# "Unemployment and government expenditure in the Eurozone: a panel data analysis"

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# Unemployment and government expenditure in the Eurozone: a panel data analysis

## Abstract

The paper examines the unemployment-government expenditure relationship in a panel of fifteen Eurozone member-states between 2000 and 2011, to provide new empirical evidence that will help clarify the exact relationship between these two variables. The study performs different unit root, cointegration and causality tests. The results show that: (1) per capita total government spending in current prices was not a part of a cointegrating relationship with unemployment and (2) there is evidence for a one-way causation from unemployment to government expenditure.

**Keywords:** panel unit root cointegratin and causality, Eurozone, unemployment and government expenditure.
**JEL Classification:** H70, C23.

## Introduction

Eurozone has been facing a severe debt crisis that began late in 2009. Several European governments – *i.e.* the governments of Greece, Portugal and Ireland – have accumulated what many consider to be unsustainable levels of government debt. Many investors have developed fears concerning the ability of these governments to meet their debt obligations. This fear was – and still is – reflected on the long-term government bond yields of these governments. At different dates the above three countries shared the same fate. They had to implement austerity measures to restore their fiscal balance, and perform structural reforms to improve competitiveness and growth prospects, in exchange for a multi-billion bailout plan from the other Eurozone countries and the International Monetary Fund (IMF).

In response to the world financial crisis of 2008-2009, many governments around the world launched large-scale fiscal stimulus packages. The American Recovery and Reinvestment Act (ARRA) in the United States and the European Economic Recovery Plan (EERP) in the European Union are the most notable. The effectiveness and the comparison between the expected and the real results, renewed the interest of both the academic and the policy circles. This debate about which is the best way to overcome the European debt crisis (or any crisis in general) mirrors to some extent the – still – unsettled academic debate of stimulus vs. austerity. As Ramey (2011, p. 673) states, "one of the few positive effects of this financial crisis has been the revival of interest in the short-run macroeconomic effects of government spending and tax changes. Before 2008, the topic of stimulus effects of fiscal policy was a backwater compared to research on monetary policy."

Proponents of the stimulus policy keep emphasizing the need to stabilize the level of the economic activity when an economic crisis occurs. They particu-larly emphasize the Keynesian multiplier effect. Their main point is that governments must take action and increase the stimulus funds. If they do not take action, under the burden of large deficits and statutory budget requirements[1], they will have to drastically cut public spending or/and raise taxes, both of which will exacerbate the recession.

From the opposing point of view, opponents contended that the stimulus funds provided by the governments would not have any effect in helping the economic growth rate and thus lowering the unemployment. Some economists, Mitchell (2005) and Riedel (2008), point the adverse mid- and long-term implications of deficit spending, which are an increased public debt and inflation. The main reasons behind the failure of the stimulus funds according to Riedel (2008, p. 1) are:

♦ "The government spending cannot be stimulative because every dollar that government spending 'injects' into the economy must first be taxed or borrowed out of the economy. Rather than create new purchasing power, these policies merely redistribute existing purchasing power."

♦ "Economic growth requires increasing the productivity of American workers. Lower marginal tax rates encourage productivity by increasing incentives to work, save, and invest."

This study mainly focuses on the investigation for evidence of short and long run relationships – of any kind – between unemployment and government expenditure. We also examine our data for evidence of a causal effect between unemployment and government expenditure.

The paper is organized as follows. In section 1, we briefly review some of the existing empirical literature. In section 2, we present our data, our econome-

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[1] The three mentioned countries are in a tougher position. They face both large deficits and –a unique form of- statutory balanced budget requirements, due to their participation in the Stability and Growth Pact (SGP).

tric techniques and the empirical results. The final section concludes this study.

## 1. Literature review

In his study Karras (1993, p. 354) states that "permanent (or persistent) changes in government consumption have a greater impact on output and employment than temporary (or cyclical) changes." In his model, a permanent increase in government consumption, due to the negative wealth effect, will increase the supply of labor as well as the demand for labor too. On the other hand, a not permanent rise of government consumption will result in an increase of only the demand for labor (by improving labor productivity).

Abrams and Wang (2006), applying a Structural Error Correction Model for twenty OECD countries between 1970 and 1999, report that, firstly, the total government consumption as a percentage of GDP does affect the unemployment, and secondly, not all government spending can cause a significant effect on unemployment. Their conclusion is that "…transfers and subsidies significantly affect the steady-state unemployment rate while government expenditures on goods and services play no significant role" (p. 2). Mahdavi and Alanis (2013), gathered US data for 50 State and Local Governments (SLGs) from 1977 to 2006. They find that real per capita public spending had a cointegrating relationship with unemployment, and that government spending had a small depressing effect on unemployment. They also argue that the allocation of government spending seems to play role in lowering unemployment rates and that there is evidence of a two-way causation between government expenditure and unemployment. However, the evidence of a causal effect from government expenditures to unemployment is more consistent than the evidence of the opposite causal direction.

Christopoulos and Tsionas (2002) examine ten European countries between 1961 and 1999. They find that there is a one-way causality relationship from government size to unemployment rate. In a related study, Christopoulos, Loizides and Tsionas (2005) examine the long-run relationship between government size and unemployment for ten European countries between 1961 and 1999. Using panel cointegration analysis for heterogeneous panel data, they support the idea that "…there is unidirectional causality from government size to unemployment rate, and the estimates support a positive equilibrium relationship between the two variables" (p. 1197).

To recapitulate, all studies show that fiscal policy can affect output and therefore unemployment rates. This happens due to the change that output brings in the demand or/and the supply of the labor market. Some studies emphasize that not all categories of government spending have a significant effect on unemployment. The extent of substitution between two variables such as public and private consumption or labor and capital, also have a significant effect on unemployment rates.

