Cost Competitiveness in the Food, Beverages and Tobacco Manufacturing of the EU and the USA: A Convergence Analysis

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Abstract
Time-series tests and analysis of disparities over time are employed in this paper to investigate convergence of cost competitiveness in the food, beverages, and tobacco manufacturing of 14 EU countries and the USA. According to the empirical results, there has been no uniform pattern of convergence across all countries for any of the three variables (unit labor cost, labor productivity, and wages) considered. There have been, however, converging dynamics for certain countries something which is consistent with club formation.

Key Words: *Competitiveness, Convergence, Food Manufacturing*

Introduction

As barriers to world trade are diminishing businessmen and policy makers have become increasingly concerned about the effects of international integration on their countries' competitiveness. A strong performance in international trade is *ceteris paribus* closely related to the ability of a country to hold down input costs relative to its main competitors. In both policy and research, emphasis has been placed on the role the cost of labor. This, not only because compensation to labor is a major component of total production costs but also because labor is far less mobile across countries compared to capital and intermediate inputs and, thus, labor cost is considered by many to be a key determinant of competitiveness (e.g. van Ark and Monnikhof, 2000; van Ark, 1995).

For international comparisons the most commonly used measure of cost competitiveness is the unit labor cost (ULC) defined as the ratio of the compensation per unit of labor to the productivity of labor (e.g. van Ark and Timmer, 2001; Dean and Sherwood, 1995). This ratio, which represents a direct link between productivity and the cost of labor used to generate output, suggests that a country can improve its cost competitiveness either by decreasing the numerator (wage) or by raising the denominator (productive performance).

International agencies (e.g. the International Labor Organization) publish regularly information on wages, labor productivity and unit labor costs for economies around the world. Several countries use this information as a guide for setting their wage policies. For example, Sweden introduced a new wage model -the Europe Norm- stressing that the average ULC ought not in the long-run to increase faster in Sweden than in the rest of the EU member states (Andersen et al., 2000). Also, a number of recent empirical

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works have considered the evolution of ULC and /or its determinants (wage and labor productivity) for groups of countries with emphasis on convergence or divergence (e.g. Fare et al., 2006; Mora et al., 2005; Jung and Doroodian, 2001; Andersen et al., 2000). The results of the empirical studies appears to depend on the methodology used, the group of countries considered, and the level of the analysis (total economy or economic sector). With regard to the latter, van Ark and Monnikhof (2000) emphasized the need for using detailed (industry-level) data because important differences between countries may cancel out at higher levels of aggregation.

In this context the objective of this paper is to determine whether unit labor costs, labor productivity, and wages have converged in the food, beverages, and tobacco manufacturing (NACE 15 & 16) of the EU and the USA. To the best of knowledge there have been no previous studies on convergence of cost competitiveness at the level of an industry. The EU food, beverages, and tobacco industry accounts for 14 percent of the total manufacturing output and for 11 percent of the total manufacturing value added, while it offers employment to 2.8 million people (European Commission, 2003).

The EU has long abolished barriers to internal trade. At the same time, the overwhelming majority of its older member states participate in the European Monetary Union (EMU) meaning that they are not longer able to use the exchange rates to restore competitiveness. In such circumstances, the relationship between wages and labor productivity has become a decisive factor for the maintenance of the territorial equilibrium in terms of economic activity and employment. The analysis of convergence takes also into account the USA which for the EU is a major trading partner of food, beverages and tobacco products.[1] The paper is structured as follows. Section 2 presents the data and section 3 discusses the analytical framework (tests for converge and determination of convergence clubs). Section 4 presents the empirical results, while section 5 offers conclusions.

The Data

The information for the empirical analysis come from the Groningen Growth and Development Centre (GGDC) database at the University of Groningen (the Netherlands). The GGDC has a long standing expertise in analyzing data on productive performance, focusing in particular on comparisons of productivity levels by sector and industry. The GGDC database has been recently expanded with measures of labor compensation (hourly wages) which together with measures of labor productivity can be used to obtain unit labor costs. At the present, the database provides information for 20 two-digit manufacturing industries in 14 EU countries and the USA over the period 1979-2001.

