejected.

The incorporation of some particular employment or unemployment variable in an aggregate wage equation was linked with some of the explanatory theories we analysed in section 1. For instance, the incorporation of two lagged employment variables, in an aggregate wage model, is usually linked with the insider - outsider theory and wage models. In addition, the decomposition of the unemployment term in two different variables (the long-term and the short-term one) has been linked with the "human capital" and the efficiency - wage theory. However, it is also acceptable to incorporate, for instance, a decomposed proxy of unemployment into an insiders - outsiders wage model.

Consequently, what we will only do here is simply to implement the different "proxies" of hysteresis in an aggregate wage equation for tracing, at least, whether such a problem exists in the Greek economy. Besides, for the labour market under study, decomposed data regarding unemployment (long-term and short-term unemployed people) is not available. As a consequence, even if hysteresis exists, we cannot actually attribute it to a particular theoretical framework.

Before we proceed to the empirical part, it is worthwhile mentioning that the incorporation of different hysteresis "proxies" is not the only way to test the existence of a natural level of unemployment in the economy. Another indirect way, proposed by Gordon (1988), is to test the homogeneity between wages and prices in equation 1. In other words, if the coefficient a_1 1 in equation 1, the existence of a vertical long-run Phillips curve and consequently of a particular level of unemployment, "the natural one", can be challenged. Moreover, for such an indirect examination regarding the existence of a natural level of unemployment, different moving average specifications for price expectations variable (P^e_t) are also required (see, for instance, Coe and Gagliardi (1985)).

3. The Evolution of Unemployment in Greece

The unemployment rate in Greece can actually be divided in three major periods: The period of medium level of unemployment (the 60's period), the period of low unemployment (the 70's period) and the period of high unemployment (which starts from early 80's and continuous during 90's).

The first major period, of medium unemployment rate (1961-1969), was characterised by a 5% average level of unemployment. The 60's were actually linked with the reconstruction of the Greek industry. The larger amount of investments was basically "moved" towards the capital intensive sectors. In the second major period (1972-1979), the Greek economy had an average unemployment rate of 2%. This lower level of unemployment can mainly be attributed to the labour intensive investments of that period in comparison to the capital intensive investments of the 60's. The 70's decade was also related to the expansion of the (public) services sector which was considered as labour intensive.

In the 1980 - 1983 period, unemployment rate accelerated. This can be attributed to two factors: The almost nil percent (0%) increase of the real GDP and the accelerating entrance (participation) of women in the labour markets. The total labour force "increased considerably" from 3,375 million people in 1979 to 3,842 million people in 1983 with, as mentioned before, no real GDP increase.

From 1984 to 1991 Greece entered the third period of high unemployment level, fluctuating between 7% and 8%. In this period the average increase of the real GDP was 2.1%, considerably smaller to the almost 5 % average increase of the 70's. The problem of unemployment worsens after 1991 and

in 1999 exceeded **11,7%,** despite the improvement on the average real GDP (2,35%) between 1992 and 1999. This substantial increase of unemployment is often rendered to the following factors: The inflow of immigrants of Greek origin from the former C.I.S. countries plus the economic immigrants from the developing countries. Finally, the important technological improvements which, due to insider-outsider effect, were not beneficiary to the entire Greek labour force.
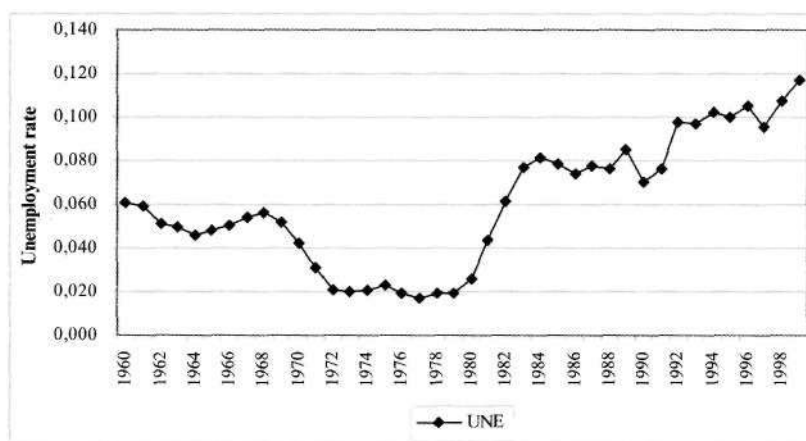

FIGURE 1. The unemployment rate in Greece.

