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PROFIT RATE CONVERGENCE IN THE EUROPEAN ECONOMIC AREA: A PANEL DATA ANALYSIS

Ivan D. Trofimov

Victoria University of Wellington, New Zealand

This paper examines profitability disparities across the European economies using the aggregate and sectoral data for the period from 1995 to 2019 and applying a combination of panel unit root tests and the club convergence procedure. For most of the sectors, no convergence was identified at the aggregate level. Convergence within the clubs to multiple equilibrium levels, however, was identified. This convergence pattern was the most typical in the knowledge-intensive service sectors. The exogenous shocks had temporary effects on the economies' profit rates (thus contributing to convergence), whereas the country- and sector-specific profitability components were characterized by stochastic behavior (attesting to nonconvergence). Overall, the persistence of profitability disparities was demonstrated. The findings suggest the importance of the firm-specific and local profitability drivers and the limited effects of the macroeconomic and competition policies on profit rates.

Keywords: convergence, panel unit root tests, industry, Europe

JEL Classification: L60, L80, N34, O47

INTRODUCTION

The convergence of the distributive variables (wages, a wage share, and capital returns) was examined both in empirical international economics and in industrial organization: in the former case, it was examined as the outcome of international factor mobility (Chou, Izyumov & Vahaly, 2016), whereas in the latter, it was examined as a result of the competitive process, inter-industry variations in wages and capital intensity, as well as the exogenous shocks that have differential effects on individual industries (Tescari & Vaona, 2014). The empirical research in the profit rate convergence proved to be limited and conflicting in the outcomes. The largely descriptive analyses by A. Bigsten, A. Isaksson, M. Söderbom, P. Collier, A. Zeufack, S. Dercon, M. Fafchamps, J. W. Gunning, F. Teal, S. Appleton, B. Gauthier, A. Oduro, R. Oostendorp and C. Pattillo (2000) and C. Udry and S. Anagol (2006) demonstrated the profit rate disparities across countries and higher rates in capital-scarce economies with no pronounced convergence (divergence) patterns. In the case of manufacturing profits in industrialized economies, A. Glyn (2004)

* *Correspondence to:* I. D. Trofimov, Victoria University of Wellington, Kelburn Parade, Kelburn 6012, New Zealand; e-mail: ivan.trofimov1@gmail.com

likewise identified no convergence despite trade liberalization, the freer movement of capital, and stronger competitive pressures. In contrast, N.-T. Chou *et al* (2016) confirmed the profit rate convergence in developing and transition economies, principally due to convergence in the output-capital ratios and a technological transfer. S. Carter (2003) noted limitations to the profit rate convergence in developed economies after the dismantlement of the Keynesian paradigm of economic governance in the 1980s to the 1990s. In the study on regional convergence in Canada's manufacturing profit rates, D. L. Rigby (1991) rejected the convergence hypothesis and noted the existence of spatial barriers even within a single economy.

In this paper, convergence tendencies in profit rates at both the industry and aggregate levels for the European Economic Area's countries that have undergone political and economic integration over the past decades are examined. The focus is on the two aspects of convergence: the degree of persistence in profitability differentials (stochastic convergence), and heterogeneity in convergence (club convergence). Respectively, a series of panel unit root tests are done, and the club convergence procedure is carried out. The two hypotheses are as follows:

H1: There is some form of the profit rate convergence across the European economies due to the integration forces, factor flows or underlying forces (convergence in the wage share or capital productivity).

H2: Convergence is incomplete and imperfect, with heterogeneity in levels, slow convergence speed and the presence of convergence clubs (due to the limitations of the integration and unification processes in Europe and profit determination by local or industry-specific factors).

Section two of the paper examines the theoretical basis of the factor price (return) convergence. Section three defines the variables, describes the data and outlines the econometric methodology. Section four contains the empirical results of the study, while the concluding remarks are presented in the final section of the paper.

LITERATURE REVIEW

The issue of economic convergence in Europe has been subjected to extensive research, with the following aspects being examined: the determinants of the GDP *per capita* convergence, the introduction of the euro, external imbalances, the total factor productivity differences, migration, the COVID-19 effects (Coutinho & Turrini, 2020; Tubić-Ćurčić & Stanišić, 2023; Licchetta & Mattozzi, 2023), labor productivity in individual industries (Kijek, Kijek & Nowak, 2020; Borović, Tomaš & Trivić, 2023), the socioeconomic and political aspects of convergence (Collier, 2020), to name but a few.

The analysis of the distributive variable convergence in general and in Europe in particular was more limited. It documented the labor share disparities and related them to the differences in the relative prices and structural change (Kónya, Krekó & Oblath, 2020), identified the substantial share disparities and attributed them to the accession to the EU and the expansion of technological opportunities to work (Prohorovs & Bistrova, 2022), provided the evidence of the profit rate convergence driven by an increase in capital productivity and, to a lesser extent, a decline in the relative price of capital goods (Chou *et al*, 2016), and confirmed the upward trend in profit shares and negative GDP-profit share correlation (Izyumov & Vahaly, 2015).

At the industry level, the pace and outcome of convergence in profit rates is determined by the producer's response to competitive pressures, production techniques, the capital mobility degree, the bargaining power of collective labor, capital intensity and composition, and other exogenous factors. Firstly, competition in product markets lowers profit margins and wages (in neoclassical economics, convergence to the long-term 'normal' level, in heterodox economics, convergence to a positive level, determined by the capital-labor ratio and the exploitation of the labor rate) (Glick & Ochoa, 1990). Secondly, a greater strength of organized labor may keep wages at a higher level at the expense of a profit, while the greater bargaining power of capital (assisted by greater capital mobility) generates the opposite outcome. Thirdly, production techniques

and the innovation pace in individual industries determine the dynamics of the price and factor returns (e.g. more innovative firms and industries earning higher profits and affording higher wages), the process independent from competitive forces and capital and labor relative power. Fourthly, exogenous factors (demographic transition, the business cycle fluctuations, regulatory changes, etc.) may affect profit rates and wages in a variety of ways, e.g. generate stability, stochastic behavior or deterministic trends in either direction, or may change dispersion across industries, etc.). For instance, T. P. Lianos and V. Droucopoulos (1993) demonstrate an increase in the dispersion of profit rates at the cycle expansion stage driven by differences in capital intensity levels. On the other hand, the economic expansion may allow higher profits for low-profit firms, thus bringing a reduction in the dispersion and convergence of profit rates. Alternatively, in the presence of entry barriers or capital requirements, the hierarchy or profit rates may persist. Fifthly and lastly, the speed of profit rate convergence across economies may be more pronounced in manufacturing, given the greater mobility of the production factors, the greater intensity and degree of the class conflict (Glyn, 2004).

Factor price disparities at the national economy or regional bloc levels are likely to be smaller than those on an international scale, given the free trade and movement of the production factors that result in the factor price convergence (Rassekh, 1992). The remaining factor price differentials may be attributed to technological polarization in specific industries, disparities in the physical infrastructure and human capital endowments (e.g. the southern and eastern European regions), and location-specific factors. In Europe, convergence forces may include labor migration (in the 1970s, migrations from Southern Europe, and in the period from 1990 to 2000s, migrations from Eastern Europe); the provision of structural funds from the EU budget to the less developed members; foreign investment from the capital abundant members (e.g. the acquisition of businesses in new members); the relocation of the assembly-type industries to the eastern European members (akin 'maquiladora' industries in the US-Mexico trade).