Labor productivity is the ratio of real value added (Q) to hours worked (L). For comparisons, value added in national currencies is converted to a common currency (1997 US$) using industry-specific Purchasing Parity Powers (PPPs). Hourly wage (W) is expressed in nominal terms. For comparisons, wages in national currencies are converted to a common currency (US$) at the official exchange rate.[2] The unit labor cost for an industry in country i and at time t can be then calculated as

$$1) \quad ULC_{it} = \frac{W_{it} / (\text{exhange rate in US\$}_{it})}{(Q \text{ in PPP}_{it}) / L_{it}}.$$

The 15 countries considered in this study are Austria, Belgium, Denmark, Finland, France, Germany (West and East), Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, the UK, and the USA. Table1 presents information on labor productivity (average levels and average annual growth rates) for the period 1979-2001. The Netherlands had the highest productivity level, followed by the USA; Greece and Portugal were the countries with the lowest productivity. Ireland had the highest growth rate, while the USA was the only country for which productivity showed no improvement. Table 2 presents information on labor compensation. The highest nominal wages were recorded in Denmark and the Netherlands and the lowest in Greece and Portugal. Labor compensation had the highest growth rates in Portugal and the UK and the lowest in France, Spain and Denmark. Table 3 presents information unit labor costs. Finland, Sweden, and Greece had the highest levels, while Portugal, Ireland and the Netherlands the lowest. The ULC decreased in Ireland and Sweden and remained essentially unchanged in Finland, Austria, Spain, and Belgium; the USA and Portugal, however, saw their ULC to increase at the high rate of 4 percent per annum.

Table 1. Labor Productivity: Country Averages and Growth Rates

Country	(1)	(2)	Country	(1)	(2)	Country	(1)	(2)
Austria	22.9	3.9	Germany	23	1.6	Portugal	10.8	1.9
Belgium	36	3	Greece	8.2	2.7	Spain	21	2.9
Denmark	32.4	2	Ireland	32.5	6.6	Sweden	28.8	3.8
Finland	22.1	4.2	Italy	26.2	2.4	UK	26.7	2.4
France	31	0.8	Netherlands	43	3.5	USA	33.8	-0.2

(1): Average Level; (2) Average Annual Growth Rate (%)

Table 2. Nominal Wages: Country Averages and Growth Rates

Country	(1)	(2)	Country	(1)	(2)	Country	(1)	(2)
Austria	12.9	4	Germany	11.6	3.2	Portugal	4.3	5.8
Belgium	16.7	3.2	Greece	5.5	4.3	Spain	10.1	3.1
Denmark	18.2	3.1	Ireland	12.2	5.3	Sweden	17.6	2.4
Finland	15	4.6	Italy	13.5	4.3	UK	16.4	5.1
France	15.8	2.4	Netherlands	18.1	3.2	USA	16	3.9

(1): Average Level; (2) Average Annual Growth Rate (%)

Table 3. Unit Labor Cost: Country Averages and Growth Rates

Country	(1)	(2)	Country	(1)	(2)	Country	(1)	(2)
Austria	0.55	0.1	Germany	0.49	1.6	Portugal	0.38	4
Belgium	0.45	0.2	Greece	0.64	1.6	Spain	0.45	0.2
Denmark	0.55	1.1	Ireland	0.38	-1.4	Sweden	0.61	-1.4
Finland	0.67	0.04	Italy	0.5	1.9	UK	0.59	2.7
France	0.5	1.6	Netherlands	0.42	-0.2	USA	0.48	4.1

(1): Average Level; (2) Average Annual Growth Rate (%)