## 2. Data and empirical results

The present study examines the relationship between the following two variables:

♦ Unemployment[1]. Our data were in a thousand persons and we just multiply with 1000 to turn it to units (not seasonally adjusted data).

♦ Total general government expenditure[2]. Our data are expressed in Euro per inhabitant, in current prices.

For the sake of brevity, we will name the variable Total general government expenditure as Government Expenditure (GE). The observations are from the 2000-2011 period. We collected the data for fifteen Eurozone countries, which are:

1. Austria.
2. Belgium.
3. Cyprus.
4. Estonia.
5. Finland.
6. France.
7. Germany.
8. Greece.
9. Ireland.
10. Italy.
11. Netherlands.
12. Portugal.
13. Slovakia.
14. Slovenia.
15. Spain.

We use the following equation for the $i$th country in year $t$:

$$u_{it} = a_i + \beta_i ge_{it} + \varepsilon_{it}. \tag{1}$$

Lower case letters stand for natural logarithms, as we have converted our data sample into natural logarithms.

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[1] The data for unemployment were taken from Eurostat, extracted on March 10, 2013, last updated on March 7, 2013. The variable's name in Eurostat website is: *Unemployment by sex and age groups − annual average, 1 000 persons [une_nb_a]*.

[2] The data for total general government expenditure were taken from Eurostat. They were extracted on March 21, 2013, last updated on March 15, 2013. The variable's name in Eurostat website is: *Government revenue, expenditure and main aggregates [gov_a_main], indicator: Total general government expenditure.*

**2.1. Testing for integration (panel unit root tests).** Granger and Newbold (1974), after testing different samples, found out that when the $R^2$ is very high and the DW statistic is very low, accepting the statistical significance of the estimated parameters is false because this significance is created by the fact that the variables are non-stationary. They named this kind of regression a spurious regression. We continue our empirical analysis by testing for the presence of a unit root in the variables of the model, using five different unit root tests. The results of the five different tests are presented in Tables 1 and 2.

The tests are categorized in two groups. Hence, there are two assumptions that can be made for $\rho_i$. First, one can assume that the persistence parameters are common across cross-sections so that $\rho_i = \rho$ for all $i$. The Levin, Lin and Chu (LLC) and Breitung tests employ this assumption. Alternatively, one can allow $\rho_i$ to vary freely across cross-sections. The Im, Pesaran and Shin (IPS), Fisher-ADF and Fisher-PP tests are of this form.

1st team: Tests with common unit root process.

Levin, Lin and Chu (LLC) and Breitung[1] tests assume that there is a common unit root process so that $\rho_i$ is identical across cross-sections. Both tests consider the following basic ADF specification:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij}\Delta y_{it-j} + X_{it}^{'}\delta + e_{it},\qquad(2)$$

where a common $a = \rho - 1$, is assumed. $p_i$ is the lag order for the difference term, and is able to vary across cross-sections. The null and alternative hypotheses for the tests may be written as:

$H_0$: $a = 0$,

$H_1$: $a < 0$.

Under the null hypothesis, there is a unit root, while under the alternative there is no unit root[2].

2nd team: Tests with individual unit root processes.

Alternatively, now we will allow $\rho_i$ to vary freely across cross-sections. The Im, Pesaran and Shin (IPS), Fisher-ADF and Fisher-PP tests are of this form. The main characteristic of these tests is the combination of individual unit root tests to derive a panel-specific result.

*2.1.1. Im, Pesaran, and Shin W-test* (IPS). Im, Pesaran and Shin begin by specifying a separate ADF regression for each cross section:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij}\Delta y_{it-j} + X_{it}^{'}\delta + e_{it}.\qquad(3)$$

The null hypothesis is:

$H_0 : a_i = 0$, for all $i$

with the alternative:

$$H_A : \begin{cases} \alpha_i = 0 & \text{for all } i = 1,...,N_1 \\ a_i < 0 & \text{for all } i = N+1,...,N, \end{cases}$$

where $i$ may be reordered as necessary which may be interpreted as a non-zero fraction of the individual processes is stationary[3].

*2.1.2. Fisher-ADF and PP tests.* An alternative approach to panel unit root tests uses Fisher's (1932) results to derive tests that combine the p-values from individual unit root tests. This idea has been proposed by Maddala and Wu, and by Choi.[4] The null and alternative hypotheses are the same as IPS.

According to the results (for significance level $a = 10\%$ and $a = 5\%$), the null hypothesis of a unit root cannot be rejected in levels (UR and GE), when we have no intercept and no trend. Additionally, the null hypothesis of a unit root can be rejected in first difference (UR and GE), when we have no intercept and no trend. When we include only an intercept, results are mixed. For level UR, we can reject $H_0$ in all tests except PP test. For level GE, two (LLC and PP) out of four tests reject $H_0$. ADF and IPS (firmly) accept the null. For the first differences, for both variables, all tests reject the null. Next, when we include an intercept and a trend, for level UR, we can reject $H_0$ in the LLC test. The other tests accept $H_0$. For level GE, only one (Breitung) out of the five tests accepts $H_0$. The IPS firmly accepts the null and the three remaining tests all reject the null. For the first differences, for UR, four tests reject the null.

Only PP test does not. For GE, four out of five tests reject the null. Only Breitung test accepts it. We proceed, assuming that all the variables are integrated of order one, or $I$ (1).

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[1] Breitung test only tests the version of the equation which includes an intercept and a trend. It does not test the version without an intercept and without a trend or the version with intercept only.
[2] More details for the tests are provided in the original papers.

[3] More details for the tests are provided in the original papers.
[4] More details for the tests are provided in the original papers.