Regarding the profit rate convergence across economies at the sectoral level, O. M. Amos Jr. (1991) postulated the slowest convergence for the industries with the highest degree of the concentration of productive firms and localization in specific places (e.g. finance in London and Frankfurt), this postulation being based on the US data. These industries, however, are characterized by the fastest rate of technological and organizational change, and (in the case of finance) the intense business reorganization that contributes to the profit convergence. The industries serving and selling to the national market (in this study, the EU market), such as manufacturing, are likely to experience a greater mobility of factors and hence convergence, whereas the industries selling and investing locally (such as various nonfinancial or public services) or the industries relying on the permanent or hardly changeable natural resource endowment of (agriculture and mining) or fixed amenities (tourism) are characterized by smaller mobility and a slower pace of convergence (Testa, 1989; Mallick & Carayannis, 1994). In the case of agriculture, the EU-wide policies (such as the common agricultural policy) and the agro-industrialization process may potentially offset slow convergence or divergence.

In general, the findings with respect to the profit rate convergence are scant and contradictory, thus requiring further empirical testing.

METHODOLOGY AND DATA

The profit rate variable is defined as the net operating surplus, NOS (i.e. the operating surplus adjusted for depreciation) divided by the net capital stock K at the current replacement costs:

$$\pi = \left(\frac{NOS}{K} \right) \times 100 \quad (1)$$

The operating surplus is taken as a residual from the production accounts and excludes the extraneous items not related to the production process. Capital stock is measured at the current replacement (rather than historical) values, because the vintages of the

capital installed at different points in time and purchased at the different price levels are not additive or commensurate with each other in the absence of the fixed nonmonetary unit of measurement and are not equally productive.

The profit rate series are presented and analyzed in level terms, with no logarithmic transformation, which approach is justified by the fact that a number of the observations are close to zero and the specific interest of the paper in the actual dynamics of the profit rates (that includes outliers, the variation of the data on a relative scale and distribution shapes).

All the data were sourced from the Eurostat databases (the relevant details provided in Table A1, see the Appendix). The time frequency is annual, and the study covers the period from 1995 to 2019. The economies included in the study are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, and the UK. Convergence is conducted for the economy as a whole, as well as for the twelve broad sectors (the list is contained in the 'Empirical results' section).

Given the high degree of the economic and policy integration in the European Union and a possible presence of cross-sectional heterogeneity and dependence, the M. H. Pesaran (2007) and J. Bai and S. Ng (2004) tests capturing these characteristics were applied. [1] The use of the Pesaran and Bai-Ng panel unit root tests was the key methodological element in the studies carried out by C. van Krevel (2023), and J. E. Payne and N. Apergis (2021).

The Pesaran test takes augmented Dickey-Fuller (ADF) regression and incorporates the cross-sectional averages of the lagged differential y_{it} and its first difference in it, namely as follows:

$$\Delta y_{it} = a_i + b_i y_{it-1} + c_i \overline{y}_{t-1} + d_i \Delta \overline{y}_t + \varepsilon_{it} \quad (2)$$

The cross-sectionally augmented IPS test statistics are calculated as:

$$CIPS(N,T) = \overline{t} = \frac{1}{N}\sum_{i=1}^{N} \tilde{t}_i(N,T) \quad (3)$$

where $t_i(p_i)$ is the t-statistic for b_i in the cross-sectionally augmented ADF regression. The null hypothesis $H_0 : b_i = 0$ for all i is contrasted against the heterogeneous alternative $H_1 : b_i < 0, i = 1,2,\ldots,N_1, b_i = 0, i = N_1+1, N_2+2,\ldots,N$, i.e. the alternative assumes that at least one of the series is stationary, whereas failure to reject the null implies that all the series are nonstationary.

Bai-Ng (2004) test traces convergence (or its absence) to the common, as well as country-specific (idiosyncratic) factors, e.g. if there is no convergence in real wages, that fact may be attributed to the factors affecting all the economies in question (e.g. technological change), or only some of them (e.g. the policies implemented in selected economies). The test treats the panel data as the sum of the deterministic country-specific component D_i, the common component (the product of the country-specific factor loading λ_i' and the vector of the common factors F_t) and the error term.

$$Y_{it} = D_i + \lambda_i' F_t + e_{it} \quad (4)$$

$$F_{mt} = \alpha_m F_{mt-1} + u_{mt} \quad (5)$$

$$e_{it} = \rho_i e_{it-1} + \varepsilon_{it} \quad (6)$$

where $t = 1,\ldots,T$, $m = 1,\ldots,r$, $i = 1,\ldots,N$.

The test uses transformed data (the first-differenced, if there is a constant in D_i, and the demeaned and the differenced, if there is a linear trend), conducts the principal component analysis in order to extract the factors (r being the number of principal components), the country-specific loadings and residuals, and examines the unit root null hypothesis separately for the common and idiosyncratic components. The number of the components is determined based on the J. Bai and S. Ng (2002) criterion. In contrast to

M. H. Pesaran (2007), the test does not assume that both integrated components are of the same order, thus testing the unit roots in the components separately.

The m common component is stationary if the null hypothesis of $\alpha_m = 1$ is rejected in favor of the alternative of $\alpha_m < 1$. The idiosyncratic component e_{it} is stationary if the null hypothesis of $\rho_i = 1$ is rejected in favor of the alternative of $\rho_i < 1$ for some i.

For the idiosyncratic components, the Fisher-type pooled ADF test is applied as follows:

$$DF^{c}_{(\hat{e})}(i) = \frac{\sum_{t=2}^{T} \hat{e}_{it-1} \Delta \hat{e}_{it}}{\left(\hat{\sigma}^2_{\varepsilon i} \sum_{t=2}^{T} \hat{e}^2_{it-1} \right)^{1/2}} \quad (7)$$

where $\sigma^2_{\varepsilon i} = \sum_{t=2}^{T} \left(\Delta \hat{e}_{it} - \hat{b}_i \hat{e}_{it-1} \right)^2 / T - 1$ and $\hat{b}_i$ is the OLS estimator from the regression of $\Delta \hat{e}_{it}$ on $\hat{e}_{it-1}$. To test for the unit roots in the idiosyncratic component, the panel-modified , P_b and $PMBS$ statistics were derived, respectively.

To account for the local version of convergence to multiple levels (at multiple speed), P. C. B. Phillips and D. Sul (2007) club convergence procedure, a nonlinear time-varying factor model capable of capturing transitional dynamics, combining both convergence in levels and growth rates, distinguishing the multiple convergence equilibria, measuring the speed of convergence while not relying on the analysis of the (non)stationarity of the series is employed. The Phillips-Sul club convergence methodology has been applied extensively, e.g. by S. Solarin, S. Erdogan and U. Pata (2023) in the OECD income inequality convergence study, I. Arif (2022) in regional convergence analysis, or M. R. Maulana and H. Aginta (2022) in the regional wage convergence research.

The model is implemented in the panel data setting that gives an additional advantage of comparing the transition path of an individual economy relative to the average level in the panel. The procedure includes the $\log t$ test for the overall convergence based on time series regression; the stepwise algorithm to identify the number of the clubs and determine their composition; the adjacent test for club merging; and the additional plots to depict the transition behavior of the panel members.

For the country i, the panel data Y_{it} is split into the two time varying components, namely the common factor μ_t and the idiosyncratic factor loading β_{it} as:

$$Y_{it} = \beta_{it} \mu_t \quad (8)$$

The idiosyncratic component is used across time and cross-sections and represents the deviation of the economy i from the common path μ_t and behavior of the economy i in relation to the other economies. Within the framework, all the economies converge to the steady state in the future irrespective of their current position $\lim_{k \to \infty} \beta_{it+k} = \beta$; however, they may converge to multiple steady states.

