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Determinants of Industrial Performance in the EU-15 Countries[4]

Abstract

The process of EU economic integration has been associated with a variety of outcomes in time and space. A critical question has to do with the impact of open markets on the differences, in economic performance, among more and less economically advanced countries. Given that industrial activity is more exposed to the forces of integration than any other productive activity, this discussion is more interesting when it focuses on industry.

The paper aims to detect the determinants of industrial performance in the EU-15 countries covering the period 1980-2003, in the ongoing process of EU integration. Understanding the factors behind success and failure may have an added value for policy-making at a time when EU structural and cohesion policies are under scrutiny.

Key-Words: integration, industrial performance, EU-15 countries

JEL: R10, R11, R12

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1. Introduction.

The process of EU economic integration has been associated with a variety of outcomes in time and space. Its impact on the economic performance of the EU member-states has been analyzing by a relatively large portion of scientific literature, especially after the signature of the Single European Act[5]. Given the restrictions imposed on trade of agricultural products and the non-tradable character of most services, such an analysis is more interesting when it focuses on the sector of industry. This sector, presents strong cut-off tendencies from any natural or political constrain, concerning the mobility of its sectors and their products, and strong linkages with the other productive sectors, as a producer and consumer of final and intermediate goods and services, and constitutes, thus, the main diffusion channel of the economic integration dynamics.

Economists accept, almost unanimously, that economic integration is a positive-sum game (Amin et al, 1992; Sachs and Werner, 1995). The process of economic integration creates and reveals, however, winners and losers, in both absolute and relative terms, as an outcome of its heterogeneous spatial and structural impact (Brülhart, 1998; Forslid et al, 2002). In advanced economies, there is a concern that the abolition of trade barriers and the free movement of capital will have negative implications for their industrial activity. In the less advanced economies, there is skepticism regarding their ability to take advantage of the opportunities provided by economic integration as they are thought to be poorly adjusted, in terms of economic and institutional structures, human capital and technology, to the conditions and demands of the free-market economic environment (Melachroinos, 2002).

These reactions are totally justifiable since, despite the ongoing process of EU economic integration, the distribution of EU industrial activities continues to take

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[5] The Single European Act was the first major revision of the Treaty of Rome. The goal of the Act was to remove the (remaining) economic barriers among the (then) European Economic Community countries, increasing, thus, their competitiveness. The Act was signed at Luxemburg on 17/02/1986 and at The Hague on 28/02/1986 and it went into effect on 01/07/1987 under the Delors Commission.

place in a heterogeneous, with externalities, economic space[6] (Ciccone, 2002). Mobile factors of production (i.e. capital and specialized labor) tend to be disproportionately clustered among EU countries on behalf of those with high market access, which is translated into strong demand for the goods they produce (Head and Mayer, 2003). The geographic distribution of industrial activities is characterized by agglomeration economies that can enhance the imbalance between core and peripheral EU countries; a fear that has been already expressed by the EU itself (European Commission, 1992). Keeping the above parameters in mind, it is natural to expect that the EU - having reached an advanced level of economic integration - is going to experience an even more intense cumulative process of industrial concentration following the US pattern (Aiginger and Davies, 2004).

Since reductions in trade costs induce agglomeration of industries, even small differences among EU countries, in such an ongoing integration context, are of high importance and result in shifts in production organization and location (Topaloglou et al, 2006). This pattern may have an overall unfavorable impact on the economic performance of the less developed countries. Lagging-behind countries having the weakest economic bases with the highest shares of sensitive (labor-intensive) sectors (Camagni, 1992) and an unfavorable geographic index (Petrakos and Zikos, 1996), have already suffered during the process of economic integration since they failed to effectively redeploy their resources in order to mitigate the adverse effects of integration (Aiginger, 1999). Under this context, it is possible that countries with industries associated with increasing returns activities can do better than others since imperfect competition can result in adverse effects (i.e. uneven distribution of the benefits of integration) (Martin and Ottaviano, 2001) and the possibility of some countries becoming net losers, in relative or, even, in absolute terms (Venables, 1996).

