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A CROSS-COUNTRY ANALYSIS OF THE OKUN'S LAW COEFFICIENT CONVERGENCE IN EUROPE

BY

CHRISTOPHE TAVERA & ROGER PERMAN

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DEPARTMENT OF ECONOMICS
UNIVERSITY OF STRATHCLYDE
GLASGOW

A cross-country analysis of the Okun's Law coefficient convergence in Europe

Christophe TAVERA ¹ and Roger PERMAN ^{2,*}

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Abstract.

In this paper, we examine whether evidence is consistent with convergence of the Okun's Law coefficient (OLC) among several alternative groupings of European economies. A two step empirical strategy is employed. The first step obtains rolling regression estimates of the OLC for individual European countries. In the second step, we examine how the cross-country variance of the OLC evolves over the decade until 2002 in the selected country groupings. We find evidence consistent with convergence of the OLC among northern European countries, and among countries with centralised wage bargaining, but an absence of convergence in other country groups.

Keywords: Okun's Law, convergence, European Union.

JEL codes: E32, E61, F02

¹ University of Rennes 1, Rennes, France.

* Corresponding author: Roger Perman, Department of Economics, University of Strathclyde, Glasgow, G61 3AF, United Kingdom. Telephone: (0)141 548 3865, Fax: (0)141 552 5589. E-mail: r.perman@strath.ac.uk

² University of Strathclyde, Glasgow, United Kingdom.

I. Introduction

Many recent papers have addressed the question of whether the European Union (EU) is an optimal currency zone by analysing the dispersion (or correlation) of observable variables such as output, output per head, and GDP growth rates or the dispersion (or correlation) of unobservable variables such as demand and supply shocks.

This paper also addresses the question of whether the EU is an optimal currency zone. However, it departs from the majority of empirical studies by analysing the dispersion of an unobservable *parameter* among European countries, and changes in the magnitude of that dispersion over time. Our motivation for this focus rests in its facility to address important questions concerning macroeconomic policy coordination. The quantitative approach adopted in this paper examines asymmetry stemming from differences in the way countries react to symmetric European shocks. That asymmetry derives in part from differences in values of important structural, macroeconomic parameters in different European countries. If the values of such parameters are heterogeneous among member states, even a common shock to the union can lead to different macro-economic consequences across the EU countries and, eventually, to the need for more or less co-ordinated specific policies.

Our primary interest in this paper, however, is not on the amount of cross-country parameter dispersion itself but rather on the temporal behaviour of that dispersion. That is, we seek to establish whether the evidence is consistent with a reduction through time of cross-country parameter variance.

We apply this general approach to the particular case of the Okun's Law coefficient, and seek to establish whether or not that coefficient exhibits convergent behaviour in European countries. This coefficient constitutes a key macro-economic parameter underlying the sensitivity of unemployment variations to fluctuations in economic activity. Although the Okun's Law coefficient is not a 'pure' structural parameter, it can be considered as a reduced-form, or semi-reduced form, parameter which incorporates several fundamental structural parameters from the firms' optimal demand for labour, the macroeconomic production function and the labour force participation equation. Thus, despite the limits inherent in the analysis of reduced-form relationships, the OLC may be interpreted as the net effect of several macro-economic structural parameters representative of the macro-economic behaviour of the country under examination and of the characteristics of the adjustment mechanisms lying behind the inverse relationship between output gaps and unemployment gaps over the business cycle.

The choice of the Okun's Law coefficient (OLC hereafter) is motivated by several considerations. First, although the negative relationship between the unemployment rate gap and the real output gap has remained quite stable, the absolute value of the OLC seems to be varying over time and from country to country. The stability of the OLC has recently been tested by several authors, using different statistical methodologies, and empirical results reveal strong evidence of structural change and temporal instability of the OLC (see, for example, Lee (2000), Moosa (1997), or Sögner and Stiassny, 2000). However, the implications of such change and instability for convergence or divergence across countries is not yet clear.

Secondly, the Okun's Law empirical relationship is a major part of traditional macro-models, as the aggregate supply curve is derived by combining Okun's Law with the Phillips curve. The Okun's Law relationship has important implications for macroeconomic policy as the size of the OLC is an important indicator of the degree of interdependence of output and labour movements around their long-run paths and is regarded as a benchmark for policy-makers to measure the cost of higher unemployment. Furthermore, the effectiveness of disinflation policy depends on the responsiveness of unemployment to the output growth rate (the sacrifice ratio). This point helps explain interest in the analysis of the convergence of the OLC for groups of countries which are (or might become) members of a monetary union with common monetary policy shocks.

Thirdly, the basic Okun's Law involves the deviation of real output and unemployment rates from their long run or full employment levels. Hence, one may assume that national macro-economic structures (such as tastes or labour market rigidities) lead to heterogeneous country-specific levels of potential output and natural unemployment rates, despite possible convergence in the size of the co-variation between the output gap and the unemployment gap over the business cycle. Finally, estimators of the OLC can be obtained with simple econometric models that can be estimated quite routinely for many countries and with standardised data series.