To eliminate the common component, P. C. B. Phillips and D. Sul (2007) rescale the panel average and define the relative transition parameter h_{it} as:

$$h_{it} = \frac{Y_{it}}{1/N \sum_{i=1}^{N} Y_{it}} = \frac{\beta_{it}}{1/N \sum_{i=1}^{N} \beta_{it}} \quad (9)$$

The cross-sectional average of the individual economies' h_{it} is set equal to unity by construction. In the case of overall convergence to a single steady state, β_{it} moves towards the constant β, h_{it} converges to unity, and the cross-sectional variation of the relative transition paths H_t approaches zero:

$$H_t = 1/N \sum_{i=1}^{N} \left(h_{it} - 1 \right)^2 \to 0 \quad (10)$$

According to the proposed representation, the null hypothesis is the overall convergence of β_{it} to β_i for all non-negative α, whereas an alternative hypothesis is nonconvergence for some i. .

$$H_0 : \beta_i = \beta \text{ and } \alpha \geq 0 \quad (11)$$

$$H_A : \beta_i \neq \beta \text{ for some } i \text{ and/or } \alpha < 0 \quad (12)$$

The hypotheses are tested by means of the $\log t$ regression:

$$\log\left(H_1 / H_t\right) - 2\log L(t) = \hat{a} + \hat{b}\log t + u_t \quad (13)$$

where $t = [rT], \ldots, T$, $r > 0$, $L(t) = \log(t)$, $\hat{a}$ is the least-square estimate of α, and $\hat{b} = 2\hat{a}$ is the parameter of the $\log t$. The $\log t$ test has an acceptable size and power properties when $r = 0.3$, hence 30% of the earlier observations in the sample are removed, according to P. C. B. Phillips and D. Sul (2007) recommendations.

The null hypothesis is tested through an autocorrelation- and heteroscedasticity-robust one-sided t-test. The null hypothesis of the overall convergence is rejected if $\hat{b} < 0$ and is significant, whereas the t-value of $\hat{b}$ is less or equal to -1.65 (at the 5% significance level). The speed of the convergence of the units within the clubs is represented by the size and significance of the beta coefficient. The negative and insignificant beta indicate the absence of convergence ($\hat{b} < 0$, $t_{\hat{b}} < -1.65$), negative but significant beta represents slow convergence ($\hat{b} < 0$, $t_{\hat{b}} > -1.65$), while positive and significant beta indicates conditional convergence in the growth rate or absolute convergence in levels ($2 > \hat{b} \geq 0$, $t_{\hat{b}} > -1.65$ and $\hat{b} \geq 2$, $t_{\hat{b}} > -1.65$, respectively).

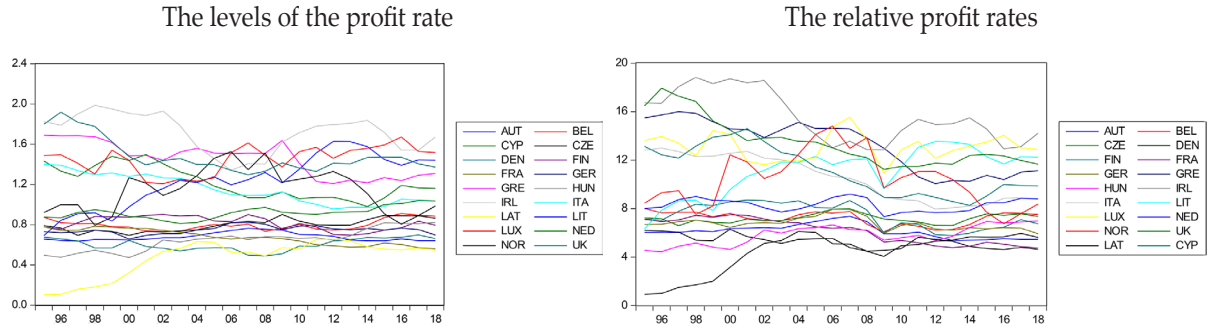
EMPIRICAL RESULTS AND DISCUSSION

The level of the profit rates varied substantially across the sectors (Table A2, Appendix and Figure 1). The highest and lowest mean profit rates (46.5% and 3.8%, respectively) were respectively observed in the financial and insurance services, and real estate activities (in the latter sector, the profit is confined to the transaction margin). The standard deviation was substantial, reflecting the variation of the rates across the economies and the time (the highest and the lowest deviations being observed in the same sectors as the mean profit rate). The highest profitability and profit volatility in the finance and insurance sectors reflect broader financialization (a complex process that includes the rising power of financial capital, the reordering of the productive sectors and a greater involvement of households in the financial sector), concentration in the financial sector, alongside the instability of the financial sector companies (Nolke, 2017). The profit rate was positively skewed in all the sectors and was close to symmetric in the aggregate economy. The positive excess kurtosis was demonstrated in administrative and support services, the real estate activities and, to a lesser extent, in the other sectors, whereas in the total economy, the profit rate distribution was platykurtic. The null hypothesis of the distribution normality was rejected in every sector, as attested by the Jarque-Bera test.

A reduction in the cross-sectional variation was observed in the level of the profit rates, but not in the relative profit rates (likely pointing to sigma convergence in the former case). A limited number of the economies clustered and co-moved, while certain economies (namely Ireland, Luxembourg, and Lithuania in the top figure) seemed to have substantially higher levels of profitability and arguably distinct fluctuation patterns. Together with the aforementioned broad disparity, this may suggest the absence or weak form of convergence at the panel-wide level and the presence of club convergence.

Among the EU new members, the profit rates were relatively stable in the Czech Republic and Hungary (Figure A1, Appendix). The (relative) profit rates in Latvia exhibited a clear decline in the post-2004 period, while in Lithuania, they grew throughout the period. The case of Lithuania demonstrates its particular success in attracting foreign investment compared to its other Eastern European peers (as manifested in the number of the established free economic zones, tax exemptions to foreign companies, a reduction in red tape) and the growth of the industries with high productivity, and innovation and the human capital

Figure 1 The levels of the profit rate (in %) and the relative profit rates across the European economies



Source: Author

content of the output. These forces contributed to the growth of the mass of profits, while wage growth slower than in the other Baltic states enhanced a profit share. In contrast, the Latvian case is a reflection of dominance in the GDP of the low-productive services, a certain slack in the structural reforms and the ongoing wage growth in the post-accession period (Danileviciene & Lace, 2017; Krasnopjorovs, 2021). The GFC decline in 2008-09 was observed for Lithuania and less so for Hungary. In Cyprus, the dynamics of the profit rates was principally driven by the level of the labor share, capital productivity and the profits in the financial sector: in the 1990s and the early 2000s, they were driven by the stable labor share and the expansion of financial inflows and profits (hence stable profitability), in the period until 2013-24, that driver was a rapid decline in capital productivity (the falling profit rate), and finally in the post-2014 period (the rising profit rate), they were driven by the severe devaluation of the labor power and reduction in the labor share (Kosmas & Ioakimoglou, 2023).

The comparison of the levels of the profit rates across the sectors may mask the conceptual and statistical differences pertaining to the calculation of the operating surplus and the capital stock. In the financial sector and agriculture, the surplus is attributed to natural capital and the financial assets that do not belong to the fixed reproducible asset category. In the public sector (or the sectors where public enterprises play a substantial role in production), the calculation of the rate of return may be meaningless, given the fact that the governments or government enterprises are not mandated to operate for a profit (while simultaneously the capital stock may be substantial). Additionally, the government operating surplus may attribute to the other sectors (e.g. a surplus from the public educational institutions or the transport infrastructure). Lastly, the operating surpluses in the wholesale and retail may be due to prior investment in stocks (which are distinguished from fixed capital).

The Pesaran CD test rejects the null hypothesis of cross-sectional independence in every sector and in the aggregate economy, thus indicating the appropriateness of the use of the cross-sectionally augmented Pesaran CIPS test and the Bai-Ng factor-based test. Both tests were implemented on the relative profit rates (the ratio of the country i's profit rate to the average profit rate in the panel), including the constant or constant plus trend and the maximum of four lags (the Pesaran CIPS test) or a single common factor (the Bai-Ng test).