The EU countries experienced, most of all, the significant changes concerning the competitive environment of European industry. The pressure to produce high-

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[6] As Starrett (1978) indicated, the explanation of reality comes from the inability of market forces to create conditions of optimal economic space (the spatial impossibility theorem).

quality products at attractive prices, forces firms to focus not only on low production cost but also on quality and innovation. The external environment of the firms - proximity to clients and suppliers, level of infrastructure, availability of skilled labor force, *inter alia* - has become the decisive factor that affects their locational decisions (Fujita and Krugman, 1995; Venables, 1996). As low labor cost is typically a characteristic of less developed countries, the emerging new conditions removed a source of competitive advantage from them (Petrakos and Pitelis, 2001).

Under these emerging conditions, significant structural changes were observed in many EU countries, leading to a plethora of specialization patterns. A theoretical controversy exists regarding the relation between the level of specialization and the level of industrial performance. An increase in the level of specialization is connected with an increase in productivity through the exploitation of scale economies (Romer, 1987; Weinhold and Rauch, 1999). Specialization, however, in sectors that are not associated with increasing returns to scale activities may have a negative impact on industrial performance due to increased competition (Grossman and Helpman, 1990; Bensidoun and Ünal-Kesenci, 1998).

A somewhat different dimension was set to the discussion by Pasinetti (1981) who suggested that the degree by which the productive structures of the less developed countries are getting more similar to the respective structures of the more developed ones determines their potential to achieve higher levels of industrial performance. On the contrary, Dalum et al (1998) supported that the less developed countries should differentiate their productive structures in order to present trends of convergence.

The dynamics of the EU economic integration process have a strong impact on the level of economic performance of the EU member-states and the subsequent planning of the relative, towards the attenuation of spatial inequalities, EU policies. The elevation of economic and social cohesion as a major EU objective[7] (Bradley,

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[7] See, the Article 130 of the Maastricht Treaty and the Article 158 of the Amsterdam Treaty.

2004) explains and necessitates the increased attention concerning such an impact. The paper aims to detect the determinants of industrial performance in the EU-15 countries covering the period 1980-2003, in the ongoing process of EU integration. Understanding the factors behind success and failure may have an added value for policy-making at a time when EU structural and cohesion policies are under scrutiny.

The second section of the paper presents and analyses the structural aspects of the EU economic integration process. The third section provides the results of the empirical model attempting to test the impact of structural factors on industrial performance at the aggregate national and the disaggregated branch level. The conclusions of the paper are reported in the last section.

2. The Structural Aspects of EU Economic Integration: Evidence from Industrial Data.

The industrial productivity level of the EU-15 countries reveals the hysterisis of the countries of European South (Table 1). Greece, Spain and Portugal are in the last places of the ranking whereas at the upper places are Ireland, Luxemburg, Finland and Sweden. Impressive is the performance of Ireland that managed to quintuple its productivity levels, despite being a peripheral and cohesion EU country. This economic miracle is the outcome of combination of low wages, supply of skilled labor, climate in favor of innovation and policy focus to establish upstream linkages between domestic and foreign firms (Braunerhjelm et al, 2000). Remarkable is the stagnation of the UK industrial productivity that can be attributed mainly to its inability to maintain high levels of innovation (Beath, 2002). The decline of the German industrial productivity, on the other hand, is considered to be natural after the embodiment of its eastern part (Klodt, 1999).

Table 1: Industrial productivity levels in the EU-15 countries (€ / employee; 1995 prices)