Figure 1 shows the evolution of the cross-section average and the cross-section standard deviation for labor productivity. The cross-section average (*AVER)* increased by almost 60 percent in a 20-year period. This is consistent with the positive, and in certain cases quite strong, productivity growth rates for all countries but the USA. The cross-section standard deviation (*SD*) increased by 53 percent indicating that the disparities of productivity levels grew larger with time. Figure 2 shows the evolution of the cross-section average and the cross-section standard deviation for nominal wages. The cross-section average declined in the early 1980s and the late 1990s and showed a largely steady increase in the years between. This behavior can be, to a certain extent, explained by changes in the exchange rates. In particular, given that wages are expressed in US$, a depreciation (appreciation) of the European currencies relative to US$ will manifest itself into lower (higher) nominal wages. The years of appreciation (depreciation) of the US$ coincide roughly with those that labor compensation decreased (increased). The standard deviation exhibited overall an upward trend although there were certain periods (especially at the beginning and the end of the sample) where it actually declined. Figure 3 shows the evolution of the cross-section average and the cross-section standard deviation of the unit labor costs. The behavior of the cross-section average was very

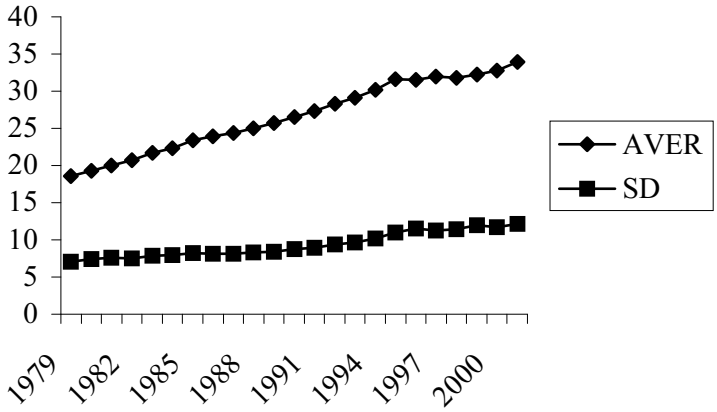

Figure 1. Labor Productivity: Cross Sectional Average and Standard Deviation

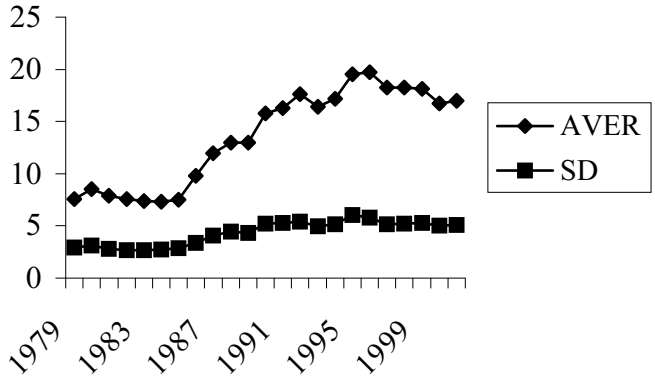

Figure 2. Nominal Wages: Cross Sectional Average and Standard Deviation

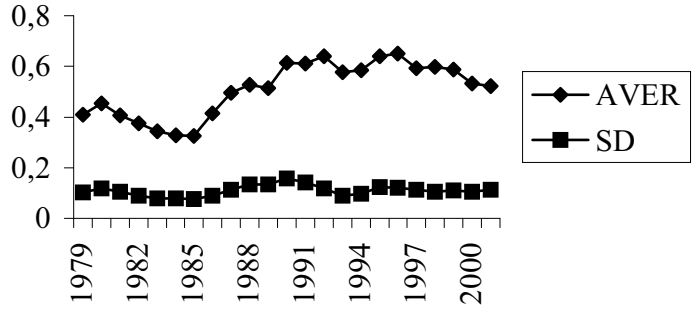

Figure 3. Unit Labor Cost: Cross Sectional Average and Standard Deviation

similar to that of wages. The standard deviation, however, did not exhibit any clear trend.

Analytical Framework

The economic growth literature proposes a number of alternative approaches to test for convergence and to identify convergence clubs.[3] These can be broadly classified into the distribution approach (e.g. Quah, 1993), the time-series approach (e.g. Bernard and Durlauf, 1995; Nahar and Inder, 2002), and the analysis of the evolution of disparities over time (e.g. Carree and Klomp, 1996; Proietti, 2005). The distribution approach requires estimation of bivariate kernel density functions something which is not tenable with a sample of only 15 countries. For this reason, the present work relies on the remaining two approaches.