In the Pesaran CIPS test, the optimal lag is selected using an iterative process, whereby the significance of the lag is determined based on the Portmanteau Ljung-Box test. The Pesaran CIPS test indicated unit roots in the total economy and in most sectors (Table 1). Arguably, the relative profit rate was stationary in mining and quarrying (the rejection of the null at lags zero and one in both specifications) and in transportation and storage (the rejection at lags zero and one in the specification with the constant). There was also some evidence of stationarity for accommodation and food service, and administrative and support services.

Table 1 The results of the Pesaran CD and CIPS tests

Sector	Pesaran CD	Pesaran CIPS (the constant)					Pesaran CIPS (the constant plus the trend)				
		Lag=0	Lag=1	Lag=2	Lag=3	Lag=4	Lag=0	Lag=1	Lag=2	Lag=3	Lag=4
[1]	59.348	-1.473*	-1.733	1.467	-1.605	-1.624	-1.802	-2.358	-2.072	-2.094	-2.011*
	0.000	0.887	0.530	0.892	0.736	0.708	0.990	0.414	0.861	0.838	0.913
[2]	45.462	-1.826*	-1.778	-1.572	-1.759	-1.734	-1.879	-1.966*	-1.647	-1.885	-1.753
	0.000	0.412	0.487	0.786	0.518	0.557	0.967	0.93	0.997	0.965	0.991
[3]	48.345	-1.939*	-1.886	-2.066	-1.762	-1.717	-2.017	-1.855	-1.911*	-1.736	-1.469
	0.000	0.218	0.288	0.096	0.481	0.554	0.896	0.975	0.957	0.993	1.000
[4]	43.249	-1.822*	-1.907	-1.900	-2.097	-1.748	-2.059	-2.195	-2.259*	-2.610	-2.136
	0.000	0.418	0.292	0.302	0.096	0.535	0.862	0.698	0.601	0.114	0.779
[5]	49.950	-2.077*	-1.544	-1.377	-1.235	-1.091	**-3.020***	-2.412	-2.164	-2.068	-1.732
	0.000	0.089	0.802	0.938	0.983	0.997	**0.001**	0.330	0.735	0.851	0.994
[6]	48.285	-1.762*	-2.053	-1.944	-1.518	-1.517	-2.077	-2.450	-2.360*	-1.831	-1.805
	0.000	0.481	0.106	0.212	0.830	0.831	0.841	0.273	0.416	0.980	0.985
[7]	47.451	-1.761*	-1.627	-1.574	-1.405	-1.053	-2.350*	-2.195	-2.317	-2.191	-1.872
	0.000	0.481	0.695	0.766	0.923	0.998	0.432	0.690	0.487	0.695	0.970
[8]	48.414	-1.447*	-1.514	-1.382	-1.281	-1.118	-2.209*	-2.507	-2.462	-2.548	-2.378
	0.000	0.894	0.835	0.935	0.973	0.995	0.668	0.199	0.256	0.153	0.385
[9]	22.041	**-2.351***	**-2.339**	-1.686	-1.970	-1.738	-2.612	**-2.704***	-1.851	-2.018	-1.840
	0.000	**0.007**	**0.008**	0.605	0.182	0.519	0.097	**0.045**	0.976	0.895	0.978
[10]	50.542	-1.515	-1.433	-1.237	-1.228	-1.334*	-2.122*	-2.194	-2.015	-1.924	-1.922
	0.000	0.834	0.905	0.983	0.984	0.957	0.790	0.692	0.898	0.951	0.953
[11]	50.520	-0.995	-1.399	-1.354	-1.362	-1.180*	-1.427	-2.062	-1.987	-2.043	-1.663*
	0.000	0.999	0.926	0.949	0.945	0.091	1.000	0.857	0.918	0.874	0.997
[12]	26.914	-2.064*	-2.099	-1.785	-1.813	-1.616	-2.390*	-2.336	-2.073	-2.359	-2.281
	0.000	0.098	0.075	0.443	0.397	0.709	0.366	0.455	0.846	0.416	0.549
[13]	50.787	-1.526*	-1.511	-1.434	-1.465	-1.516	-1.867	-1.953*	-1.734	-1.789	-1.669
	0.000	0.822	0.838	0.904	0.880	0.833	0.972	0.938	0.993	0.987	0.997

Notes: The p-values are in parentheses. Stationarity at 1%, 5% and 10% critical levels is indicated in bold, bold italics, and italics, respectively. * represents the lag length selected by the Portmanteau Ljung-Box test.

Source: Author

The Bai-Ng test (Table 2) indicated the stationarity of the common component in the majority of the sectors, with the exception of the administrative and support service sectors, construction, and wholesale and retail trade, and provided some evidence of non-stationarity in information and communication (the specification with the constant), and in the total economy and real state (the specification with the constant and the trend). The results for the common component suggest the temporary effects of global and regional shocks on aggregate or sectoral profitability. The idiosyncratic components in most sectors were characterized by stochastic behavior (hence nonconvergence was likely a country-specific phenomenon). The agriculture, forestry and fishing, financial and insurance services, and to a smaller extent administrative and support services stood as the exceptions. According to J. Bai and S. Ng (2002), series are deemed to be nonstationary if one of the common components is nonstationary, or the idiosyncratic component is nonstationary (as was the case with 11 out of 13 series), or both. Noting the greater power of the Bai-Ng test, non-stationarity and a lack of convergence are confirmed for the aggregate economy and all the sectors except the sectors of agriculture, forestry and fishing, and financial and insurance services. In the former sector, stationarity and panel-wide convergence are attributed to the implementation of the Common Agricultural Policy;

Table 2 The results of the Bai-Ng panel unit root test

Sector	The constant					The constant plus the trend					
	ADF	Pa	Pb	PMBS	Outcome	ADF	Pa	Pb	PMBS	Outcome	Overall outcome
[1]	**-1.945**	-0.739	-0.654	-0.406	UR	-1.584	**-2.112**	**-1.676**	-1.209	UR	UR
	0.046	0.230	0.257	0.342		0.108	**0.017**	**0.047**	0.113		
[2]	**-4.666**	-0.775	-0.708	-0.217	UR	**-4.700**	-0.812	-0.713	-0.566	UR	UR
	0.000	0.219	0.239	0.414		**0.000**	0.209	0.238	0.286		
[3]	**-1.692**	0.998	1.340	2.421	UR	**-4.317**	0.295	0.311	0.366	UR	UR
	0.086	0.841	0.910	0.992		**0.000**	0.616	0.622	0.643		
[4]	-1.397	**-1.769**	**-1.348**	-1.011	UR	-0.952	**-1.959**	**-1.609**	-1.131	UR	UR
	0.157	**0.038**	**0.089**	0.156		0.302	**0.025**	**0.054**	0.129		
[5]	-4.899	**-2.041**	**-1.335**	**-1.588**	ST	**-4.899**	**-1.753**	**-1.502**	-0.991	ST	ST
	0.000	0.021	0.091	0.056		**0.000**	**0.040**	**0.067**	0.161		
[6]	-0.587	-0.350	-0.255	-0.665	UR	-0.635	-0.100	-0.100	-0.027	UR	UR
	0.464	0.363	0.399	0.253		0.440	0.460	0.460	0.489		
[7]	**-1.987**	**-3.782**	**-2.013**	**-1.491**	ST	**-2.357**	**-1.356**	-1.124	-0.821	UR	Inc
	0.042	0.000	0.022	0.068		**0.017**	**0.088**	0.130	0.206		
[8]	-1.452	0.958	1.079	1.078	UR	**-2.908**	-1.170	-1.030	-0.810	UR	UR
	0.141	0.831	0.860	0.860		**0.003**	0.121	0.152	0.209		
[9]	**-4.241**	-1.176	-0.978	-0.680	UR	**-4.081**	-0.710	-0.655	-0.505	UR	UR
	0.000	0.120	0.164	0.248		**0.000**	0.239	0.256	0.307		
[10]	**-2.713**	-0.531	-0.432	-0.751	UR	**-2.645**	-1.265	-1.109	-0.821	UR	UR
	0.006	0.298	0.333	0.226		**0.007**	0.103	0.134	0.206		
[11]	**-4.899**	0.562	0.454	-0.633	UR	-0.434	-0.908	-0.807	-0.661	UR	UR
	0.001	0.713	0.675	0.264		0.520	0.182	0.210	0.254		
[12]	**-1.835**	0.163	0.178	0.634	UR	**-1.895**	-0.827	-0.743	-0.569	UR	UR
	0.061	0.565	0.571	0.737		**0.053**	0.204	0.229	0.285		
[13]	-1.156	0.524	0.644	1.404	UR	0.512	0.306	0.328	0.378	UR	UR
	0.221	0.700	0.740	0.920		0.835	0.620	0.628	0.647		

Notes: According to Table 1, stationarity at all critical levels is indicated in bold. UR, ST, Inc indicate the unit root, stationarity, and the inconclusive case. The lag length selection was performed by choosing the specification that minimizes the Bayesian information criterion. The maximum lag length is given by $k_{\max} = floor(\min\{T/3,12\} * (T/100)\,\hat{}\,0.25)$.