	1980	1985	1990	1995	2000	2003
IRELAND	4,042	4,843	7,507	9,313	15,644	20,147
LUXEMBURG	8,658	9,139	10,858	12,198	13,560	14,123
FINLAND	5,548	6,484	7,745	8,927	12,355	13,463
SWEDEN	5,107	6,626	6,901	8,370	12,012	12,642
AUSTRIA	5,683	7,490	8,612	8,750	10,882	11,359
BELGIUM	6,800	7,615	9,734	9,029	10,081	10,549
GERMANY	12,783	11,875	12,918	9,669	10,471	10,519
FRANCE	6,056	6,083	7,553	8,082	9,146	9,448
DENMARK	6,960	7,284	6,918	7,572	7,898	8,171
ITALY	6,443	5,975	6,817	7,308	7,566	7,301
NETHERLANDS	5,379	5,146	6,972	6,869	7,143	7,063
UK	5,033	4,774	5,562	5,696	5,801	5,683
SPAIN	4,767	4,471	4,903	4,813	5,269	5,366
PORTUGAL	2,363	2,154	2,870	2,984	3,556	3,388
GREECE	2,605	2,508	2,529	2,435	2,487	2,669

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

The majority of the EU-15 countries seem to maintain their industrial participation around the level of 20% in their total GDP (Table 2). Exceptional, in line with the observations made above, is the share of the Irish industry with levels higher than 40%. Very high are also the shares of Finland and Sweden that surpass the level of 25% whereas at the other side of the ranking is Greece with industrial share slightly higher than 10%.

Table 2: Share of Industry in GDP

	1980	1985	1990	1995	2000	2003
IRELAND	20.35	19.71	27.12	29.91	37.49	41.65
FINLAND	19.26	20.58	21.32	25.02	28.31	29.36
SWEDEN	17.08	20.16	18.95	22.02	26.58	27.51
AUSTRIA	15.98	20.28	20.48	19.56	21.34	21.85
GERMANY	29.00	27.63	27.42	22.28	21.83	21.43
BELGIUM	17.52	19.51	21.15	19.90	20.73	20.93
ITALY	24.34	21.88	22.33	21.96	21.30	20.62
FRANCE	16.88	16.09	17.61	18.72	19.67	20.12
PORTUGAL	23.51	21.33	20.96	19.76	20.67	19.85
UK	24.56	22.12	22.99	21.70	19.71	18.35
SPAIN	21.33	19.41	18.74	18.14	18.07	17.93
NETHERLANDS	15.59	14.63	18.01	17.50	16.86	17.17
DENMARK	18.75	18.69	17.29	17.15	15.84	15.34
LUXEMBOURG	23.11	19.64	19.14	14.32	13.59	15.16
GREECE	13.88	13.91	13.17	12.32	11.46	10.83

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

The aggregate level evidence indicates the exceptional industrial performance of Ireland that presents trends of intense industrialization. Analogous, although clearly less strong, are the trends for Sweden and Finland, contrasting to the trends of the majority of the EU core countries that experience a rather stable industrial performance. The countries of the EU South present significant hysterisis, having rather low shares of industrial activity.

The industrial sectors are disaggregated according to NACE[8] 2-digit classification and grouped in three general categories that grossly represent labor-intensive (LINT), intermediate-intensiveness (IINT) and capital-intensive (CINT) industries (Jackson and Petrakos, 2001) (Tables 3 and 4). A general trend is recorded, in terms of both GDP and employment, towards the decrease of the shares of the LINT sectors and the increase of the shares of the IINT and the CINT sectors. There is, however, a variety of trends among the EU-15 countries indicating that changes in the composition of industrial sectors were not everywhere the same.

The majority of the EU-15 countries experienced decreasing trends in the industrial shares of their LINT sectors. The case of Ireland is notable since this country recorded a fall of about 14% and 21% in GDP and employment terms, respectively. There is, moreover, a large number of countries experienced the same trend, with reductions higher than 5%. On the contrary, Luxemburg is a characteristic exception since it recorded an increase of almost 11%, in both terms. Despite these downturn trends, however, LINT sectors remain the dominant sectoral group in the industrial activity of all EU-15 countries.

The evolution of the shares of the IINT sectors is quite the opposite since the majority of EU-15 countries recorded increasing trends. These trends, however, are extremely smaller (in absolute prices) comparing to the respective of the LINT sectors. Exceptions to both rules are the countries of Luxemburg and the Netherlands where high decreases in terms of GDP and employment, respectively, can be observed.

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[8] Nomenclature of Classification for Economic Activities.