Let us denote the variable of interest (labor productivity, wage, or unit labor cost) by *y*. According to Bernard and Durlauf (1995) and Evans and Karras (1996) countries *i* and *j* converge if their long-run forecasts of *y* are equal. That means,

$$2) \quad \lim_{n\to\infty} E(y_{it+n} - y_{jt+n} / I_t) = 0$$

where *E* is the expectation operator and I_t is all information available at time *t*. Based on the above definition, Nahar and Inder (2002) proposed the estimation of the following regression model

$$3) \quad v_{it} = \theta_0 + \theta_1 t + \theta_2 t^2 + ...\theta_k t^k + u_{it},$$

to investigate convergence for *N* countries. In (3), $i = 1, ..., N$, $v_{it} = (y_{it} - (\sum_{i=1}^{N} y_{it})/N)^2$ (the squared difference between y_{it} and the average of the cross-section distribution of *y* at *t*), θs are parameters to be estimated, and u_{it} is the error term. Economy *i* convergences to the cross-section average when its *average slope function*

$$4) \quad ASF = \frac{1}{T}\sum_{t=1}^{T} \frac{\partial v_{it}}{\partial t}$$

is strictly negative, with T being the length of the time period considered.[4] Because of (3), the *ASF* may be re-written as

$$5) \quad ASF = \theta_1 + \theta_2\ r_2 + ... \ \theta_k r_k$$

where $r_2 = \frac{2}{T}\sum_{i=1}^{T} t, ..., \ ..... \ r_{k-1} = \frac{k-1}{T}\sum_{i=1}^{T} t^{k-2}$, and $r_k = \frac{k}{T}\sum_{i=1}^{T} t^{k-1}$. The null hypothesis of non convergence (the *ASF* is strictly positive or zero) is tested against the alternative of convergence via an one-sided *t*-test. A number of countries are said to form a convergence club when they all have strictly negative average slope functions.

In convergence analysis the most common measure of disparity is the standard deviation of the cross-section distribution. For this reason, the reduction in disparities over time is often termed as *σ-convergence* (e.g. Sala-i-Martin, 1996). Here, to test for σ-convergence we use the approach proposed by Brillinger (1989). Under the null hypothesis the cross-section standard deviation is constant ($\sigma_t = \mu$, for every *t*) while under the alternative it follows a monotonic stochastic trend ($\sigma_t = \mu_t + \varepsilon_t$), where μ_t denotes the level and ε_t denotes a stationary and strictly invertible zero-mean process. The relevant test statistic is

$$6) \quad \tau = \frac{\sum_{t=1}^{T} w_t \sigma_t}{(s_L^2 \sum_{t=1}^{T} w_t^2)^{0.5}}.$$

In (6), w_t are weights which are calculated as $w_t = [(t-1)(1-\frac{t-1}{T})]^{0.5} - [t(1-\frac{1}{T})]^{0.5}$ so that $w_{T-j} = -w_{j+1}$ (hence $\sum_t w_t = 0$); s_L^2 is a consistent estimate of the *long-run variance* of the residuals of the OLS regression of σ_t on a deterministic linear trend.[5] The distribution of τ under the null (σ-convergence) can be approximated by the standard normal. For σ-convergence the case of interest is an one-sided test against a monotonically decreasing alternative (i.e. $\mu_t \leq \mu_{t-1}$, with strict inequality for some *t*).

If the null hypothesis of σ-convergence for *all N* is rejected, one should examine whether the countries can be suitably partitioned into smaller σ-convergence clubs. For this purpose, the paper employs the hierarchical agglomerative clustering algorithm (Proietti, 2005) which uses as a criterion function for clustering the Brillinger's τ-statistic. The structure of the algorithm can be summarized as follows:

(1) in the beginning each country represents a separate club. Thus, initially, there are *N* clubs, $C_i, i = 1, 2, ..., N$;

(2) compute the standard deviation $\sigma_t^{i,j}$ for every *t* and for every pair of clubs *[i, j]*;

(3) compute the statistic $\tau^{[i,j]}$ for each pair;

(4) if the minimum $\{\tau^{[i,j]}\}$ is above the critical value at the 5 percent level (-1.65) then stop; otherwise, choose the pair for which $\tau^{[i,j]}$ is minimum;

(5) combine clubs C_i and C_j;

(6) iterate steps (1) to (5) until $\{\tau^{[i,j]}\}$ is not significant at the 5 percent level or until all countries belong to a unique club.