As empirical proxies for the unobserved parameters, we obtain rolling regression estimates of the Okun's Law coefficients for European countries. Then, evaluating the time path of these parameter estimates, we seek evidence for the presence of a convergence process of the OLC by analysing the temporal behaviour of the cross-country dispersion of the estimated OLC's. The empirical strategy is applied to several country groups: a broad set of European countries, and several subsets of those countries, one of which consists of the current EMU members. The literature on sigma convergence suggests that groups exhibiting convergence would be expected to show declining variances of the Okun's Law coefficient while diverging groups should have increasing variances. This is the principal criterion adopted in this paper to evaluate the presence or the absence of convergence of the OLC in Europe.

The plan of the paper is as follows. Section II outlines the theoretical background and Section III presents the empirical strategy. Section IV reports the results and Section V contains some concluding remarks.

II. Theoretical background

Okun (1962) initiated the search for a quantifiable relationship between output fluctuations and variations in unemployment suitable for policy analysis. In what has become known as the Okun's Law relationship, it is claimed that there is a negative correlation between the cyclical components of output and the unemployment rate. The stability of the OLC in many European and non European countries has been examined in many recent empirical papers, using a variety of specifications of the Okun's Law relationship. For example, Harris and Silverstone (2001), Mayes and Virén (2002) and Virén (2001) have tested for asymmetry of the OLC; Lee (2000), Weber (1995) and Sögner and Stiassny (2000) have tested for structural change in that parameter; and Schnabel (2002) has used rolling regression-estimates of the OLC to analyse its time dependence.

Taken as a whole, those papers show without ambiguity that the quantitative as opposed to the qualitative estimates of the OLC are unstable in European countries. Moreover several countries exhibit an overall increase in the absolute value of the unemployment-output trade-off in recent decades.

In this paper, we analyse whether this instability of the OLC in European countries has resulted in a convergence or a divergence of the OLC across European countries and across countries belonging to specific groups. Our results complement and reinforce those reported in Perman and Tavera (2004) which employs a different empirical technique to address similar questions.

One of the criteria for the existence of an optimal currency area in Europe is the absence of differences in the way countries react to symmetric euro areas shocks. If there is homogeneity of the Okun's Law relationships in Europe, unemployment rate variations will be quantitatively similar following symmetric output shocks, and variations of output along the European business cycle will lead to similar movements in employment. Detecting some evidence of convergence of the Okun's Law relationships may thus limit some potential dilemmas and conflicts implied by a single monetary policy. However, evidence of heterogeneity and/or divergence of the Okun's Law relationships will limit the scope of a single monetary response for coping with undesirable common output variations along the European business cycle.

A word of caution is appropriate here. In this paper, convergence and/or homogeneity of the Okun's Law coefficient is being interpreted in a conditional sense. That is, our interest lies in the existence (or non-existence) of convergence and/or homogeneity of the Okun's Law coefficient conditional upon country-specific values of the natural rates of output and unemployment. Movements of the natural rates of output and unemployment are assumed to be dependent on national or European structural adjustments which are mainly orthogonal to movements of the cyclical components of output and unemployment. Hysteresis effects on the labour market are thus ruled out in this paper.

III. Econometric considerations

Let Y_t and Y_t^* represent, respectively, the logs of the observed and potential GNP. Similarly, let U_t and U_t^* represent the observed and natural rates of unemployment. In its simplest form, the empirical relationship between unemployment and output suggested by Okun is a 'gap' equation of the type:

$$U_t^c = a.Y_t^c + \omega_t \text{ with } \alpha < 0 \quad (1)$$

where $Y_t^c = Y_t - Y_t^*$ is cyclical GNP, $U_t^c = U_t - U_t^*$ is the cyclical unemployment rate, and ω_t is a stochastic error term. In Equation (1) the parameter a is known as the Okun's law coefficient.

Equation (1) is a static version of Okun's Law which assumes that the relationship is totally contemporaneous, which may not be plausible theoretically. It may also be inadequate empirically owing to the omission of significant time lags, especially in the reaction of labour

demand. Following Hendry, Pagan and Sargan (1984) the dynamic model used here is the Autoregressive Distributed Lag (or ADL) model:

$$U_t^c = \sum_{s=0}^p a_{0,s} Y_{t-s}^c + \sum_{s=1}^q a_{1,s} U_{t-s}^c + \omega_t \quad (2)$$

where the contemporaneous (impact or short-run) effect of unemployment on output is measured by the coefficient $a_{SR} = a_{0,0}$ while the medium-run (or total) effect is given by

$$a_{MR} = \frac{a_{0,0} + \dots + a_{0,p}}{1 - (a_{1,1} + \dots + a_{1,q})} \quad (3)$$

A major step in the estimation of the OLC is the determination of potential output and the natural rate of unemployment. These variables are not observable and have to be estimated, with common approaches including differencing and the removal of deterministic linear, quadratic or broken trends. A problem with some of the relatively simple methods is that they fail to account adequately for the stochastic components of unemployment and real output in determining their potential components. As noted by Freeman (2000), the choice of detrending methodology can account for the failure to reject non-stationarity in the variables being used in the regression, resulting in a misspecification of the regression model.