4. The Bargaining Process and the Incomes Policy in Greece

The bargaining process in Greece can be divided in two different time periods: The periods before and after the collapse of the dictatorship (1974). More specifically, the end of the dictatorship is characterised as a turning point for the way nominal wages are settled between employers and employees. As Alogoskoufis (1995) reports *"Until the end of the dictatorship, the GSEE* (Confederation of Greek Workers) *and the labour movement remained firmly under government control. Strikes were banned during the dictatorship."* But even after 1974 the bargaining process was not without government intervention. This was, in a sense, supported by the centralised form of the bargaining process in Greece. According to OECD (1996) economic surveys, the Greek bargaining system ...*is relatively centralised as the negotiations for minimum wages, which are determined by the national collective agreement, set the tone for the narrower collective agreements, and these negotiations are undertaken with representatives from each of the two social partners (labour and employers)* .

The Incomes Policies can also be divided, following Ioannou (1992) methodology, in two: The norm-based and the partial indexation policy.

The norm-based Incomes Policy was applied by the Greek government during the period 1975-1981. The basic concept of such Incomes Policy was given by Ioannou (1992): *"The government announced, before the annual bargaining round, norm or guideline for nominal wage increases in two semestral segments"*. In other words, a governmental intervention guided the bargaining process.

As regards to the partial indexation policy, Demekas and Kontolemis (1996) stated that *"in 1982, the Socialist government legislated an automatic wage indexation mechanism (ATA). This was temporarily revoked during the 1985-86 stabilization program, when wages were frozen, and was finally abolished in 1990. Since then, most collective agreements have included some form of ex post indexation in the form of catch-up clauses (increases awarded after the fact if inflation exceeded a certain level foreseen in the agreement".*

5. The Econometric Methodology, Estimated Models and Results

Methodology and Estimated Models

As indicated at section 2, there are three alternative wage models which incorporate different formulations of the hysteresis effect: Equations 3, 5 and 7. Equation 3, however, cannot be estimated for the Greek economy because, as mentioned in section 2, data regarding the long-term and the short-term unemployed people is not available. Greece only recently has started to collect this kind of data. Nevertheless, this could be the most precise way for testing hysteresis in such an aggregate wage model approach. As a result, equations 5 and 7 are the remaining aggregate wage models to be estimated.

Four different versions of the aggregate wage equations 5 and 7 are presented next. These four models are going to be actually tested and presented at Table 1. They are basically differentiated on whether we use employment or unemployment variables as explanatory terms regarding nominal wage growth and whether these terms are tested on logs form or not (in order to take into consideration any non-linear effects of unemployment variable). More specifically:

$$\Delta W_t/W_{t-1} = a_0 + a_1 \Delta P_t^e - a_2 U_{t-1} + a_3 \Delta U_{t-1} + a_4 \Delta Q_{t-1}/Q_{t-2} + a_5 \ IP1 + a_6 \ IP2 + e_{1t} \tag{8a}$$

$$\Delta W_t / W_{t-1} = a_o + a_1 \Delta P^e_t + c_2 Empl_{t-1} - c_3 Empl_{t-2} + a_4 \Delta Q_{t-1}/Q_{t-2} + a_5 \text{ IP1} + a_6 \text{ IP2} + e_{2t} \qquad (8b)$$

$$\Delta W_t / W_{t-1} = a_o + a_1 \Delta P^e_t - \beta_2 \log(U)_{t-1} + \beta_3 \Delta \log(U)_{t-2} + a_4 \Delta Q_{t-1}/Q_{t-2} + a_5 \text{ IP1} + a_6 \text{ IP2} + e_{3t} \qquad (8c)$$

$$\Delta \log(W_t) = b_o + b_1 \Delta \log(P_{t-1}) + b_2 \log(Empl)_{t-1} - b_3 \log(Empl)_{t-2} + a_4 \Delta \log(Q_{t-1}) + a_5 \text{ IP1} + a_6 \text{ IP2} + e_{4t} \qquad (8d)$$

(in equations 8a-c we assume that $\Delta P^e_t = \Delta PM = P_{t-1} - P_{t-2}/P_{t-2}$)

The variables we used are: The consumer price index (P), the average nominal wages in the non-agricultural economy (W, in index form), the total employment (Empl), the unemployment rate (U, unemployed people / total labour force), the productivity (Q1970=loo, GDPi97o=ioo / total employment). For all indices, 1970 = 100. In addition IP1 and IP2 variables represent the two kind of Incomes Policies applied in 1975-1981 and 1982-1984, 1987-1989 respectively.