The Empirical Results

We start with the presentation of the empirical results from the time-series approach. Model (3) for each country has been estimated using the E-views 5.1 program. The appropriate value of *k* has been selected using the Schwartz Information Criterion (SIC). Table 4 presents estimates of the average slopes and the corresponding *t*-statistics. With regard to labor productivity, evidence of convergence to the cross-section average is found for Austria, Denmark, Finland, France, and the USA. Therefore, these 5 countries form a convergence club. For one country (Italy) the average slope is not statistically significant at any reasonable level, while for the remaining 9 countries the average slopes are positive and strongly significant indicating divergence. With regard to hourly nominal wages, evidence of convergence to the cross-section average is found for only 2 countries (France and Ireland). For 7 countries (Austria, Belgium, Denmark, Finland, Italy, the Netherlands, and Sweden) the average slopes are not significant at any reasonable level, while for the remaining 6 there is strong evidence of divergence. With regard to ULC, 4 countries (France, Italy, Portugal, and Sweden) appear to form a convergence club. For 8 countries (Austria, Belgium, Denmark, Finland, Germany, Greece, Ireland, and Sweden) the average slopes are not statistically significant, while for the remaining 3 (the Netherlands, the UK, and the USA) there is strong evidence of divergence.

Table 4. Average Slopes and t-Statistics

	Labor Productivity		**Nominal Wages**		**Unit Labor Cost**	
Country	*Average Slope*	*t-Statistic*	*Average Slope*	*t-Statistic*	*Average Slope*	*t-Statistic*
Austria	–1.42	-6.42*	-.024	-.72	.0003	1.19
Belgium	4.79	4.19	-.37	-.76	-.0003	.98
Denmark	-1.18	-2.79*	.51	.1.31	-.00002	-.11
Finland	-1.37	-4.63*	-.08	-.24	.0003	.14
France	-3.61	-3.06*	-.55	-4.99*	-.0002	-2.21*
Germany	1.54	3.93	.56	3.71	-.00003	-.24
Greece	15.61	21.17	1.82	2.19	.0004	.86
Ireland	8.55	7.77	-.33	-3.75*	.0004	.99
Italy	.10	1.11	.08	.52	-.0006	-3.96*
Netherlands	19.02	5.16	.38	.69	.0009	3.18
Portugal	12.95	10.52	1.64	2.18	-.0029	-3.78*
Spain	1.72	6.27	1.27	5.82	-.00001	-.08
Sweden	1.9	9.53	-.73	-.93	-.004	-6.64*
UK	.17	5.47	1.34	5.23	.002	5.51
USA	-2.54	-1.83*	1.53	3.93	.003	4.43

*indicates significance at the 5 percent level (or less)

As noted Mora et al. (2005), the assumption of the existence of a representative or benchmark economy (which is implicit to the time series approach) may be quite restrictive. The σ-convergence analysis dispenses with this potential restriction and, thus, it may shed more light on the process of converge or divergence. In this work we search first for *global* σ-convergence (where the term global means that we consider together the dynamics of *all* countries) using the τ-statistic in equation (6). In case that global σ-convergence is rejected, we search for subsets of countries which have converging dynamics using the clustering algorithm described above. The necessary estimations and computations have been carried out using the Ox Program.[6]

The τ-statistic for labor productivity is 8.99 suggesting that the cross-section standard deviation computed from *all* the 15 countries has increased with time. The τ-statistic for nominal wages is 2.76 suggesting again σ-divergence, while τ-statistic for ULC is 0.285 suggesting that the dispersion of the unit labor costs has remained fairly stable. These results are consistent with the visual evidence in Figures 1 to 3. They are also consistent with results from the time-series approach according to which not *all* countries belong to a single convergence club for any of the variables considered.