The Hodrick and Prescott (1980, 1997) filter (hereafter, the HP filter) has become a standard method for removing trend movements in the business cycle literature. It decomposes an integrated time series into a stochastic trend and a cyclical component by minimising the variance of the cyclical component subject to a penalty for variations in the second difference of the trend component. Although the use of the HP filter may be subject to criticism and somewhat more sophisticated decomposition procedures have been developed (see for instance the Beveridge-Nelson (1981) method, the Harvey (1985) structural time series approach, or the Baxter and King (1995) band-pass filter), the HP filter remains one of the standard methods for detrending. Our use of the HP filter in this paper also allows us to take account of the possible existence of stochastic trends in the original output and unemployment series.

Rolling regression estimates of the OLC are obtained by estimating Equation (2) for each country i separately and for the initial sub sample $t = 1, \dots, T_1$ with $T_1 < T$ and T being the last observation in the full sample. Next, Equation (2) is estimated for each country i separately and for each rolling regression sub sample $t = 2, \dots, (T_1 + 1)$, $t = 3, \dots, (T_1 + 2)$, ..., $t = S, \dots, T$ (with $T = T_1 + S$) respectively. Note that in this case T_1 is the dimension of the fixed window size used throughout the rolling regressions.

Testing for convergence of the OLC

We admit the possibility that Europe might be divided into convergence clubs (i.e. distinct groups of countries that revert toward different OLC common trends) or that some countries revert toward a common trend while others diverge from that common trend and from each other. We thus set up K groups of European countries. Each group $k = 1, \dots, K$ is formed on

the basis of specific macroeconomic considerations which motivate examining the OLC convergence process across the countries included in that group.

It is now possible to examine the behaviour of each group's OLC differentials over time and ascertain whether there is any evidence of convergence within them. The conventional, cross-country regression method for determining convergence has recently been criticised by Friedman (1992) and Quah (1993) among others. Moreover, such an approach would not be sensible in our case in which the primary focus of the convergence analysis is on groups with sizes varying between four and twelve European countries. Even were regression to be feasible, the very limited degrees of freedom would severely limit the power of our results.

In line with numerous recent studies on convergence (see for example Bernard and Durlauf, 1995) we avoid cross-country regressions and rely instead on time series information for determining the existence, or lack thereof, of convergence. The literature on sigma convergence suggests that groups exhibiting convergence would be expected to exhibit declining variances of the Okun's Law coefficient while diverging groups should have increasing variances. Thus, we use this criterion of convergence to evaluate the presence or the absence of convergence of the OLC in Europe. In this respect, we admit that there may be convergence of the OLC in the k^{th} group if:

$$V_T^k < V_{T_1}^k \quad \text{for} \quad T_1 < T$$

where V_T^k (respectively $V_{T_1}^k$) is the cross-country variance of the OLC in group k at time T (respectively at time T_1).

A graph plotting the time path of the V_t for $t = T_1, (T_1 + 1), \dots, T$ will provide a preliminary visual analysis of the sigma-convergence process. Moreover, following Bernard and Jones (1996) and Ben-David and Khimi (2000), we will complement this visual analysis of the sigma convergence process by a statistical indicator obtained by fitting the regression:

$$V_t^k = \alpha_k + \beta_k T_t + \varepsilon_t^k \quad (4)$$

where V_t^k is the variance of the k^{th} group's estimated OLC ($V_t^k = (1/N_k) \sum_{i \in k} (a_{i,t}^k - \bar{a}_t^k)^2$ with $\bar{a}_t^k = (1/N_k) \sum_{i \in k} a_{i,t}^k$, and N_k is the number of countries included in the k^{th} group), T_t is a time trend and ε_t^k is a white noise process.

The coefficient on the time trend in Equation (4) provides an indication of the direction and magnitude of the single-period change in the variance of the k^{th} group's OLC. As such, it provides us with a descriptive, aggregate indicator of the dynamic properties of the time series V_t^k . It is this indicator that constitutes the criterion of convergence adopted in this paper.

Note that operating within the particular framework given by Equation (4), we do not have the means to obtain explicit test statistics for the presence of a deterministic trend and/or a unit root in the series V_t^k . Evans (1996), working with an augmented specification of equation (4) – specifically an augmented Dickey-Fuller regression in the variance of the OLC's – is able to

test explicitly for deterministic and stochastic trends. He also develops an associated strategy that is amenable to testing hypotheses regarding convergence (or non-convergence) of processes of interest. In another paper (Perman and Tavera, 2004), we employ the Evans method to formally test hypotheses about convergence or non-convergence of the OLC in Europe. As our present focus is on inferences that might be drawn from the direction and magnitude of changes over time in within-group OLC variances, we do not follow the Evan's line of enquiry in this paper.