The most interesting changes can be observed in the CINT sectors of industrial activity, sectors that are mainly associated with increasing returns activities (Jackson and Petrakos, 2001). With the exceptions of Portugal and the Netherlands, the EU-15 countries recorded increasing trends concerning the shares of these sectors in industrial GDP. The highest increase is observed in Ireland with change of almost 13% that allowed this country to have, in the year 2000, one the highest respective shares. Mixed trends, on the contrary, are recorded in industrial employment terms since many EU-15 countries experienced decreases. Ireland is again experienced a high increase of almost 12%, having in the year 2000, the highest CINT shares along with Germany and France. Many countries do not present the same accordance in their industrial GDP and employment CINT shares, however, with the Netherlands being the most characteristic case with almost marginal decrease in GDP and increase of 13% in employment.

Table 3: Sectoral Shares of Industrial GDP

	1980			1990			2000		
	LINT	IINT	CINT	LINT	IINT	CINT	LINT	IINT	CINT
BELGIUM	37.84	38.99	23.17	37.02	38.45	24.53	37.08	38.66	24.26
DENMARK	53.20	27.64	19.16	49.71	30.06	20.23	46.07	33.07	20.86
GERMANY	41.98	26.26	31.76	37.11	27.38	35.51	34.31	29.17	36.52
GREECE	70.66	18.02	11.32	66.89	21.64	11.47	63.93	22.51	13.56
SPAIN	45.12	33.00	21.88	46.36	29.77	23.87	46.54	28.24	25.22
FRANCE	41.99	29.21	28.80	38.39	30.22	31.39	37.27	29.01	33.72
IRELAND	51.08	25.59	23.33	39.87	26.77	33.36	36.93	27.45	35.62
ITALY	46.77	31.25	21.98	44.76	31.41	23.83	44.18	33.02	22.80
LUXEMBOURG	21.24	70.70	8.06	26.37	62.80	10.83	31.88	54.45	13.67
NETHERLANDS	43.13	31.46	25.41	38.21	37.23	24.56	39.22	35.85	24.93
AUSTRIA	53.21	25.32	21.47	46.90	26.55	26.55	43.92	29.47	26.61
PORTUGAL	59.07	22.81	18.12	61.52	23.57	14.91	63.66	24.39	11.95
FINLAND	50.89	29.37	19.74	47.31	31.19	21.50	42.17	29.94	27.89
SWEDEN	43.18	28.97	27.85	41.50	29.29	29.21	36.26	29.27	34.47
UK	43.50	28.98	27.52	41.44	30.29	28.27	36.43	30.88	32.69

DA: Food. Beverages & Tobacco (LINT)	DI: Non-Metallic Mineral Products (IINT)
DB: Textiles & Wearing Apparel (LINT)	DJ: Fabricated Metal Products (IINT)
DC: Leather Products (LINT)	DK: Machinery (excl. Electrical) (CINT)
DD: Wood Products (LINT)	DL: Electrical Machinery & Optical Equipment (CINT)
DE: Paper. Publishing & Printing (LINT)	DM: Transport Equipment (CINT)
DF: Fuel Products (IINT)	DN: Other Manufactured Products (LINT)
DG: Chemical Products (IINT)	LINT: Labor-intensive industries
DH: Rubber & Plastic Products (IINT)	IINT: Industries of intermediate intensiveness
	CINT: Capital-intensive industries