Table 1. Panel unit root test at tevels ($p$-values)[1]

| Unemployment | | | |
|---|---|---|---|
| Tests | No intercept and no trend | Intercept only | Intercept and trend |
| Levin, Lin and Chu [Null: Unit root (assumes common unit root process)] | 0.9852 | 0.0000 | 0.0000 |
| Breitung $t$-stat [Null: Unit root (assumes common unit root process)] | | | 0.2974 |
| ADF − Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 0.9999 | 0.0082 | 0.2253 |
| PP – Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 0.9997 | 0.9524 | 1.0000 |
| Im, Pesaran and Shin $W$-stat [Null: Unit root (assumes individual unit root process)] | | 0.0201 | 0.2129 |
| Government expenditure | | | |
| Tests | No intercept and no trend | Intercept only | Intercept and trend |
| Levin, Lin and Chu [Null: Unit root (assumes common unit root process)] | 1.0000 | 0.0000 | 0.0018 |
| Breitung $t$-stat [Null: Unit root (assumes common unit root process)] | | | 0.9985 |
| ADF − Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 1.0000 | 0.3966 | 0.0066 |
| PP – Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 1.0000 | 0.0032 | 0.0016 |
| Im, Pesaran and Shin $W$-stat [Null: Unit root (assumes individual unit root process)] | | 0.5141 | 0.0513 |

Table 2. Panel unit root test at first differences ($p$-values)[2]

| Unemployment | | | |
|---|---|---|---|
| Tests | No intercept and no trend | Intercept only | Intercept and trend |
| Levin, Lin and Chu [Null: Unit root (assumes common unit root process)] | 0.0000 | 0.0000 | 0.0000 |
| Breitung $t$-stat [Null: Unit root (assumes common unit root process)] | | | 0.0036 |
| ADF − Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 0.0000 | 0.0020 | 0.0354 |
| PP – Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 0.0000 | 0.0101 | 0.2272 |
| Im, Pesaran and Shin $W$-stat [Null: Unit root (assumes individual unit root process)] | | 0.0010 | 0.0988 |
| Government expenditure | | | |
| Tests | No intercept and no trend | Intercept only | Intercept and trend |
| Levin, Lin and Chu [Null: Unit root (assumes common unit root process)] | 0.0000 | 0.0000 | 0.0000 |
| Breitung $t$-stat [Null: Unit root (assumes common unit root process)] | | | 0.2660 |

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[1] Automatic lag length selection based on AIC with a max lag of 1.
[2] Automatic lag length selection based on AIC with a max lag of 1.

Table 2 (cont.). Panel unit root test at first differences (*P*-Values)

| Government expenditure | | | |
|---|---|---|---|
| Tests | No intercept and no trend | Intercept only | Intercept and trend |
| ADF – Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 0.0003 | 0.0000 | 0.0005 |
| PP – Fisher Chi-square [Null: Unit root (assumes individual unit root process)] | 0.0000 | 0.0000 | 0.0000 |
| Im, Pesaran and Shin *W*-stat [Null: Unit root (assumes individual unit root process)] | | 0.0000 | 0.0036 |

**2.2. Testing for cointegration (panel cointegration tests).** Granger (1981, 1986) and Engle-Granger (1987) have suggested the cointegration analysis to test for long-run relationships between two variables. We are going to use Pedroni's panel residual-based tests for cointegration. Pedroni (1999, 2004) suggested, in his work, different cointegration tests for panel data. These tests allow for heterogeneous intercepts and trend coefficients across individual members of the panel.

Pedroni's residual equation is:

$$y_{it} = a_i + \delta_i t + \beta_{1i} x_{1it} + \beta_{2i} x_{2it} + ... + \beta_{Mi} x_{Mit} + e_{it} \quad (4)$$

for $t = 1,...,T$; $i = 1,...,N$; $m = 1,...,M$; where variables $y$ and $x$ are assumed to be integrated of order one, i.e. $I(1)$, $t$ is the number of periods, $i$ is the number of cross-sections and $m$ is the number of regressors. Parameter $\alpha_t$ is the individual intercept and $\delta_t$ is the individual trend effect. These two parameters can be set to zero.

Pedroni has seven different statistics for his test, categorized into two groups. Three of these statistics, which make the first group, and have what is referred to as group mean (or they called between-dimension based statistics). The statistics referred to as group-rho, group-PP and group-ADF statistics. The remaining four statistics make up the second group. Pedroni named this group panel statistic (or within-dimension based statistics). The statistics are

referred to as panel-v, panel-rho, panel-PP and panel-ADF statistics. The general approach is that the obtained residuals from equation (4), $e_{it}$ are tested if they are $I(1)$, by running for each cross-section, the regression:

$$e_{it} = \rho_i e_{it-1} + u_{it} \quad (5)$$

or

$$e_{it} = \rho_i e_{it-1} + \sum_{j=1}^{p_i} \psi_{ij} \Delta e_{it-j} + u_{it}. \quad (6)$$

In both tests, the null hypothesis of no cointegration is $H_0 : \rho_i = 1$. This means that the residuals from equation (4), $e_{it}$ will be $I(1)$. The difference between the two groups is the alternative hypothesis. The between-dimension test the *heterogeneous* alternative hypothesis is $H_A : \rho_i < 1$ for all $i$. The within-dimension test the *homogenous* alternative is $H_A : (\rho_i = \rho) < 1$ for $i$, where $\rho$ is the coefficient of the autoregressive term in the equations (5) or (6). As noted by Pedroni (2004), when we allow $\rho_i$ to vary across the cross-section units of our panel data we can introduce an additional source of potential heterogeneity in our tests. As a result, the important cointegration tests are the group-mean (between-dimension) cointegration tests and their statistics.

Results presented in Table 3 show that the null of no cointegration cannot be rejected in favor of the existence of cointegration between the two variables.