IV. Empirical results

This study uses semestrial (biannual) data for 17 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. The sample period runs from the first semester of 1970 to the second semester of 2002 and the data are taken from the OECD Economic Outlook database.

Following a suggestion of Rven and Uhlig (2002), the smoothing parameter, λ , of the HP filter is adjusted according to the fourth power of the sampling frequency. For semestrial observations, this implies that $\lambda = 1600 / 2^4 = 100$.

In order to adequately capture the dynamic characteristics of the OL equation without sacrificing excessive degrees of freedom, some limited dynamics are introduced into the ADL model. The maximum number of lags for each country is set at four semesters and, subject to that constraint, the optimal lag length is selected using the Akaike criterion.

The ADL model is estimated with the technique of Seemingly Unrelated Regressions (SUR). A 17 equation-system is formed by stacking the equations associated with each of the seventeen retained countries. In contrast to OLS, the SUR technique takes into account potential cross-country residuals correlation due, for example, to European common shocks.

The rolling regressions are performed by first estimating the OLC with an initial range of observations running from the first half of 1970 to the second half of 1992 ($T_l = 1992 / 2$). Starting from this 40-observations initial sub-sample, successive sub-samples are formed by simultaneously adding one observation at the end of the sample and dropping one observation at the beginning of the sample so that the number of observations in each regression is constant and equal to 40.

Convergence of the OLC is examined for several groupings of European countries. A first grouping is made using general macroeconomic considerations:

- 'All EC countries' contains all the retained European countries
- 'Euro zone' countries contains European countries belonging to the Euro zone (Austria, Belgium, Finland, France, Germany, Italy, Luxembourg, Netherlands, Portugal, Spain, Ireland, Greece)
- 'High GDP' countries includes the four European countries with the highest level of GDP (France, Germany, Italy, United Kingdom).

A second grouping is performed on the basis of geographical considerations:

- 'Septentrional' countries (Denmark, Finland, Ireland, Norway, Switzerland, United Kingdom)
- 'Occidental' countries (Austria, Belgium, France, Germany, Luxembourg, Netherlands)
- 'Meridional' countries (Greece, Italy, Portugal, Spain).

The third grouping is made on the basis of the Bayoumi-Eichengreen (1993) classification of European countries according to the degree of correlation of demand and supply shocks across countries (a high degree of correlation being considered as a prerequisite for the existence of an optimal monetary zone):

- 'B-E core' countries are characterised by similar supply and demand shocks (Belgium, Denmark, France, Germany, Luxembourg, Netherlands)
- 'B-E periphery' countries are characterised by asymmetric macroeconomic shocks (Greece, Ireland, Italy, Portugal, Spain, United Kingdom).

The fourth and last grouping includes two groups of countries with wage bargains taking place at different levels (decentralised or centralised). Using an aggregate indicator of centralisation suggested by Soskice (1990), European countries are allocated into two groups:

- 'CD centralised' consists of countries with a high level of centralisation: Austria, Greece, Denmark, Belgium, Luxembourg and Norway
- 'CD decentralised' consists of countries with a moderate level of centralisation: Germany, Italy, Spain, Sweden and Portugal.

The United Kingdom is not included in either group, as we take it to be completely decentralised.

A summary of estimation results from the individual country Okun's Law regressions is presented in Table 1. Specifically, the table gives, for each country, the across-windows mean value of the estimated short-run and medium-run OLC, the mean value of the associated t-statistics and the mean value of the R^2 . The time paths of the short-run and medium-run estimates of the OLC for each country are plotted in Figure 1.

Table 1: OLC estimators and goodness of fit

Country	\hat{a}_{SR}	$\tau(\hat{a}_{SR})$	\hat{a}_{MR}	$\tau(\hat{a}_{MR})^{(1)}$	R^2
Austria	-0.061	-3.766	-0.099	-4.727	0.77
Belgium	-0.093	-7.106	-0.280	-12.890	0.90
Denmark	-0.163	-6.705	-0.633	-13.253	0.92
Finland	-0.218	-7.990	-0.672	-7.498	0.92
France	-0.144	-2.925	-0.364	-11.261	0.77
Germany	-0.009	-3.928	-0.159	-2.026	0.91
Greece	-0.023	-0.932	-0.081	-2.860	0.94
Ireland	-0.083	-2.436	-0.171	-3.519	0.89
Italy	-0.108	-4.695	-0.630	-5.176	0.47
Luxembourg	-0.021	-2.313	-0.048	-2.551	0.59
Netherlands	-0.116	-5.595	-0.572	-13.905	0.96
Norway	-0.099	-5.408	-0.371	-35.689	0.81
Portugal	-0.108	-2.802	-0.342	-13.020	0.89
Spain	-0.332	-2.470	-0.791	-8.018	0.79
Sweden	-0.151	-6.569	-0.463	-31.406	0.89
Switzerland	-0.038	-4.613	-0.109	-4.833	0.85
United-Kingdom	-0.233	-6.117	-0.681	-12.953	0.95