Annual data figures are used covering the time period 1960 - 1999. The source of the data is the National Accounts and the National Statistical Service of Greece. In addition, it must be stated here, that all explanatory variables of the money wage growth have been lagged once. This restriction was considered necessary because no wage settlement is agreed, during the bargaining process, using information of the current time period. In other words, using annual data, it is assumed that the nominal wage increases are decided on the basis of information of the previous year concerning unemployment, employment, inflation and productivity growth. Moreover, equations 8a-d, will be tested separately nwith the inclusion of a lagged dependent variable (nominal wage interia). This will help us to see the importance employees render on the previous year nominal wage increases.

Results

The empirical results, regarding aggregate wage equations 8a-d, are presented in Table 1.

Before we comment the results of Table 1 we should report that only wage models 2a,b & 4b did not suffer from any autocorrelation problems. This gives us a clear indication that these are the most reliable aggregate wage models. However, we will proceed commenting all wage models of Table 1.

TABLE 1. The Phillips-type Aggregate Wage Equations with I.P.

Expl. varbs.	ΔWAGESt (=ΔWt/Wt-1) (1a)	(1b)	(2a)	(2b)	(3a)	(3b)	Expl. varbs. (logs)	ΔLWt (=in logs) (4a)	(4b)
Constant	0.16 (4.86)	0.14 (4.18)	0.39 (3.46)	0.35 (3.31)	-0.04 (-0.97)	-0.06 (-1.39)	Constant	0.41 (3.41)	0.35 (3.11)
$\Delta W_{t-1}/W_{t-2}$	-	0.42 (2.41)	-	0.43 (2.64)	-	0.44 (2.60)	ΔLW_{t-1}	-	0.45 (2.76)
$\Delta P_{t-1}/P_{t-2}$	0.08 (0.63)	0.06 (0.55)	-0.02 (-0.14)	-0.04 (-0.37)	0.07 (0.55)	0.06 (0.55)	ΔLP_{t-1}	-0.008 (-0.04)	-0.04 (-0.33)
U_{t-1} [(3): LU_{t-1}]	-0.93 (-2.69)	-0.86 (-2.67)	-	-	-0.05 (-2.94)	-0.05 (-3.08)	U_{t-1}	-	-
ΔU_{t-1} [(3): ΔLU_{t-1}]	0.62 (0.70)	0.41 (0.55)	-	-	0.03 (0.72)	0.02 (0.5)	ΔU_{t-1}	-	-
$Empl_{t-1}$	-	-	0.33 (-2.17)	0.34 (2.43)			$LEmpl_{t-1}$	0.93 (2.01)	0.97 (2.31)
$Empl_{t-2}$	-	-	-0.42 (-2.66)	-0.42 (-2.91)			$LEmpl_{t-2}$	-1.21 (2.53)	-1.21 (-2.81)
$\Delta Q_{t-1}/Q_{t-2}$	0.17 (1.12)	-0.09 (-0.50)	0.33 (2.28)	0.07 (0.42)	0.17 (1.13)	-0.11 (-0.65)	ΔLQ_{t-1}	0.28 (2.20)	0.05 (0.34)
IP1 (1975-81)	0.02 (1.05)	0.008 (0.31)	0.04 (2.26)	0.02 (1.24)	0.01 (0.34)	-0.01 (-0.41)	IP1 (1975-81)	0.03 (2.17)	0.02 (1.17)
IP2 (1982-84)	0.06 (2.88)	0.05 (2.76)	0.06 (3.32)	0.05 (3.16)	0.06 (3.17)	0.05 (3.04)	IP2 (1982-84)	0.05 (3.29)	0.04 (3.15)
1987-89							1987-89		
R^2	0.65	0.71	0.69	0.75	0.66	0.73	R^2	0.69	0.75
D.W.	1.86	2.26	1.75	2.04	1.83	2.28	D.W.	1.73	2.04
LM(2)	8.76	8.75	7.18	4.88	9.02	10.02	LM(2)	7.44	4.55
LM(3)	8.90	8.76	7.39	7.63	9.02	10.02	LM(3)	7.59	6.98
Normality	0.11	0.33	0.13	0.31	0.63	1.21	Normality	0.17	0.30
RESET(1)	0.93	0.83	0.06	0.03	1.26	0.93	RESET(1)	0.00007	0.07
ARCH (1)	0.008	0.33	0.17	1.70	0.02	0.14	ARCH (1)	0.14	1.33

I.P.: Incomes Policies. LU_{t-1} and $L\Delta U_{t-1}$ variables are in logs in order to take into consideration any non-linear effects of unemployment. Critical value for $X^2(2)=5.99$ and $X^2(3)=7.81$ for 5%. Note: The diagnostics which were implemented are: D.W., which is the Durbin Watson statistic; RESET (1), which is a test for the functional form misspecification [distributed as $X^2(1)$ here]; ARCH(1), which is the test for heteroscedasticity [distributed as $X^2(1)$ here]; LM(3), which is the Lagrange Multiplier test for autocorrelation [distributed as $X^2(3)$ here] and finally the NORMALITY test for the residuals [distributed as $X^2(2)$ here]. Finally, OLS estimation process will be used in all examined cases. All variables in equation (4) are in logs.