Source: Author

in the latter, however, they are attributed to the dynamics of the industry characterized by a free flow of labor and capital, the high speed of technological change and regulatory unification.

As far as both the common and country-specific (idiosyncratic) dynamics of the profit rates are concerned, the outcomes of both the Pesaran CIPS and the Bai-Ng tests demonstrate a clear similarity (stochastic behavior in the rates for the majority of the industries, except for agriculture, forestry and fishing), which reflects the common underlying data and the features of the tests (both attend to the cross-sectional dependence, and both estimate the unobservable common components, albeit in different ways). When only the idiosyncratic component is concerned, the similarities are even stronger, with stationarity additionally identified by both tests in the administrative and support services.

The Phillips-Sul club convergence procedure was implemented on the profit rate data in levels (Table 3). Based on the $\log t$ test, the null hypothesis of convergence for all the economies in the panel is rejected in all the cases, with the beta coefficient being negative and significant (Panel A). Panel B contains information on the number of the clubs, the constituent units in each club and the divergent units. The largest number of the clubs were identified in manufacturing, and in the administrative and support services (four clubs in each sector), only to be followed by the accommodation and food services, agriculture, forestry and fishing, and the financial and insurance services (three clubs in each sector). In the other sectors, maximum two clubs were identified (mining and quarrying contained one single club). The number of the divergent units ranged from zero in the total economy, accommodation and food service, construction, and information and communication, to two in the financial and insurance services and transportation and storage. There was divergence within one of the clubs (Club 1 in the real estate activities). The slowest speed of convergence within the clubs was that noticed in Club 2 in the construction sector (negative but significant beta), whereas in all the other cases, the beta coefficient was positive. The majority of the clubs were characterized by conditional convergence in the growth rate. Only three clubs experienced absolute convergence: Club 3, in accommodation and food service; Club 2, in real estate activities, and Club 2, in transportation and storage. In the majority of the sectors, there was no over-determination of the true number of clubs. In the manufacturing and financial and insurance services, the final number of the clubs after merging stood at three and two, respectively, whereas in the

Table 3 The club convergence tests

Total economy				Manufacturing				Accommodation and food service			
A. Log-t test				A. Log-t test				A. Log-t test			
	Beta	SE			Beta	SE			Beta	SE	
Full sample	-0.540*	0.034		Full sample	-1.247*	0.022		Full sample	-0.978*	0.016	
B. Club statistics				B. Club statistics				B. Club statistics			
	# of units	Beta	SE		# of units	Beta	SE		# of units	Beta	SE
Club_1	4	1.094*	0.097	Club_1	5	0.242*	0.121	Club_1	6	0.427*	0.035
Club_2	14	0.074*	0.015	Club_2	2	1.754*	0.274	Club_2	8	1.204*	0.171
Divergent	0			Club_3	4	0.288	0.197	Club_3	2	2.119*	1.053
				Club_4	2	0.604	1.835	Divergent	0		
				Divergent	1						
C. Club merging				C. Club merging				C. Club merging			
Nil				Club_1 (C1+C2)	7	-0.131	0.086	Nil			
Administrative and support services				Agriculture, forestry and fishing				Construction			
A. Log-t test				A. Log-t test				A. Log-t test			
	Beta	SE			Beta	SE			Beta	SE	
Full sample	-1.452*	0.013		Full sample	-1.534*	0.028		Full sample	-1.275*	0.142	
B. Club statistics				B. Club statistics				B. Club statistics			
	# of units	Beta	SE		# of units	Beta	SE		# of units	Beta	SE
Club_1	2	0.176	1.604	Club_1	9	0.194*	0.054	Club_1	4	1.214*	0.238
Club_2	2	1.682	1.555	Club_2	4	0.657*	0.054	Club_2	11	-0.408	0.319
Club_3	2	0.128	0.163	Club_3	2	1.659	1.894	Divergent	0		
Club_4	5	0.471*	0.115	Divergent	1						
Divergent	1										
C. Club merging				C. Club merging				C. Club merging			
Nil				Nil				Nil			

Table 3 (Continued)

Financial and insurance services				Information and communication				Mining and quarrying			
A. Log-t test				A. Log-t test				A. Log-t test			
	Beta	SE			Beta	SE			Beta	SE	
Full sample	-1.266*	0.045		Full sample	-0.805*	0.012		Full sample	-0.552*	0.052	
B. Club statistics				B. Club statistics				B. Club statistics			
	# of units	Beta	SE		# of units	Beta	SE		# of units	Beta	SE
Club_1	7	0.66*	0.130	Club_1	11	0.253*	0.031	Club_1	7	0.926*	0.128
Club_2	4	0.273*	0.113	Club_2	4	0.81*	0.233	Divergent	1		
Club_3	2	0.997*	0.353	Divergent	0						
Divergent	2										
C. Club merging				C. Club merging				C. Club merging			
Club_1 (C1+C2)	11	0.429*	0.089	Nil				Nil			
Professional, scientific and technical services				Real estate activities				Transportation and storage			
A. Log-t test				A. Log-t test				A. Log-t test			
	Beta	SE			Beta	SE			Beta	SE	
Full sample	-0.870*	0.037		Full sample	-1.406*	0.037		Full sample	-1.138*	0.049	
B. Club statistics				B. Club statistics				B. Club statistics			
	# of units	Beta	SE		# of units	Beta	SE		# of units	Beta	SE
Club_1	11	0.301*	0.086	Club_1	13	-0.309*	0.032	Club_1	6	0.304*	0.035
Club_2	4	0.651*	0.097	Club_2	2	3.322*	0.747	Club_2	2	6.72*	1.806
Divergent	1			Divergent	1			Divergent	2		
C. Club merging				C. Club merging				C. Club merging			
Club_1 (C1+C2)	15	-0.074**	0.046	Nil				Club_1 (C1+C2)	8	0.221*	0.064

Table 3 (Continued)

Wholesale and retail trade			
A. Log-t test			
	Beta	SE	
Full sample	-0.389*	0.010	
B. Club statistics			
	# of units	Beta	SE
Club_1	10	0.661*	0.066
Club_2	5	0.252	0.177
Divergent	1		
C. Club merging			
Nil			

Note: (*) and (**) indicate the coefficient significance at the 1% and 10% levels, respectively. SE represents the standard errors.

Source: Author

professional, scientific and technical services, and transportation and storage as well, the merging procedure resulted in the formation of one single club with one or two diverging economies (Panel C).

With regard to the composition of the individual clubs (Table A3, Appendix), substantial heterogeneity was evident, both in terms of the club size (e.g. Club 2 in manufacturing including only two economies versus Club 2 in construction including eleven economies), and the position of the individual economies (e.g. Denmark is placed in the same club as Luxembourg in agriculture, forestry and fishing, but is put together with Greece, the UK and Italy in the financial and insurance services). The interpretation of the specific position of an economy in a particular club warrants in-depth analysis of its own, and the club composition results can only be deemed to be correct insofar as the econometric procedure was adhered to.