Table 3. Pedroni residual cointegration test (*P*-values)[1]

| Statistics | No intercept or trend | Individual intercept | Individual intercept and individual trend |
|---|---|---|---|
| Alternative hypothesis: Common AR coefficients (within-dimension) | | | |
| Panel v-statistic | 0.7342 | 0.0460 | 0.7243 |
| Panel rho-statistic | 0.4299 | 0.7148 | 0.9977 |
| Panel PP-statistic | 0.1334 | 0.8036 | 0.9470 |
| Panel ADF-statistic | 0.0085 | 0.0001 | 0.0002 |
| Alternative hypothesis: Individual AR coefficients (between-dimension) | | | |
| Group rho-statistic | 0.9935 | 0.9791 | 0.9999 |
| Group PP-statistic | 0.4776 | 0.9227 | 0.9585 |
| Group ADF-statistic | 0.399 | 0.0000 | 0.0105 |

[1] Automatic lag length selection based on AIC with a max lag of 1

*2.2.1 Testing for causality (Panel causality tests).* Correlation does not necessarily imply causation. Therefore, we will test our two variables for causality regardless the fact that they do not have a long run relation (they are not cointegrated). The Granger (1969) approach to the question of whether $x$ causes $y$ is to see how much of the current $y$ can be explained by past values of $x$.

In general, the bivariate regressions for panel data take the form:

$$y_{i,t} = a_{0,i} + \alpha_{1,i} y_{i,t-1} + \ldots$$
$$+\alpha_{m,i} y_{i,t-1} + \beta_{1,i} x_{i,t-1} + e_{i,t}, \qquad (7)$$

$$x_{i,t} = a_{0,i} + \alpha_{1,i} x_{i,t-1} + \ldots$$
$$+\alpha_{m,i} x_{i,t-1} + \beta_{1,i} y_{i,t-1} + e_{i,t}, \qquad (8)$$

where $t$ denotes the time period dimension of the panel, and $i$ denotes the cross-sectional dimension. We will test our data with two approaches to causality testing in panels. The first is to treat the panel data as one large stacked set of data, and then to perform the Granger Causality test in the standard way[1], with the exception of not letting the data from one cross-section enter the lagged values of data to the next cross-section. This method assumes that all coefficients are the same across all cross-sections, *i.e.*:

$$\alpha_{0,i} = \alpha_{0,j}, \alpha_{1,i} = \alpha_{1,j}, \ldots, \alpha_{m,i} = \alpha_{m,j}, \forall i, j, \qquad (9)$$

$$\beta_{1,i} = \beta_{1,j}, \ldots, \beta_{m,i} = \beta_{mj} \forall i, j. \qquad (10)$$

The second approach is the causality test suggested by Dumitrescu-Hurlin (2012)[2]. They make an extreme opposite assumption, allowing all coefficients to be different across cross-sections:

$$\alpha_{0,i} \neq \alpha_{0,j}, \alpha_{1,i} \neq \alpha_{1,j}, \ldots, \alpha_{m,i} \neq \alpha_{m,j}, \forall i, j \qquad (13)$$

$$\beta_{1,i} \neq \beta_{1,j}, \ldots, \beta_{m,i} \neq \beta_{mj} \forall i, j \qquad (14)$$

In Tables 4 and 5, we show results for both Granger causality and Dumitrescu-Hurlin tests. In Granger causality test, we reject the null that GE does not Granger cause $U$ and also reject the null that $U$ does not Granger cause GE. More important, though, are the results of the Dumitrescu-Hurlin test, which is for heterogeneous panels, as is ours. The Dumitrescu-Hurlin test shows different results. We can accept the null of GE does not homogeneously cause $U$, however, we can reject the null that $U$ does not homogeneously cause GE. Therefore, it appears that Granger causality (according to Dumitrescu-Hurlin

test) runs one-way from $U$ to GE and not the other way around.

Table 4. Pairwise Granger causality test (Lags: 2)

| Null hypothesis: | Obs. | F-statistic | Prob. |
|---|---|---|---|
| GE does not Granger Cause U | 150 | 6.82194 | 0.0015 |
| U does not Granger Cause GE | | 12.2943 | 1.E-05 |

Table 5. Pairwise Dumitrescu-Hurlin panel causality test (Lags: 2)

| Null hypothesis: | W-stat. | Zbar-stat. | Prob. |
|---|---|---|---|
| GE does not homogeneously cause $U$ | 5.28198 | 1.01255 | 0.3113 |
| U does not homogeneously cause GE | 11.3246 | 4.15237 | 3.E-05 |

## Conclusions and limitations

In this study we have examined the long run relation between unemployment and government spending in a panel framework, using data from fifteen Eurozone countries in the period of 2000-2011. We have implemented panel-based, unit root and cointegration tests to draw reliable conclusions about this relation. We then test the two variables for causality. We have found that there is evidence for one-way causation from unemployment to government expenditure. Although most studies find the reverse causation, i.e. causality from government expenditure to unemployment, the causation that we have found may also be worth mentioning. According to this alternative, higher unemployment rates are the result of political pressure to increase unemployment insurance and other transfer programs. The main result that we have found is that there is an absence of cointegrating relationship between the two variables. As we have mentioned above models with high $R^2$ and low DW statistic indicate spurious relations. The absence of cointegration showed that the relation between unemployment and government expenditure is probably spurious. But all the empirical literature mentioned in the first part of the study shows that, in general, there is a relationship between unemployment and government expenditure. Then, why is there this limitation to find the same results? Firstly, the periods included in the panel data might be too small for the panel tests to find a cointegrating relationship. Most studies have time periods of twenty-five years or more, and they still consider the time period might be small (e.g. see Christopoulos, Loizides and Tsionas, 2005). In addition, Christopoulos and Tsionas (2002) examined the bilateral causality effects between government size and unemployment using a small sample. They found that this relationship is not simple. In particular, they did not use any stationary or cointegration properties under which their data sample would possibly depend on. Not only our data sample was small, but also we found different results than most authors, but Christopoulos and Tsionas (2002). This,