(1) As the a_{MR} parameter involves a non-linear function of the regression coefficients, the associated t-statistics are computed using the Delta method

The mean values of the short-run and medium-run OLC's are negative for all retained countries. Moreover, the t -statistics reveal that short and medium run OLC's are significantly different from zero at the 5% confidence level for all countries except Greece (for the short-run version of the OLC). As one would expect, the absolute value of the short-run OLC is systematically lower than the absolute value of the medium-run OLC.

The ranking of the medium-run estimates of the OLC (only a few papers present the estimated values of the short-run OLC) is rather close to the rankings of Lee (2000) and Sögner and Stiassny (2000). Austria and Switzerland exhibit low absolute values of the OLC while the UK, Denmark and Netherlands are in the upper part of the classification. France falls somewhere in the middle of the ranking. Figure 1 shows that, in line with the empirical results found in Lee (2000) and Moosa (1997), twelve out of the seventeen countries exhibit an increase in the absolute value of the OLC during the decade to 2002. This last result shows that the effects on unemployment of GDP variations have become stronger over time, perhaps as a consequence of stronger international competition and lower staffing turnover costs leading firms to reduce labour hoarding.

Figure 2: Time evolution of the estimated values of the OLC ((Short-run estimates of the OLC are represented by a continuous line and medium-run estimates of the OLC are represented by a broken line)