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

Table 4: Sectoral Shares of Industrial Employment

| | 1980 | | | 1990 | | | 2000 | | |
	LINT	IINT	CINT	LINT	IINT	CINT	LINT	IINT	CINT
BELGIUM	44.20	31.66	24.14	43.62	31.77	24.61	42.12	32.26	25.62
DENMARK	51.53	25.08	23.39	49.24	27.35	23.41	47.56	30.76	21.68
GERMANY	41.52	24.98	33.50	38.51	25.99	35.50	38.66	26.85	34.49
GREECE	64.57	21.10	14.33	66.08	21.53	12.39	64.95	22.96	12.09
SPAIN	50.85	26.81	22.34	50.55	25.29	24.16	50.37	26.17	23.46
FRANCE	42.19	27.01	30.80	41.41	27.32	31.27	41.25	27.26	31.49
IRELAND	59.53	19.26	21.21	47.80	24.88	27.32	38.72	28.10	33.18
ITALY	50.23	26.56	23.21	50.64	27.12	22.24	52.27	26.47	21.26
LUXEMBOURG	43.16	29.61	27.23	41.85	29.69	28.46	40.87	29.50	29.63
NETHERLANDS	23.99	68.63	7.38	29.53	57.90	12.57	34.65	44.97	20.38
AUSTRIA	53.02	24.81	22.17	49.74	25.41	24.85	48.81	26.27	24.92
PORTUGAL	64.55	20.42	15.03	64.29	21.09	14.62	64.32	21.09	14.59
FINLAND	51.92	23.92	24.16	47.22	30.30	22.48	43.55	34.65	21.80
SWEDEN	33.71	30.58	35.71	36.81	30.60	32.59	40.44	28.62	30.94
UK	44.89	24.80	30.31	44.80	26.66	28.54	42.53	27.77	29.70

DA: Food. Beverages & Tobacco (LINT)	DI: Non-Metallic Mineral Products (IINT)
DB: Textiles & Wearing Apparel (LINT)	DJ: Fabricated Metal Products (IINT)
DC: Leather Products (LINT)	DK: Machinery (excl. Electrical) (CINT)
DD: Wood Products (LINT)	DL: Electrical Machinery & Optical Equipment (CINT)
DE: Paper. Publishing & Printing (LINT)	DM: Transport Equipment (CINT)
DF: Fuel Products (IINT)	DN: Other Manufactured Products (LINT)
DG: Chemical Products (IINT)	LINT: Labor-intensive industries
DH: Rubber & Plastic Products (IINT)	IINT: Industries of intermediate intensiveness
	CINT: Capital-intensive industries

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

The changes that took place in the sector of industry, during the period under analysis, can be traced in a more quantified way by the application of the Coefficient of Structural Change (CSC) proposed by Havlik (1995) (Table 5). The CSC is a correlation coefficient of the allocation of industrial employment among the industrial sectors, in two discrete time periods. The coefficient takes the formula CSC = Cor ($X_{i,t}$, $X_{i,t+k}$), where i = DA, DB, …, DN industrial sector, t = the base year and k = 1, 2, 3, …, T years after the base year, and values in the interval [0, 1]. High values of the CSC indicate that the sectoral distributions of employment in the current and the base year are very similar, whereas respective low values of the CSC indicate that significant structural changes have taken place.

Table 5: Coefficient of Structural Change

	1980-80	1980-85	1980-90	1980-95	1980-00	1980-03
ITALY	1.000	0.998	0.998	0.998	0.991	0.990
PORTUGAL	1.000	0.998	0.993	0.993	0.984	0.982
NETHERLANDS	1.000	0.998	0.994	0.994	0.983	0.981
GERMANY	1.000	0.994	0.989	0.989	0.978	0.976
AUSTRIA	1.000	0.996	0.976	0.976	0.956	0.958
BELGIUM	1.000	0.996	0.993	0.993	0.966	0.955
SPAIN	1.000	0.995	0.990	0.990	0.965	0.954
DENMARK	1.000	0.997	0.980	0.980	0.944	0.934
UK	1.000	0.993	0.982	0.982	0.937	0.922
FRANCE	1.000	0.990	0.971	0.971	0.906	0.887
GREECE	1.000	0.995	0.992	0.988	0.927	0.878
LUXEMBOURG	1.000	0.996	0.971	0.971	0.734	0.637
SWEDEN	1.000	0.984	0.920	0.920	0.610	0.534
FINLAND	1.000	0.925	0.776	0.776	0.561	0.524
IRELAND	1.000	0.969	0.846	0.846	0.494	0.440

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

Impressive is the fact that the countries with the highest industrial productivity (i.e. Ireland, Finland and Sweden) presented the highest levels of structural change in the period 1980-2003. Significant structural changes, however, are presented also in countries with modest (i.e. France) or poor industrial performance (i.e. Greece). This indicates that the speed of structural change cannot be considered as an a priori positive or negative condition for industrial performance. The levels of CSC are not able to reveal the way that each country responded to the pressures received through their contact with the international environment.