For the total economy, Club 1 included the four economies (Ireland, Luxembourg, Lithuania and the UK) that were quite distinct from the core Club 2 that contained 14 economies. The higher aggregate profitability levels in Luxembourg may be attributed to the country's position as a major financial center (financial profits being the major component of aggregate profits). This factor (the City of London as the financial center) may likewise explain higher profitability levels in the UK. In the case of Ireland, the revival of profitability was driven by a combination of pro-business tax policies, foreign investment inflows (manifested in the number of multinational corporations' headquarters), and the expansion of high-tech exports (such as automobiles and pharmaceuticals). Lithuania benefited from the same type of factors as Ireland in ensuring high profit rates, complemented by the lower wage levels, and the emigration of the labor force (and a decline in the wage share of the GDP).

The manufacturing sector did not experience higher convergence (the total number of the clubs being greater than in most other sectors), which contravenes the hypothesis of faster manufacturing convergence due to the internationalization of the production chains in the sector (Glyn, 2004). Limited convergence in manufacturing is in line with evolutionary and innovation economics predictions tracing manufacturing dynamics to the level of individual high-performing firms, the innovation clusters and the other local and regional drivers (Roberts, 2001; Howitt & Mayer-Foulkes, 2005).

A greater number of the clubs in the accommodation and food services, and the administrative and support services may be explained by a smaller degree of the movement of labor and capital and the presence of the local drivers of profitability. The sectors with a higher degree of the mobility of capital and the labor force with transferable skills and/or more intense

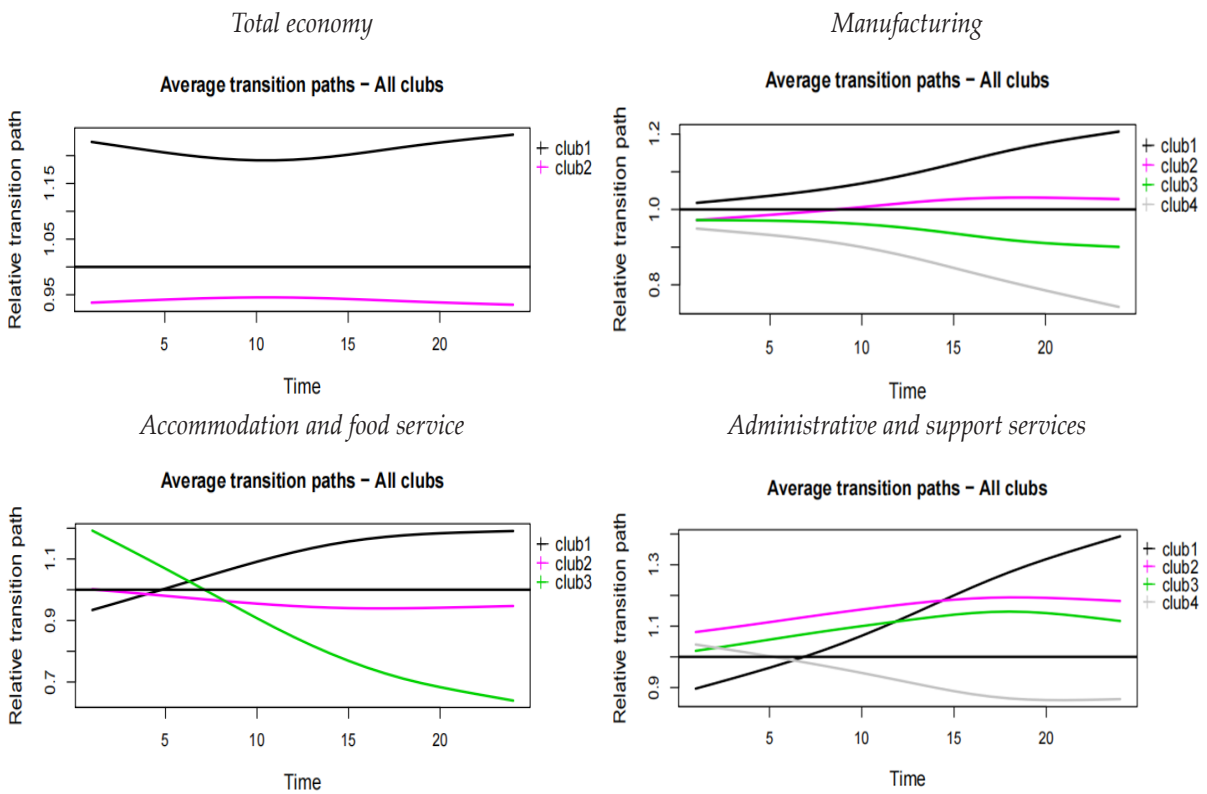
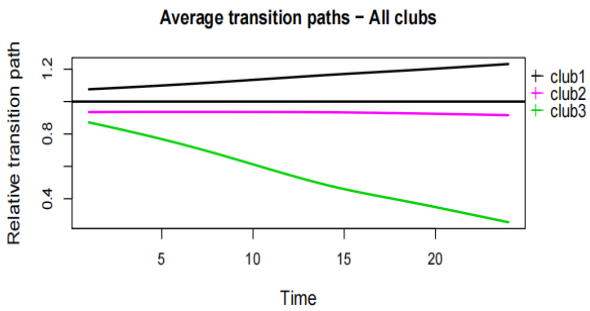
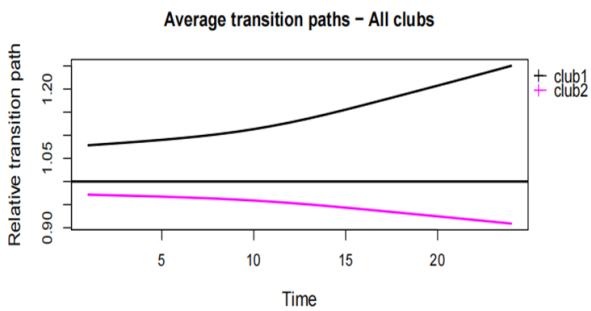


Figure 2 The relative transition paths (the average for the club)