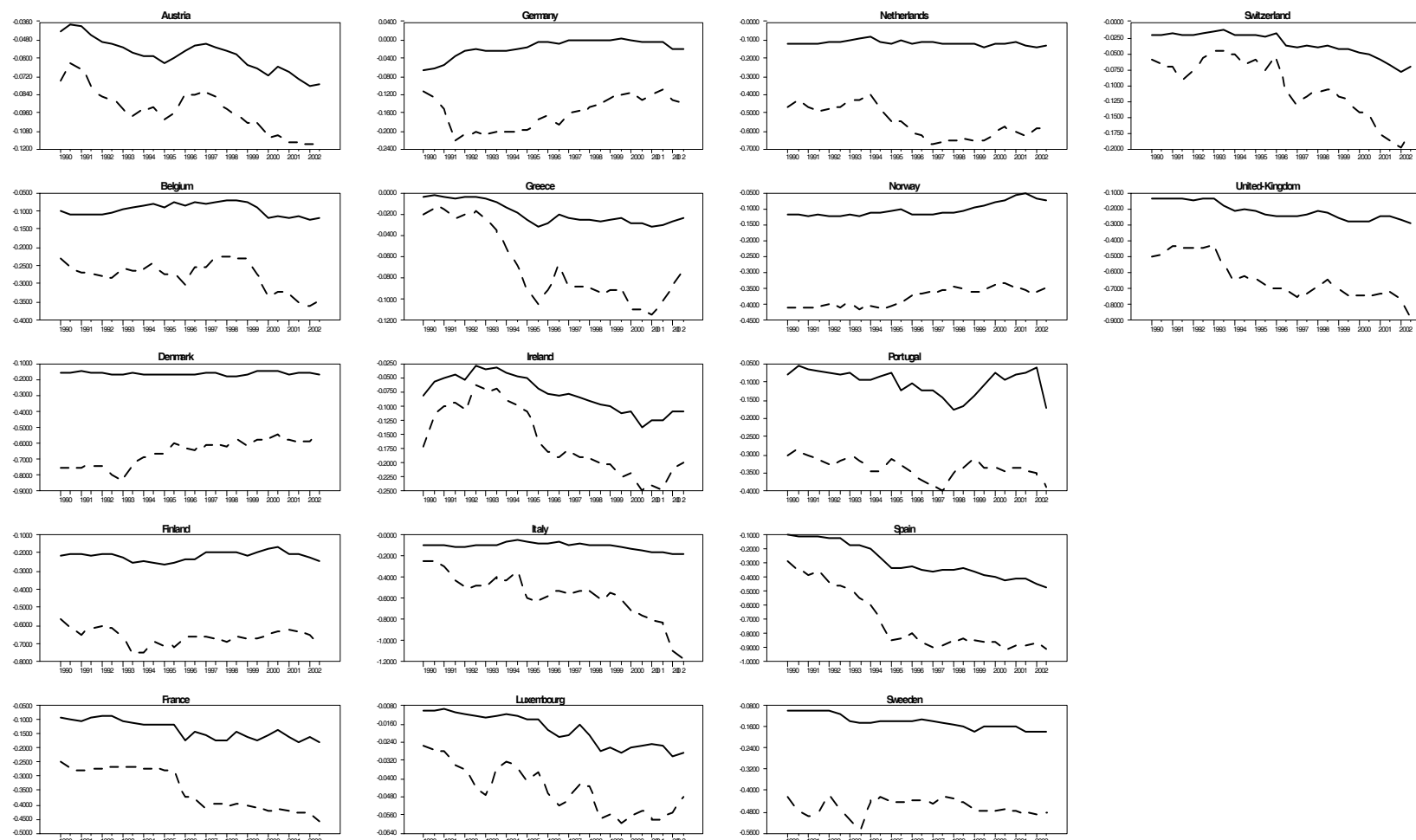


Table 2 presents the initial and final cross-country variances of the OLC for each of the retained country groupings. Observation of the figures reported in this table permits some interesting preliminary indications concerning the evolution of the degree of heterogeneity of the short-run and medium-run OLC between the first and last tranches of the retained rolling-sample for each country group. The complete time paths of the variance of the OLC are shown in Figures 1A and 1B in the appendix. Complementary information about the time path of the OLC is displayed in Table 3 which contains estimated trend coefficients, the associated t -statistics and the regression R^2 for each country group, for both the short-run and medium-run OLC. The Newey-West (1987) procedure was used to produce consistent estimates of variance-covariance matrices and t -statistics.

Table 2: Initial and final variance of the estimated OLC

Country group k	Short-run OLC		Medium-run OLC	
	$V_{T_i}^k$	V_T^k	$V_{T_i}^k$	V_T^k
All EC countries	0.0050	0.0099	0.0531	0.0725
Euro zone	0.0053	0.0115	0.0464	0.0843
High GDP	0.0037	0.0087	0.0233	0.0949
Septentrional	0.0063	0.0056	0.0753	0.0491
Occidental	0.0015	0.0030	0.0187	0.0379
Meridional	0.0064	0.0232	0.0464	0.1241
B-E core	0.0028	0.0037	0.0488	0.0423
B-E periphery	0.0060	0.0175	0.0508	0.1082
CD centralized	0.0030	0.0023	0.0616	0.0335
CD decentralized	0.0051	0.0198	0.0237	0.0957

Table 3: Regression of OLC variances on trend

Country group k	Short-run OLC			Medium-run OLC		
	$\hat{\beta}_k$	$ \tau(\hat{\beta}_k) $	R^2	$\hat{\beta}_k$	$ \tau(\hat{\beta}_k) $	R^2
All EC countries	0.030	9.30	0.83	0.100	5.48	0.63
Euro zone	0.038	9.23	0.83	0.220	7.73	0.77
High GDP	0.033	5.88	0.66	0.394	7.43	0.75
Septentrional	-0.007	1.98	0.17	-0.199	11.06	0.87
Occidental	0.011	5.18	0.60	0.141	5.12	0.59
Meridional	0.108	11.38	0.88	0.445	7.91	0.78
B-E core	0.006	3.05	0.34	-0.035	1.53	0.12
B-E periphery	0.073	9.58	0.84	0.319	6.80	0.72
CD centralized	-0.006	5.32	0.61	-0.200	6.75	0.72
CD decentralized	0.095	12.20	0.89	0.429	11.03	0.87

Rather high R^2 statistics in most country groups show that the linear trend model fits adequately the time path of the estimated OLC in these groups. This can be confirmed by visual inspection of the OLC series in Figures 1A and 1B. The markedly low R^2 for Septentrional countries (with the short-run OLC) and for the Bayoumi-Eichengreen core countries (with both the short-run and medium-run OLC) may be attributed to the fact that the dispersion of the OLC has been moving up and down without any clear tendency since 1993 in these groups. Moreover, the trend coefficients are everywhere significant at the 5% confidence level except in the case of the Bayoumi-Eichengreen core medium-run OLC where the corresponding $\hat{\beta}_k$ is significant at the 17% confidence level only.

Positive (respectively negative) trend coefficients systematically go in hand with an increase (respectively a decrease) of the variance of the OLC between the initial and final rolling regressions. Moreover, with the exception of the Bayoumi-Eichengreen core group, there is no sign reversal for the trend coefficient so that the decreasing (respectively increasing) heterogeneity of the short-run OLC is consistent with a decreasing (respectively increasing) heterogeneity of the medium-run OLC.

As shown in Table 2, comparison of the cross-country variances of the OLC for the short-run OLC on the one hand, and for the medium-run OLC on the other, reveals that both the initial and final variances of the medium-run OLC are systematically greater than the corresponding variances of the short-run OLC. Following a common output shock on a given country group, the initial dispersion of the resulting impact on unemployment rate is thus amplified by subsequent macroeconomic adjustment mechanisms as the multiplier effect on unemployment tends towards its final value. The initial heterogeneity of the unemployment response to the output shock thus underestimates the medium-run heterogeneity of the unemployment response.