The positive values of the τ-statistic can be due to aggregation of countries which belong to different convergence clubs that are characterized by diverging dynamics. Table 5 reports the aggregation history of the algorithm for labor productivity. The club formed at the ρ^{th} iteration is denoted by C_ρ (for instance, at iteration 2 Finland is added to the club comprising of Austria and Italy). Given the critical value of –1.65, the algorithm suggests that the 15 countries can be partitioned into five convergence clubs. The first consists of 10 countries (Austria, Italy, Finland, Denmark, Sweden, the UK, France, the USA, Germany, and Spain); the second consists of only two countries (Greece and Portugal); the remaining three clubs are single-member ones, meaning that Belgium, Ireland, and the Netherlands are separate countries (they do not have converging labor productivity dynamics with any other country). We note that Austria, Denmark, Finland, France, and the USA which are found to form a convergence club with the time-series approach belong to the same σ-convergence club as well.

Table 5. Labor Productivity: Hierarchical Cluster Analysis

Iteration	Clubs C_i	$\tau^{[i, j]}$
1	[Austria][Italy]	-7.45
2	[C_1][Finland]	-7.31
3	[C_2][Denmark]	-8.98
4	[C_3][Sweden]	-12.57
5	[C_4][UK]	-8.32
6	[C_5][France]	-5.86
7	[C_6][USA.]	-5.92
8	[C_7][Germany]	-7.44
9	[C_8][Spain]	-4.40
10	[Greece][Portugal]	-2.85

Fare et. al. (2006) investigated convergence in labor productivity for the total EU manufacturing using recursive and rolling cointegration tests (e.g. Rangvid and Sorensen, 2001). They found no empirical support for the hypothesis that the EU is a single convergence club with respect to labor productivity. They, however, obtained evidence of increasing convergence among groups of countries such as Belgium, Denmark, the Netherlands, and Sweden or Greece, Portugal and Ireland. Mora et. al. (2005), also found no evidence of convergence for the economy-wide labor productivity in the Euro-area countries.

Table 6 reports the aggregation history of the algorithm for nominal wages. The algorithm suggests that the 15 countries can be partitioned into twelve convergence clubs. The first consists of 3 countries (Finland, France, and Italy), the second consists of 2 countries (Sweden and UK); the remaining 10 clubs are single-member ones. The large number of separate countries implies that convergence in nominal wages is quite difficult. The results from the σ-convergence analysis are, thus, in line with those obtained from the time series approach. A number of authors (e.g. Jackman, 1997; Demertzis and Hallet, 1995) have predicted that the European integration and especially the formation of the EMU will work towards a reduction in wage differentials due to a "demonstration" or "fair wage' effect (associated with the ability to compare wages across countries in the same currency). Their prediction, however, does not appear to be supported by the evolution of wages in the food, beverages, and tobacco industry. Jung and Doroodian (2001) using cointegration tests, found that nominal wages in the manufacturing sectors of Belgium, Denmark, France, Germany, Italy, the Netherlands, and the UK were converging. Mora et. al. (2005), however, reported mixed results with regard to nominal wages for the Euro-area countries. The time-series approach (based on ADF tests) indicated divergence, while the polarization index (Esteban, 1994) suggested reduction in disparities over time.

Table 6. Wages: Hierarchical Cluster Analysis

Iteration	Clubs C_i	$\tau^{[i, j]}$
1	[Finland][France]	-3.56
2	[C_1][Italy]	-2.05
3	[Sweden][UK]	-1.68

Table 7 reports the aggregation history of the algorithm for unit labor costs. The algorithm suggests that the 15 countries can be partitioned into just two convergence clubs. The first consists of 14 countries, while the second has only one member (Ireland). We note that France, Italy, Portugal, and Sweden which are found to form a convergence club with the time-series approach belong to the same σ-convergence club as well. Mora et al. (2005) again reported mixed evidence with respect to the economy-wide unit labor costs; only 3 countries (Austria, Finland, the Netherlands) were found to converge to the cross-section average, while the evolution of the polarization index suggested convergence.