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[1] More details for the tests are provided in the original papers.
[2] More details for the tests are provided in the original papers.

according to the latter authors, might be due to the fact that political pressures could expand the public sector in Eurozone countries through unemployment persistence. Unfortunately on March 10, 2013, the date that the data was extracted from Eurostat, there were no more periods which could be included in the data without leaving out some countries. Secondly, the severe economic crisis in the Eurozone has not affected all the Eurozone countries. Additionally, among the affected countries, which all have implemented austerity measures under the guidance of the IMF (International Monetary Fund), ECB (European Central Bank) and EC (European Commission), have been differences between their adjustment processes. If we had divided the sample data into two groups i.e. the first group between 2000 and 2008, and second group between 2009 and 2011, this would have resulted in an even smaller data sample. Therefore, further empirical studies, with richer data sets, must be conducted to eliminate the possibility that the small time period sample fits/favors the spurious relation.

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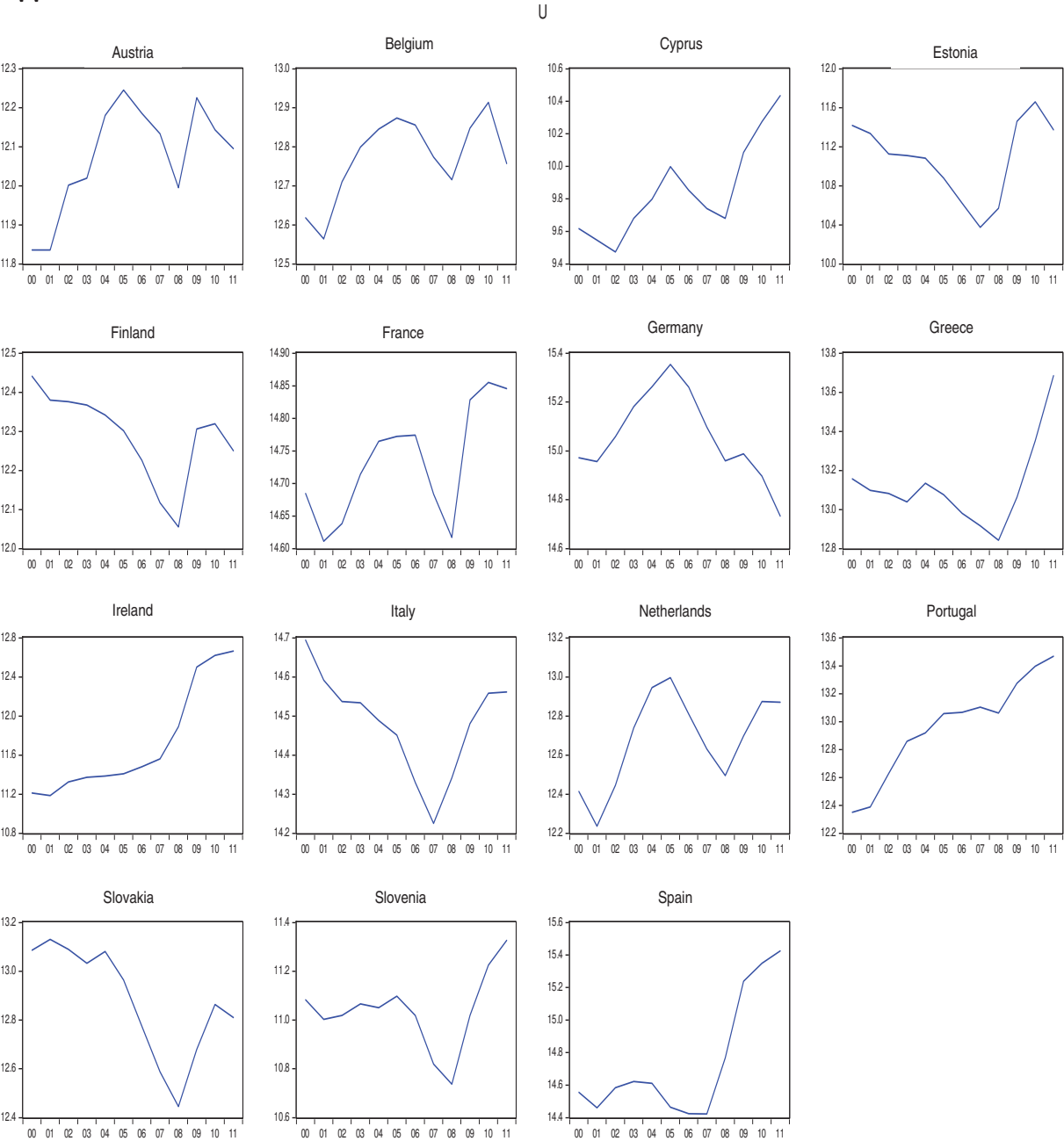
## Appendix