However, the estimators of β_k included in Table 3 further show that, for each country group, the trend coefficient associated with the medium-run OLC is larger (in absolute value) than the trend coefficient estimated with the short-run OLC. The speed of convergence/divergence of the OLC is thus larger for the estimates of the medium-run OLC than for the estimates of the short-run OLC.

Turning to the time path of variances of the OLC, Table 3 reveals that only three country groups (Septentrional countries, Calmor-Driffil centralised countries and Bayoumi-Eichengreen core countries in the case of the medium-run OLC only) exhibit negative $\hat{\beta}_k$ and are thus characterised by convergence of the OLC or, put differently, a significant movement towards synchronisation of the unemployment reaction to cyclical output variations. With the exception of the Bayoumi-Eichengreen core group (where the low R^2 and the sign reversal of the trend coefficient when moving from the short-run OLC to the medium-run OLC suggests caution in interpretation of the empirical results), North Europe countries and European countries with centralised wage bargaining are reaching a higher level of homogeneity of the OLC during the ten year-period from 1993 to 2002. Moreover, the speed of convergence, indicated by the absolute value of the trend coefficients, is very similar across the two groups. Note that only Denmark and Norway belong to both groups.

The other groups exhibit positive and significant $\hat{\beta}_k$ coefficients. Upward trending variances reveal that there is divergence of the OLC through the 1990's in these groups. This divergence of the medium-run OLC is also at work in the subgroup of countries with high levels of GDP, where the speed of divergence is close to four times larger than the speed of divergence obtained for the whole set of EC countries. Considering the case of Euro zone members, this implies that despite the harmonisation of many legal and economic systems underlying the market structures, the increasing dispersion of the OLC probably follows from differences in structures of goods, labour and financial markets. Increasing asymmetry of the unemployment-output correlations implies the existence of structural problems associated with a single monetary policy for the twelve EMU member economies. These problems may be intensified by the variety of monetary transmission mechanisms in EMU countries. This situation may worsen as and when EMU is enlarged to incorporate countries such as Poland. Enlarging the EMU to Eastern countries may result in a higher degree of asymmetry of macroeconomic structural parameters. Furthermore, the divergence of the OLC across the group of the High GDP countries reduces the probability of specific co-ordinated macroeconomic policies aimed at managing the expected employment effects of a common output shock.

Geographical groupings show that divergence of the OLC is at work in Occidental and Meridional countries while convergence is at work across countries in the Septentrional group. Greater homogenisation of interactive macroeconomic mechanisms between labour and goods markets has taken place in northern European countries during the ten last years of the sample. This convergence may be the result of both national-specific and European-wide macroeconomic structural evolutions which began prior to, but continued through, the last decade (labour market rigidities, technological adoption rates, preferences, market structures, government policies) and which led to a partial harmonisation of macroeconomic adjustment mechanisms in the sub-group of Septentrional countries. This decreasing variance of the short-run and medium-run OLC also indicates that a common monetary policy could be appropriate to reduce unemployment fluctuations in this group of countries following a common output shock.

Evidence reported in Table 3 also shows that there is convergence of the OLC across countries with centralised wage bargaining while there is divergence in the group of European countries with decentralised wage bargaining. Moreover, the speed of divergence is very rapid in the latter group. The opposite results obtained for the Calmor-Driffil centralised and non centralised groups is a statistical indication that the degree of heterogeneity of labour market structures constitutes one of the key elements determining whether or not OLC convergence takes place among a specified set of countries.

The nature of real wage determination is considered to be a key factor in the mechanism of adjustment to symmetric and asymmetric shocks and there has been a trend in Europe towards decentralised wage bargaining since the 1980s, following from the decentralisation of business decisions and stronger international competition. The statistical evidence in favour of convergence of the OLC in centralised countries shows that this movement towards decentralisation of the wage bargaining process may have taken place predominantly in centralised countries and may be considered as an explanation of the increasing homogeneity of the slope coefficients of the Okun's Law relationships in these country groups.

Lastly, the hypothesis of convergence of the OLC is not rejected by the data for the Bayoumi-Eichengreen core group but this result is partly mitigated by the markedly low R^2 and t-statistic values (in the case of the medium-run OLC). However, empirical results clearly indicate that there is divergence of the short-run and medium-run OLC in the group of peripheral countries. This empirical result adds some new clues to the relevance of the country groupings suggested by Bayoumi and Eichengreen since their suggested grouping seems to be also valid when analysing the convergence of the OLC instead of the correlation of supply and demand shocks as examined in these authors' initial paper.