From the above results we can infer the following: The *partial indexation policy* (IP2) was significant and had a positive (although small) effect on the nominal wage changes of all models of Table 1. On the other hand, the *norm-based Incomes Policy* (IP1) was significant in the two wage models with the employment variables (model 2a and model 4a, the logged one) . Moreover, *inflation* was insignificant in all cases and away from any homogeneity assumption with respect to aggregate wages. To the contrary, the lagged dependent variable *(nominal wage interia)* was in all cases statistically significant. This implies that employees give attention on their previous year money wage growth and not to inflation. Concerning *productivity,* with the exception of models 2a and 4a, the results did not favour the assumption that it was a significant variable for the determination of money wage growth.

Turning to the *hysteresis effect,* through the different employment and unemployment variable specifications, we can infer the following: In all aggregate wage models where unemployment variables were applied (models 1a,b and 3a,b) only the level and not the change of unemployment was statistically significant. Therefore, without neglecting the autocorrelation problem for some models, hysteresis does not seem to find any statistical support. Furthermore, the aggregate wage models with the two lagged employment variables as explanatory terms (Models 2a,b and 4a,b), favoured the rejection of hysteresis in the Greek labour market. Analytically, although both lagged employment variables were statistically significant it does not seem to have identical coefficients (with opposite signs).

However, we moved a step forward by imposing and testing -on models 2a,b and 4a,b- the restriction that the two lagged employment variables have opposite and similar values (see Table 2). We did so because the employment data of Greece is much more reliable than the unemployment data. In addition, the two coefficients are not arithmetically far away from each other and, with the exception of model 4a, we had no autocorrelation problem on these wage models. However, in all cases the restrictive assumption (of hysteresis) was not favoured against the alternative.

TABLE 2

Wald Test for Hysteresis ($\beta_1 = -\beta_2$)

Aggregate Wage Equation

$W_t = a_o + a_1 P^e_t + \beta_1 N_{t-1} + \beta_2 N_{t-2} + a_3 Z_t +$ (Incomes Policies)

Equation	(2a)	(2b)	(4a)	(4b)
X^2 (1)	7.90	7.83	7.52	7.40

Critical value for X^2 (1) = 3.84 for 5% and = 5.02 for 2.5%.

Although the hysteresis assumption actually failed in all aggregate wage models, an alternative approach regarding its existence in the Greek labour market was further applied. Focusing on unemployment variable exclusively, an Alogoskoufis and Manning (1988) type of second order autoreggresive unemployment model was implemented. More specifically, the following model was tested:

$$U_t = \varphi o + \varphi \iota \ U_{T-1} + \varphi_2 \ U_{t}2 + time + e_t \qquad (9)$$

If $\varphi_1 + \varphi_2 = 1$ in equation 9 then full persistence or hysteresis exist in the examined economy.

TABLE 3

Unemployment Second Order Autoreggresive Model*

$U_t = \varphi_0 + \varphi_1 U_{t-1} + \varphi_2 U_{t-2} + time + e_t$

	φ_0	φ_1	φ_2	time	$\varphi_1 + \varphi_2$	R^2	LM(3)
Coefficient	-	1.32	-0.31	-	0.99	0.93	1.03
t-ratios	(8.26)	(-1.89)					
Coefficient	0.001	1.31	-0. 33	-	0.98	0.93	1.29
t-ratios	(0.64)	(8.13)	(-1.96)				
Coefficient	-0.0003	1.16	-0. 27	0.0003	0.89	0.94	0.55
t-ratios	(-0.12)	(7.06)	(-1.73)	(2.41)			

*Alogoskoufis & Manning type of Hysteresis tests

Wald Test for Full Persistence or Hysteresis	$\varphi_1 + \varphi_2 = 1$	φ_0	time
$X^2 (1)$	0.41	No	No
$X^2 (1)$	0.09	Yes	No
$X^2 (1)$	3.46	Yes	Yes

Critical value for $X^2 (3) = 7.81$ for 5% and $= 9.35$ for 2.5%.
Critical value for $X^2 (1) = 3.84$ for 5% and $= 5.02$ for 2.5%.