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**Fig. 1. Individual cross-section graphs of unemployment (y-axis = data in natural logarithms, x-axis = years)**
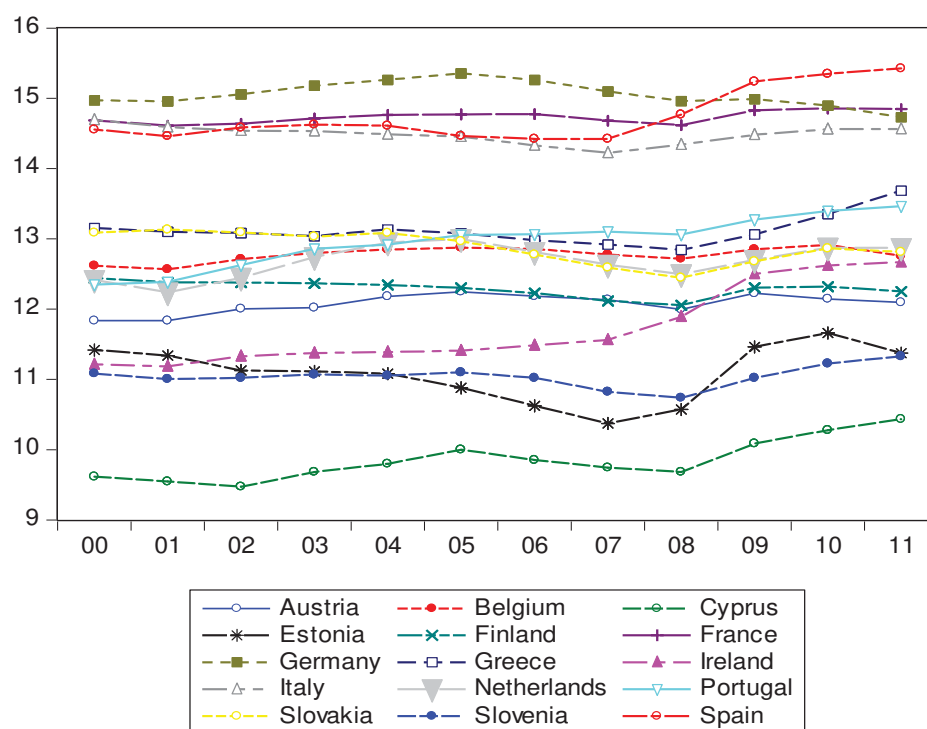
**Fig. 2 Combined cross-section graph of unemployment (y-axis = data in natural logarithms, x-axis = years)**

Table 1. Descriptive statistics of cross-section of unemployment

|  | Mean | Median | Max | Min | Std. dev. | Skew. | Kurt. | Obs. |
|---|---|---|---|---|---|---|---|---|
| 1 | 12.07477 | 12.11432 | 12.24529 | 11.83501 | 0.139429 | -0.599390 | 2.195771 | 12 |
| 2 | 12.77295 | 12.78681 | 12.91411 | 12.56375 | 0.106062 | -0.642711 | 2.447733 | 12 |
| 3 | 9.848423 | 9.769548 | 10.43412 | 9.472705 | 0.295550 | 0.704024 | 2.435222 | 12 |
| 4 | 11.08499 | 11.11986 | 11.66135 | 10.37349 | 0.400390 | -0.416826 | 2.037051 | 12 |
| 5 | 12.29008 | 12.31266 | 12.44114 | 12.05525 | 0.112351 | -0.870980 | 2.885963 | 12 |
| 6 | 14.73239 | 14.73925 | 14.85508 | 14.61121 | 0.087007 | -0.003644 | 1.668224 | 12 |
| 7 | 15.05944 | 15.02237 | 15.35302 | 14.73220 | 0.178860 | 0.019062 | 2.277000 | 12 |
| 8 | 13.11856 | 13.07841 | 13.68426 | 12.84265 | 0.218492 | 1.466639 | 4.928360 | 12 |
| 9 | 11.71763 | 11.44502 | 12.66666 | 11.18442 | 0.560490 | 0.868258 | 2.070651 | 12 |
| 10 | 14.48279 | 14.51090 | 14.69431 | 14.22497 | 0.129598 | -0.505716 | 2.668306 | 12 |
| 11 | 12.67963 | 12.71868 | 12.99680 | 12.23563 | 0.238647 | -0.406658 | 2.027424 | 12 |
| 12 | 12.96402 | 13.05836 | 13.46737 | 12.35017 | 0.359144 | -0.445281 | 2.228685 | 12 |
| 13 | 12.87873 | 12.91407 | 13.13033 | 12.44509 | 0.223825 | -0.582110 | 2.148513 | 12 |
| 14 | 11.03859 | 11.03476 | 11.32660 | 10.73640 | 0.155449 | -0.188149 | 3.183589 | 12 |
| 15 | 14.74336 | 14.59681 | 15.42475 | 14.42201 | 0.373395 | 0.974101 | 2.275160 | 12 |
| All | 12.76576 | 12.76565 | 15.42475 | 9.472705 | 1.494334 | -0.099953 | 2.310470 | 180 |