Towards the examination of this issue the Index of Dissimilarity in Industrial Structures (IDIS), proposed by Jackson and Petrakos (2001), is employed (Table 6). The IDIS is the sum of the square differences of the allocations of industrial employment among industrial sectors between an EU-15 country and the EU-15 average, in a given year. The IDIS takes the formula $\sum_{i=DA}^{DN} (a_t - b_t)^2$, where a and b are the economies under comparison, i is the industrial sector under consideration and t is the year of comparison, and values higher than (or equal to) 0. High values of the IDIS signify significant differences between the industrial structures of the country under consideration and the EU-15 average while increasing values of the IDIS overtime signify that these differences are getting stronger.

Table 6: Index of Dissimilarity

	1980	1985	1990	1995	2000	2003
GREECE	447.152	433.885	494.684	444.192	442.323	431.250
PORTUGAL	325.502	418.617	389.222	402.998	415.971	399.911
IRELAND	359.245	205.262	151.814	152.616	226.586	270.491
LUXEMBOURG	1,310.526	1,034.768	676.097	401.381	234.234	192.685
ITALY	63.802	83.268	92.686	126.865	146.274	142.114
FINLAND	46.019	48.266	85.346	87.059	109.526	114.487
NETHERLANDS	111.248	121.255	115.799	107.653	108.032	110.921
DENMARK	120.994	101.598	101.698	91.730	89.927	88.728
SWEDEN	264.819	183.660	111.983	65.518	57.629	65.515
AUSTRIA	71.737	66.144	59.887	62.043	59.499	59.869
FRANCE	17.033	26.557	30.577	38.195	49.235	58.692
BELGIUM	44.256	53.057	50.031	53.219	56.009	58.571
GERMANY	44.805	54.884	59.967	56.735	49.753	45.294
SPAIN	46.537	58.819	42.703	48.999	44.660	41.224
UK	8.657	4.129	5.468	6.360	12.390	17.643

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

The levels of the IDIS are rather low in the majority of the EU-15 countries. The high(er) levels that are traced in Ireland and Greece provide an indication that dissimilarity is not bad in every case. In the case of Ireland, such dissimilarity can be considered as a strategic choice whereas in the case of Greece, it can be considered as the negative impact of competition.

The same conclusion stands also for the levels of specialization (Table 7). These levels can be assessed with the use of the entropy index proposed by Theil (1967). Theil Index takes the form $\sum_{i=1}^{I}((\alpha_i/\alpha)*\log(\alpha/\alpha_i))$, where α_i is the level of employment of sector i and α is the level of total industrial employment in the country under consideration. The Theil index takes values in the interval [0, 1] after its division with its theoretical maximum log(n), where n is the number of industrial sectors, from complete to no specialization (or from no to complete diversification).

Indeed, high levels of specialization (or alternatively, low levels of diversification) are observed simultaneously in both countries with high and low industrial productivity. The differences in their industrial productivity are attributed, thus, to the nature of their specialization. Some countries (i.e. Ireland, Finland) are specialized in IINT or CINT sectors whereas some other countries (i.e. Greece,

Portugal) are specialized in LINT sectors. The former groups of industrial sectors are associated with increasing returns to scale activities whereas the latter are associated with constant returns to scale activities (Jackson and Petrakos, 2001).