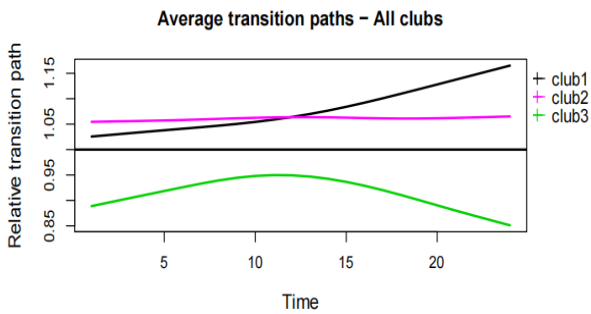
Agriculture, forestry and fishing



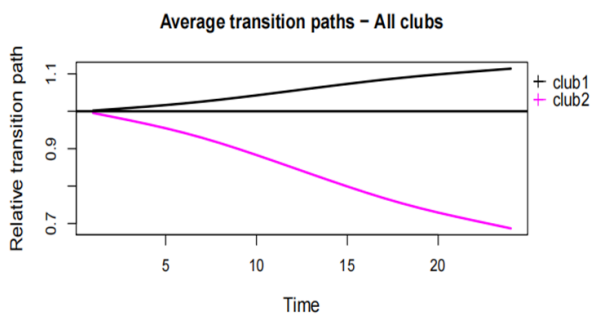
Construction



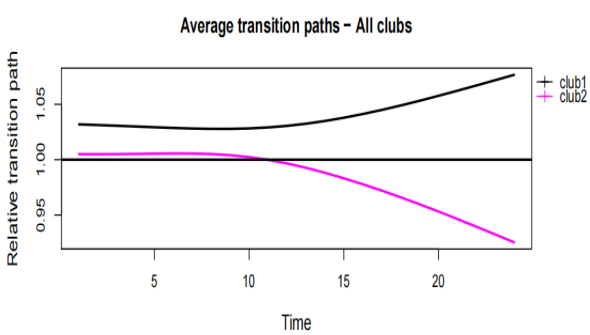
Financial and insurance services



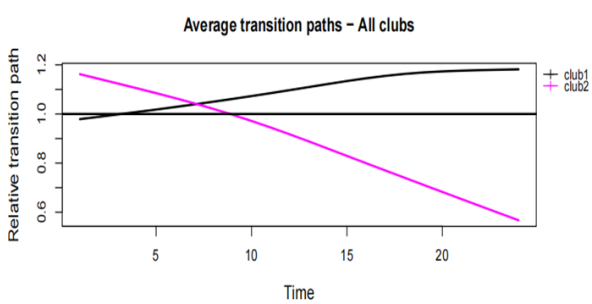
Information and communication



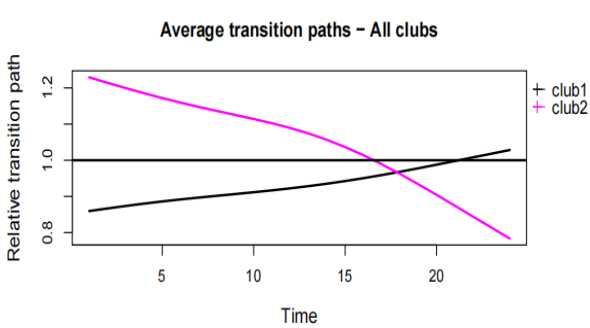
Professional, scientific and technical services



Real estate activities



Transportation and storage



Wholesale and retail trade

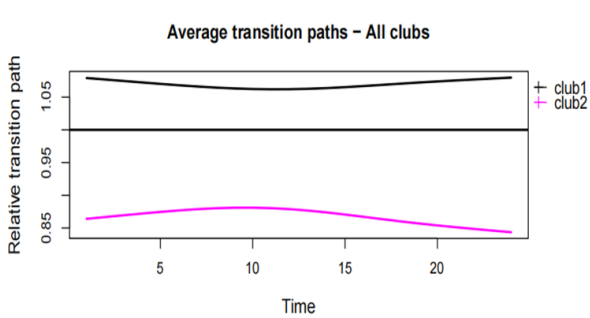


Figure 2 The relative transition paths (the average for the club) (Continued)

business reorganization and regrouping (the financial and insurance, information and communication, and professional services) experienced faster convergence, as was attested by the formation of a smaller number of convergence clubs.

Figure 2 illustrates the average transition paths for the clubs where the transition path towards unity level corresponds to convergence across the clubs. In the total economy and the wholesale and retail trade sectors, there was a very moderate convergence of each of the two clubs towards the unity level in the first decade (1995-2004), only to be followed by moderate divergence. In the five sectors (manufacturing; agriculture, forestry and fishing; construction; information and communication; and professional, scientific and technical services), the initial distance between the average transition paths was small, growing progressively over the years away from the unity level. In the other sectors, the divergence likewise took place; however, the paths tended to change the position, crossing the unity level (convergence followed by divergence) and the other paths.

CONCLUSION

The panels were characterized by cross-sectional dependence, necessitating use of appropriate panel unit root tests (the Pesaran CIPS and Bai-Ng factor-based tests). The former indicated stochastic behavior and the presence of the unit roots for the profit rate in all the sectors (the instances of stationarity at certain lags were more inconsequential). The factor-based test treated the common and idiosyncratic components separately. The common component of the profit rates was stationary in the majority of the sectors, indicating that global and regional shocks had a transitory effect on profitability. On the other hand, the idiosyncratic component contained the unit root in nearly all the cases, suggesting that the profit rate disparities had the domestic and industry-specific origins. The Pesaran-Sul club convergence procedure rejected the hypothesis of a panel-wide convergence. The number of the identified clubs was significant relative to the limited number of the economies included in the panel.

A number of the sectors (transportation, finance and insurance, information and communication, and professional services) experienced the formation of a limited number of clubs, which is the expected result given the well-integrated infrastructure in Europe, the high speed of organizational and technical change, strong competitive pressures, and significant factor mobility in the knowledge-intensive sectors. Likewise, the sectors with the local determinants of profitability (accommodation and food, administration and support activities) exhibited the formation of a larger number of clubs, which is indicative of more limited convergence. Multiple clubs were observed in the manufacturing and agricultural sectors, despite a relatively higher degree of factor mobility in the former case, and the operation of the common agricultural policy in the latter.

The findings demonstrate the substantial disparities in the levels of the profit rates and nonconvergence, despite the absence of the spatial barriers in the EU, thus having a number of theoretical and policy implications. Firstly, a number of studies documented a steadfast tendency to more competitive markets in the EU manifested in a lower (compared to the other developed economies and blocs) concentration, excess profits, and regulatory barriers to entry pronounced across most industries and member states, both the old and the new (Gutiérrez & Phillipon, 2018).[2] The process, however, is a relatively new phenomenon, originating in the 2010s, while the present study also covers the older period (characterized by more noncompetitive conduct). The nonconvergence findings are thus the outcome of the adopted approach to measurement and specification. Secondly, the free movement of labor and capital (manifested in FDI flows) did not bring in convergence, thus lending scant support to convergence through international trade and the investment thesis (according to the Heckscher-Ohlin-Samuelson theorem). The source of the inter-country profit and wage differentials are thus likely to be structural, social and political-economic, related to the functioning of the regional (local) labor markets, and the country-specific business financing and innovation modes. Thirdly,

the economic development initiatives and policies that encourage the development of a particular industry implemented at the European Union level without the due consideration of the local economic conditions may prove futile and ineffective. In contrast, the regional policies that correct the local determinants of profitability disparities would likely be more effective in fostering convergence. Fourthly, nonconvergence may be explained in terms of persistent differences in competitive advantage and profitability existing at the firm-level (irrespective of the flows of production factors at the macroeconomic level or competitive dynamics at the industry level). This is a result of a very specific way in which rare, inimitable, and non-substitutable resources are combined and put in use by individual firms, according to the resource-based view of competitive dynamics (Bhandari, Ranta & Salo, 2022). This also reflects the way in which regional (as opposed to national) systems of innovation generate the products and processes that bring in profits. The findings thus highlight the importance of the firm- and location-specific determinants of profitability (and profitability disparities) in line with the resource-based and evolutionary economics (as opposed to the structure-conduct-performance) conceptualization of industry dynamics. Policy-wise, this view of competitive dynamics and this paper's findings likely suggest the persistence of profit differentials in the long run, the limited effect of macroeconomic shocks on profits, and a possible ineffectiveness of anti-trust policies and attempts to bring profits to a 'standard rate of return' given the fact that macroeconomic profits are principally a result of the unique and heterogeneous managerial capacity and resource combinations at the firm level (Joffe, 2022). The local and regional innovation policy may nonetheless play its role. The future research in profit disparities will need to go a level down in order to trace the firm-specific sources of the disparities.

ENDNOTES

1 The Pesaran CIPS proxies the component by averages on the units of the model regressors and the dependent variable. The Bai-Ng test estimates the component directly by the principal component analysis.

2 This in turn is a result of the existence of the more independent regulatory authorities in the EU at the community level, the tougher implementation of anti-trust laws, and weaker lobbying and vested interest penetration in the government.

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Ivan D. Trofimov is a senior lecturer at Kolej Yayasan Saad/Victoria University of Wellington programme, Malaysia. He received his doctorate degree from Macquarie University, Australia, in the field of international political economy. The areas of his research are empirical macroeconomics, time series econometrics, the analysis of distributional issues in economics and economic growth.