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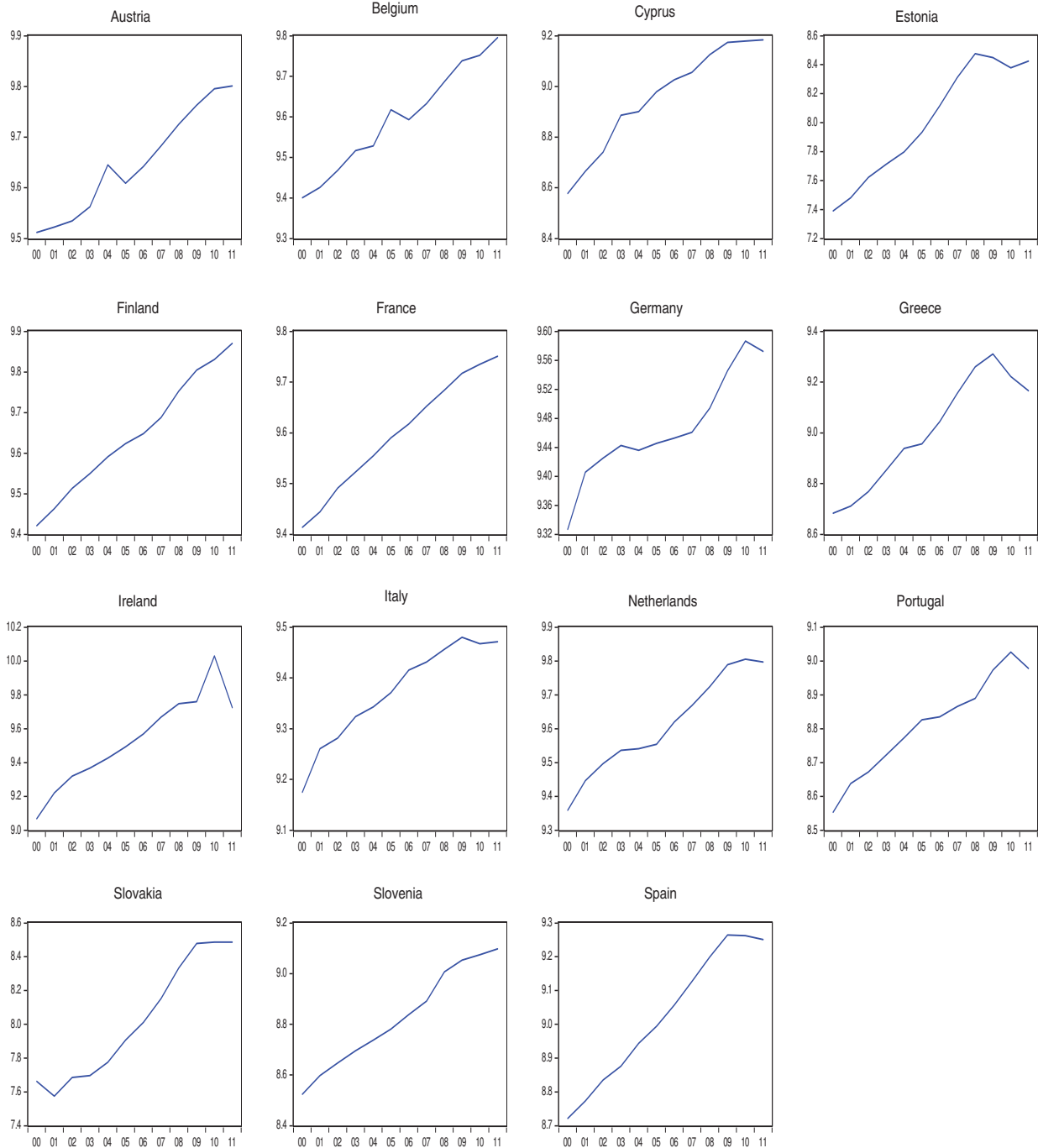


**Fig. 3. Individual cross-section graph of government expenditures (y-axis = data in natural logarithms, x-axis = years)**
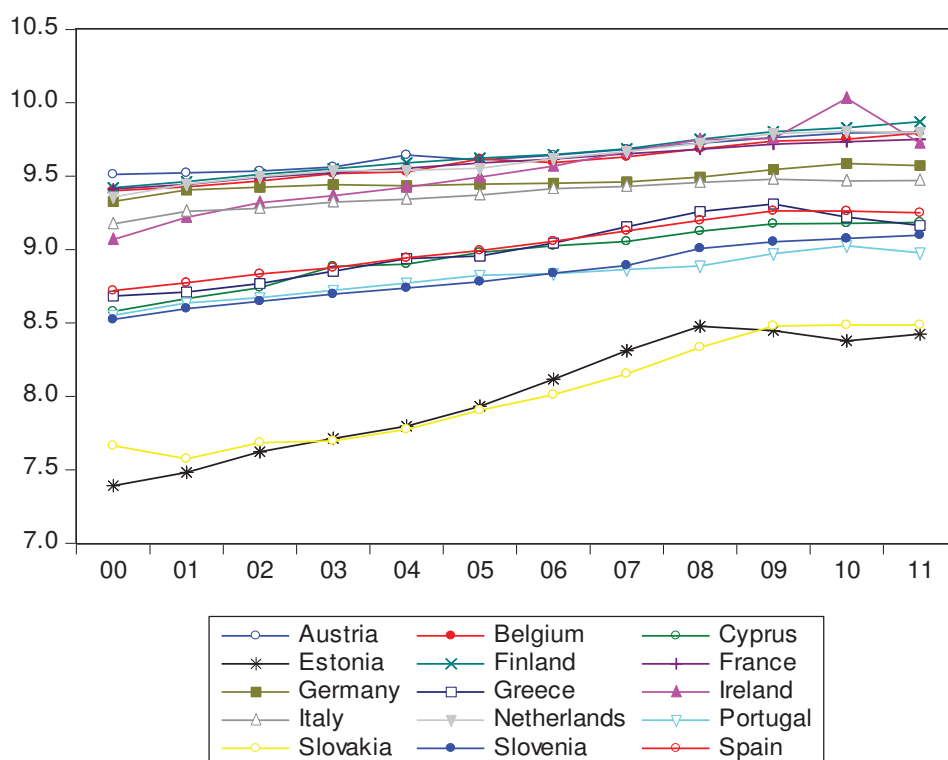
**Fig. 4. Combined cross-section graph of government expenditures (y-axis = data in natural logarithms, x-axis = years)**

