



# Unemployment in Greece: Evidence from Greek regions using panel unit root tests



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## ABSTRACT

The purpose of the paper is to examine the nature of Greek regional unemployment. The paper contributes to the literature assessing the stochastic properties of Greek unemployment rate in the context of the Greek regions by relying on various univariate and panel unit root tests. In particular, recently developed and more powerful panel unit-root tests that control for structural breaks, heterogeneity and cross-sectional dependence in the panel are employed. The results show that in all cases, after taking into account the fact that regional unemployment rates in Greece are subject to a structural break, the null hypothesis of a unit root is not rejected, indicating that the Greek regional unemployment series are non-stationary with the presence of a structural break.

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## 1. Introduction

The issue of unemployment clearly is one of the most pressing problems for most countries over the recent decades. Nearly five years after the worst recession that hit OECD countries since the 1930s, most of the concern of economists is that the unemployment rate in a number of OECD countries remains stubbornly high and shows no apparent tendency to return to its natural level. Moreover, recent reports suggest that job creation will remain anaemic in the near term implying tackling high and persistent unemployment and alleviating the human costs of unemployment should be at the top of the political agenda (OECD, 2012).

Even before the global financial crisis, the Greek economy was in the middle of a deep crisis, characterized mainly by large fiscal

deficits, huge debt, a continued erosion of competitiveness and high unemployment rates. The crisis of 2009 amplified these negative effects and accelerated the downturn of the Greek economy (Bank of Greece, 2009). In May 2010, Greece embarked on an ambitious economic adjustment programme to deal with the chronic deficiencies of the economy by restoring sustainable public finances, competitiveness and setting the foundation for solid long-term growth.

The rate of unemployment in Greece almost tripled over the 1980s and 1990s reaching 12.1 percent in 1999 before it started its decline, but remained high for over a decade. Over that period, regional unemployment disparities were diminishing and the behaviour of unemployment has not been uniform across regions. The downward trend in unemployment was reversed after the crisis. The strong fiscal contraction which resulted from the program caused an increase unemployment rate from 11.0% in the first quarter of 2010 to 16.7% in the second quarter of 2011.

The high and highly persistent unemployment rates experienced by many countries and regions in Europe and the US have attracted a significant amount of both theoretical and empirical work and are mainly explained by the hysteresis hypothesis.

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Hysteresis in unemployment implies that cyclical fluctuations have permanent effects on the level of unemployment due to labour market restrictions (Blanchard & Summers, 1986). By contrast, the natural rate of unemployment hypothesis characterizes unemployment as a mean reverting process, so shocks to the series have only temporary effects. These theories can be investigated, by examining the order of integration of the unemployment rate. Level stationarity of unemployment (rejection of the unit root hypothesis) would support the natural rate of unemployment hypothesis while the presence of a unit root would imply that shocks affecting the series have permanent effects supporting the hysteresis hypothesis. In a seminal work, Blanchard and Summers (1986) use conventional unit root tests to examine the impact of hysteresis on unemployment and they provide evidence of non-stationarity of unemployment in European Union (EU) concluding that unemployment exhibits hysteresis, while, they find evidence of stationarity for the U.S.

However, it is well documented in the literature that conventional unit root tests, such the augmented Dickey-Fuller, exhibit very low power when the time span of the data is short. To address this problem, two different approaches are followed in the literature on hysteresis: first, the use of unit-root testing techniques that allow for the presence of structural breaks, such as the tests of Zivot and Andrews (1992), Lee and Strazicich (2003) and the more recent ones of Enders and Lee (2012a, 2012b) that account for smooth structural breaks and, second, the application of panel unit root methods that help increase the power of the tests (Maddala & Wu, 1999; Im, Pesaran, & Shin, 2003; Christopoulos & Leon-Ledesma, 2007; Dreger & Reimers, 2009).

At the same time, most of the analysis is performed under the assumption of cross-sectional independence among regions or countries. However, cross-sectional dependence is an important characteristic in the analysis of macro and regional panel data models (Sarafidis & Wansbeek, 2012). This type of interdependence can reflect global common shocks with heterogeneous impact across countries, such as the oil crises in the 1970s or the recent financial crisis. Alternatively, it can be the result of local spillover effects between countries or regions (Banerjee, Eberhardt, & Reade, 2010). Latest empirical evidence supports the interdependence of regional unemployment in Greece (Lolos & Papapetrou, 2012). Also, the recent and simultaneous increase in unemployment at the national level and across regions in Greece provides evidence of potentially strong cross-sectional dependence, suggesting that panel unit root tests that do not allow for cross-sectional dependence may lead to spurious results.