Table 7: Theil Index

	1980	1985	1990	1995	2000	2003
ITALY	0.949	0.948	0.949	0.946	0.945	0.947
BELGIUM	0.955	0.951	0.952	0.950	0.948	0.946
SPAIN	0.946	0.941	0.943	0.942	0.940	0.938
UK	0.943	0.945	0.947	0.946	0.938	0.936
GERMANY	0.931	0.928	0.923	0.918	0.920	0.921
FRANCE	0.947	0.941	0.939	0.933	0.926	0.921
AUSTRIA	0.929	0.928	0.925	0.920	0.920	0.919
DENMARK	0.918	0.920	0.918	0.920	0.919	0.917
FINLAND	0.938	0.943	0.935	0.928	0.917	0.912
LUXEMBOURG	0.795	0.824	0.867	0.896	0.908	0.908
SWEDEN	0.897	0.910	0.918	0.917	0.909	0.902
PORTUGAL	0.894	0.883	0.896	0.897	0.897	0.900
NETHERLANDS	0.927	0.919	0.914	0.907	0.901	0.897
IRELAND	0.875	0.897	0.903	0.900	0.886	0.879
GREECE	0.864	0.867	0.860	0.866	0.863	0.861

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

From the figures presented above it is evident that the same phenomena (high structural change, high levels of dissimilarity, high levels of specialization) can lead to different outcomes. Before the incorporation of all this set of information into an econometric model, it is necessary to estimate the level of economic integration of each EU-15 country, in the EU-15 area, since their industrial activity is developed under a context of an ongoing integration process.

Following Petrakos et al (2005), the level of economic integration of the EU-15 countries can be estimated from the performance of the Index of Economic Integration (IEI) (Table 8). The IEI is the share of intra-EU trade (exports and imports) to total trade activity of each EU-15 country and is given by the formula TRADE$_{EU}$ / TRADE$_{TOTAL}$. The IEI takes values in the interval [0, 1], from no to complete economic integration.

Table 8: Index of Integration

	1980	1985	1990	1995	2000	2003
PORTUGAL	0.527	0.570	0.754	0.771	0.771	0.778
BELGIUM	0.990	0.729	0.776	0.735	0.718	0.723
LUXEMBOURG	0.690	0.729	0.776	0.735	0.718	0.723
SPAIN	0.376	0.456	0.662	0.683	0.660	0.671
DENMARK	0.672	0.625	0.659	0.618	0.656	0.645
AUSTRIA	0.629	0.620	0.696	0.679	0.662	0.639
SWEDEN	0.590	0.595	0.634	0.634	0.633	0.628
FRANCE	0.524	0.576	0.640	0.635	0.631	0.626
NETHERLANDS	0.663	0.697	0.712	0.667	0.610	0.608
IRELAND	0.765	0.705	0.739	0.654	0.597	0.604
GREECE	0.505	0.503	0.677	0.661	0.560	0.566
ITALY	0.471	0.513	0.623	0.586	0.557	0.544
GERMANY	0.578	0.580	0.621	0.575	0.526	0.534
FINLAND	0.527	0.509	0.602	0.576	0.530	0.526
UK	0.495	0.541	0.574	0.562	0.509	0.511

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

The different levels of economic integration provide strong evidence that the impact of the homonymous process is heterogeneous concerning the EU-15 countries and the industries activated in their territory.

3. Industrial Performance in an Economic Integration Context: An Econometric Investigation of the Impact of Structural Factors.

The analysis of the previous section indicated that some structural aspects of the EU economic integration process may enhance the industrial performance of the EU-15 countries whereas some others may operate as constraints. The relation between industrial performance and industrial structure can be supported in a more formal way, with the construction of an industrial performance econometric model. The model uses panel data covering the period 1980-2003, in the ongoing process of EU economic integration.

The dependent variable of the model is the level of industrial productivity (INDPRO). This variable is used as a better (than industrial GDP or industrial employment) performance indicator since it includes both the aspects of GDP and employment. The EU-15 countries are split into two groups according to the growth

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that have recorded in their industrial productivity levels during the period under consideration. The first group includes the EU-15 countries that experienced industrial productivity growth higher than the respective of the EU-15 average (i.e. the countries of Belgium, France, Ireland, Luxemburg, Austria, Finland and Sweden) and the second group includes the rest of the EU-15 countries (i.e. the countries of Denmark, Germany, Greece, Spain, Italy, the Netherlands, Portugal and the UK).

The independent variables of the econometric model are the Coefficient of Structural Change (CSC), the Index of Dissimilarity (IDIS), the Index of Economic Integration (IEI), the Theil Index (THEIL) and the shares of CINT sectors in industrial employment (CINTSH). The model uses national fixed effects and is corrected for heteroskedasticity with the use of the White test (no cross terms) (White, 1980).