Table 2. Descriptive statistics of cross-section of government expenditures

|     | Mean     | Median   | Max      | Min      | Std. dev. | Skew.     | Kurt.    | Obs. |
|-----|----------|----------|----------|----------|-----------|-----------|----------|------|
| 1   | 9.649575 | 9.643436 | 9.800884 | 9.511652 | 0.105150  | 0.128160  | 1.652508 | 12   |
| 2   | 9.596407 | 9.605240 | 9.795429 | 9.400688 | 0.130889  | -0.000586 | 1.778421 | 12   |
| 3   | 8.957914 | 9.002850 | 9.184458 | 8.578025 | 0.207889  | -0.551646 | 2.045471 | 12   |
| 4   | 8.007851 | 8.024366 | 8.476954 | 7.391230 | 0.401174  | -0.193835 | 1.518298 | 12   |
| 5   | 9.646088 | 9.635323 | 9.870572 | 9.421047 | 0.146880  | 0.054839  | 1.822855 | 12   |
| 6   | 9.597822 | 9.603797 | 9.750616 | 9.413600 | 0.114358  | -0.185533 | 1.765943 | 12   |
| 7   | 9.466049 | 9.449068 | 9.586528 | 9.326762 | 0.073715  | 0.101314  | 2.596254 | 12   |
| 8   | 9.005534 | 8.999993 | 9.310140 | 8.683656 | 0.219529  | -0.127283 | 1.627043 | 12   |
| 9   | 9.532343 | 9.530638 | 10.02934 | 9.068443 | 0.269757  | 0.038812  | 2.365850 | 12   |
| 10  | 9.372959 | 9.393098 | 9.480161 | 9.174869 | 0.098105  | -0.627663 | 2.297317 | 12   |
| 11  | 9.611072 | 9.586518 | 9.805445 | 9.358312 | 0.147126  | -0.064224 | 1.872556 | 12   |
| 12  | 8.812498 | 8.830598 | 9.026418 | 8.552811 | 0.146321  | -0.225726 | 2.051740 | 12   |
| 13  | 8.020836 | 7.958677 | 8.486487 | 7.574712 | 0.353920  | 0.231433  | 1.464144 | 12   |
| 14  | 8.829058 | 8.809338 | 9.098134 | 8.524129 | 0.196981  | 0.022014  | 1.675297 | 12   |
| 15  | 9.025359 | 9.025327 | 9.264298 | 8.721227 | 0.197227  | -0.126295 | 1.604072 | 12   |
| All | 9.142091 | 9.321006 | 10.02934 | 7.391230 | 0.571245  | -1.115058 | 3.722560 | 180  |
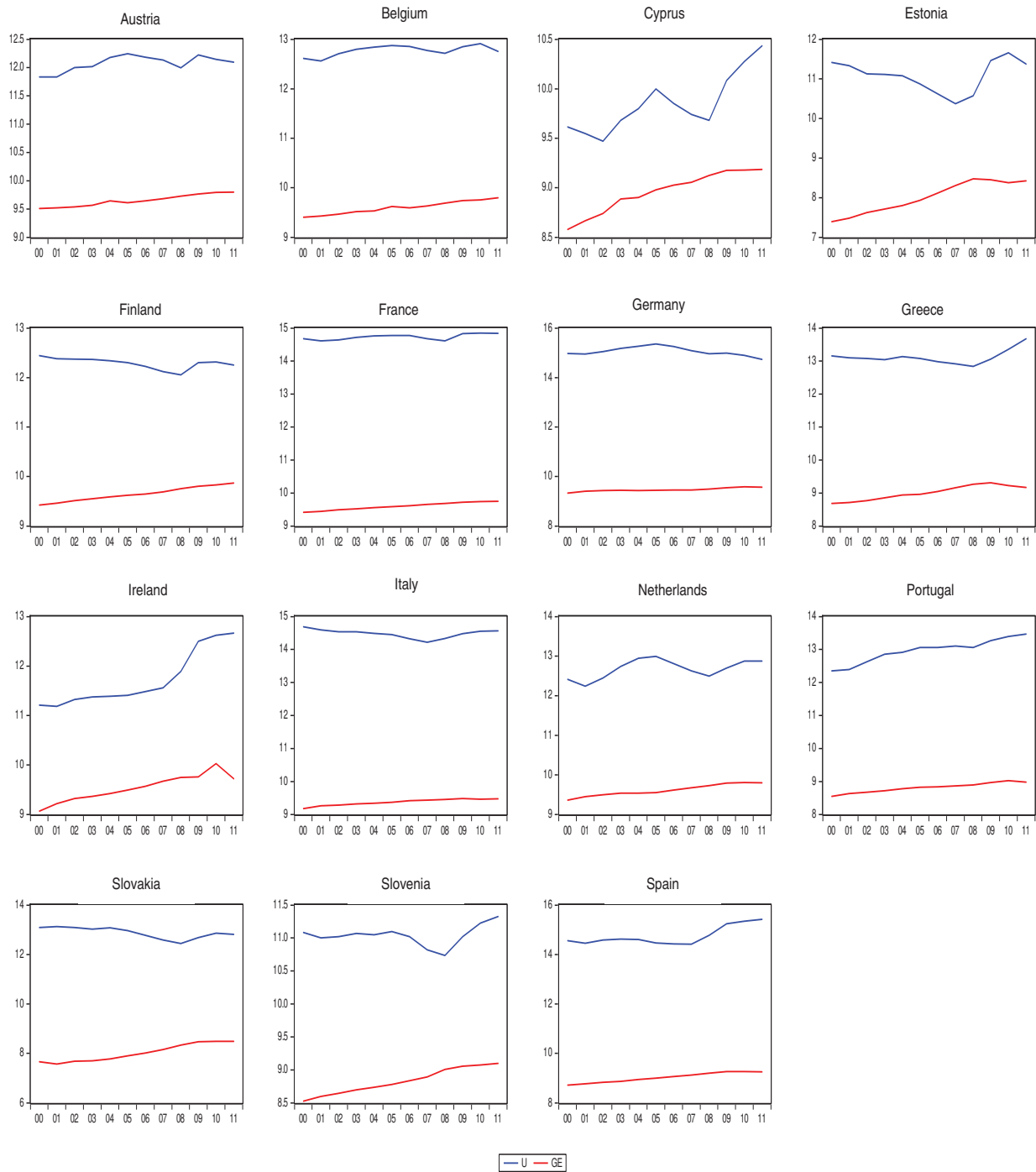
**Fig. 5. Individual cross-section graphs of government expenditures and unemployment
(y-axis = data in natural logarithms, x-axis = years)**