Table 7. Unit Labor Cost: Hierarchical Cluster Analysis

Iteration	Clubs C_i	$\tau^{[i, j]}$
1	[Austria][Germany]	-228.07
2	[C_1][Sweden]	-169.31
3	[C_2][Spain]	-242.58
4	[C_3][France]	-211.14
5	[C_4][Belgium]	-186.97
6	[C_5][Denmark]	-164.02
7	[C_6][Italy]	-144.46
8	[C_7][Portugal]	-120.45
9	[C_8][Netherlands]	-112.79
10	[C_9][UK]	-57.90
11	[C_{10}][Finland]	-23.01
12	[C_{11}][Greece]	-15.38
13	[C_{12}][USA]	-2.75

Conclusions

The impact of international integration on competitiveness has become recently an important policy and research topic. There are concerns that integration may undermine the cost competitiveness of countries in which increases in labor productivity fall short of increases in wages. In this respect, Europe represents an interesting case because the process of economic integration in the region has proceeded over several decades and it has been reinforced with the formation of Single European Market and the EMU.

A number of earlier studies have attempted to shed some light into these issues by examining the tendency of labor productivity and/or wages to converge. The empirical evidence which was based on aggregate (economy-wide or sectoral) data has been often conflicting. Given that important differences between countries may cancel out with highly aggregated data, the present paper focuses on the food, beverages, and tobacco industry of 14 EU countries and the USA. Moreover, the investigation employs two alternative approaches, namely, the time-series and the analysis of the evolution of disparities over time (σ-convergence).

The empirical results indicate that there is no uniform pattern of convergence across *all* countries for any of the three variables (labor productivity, nominal wages, and unit labor costs) considered. There exist, however, converging dynamics for certain countries something which is consistent with club formation. Ampler evidence of converging dynamics comes from the analysis of the σ-convergence analysis which involves less restrictive assumptions compared to the time-series one. For labor productivity, 10 out of 15 countries belong to the same σ-convergence converge club. For nominal wages, the majority of clubs are single-member ones implying that the dynamics of this variable are predominantly diverging. It appears, therefore, that nominal wages have been largely influenced by factors at the national level such as the bargaining between the unions and employers rather than by the “fair wage” considerations. For unit labor cost,

14 out of 15 countries belong to the same σ-convergence club. This means that firms in each country have taken measures (e.g. innovative activities to enhance their productivity performance or restrictions in wage increases) in order not to lose ground relative to their foreign competitors maintaining, thus, the territorial equilibrium in the industry.

Notes

1. The USA is the leading destination country which receives about 20 percent of the industry's total exports (European Commission, 2003).
2. A full documentation of sources and methods can be downloaded from the internet site of the GGDC, www.ggdc.net.dseries. shtml
3. For a recent review of approaches and empirical studies see Islam (2003).
4. The cross-section average stands for a "*representative*" or "*benchmark"* economy. Nahar and Inder (2002) also presented an alternative regression model in which the dependent variable is the squared deviation of economy *i* from the "*leading"* (the one that performs better than any other in the sample in *all* periods). In the food, beverages, and tobacco manufacturing, however, there is no leading economy to use it as a benchmark.
5. The "long-run variance" is defined as the $\lim_{T\to\infty} T^{-1}E(s_T^2)$, where s^2 stands for the residual variance (e.g. Kwiatkowski et al., 1992). s_L^2 can be calculated as $s_L^2(l) = \hat{\gamma}(0) + 2\sum_{\tau=1}^{m}(1-\frac{l}{m+1})\hat{\gamma}(l)$, where l is a truncation parameter and $\hat{\gamma}(l)$ is residual autocovariance at lag l (Newey and West, 1987).
6. The truncation parameter *l* required for computing s_L^2 has been set equal to 2 which is the integer part of $[4(T/100)^{2/9}]$ as suggested by Newey and West (1994).

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