V. Conclusion

This paper tests for convergence of short-run and medium-run version of the OLC with a two-step econometric procedure. Empirical results show that North-European countries and European countries with centralised wage bargaining exhibit evidence of convergence of both the short-run and medium-run versions of the OLC during the ten-year period from 1993 to 2002. Moreover, the estimated speed of convergence are similar and rather high in these country groups. Alternative country groupings systematically exhibit divergence of the OLC estimates and the speed of divergence is larger with the medium-run estimate of the OLC than with the short-run estimate.

This statistical evidence found in favour of convergence of the OLC in centralised countries may be considered as the result of pressures towards decentralised wage bargaining that started in the 1980s in Europe and have taken place predominantly in centralised countries, thereby increasing homogeneity of the slope coefficients of the Okun's Law relationships in these country groups.

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APPENDIX.

Figure 1A: Cross-country variance of the short run ADL estimate of the OLC

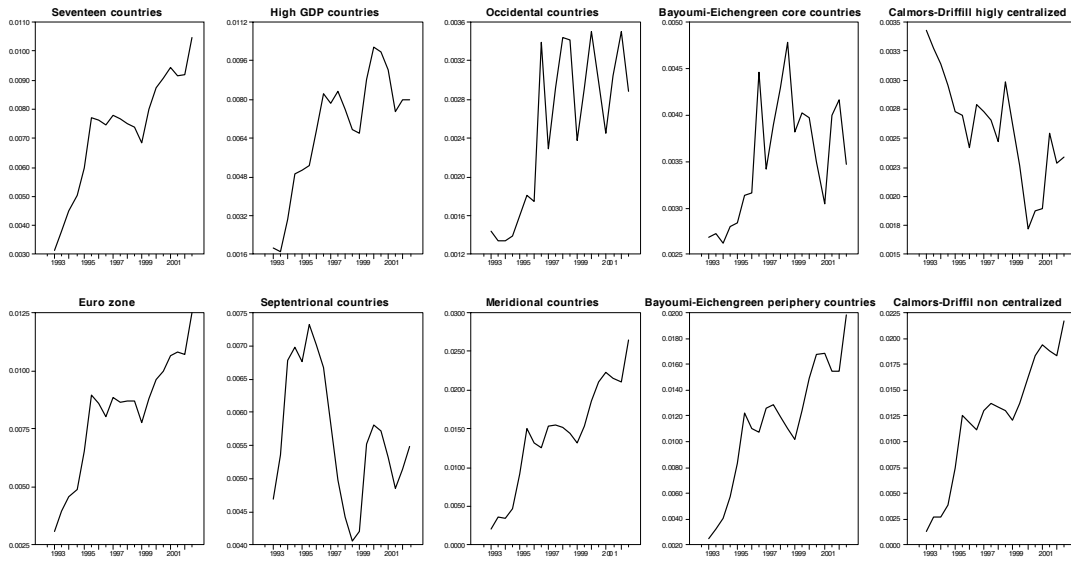
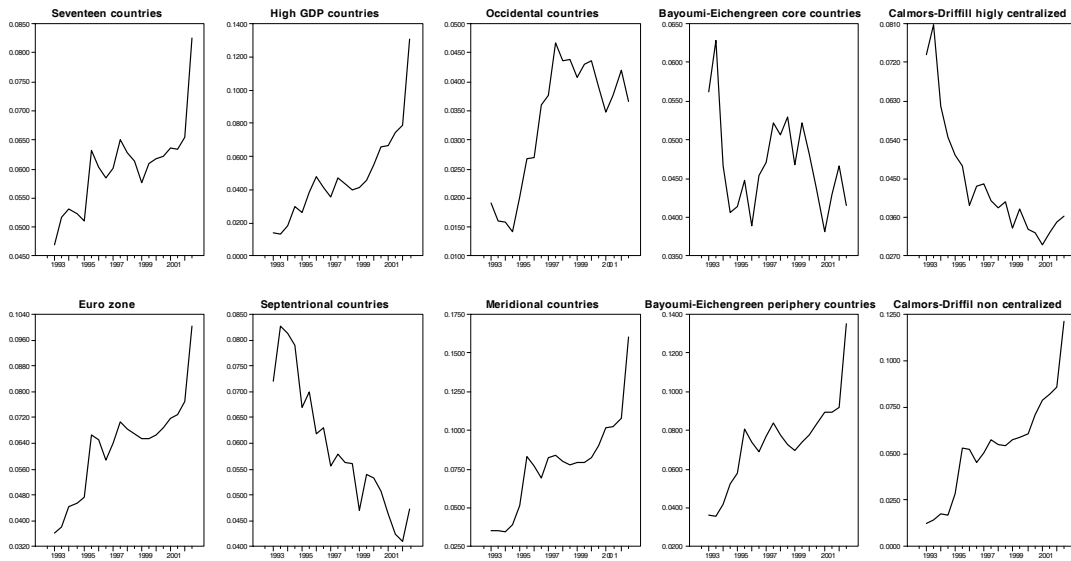


Figure 1B : Cross-country variance of the medium run ADL estimate of the OLC



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