The econometric models below reveal some very interesting and enlightening results (Tables 9 and 10). The more and the less productive EU-15 countries present many similarities and dissimilarities.

Table 9: An econometric model of industrial performance for the most productive EU-15 countries

Independent Dependent	INDPRO
(Constant)	108,149.800 (0.000)
IEI	301.594 (0.882)
CSC	-12,982.880 (0.000)
IDIS	-9.367 (0.000)
THEIL	-104,429.700 (0.000)
CINTSH	318.900 (0.000)
BELGIUM	4,136.343
FRANCE	-1,269.416
IRELAND	-3,790.737
LUXEMBURG	5,620.048
AUSTRIA	873.436
FINLAND	-654.950
SWEDEN	-4,914.724
ADJ. R^2	0.975
F	598.569 (0.000)
N	168

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

Table 10: An econometric model of industrial performance for the less productive EU-15 countries

Independent Dependent	INDPRO
(Constant)	-16,846.610 (0.000)
IEI	432,669 (0.119)
CSC	-11,400,940 (0.000)
IDIS	9.091 (0.000)
THEIL	28,436.870 (0.000)
CINTSH	236.521 (0.000)
DENMARK	1,677.406
GERMANY	2,994.107
GREECE	-705.792
SPAIN	-787.497
ITALY	856.401
NETHERLANDS	-132.305
PORTUGAL	-2,346.166
UK	-1,556.156
ADJ. R^2	0.937
F	235.812 (0.000)
N	192

Source: Data from Cambridge Econometrics European Regional Database (2006) elaborated by the authors

The process of EU economic integration (IEI) had overall positive effects for both the more and the less productive EU-15 countries. These effects, however, proved to be statistically insignificant for both groups of countries. The recorded structural change (CSC), an impact of the internationalization of the markets, had a negative and statistically significant impact on the level of industrial productivity for both groups of countries. The high shares of capital-intensive sectors in industrial employment (CINTSH) alleviate, however, these negative effects as their positive and statistically significant sign indicates.

The differential factors for the two groups of countries are their levels of specialization and their levels of dissimilarity with the EU-15 average industrial employment structure. The more productive EU-15 countries have negative and statistically significant sign for both variables. These results reveal that the high levels of specialization allowed them to exploit of scale in sectors that are associated with IRS activities. The respective signs for the less productive EU-15 countries are positive and statistically significant. These results indicate that the high levels of

diversification make these countries less vulnerable to asymmetric shocks, allowing them to exploit the benefits of dissimilarity since they are not able to specialize in sectors associated with IRS industrial activities.

4. Conclusions.

The descriptive and the econometric analysis reveal the different outcomes that the dynamics of the EU economic integration process have generated. Countries such as Ireland, Sweden and Finland managed to be benefited whereas countries such as Greece, Portugal and Spain didn't experience the same results.

The EU economic integration process had overall positive results indicated that it is better to be inside than outside (the EU). The results, however, were not statistically significant since many factors had a negative impact on industrial productivity that it is considered to be the most appropriate proxy for industrial performance.

The impact of restructuring, under the conditions of internationalization, was negative in both the more and the less productive EU-15 countries. This impact, however, is counterbalanced in the EU-15 countries that managed to maintain high shares of capital-intensive sectors in their industrial employment. The existence of such sectors is of extreme importance since they are connected with increasing returns to scale activities.

High levels of specialization allow the more productive EU-15 countries to maintain relatively high shares in the capital-intensive sectors, benefited simultaneously from economies of scale. On the contrary, it is revealed that the less productive EU-15 countries cannot be specialized to these sectors due to increased competition. Given this fact, it is better for them to be diversified in order to be less vulnerable to asymmetric shocks.

The results of the paper allowed for a better understanding of the factors behind success and failure concerning the industrial performance of the EU-15 countries.

Such an understanding may have an added value for policy-making at a time when EU structural and cohesion policies are under scrutiny.

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