To the contrary of the previous outcomes, the results of Table 3 advocate in favour of full persistence or hysteresis effect in the Greek economy. However, it is important to remind the reader that the unemployment data

concerning the Greek labour market is not so reliable in particular during 60s and 70s.

In favour of hysteresis assumption is also the "verdict" of the unit root tests applied on unemployment at Table 4. In other words, the random walk hypothesis is accepted for the level of unemployment (e.g. U_t is not I(0)). Economically speaking, this implies that the assumption of a "natural level of unemployment" is not rejected. The variable turns out to be I(1).

TABLE 4

Unit Root Tests for Unemployment*

Testing that $U_t \sim I(0)$: $\Delta U_t = \gamma_0 + \gamma_1 U_{t-1} + e_t$

	γ_0	γ_1	LM(4)
Coefficient	0.0007	0.01	-4.41
t-ratios	(0.23)	(0.25)	

Testing that $U_t \sim I(1)$: $\Delta^2 U_t = \gamma_0 + \gamma_1 \Delta U_{t-1} + e_t$

	γ_0	γ_1	LM(4)
Coefficient	0.001	-0.68	1.24
t-ratios	(0.82)	(-4.32)	

*The D.F. & A.D.F. critical value for the one variable case is -3.50 (at 5%)

6. Concluding Comments

In this paper we attempted to trace the existence of hysteresis in the Greek labour market for a prolonged time period (1960-1999). This was performed by implementing alternative specifications of employment and unemployment variables into a Phillips-type aggregate wage equation. From Table 1, all the unrestricted tests on both the employment and unemployment data did not favour the assumption of hysteresis, at least inside the aggregate wage equation framework. Moreover, the Wald restricting test on the wage models with the employment variables advocated against hysteresis existence. This allow us to infer that Phillips curve "is alive and well" in the Greek labour market and still operates as an instrument for economic policy. Finally, money wage interia (the lagged dependent variable) seems to dominate the employees and employers current agreement regarding the money wage growth settlement.

The only evidence of disagreement regarding hysteresis rejection was the second order autoreggresive model for the unemployment variable, which

seems to support rather than reject the full persistence or hysteresis assumption. However, this evidence should be treated with caution due to the problems related with the unemployment data.

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Notes

1. As Jenkinson (1988) explains, the exogenous supply factors which determine the natural level of unemployment (U*) are basically the following: Labour mismatch (MM), trade union power (U^p), benefit replacement ratio (ρ), employers' labour taxes (TL) et.al. In algebraic form we have that: $U^* = f$ (MM, U^p, ρ , T_L).

2. According to Nickell (1987), people who are unemployed for more than 12 months are regarded as long-term unemployed.

3. In mathematical terms: $a_{23} = a_{22}$ in equation 3.

4. Their labour demand equation is: $N_t = sN_{t-i} - (1 - s)b (w - p)t + e_t$. For a more analytical presentation of how we end up with the aggregate wage equation 6c, see section 3.2 of Blanchard and Summers (1986) paper or section IV of Moghadam and Rijckeghem (1994) paper.

5. In this paper we are not testing the homogeneity between wages and prices and its implications for the Greek economy basically for two reasons: First, because the main issue of this paper is the direct examination of the existence of hysteresis and second, for homogeneity test between aggregate wages and prices, quarterly data are needed. However, no such unemployment or/and aggregate wage data are available for such a prolonged time period like the examined one.

6. It is worth mentioning that the employment status of the labour union's insiders is more protected at least in comparison to other European countries. In more detail, from 1983 onwards the number of employees that was permitted to be sacked was limited to 2% of the firm's labour force per month. This proportion is regarded one of the lowest in Western Europe. This regulation, to some extent, "eases" the negotiating position of the employees during the bargaining process.

7. This variable has been produced by dividing the employees total income (the code of this variables at the National Accounts is YELWS) to the total employment. Then this term was transformed in an index form.

8. To the contrary of other countries experience (see, for instance, Watts and Mitchell's incomes policy dummies for Australia), the cumulative outcome of the incomes policies in Greece was a rather positive one for the employees. In other words, they were introduced in order to help rather than to restrain their wage income. It is characteristic that when the partial indexation policy was temporarily abolished in 1985-6 period the employees lost almost 14,3% of their purchasing power the following two years (1986-87). The same happened in 1990-1993 period when the partial indexation policy was permanently abolished (12,5% total purchasing power reduction).

9. Mathematically speaking, with the implementation of the Wald test, we tested the restriction that $\beta_1 = -\beta_2$ on equation 7.

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