APPENDIX

Table A1 The description of the variables

Variable	Measurement	Scope	Source
Net operating surplus and mixed income	At current prices in millions of euros	NACE Review 2 industries (up to NACE A*64)	National accounts aggregates by industry (up to NACE A*64) [NAMA_10_A64__custom_769759]. Available at https://ec.europa.eu/eurostat/databrowser/product/page/nama_10_a64
Net total fixed assets	Current replacement costs in millions of euros	NACE Review 2 industries (up to NACE A*64)	Cross-classification of fixed assets by industry and by asset (stocks) [NAMA_10_NFA_ST__custom_769768]. Available at https://ec.europa.eu/eurostat/databrowser/product/page/nama_10_nfa_st

Source: Author

Table A2 The descriptive statistics

Sector	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	J-B	J-B (Prob)
Total economy [1]	9.058	7.947	18.822	0.932	3.519	0.589	2.579	28.142	0.000
Manufacturing [2]	14.627	12.677	43.033	2.346	8.052	1.672	5.746	262.030	0.000
Accommodation and food service [3]	25.105	20.332	70.307	1.400	15.025	0.931	3.023	55.467	0.000
Administrative and support services [4]	20.696	18.713	142.852	-2.780	18.751	3.436	19.880	4982.307	0.000
Agriculture, forestry and fishing [5]	16.952	15.297	58.895	0.144	10.293	1.266	5.035	168.844	0.000
Construction [6]	46.101	35.631	200.536	0.555	29.965	1.906	8.093	607.103	0.000
Financial and insurance services [7]	46.515	34.079	160.304	2.011	36.104	1.262	3.947	108.988	0.000
Information and communication [8]	18.315	16.332	80.883	-0.445	13.001	1.846	7.607	557.646	0.000
Mining and quarrying [9]	20.462	15.137	68.197	1.033	15.639	0.977	3.182	30.780	0.000
Professional, scientific and technical services [10]	43.874	41.832	177.452	4.567	25.279	1.124	5.544	184.367	0.000
Real estate activities [11]	3.754	3.083	16.490	0.035	2.428	2.585	11.531	1592.048	0.000
Transportation and storage [12]	8.682	6.801	31.494	0.458	6.361	1.568	5.020	139.172	0.000
Wholesale and retail trade [13]	41.478	32.587	140.199	7.099	25.565	1.456	4.934	195.509	0.000

Source: Author

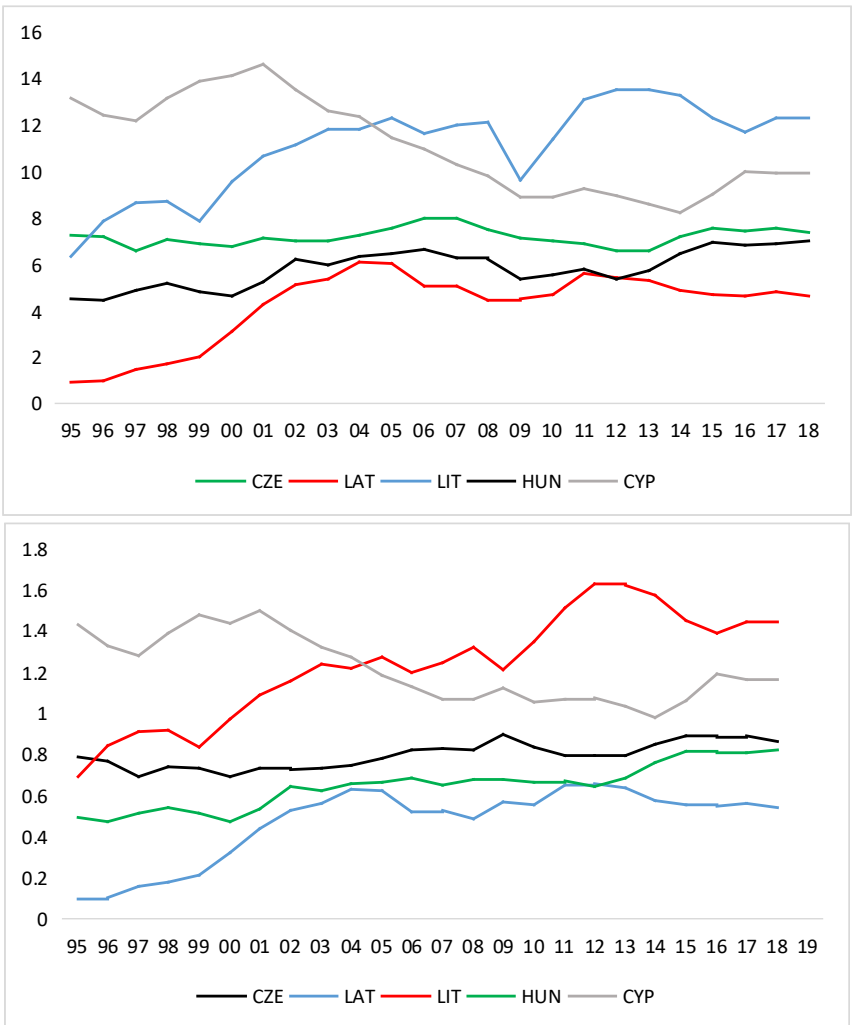

Figure A1 The (relative) profit rates of the new EU members

Source: Author

Table A3 The composition of the convergence clubs

[1]	Club_1	IRL, LUX, LIT, UK
	Club_2	GRE, CYP, NED, ITA, NOR, CZE, BEL, HUN, FIN, GER, DEN, AUT, LAT, FRA
	Divergent	None
[2]	Club_1	LIT, GRE, UK, GER, DEN
	Club_2	NED, CZE
	Club_3	AUT, FIN, HUN, BEL
	Club_4	FRA, NOR
	Divergent	ITA
[3]	Club_1	GRE, FIN, NED, FRA, AUT, NOR
	Club_2	LIT, GER, DEN, BEL, ITA, IRL, CZE, UK
	Club_3	LUX, HUN
	Divergent	Nil
[4]	Club_1	UK, FIN
	Club_2	HUN, FRA
	Club_3	NED, NOR
	Club_4	CZE, GRE, GER, ITA, BEL
	Divergent	AUT
[5]	Club_1	IRL, NOR, CZE, FIN, HUN, GRE, FRA, BEL, UK
	Club_2	ITA, LIT, NED, GER
	Club_3	DEN, LUX
	Divergent	AUT
[6]	Club_1	GER, UK, FRA, FIN
	Club_2	ITA, DEN, NED, CZE, NOR, LUX, HUN, LIT, BEL, AUT, GRE
	Divergent	Nil
[7]	Club_1	LUX, FIN, NOR, NED, IRL, CZE, BEL
	Club_2	GRE, UK, DEN, ITA
	Club_3	HUN, GER
	Divergent	FRA, AUT
[8]	Club_1	IRL, FIN, GER, NOR, LUX, UK, NED, CZE, BEL, ITA, AUT
	Club_2	FRA, LIT, DEN, GRE
	Divergent	Nil
[9]	Club_1	NOR, NED, DEN, AUT, GRE, LUX, LIT
	Divergent	CZE
[10]	Club_1	BEL, ITA, GRE, LUX, UK, NED, NOR, LIT, DEN, FIN, HUN
	Club_2	AUT, GER, CZE, IRL
	Divergent	FRA
[11]	Club_1	UK, GRE, LUX, LIT, HUN, IRL, CZE, ITA, DEN, FIN, FRA, GER, AUT
	Club_2	BEL, NOR
	Divergent	NED
[12]	Club_1	FIN, NED, NOR, ITA, FRA, AUT
	Club_2	GER, GRE
	Divergent	LIT, CZE
[13]	Club_1	IRL, NED, LUX, LIT, ITA, FRA, GRE, DEN, FIN, NOR
	Club_2	BEL, AUT, UK, CZE, HUN
	Divergent	GER