The two distinct directions on unit root testing have been combined recently in the development of panel unit root tests that allow for the presence of structural breaks and cross-sectional correlation. Im, Lee, and Tieslau (2005) extends the univariate Lagrange Multiplier (LM) unit root test of Lee and Strazicich (2003) to a panel LM test. Recently, Im, Lee, and Tieslau (2010) further extend the panel LM unit root test to allow for the presence of heterogeneous structural breaks in both the intercept and slope of each cross-sectional unit and cross-sectional dependence in the panel.

The purpose of this paper is to examine the nature of Greek unemployment allowing for cross-sectional dependence among Greek regions and for the presence of structural breaks. To our knowledge little work has so far addressed this problem systematically in the context of the Greek regions. Empirical evidence depicts unemployment (at the national level) in Greece as a unit root process whereas in the context of Greek regions the evidence is scarce (Katsimi, 2000; Christopoulos, 2004; Apergis, 2005; Cheng, Wu, Lee, & Chang, 2014). This paper contributes to the literature assessing the stochastic properties of Greek regional unemployment rates using various univariate and panel unit root tests as

well as the recently developed and more powerful panel unit-root tests that allow for structural breaks. For that purpose, we apply the Lagrange Multiplier (LM) panel unit root test of Im et al. (2010) that makes use of a simple transformation in order to obtain a test statistic which is invariant to both the location and the size of breaks in the level or trend of the series in the panel. This test depends only on the number of breaks in the series and, therefore, has significantly greater power than all previous panel tests. In addition, the test corrects for the presence of cross-correlations in the innovations of the panel by applying the cross-sectionally augmented procedure of Pesaran (2007) that is found to perform robustly under various specifications of cross-sectional dependence (Baltagi, Bresson, & Pirotte, 2007). We believe that the findings of our analysis are important as we contribute to the existing literature on regional unemployment behaviour of Greece, a country currently in the middle of a deep crisis and the investigation of unemployment behavior is of paramount importance for policy making. The findings of our analysis might be indicative of other countries sharing similar economic characteristics with Greece, such as some Southern and Eastern European countries.

The remainder of the paper is organized as follows. Section 2 provides a short theoretical and empirical review of the concept and tests for unemployment hysteresis. Section 3 presents some basic characteristics of the Greek labour market. Section 4 discusses the econometric methodology. Section 5 presents the data and reports the empirical results. Finally, in Section 6 concluding remarks are provided.

## 2. Theoretical and empirical evidence

The high levels and strong persistence of unemployment rates in Europe, especially after the first oil shock, have attracted a sufficient number of theoretical and empirical papers focused on understanding the behaviour of unemployment. Various economists suggest that major macroeconomic disturbances, such as a productivity slowdown, the steep rise in oil prices in the 1970s and changes in world interest rates could account for the rise and persistence of unemployment (Roed, 1997).

There are different hypothesis for the dynamics of aggregate unemployment rates. In their seminal work, Friedman (1968) and Phelps (1968) established the natural rate hypothesis which states that the unemployment rate tends to fluctuate around some equilibrium level associated with labour markets in equilibrium. This natural rate depends on fundamentals in the economy, which are considered as exogenous. Unemployment shocks are considered temporary, which implies that unemployment is mean reverting. However, the theory was not able to explain the high and persistent unemployment rates in Europe following the first oil shock.

Phelps (1972) suggested that the natural rate of unemployment may not be unique but path dependent so it could rise as a consequence of negative shocks resulting in prolonged departures from equilibrium unemployment rates. The structuralist hypothesis as suggested by Phelps (1994) and Phelps and Zoega (1998) explains the rise in European unemployment through the adjustment to an underlying equilibrium unemployment rate, which has increased from one time period to another in response to structural factors of the economy. They suggest that several real disturbances in the economy and the ensuing adjustment to them may shift up or tilt the path of unemployment rate (Phelps, 1994). The underlying idea is that unemployment may remain higher because some or all of the driving forces are persisting and non-neutral to the unemployment rate in the long-run and not because the volume of unemployment has some inherent persistence in the sense of

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