
Work in 27 European Countries: Testing the North-South Hypothesis

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The Third European Work Environment Survey data have been analysed in an effort to find the differences between the fifteen old EU member states and the twelve acceding and candidate countries as regards their work environment. The analysis focuses on sixteen work indicators pertaining to industry, organisational size, work environment, working hours and work-related health issues. A cluster analysis shows that the twenty-seven countries can be combined into five clusters: north-west Europe, central Europe with Italy and Portugal, Greece and Spain as a couple, and Cyprus and Romania as two one-country clusters. The main results of the analysis are: (1) Complex, computerised and autonomous work as well as repetitive work are mainly found in the richer western and northern European countries. (2) Work pressure is also highest in these countries, though Cyprus and Malta score very high on work pressure too. (3) Long working hours, non-standard working hours, heavy work and job hazards are mainly found in the new central and southern European countries and in Greece and Spain. (4) Work-related stress and fatigue and work-related musculo-skeletal pains are somewhat more common in the central and southern countries, but Finland, Sweden, Denmark, and France score high on them as well. The north-south hypothesis pertaining to the work environment (more challenging jobs and fewer job hazards and work-related health problems in the north) is only partly confirmed.

Keywords: work environment, European Union, cross-national, cluster analysis

Introduction

In the past few decades, the growth of multinational corporations, international investments and international co-operation has led to cross-national interest in organisational issues such as technological development, organisational design, culture and work values, working conditions, leadership, stress and motivation. This comparative interest has been reinforced by European legislation and the European Union enlargements in 1981, 1986, 1995 and 2004. Numerous measures have been and will be implemented by the European Union to do away with barriers to free trade, capital and service transfers, people's mobility and ob-

stacles arising from rules and regulations. The consequences for companies in Europe will be enlarged markets, more competition as well as cooperation, increased scale through mergers, and the closure of small firms. The results of cross-national organisational research may have practical value for the human resources and policies of multinational enterprises, governments and European authorities.

Literature on work and organization can lead to the conclusion that although there is lively interest in cross-national organisational investigations, barely any consistent and comparative studies have been conducted on the quality of the work environments in various countries. 'In fact, information often either

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does not exist or is not accessible or, if available, is not comparable because of the differences between the monitoring systems of the various member states' (Paoli 1992). Against this background, the European Foundation for the Improvement of Living and Working Conditions in Dublin took the initiative in 1991-1992 to carry out the First European Survey on the work environments in all twelve EU countries (Paoli 1992). The theoretical basis for the examination was linked to the Job Demands-Job Control-Job Support Model of Karasek (1979), and its effects on workers' health and well-being. Because of its relevance to workers' health and well-being, information on working conditions and working hours is also included in the survey.

Based on the dataset of the First European Survey conducted by the European Foundation, Smulders, Kompier and Paoli (1996) carried out a study on the differences and similarities in the work environment of the twelve countries that were EU member states in 1992. A cluster analysis shows that the differences in the work environments in Europe could best be summarised as four clusters: the northern cluster (Denmark, West Germany, former East Germany, the Netherlands and Great Britain), the mid-western cluster (Belgium and Luxembourg), the southern cluster (Spain, Portugal, France, Italy and Ireland), and the isolated southern cluster (Greece). Compared to other European countries, the overall quality of working life in the southern countries and Ireland was below average. In the northern and mid-western European countries, the quality of the work environment was above average. This can be called the north-south differentiation with respect to the work environment in Europe. The same differentiation is also seen in other cross-national studies. Six studies were found that cluster the countries into more or less homogeneous groups with respect to work-related values or beliefs, the importance of work goals, leadership styles, job satisfaction and so forth (Haire, Ghiselli and Porter 1966; Sirota and Greenwood 1971; Ronen and Kraut 1977; Hofstede 1980; Griffeth, Hom, Denisi and Kirchner 1985; Brodbeck, Frese and Akerblom 2000). One overall conclusion in these studies is that there is a clear north-south differentiation in Europe with respect to these work-related characteristics. The ques-

tion however is whether there is also a north-south differentiation with respect to countries' work environments in far more than the twelve EU member states in the analysis. In part, this article addresses this question.

In 1996 the European Foundation for the Improvement of Living and Working Conditions in Dublin gathered data for the Second European Survey, again on the physical, climatic and psychosocial working conditions, social and material support in the job situation, job control, and working hours (Paoli 1997). And in 2000 the Third Survey on the fifteen EU member states was carried out and reported (Paoli and Merllié 2001). In 2001 the Third Survey was expanded to also include the ten acceding and the two candidate countries (Bulgaria and Romania). The ten newcomers that joined the EU on 1 May 2004 were Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic and Slovenia. Bulgaria and Romania will join the Union in 2007, providing they meet the required standards of readiness in time (Paoli and Parent-Thirion 2003).

The European Foundation published several reports based on the further analysis of the third survey dataset. They focus on such topics as work organisation and health, types of employment and health, technology and working conditions, time and work intensity, duration of work, employment status, gender, age, and sectorial profiles of working conditions. But up to now, no combined analysis has been conducted of the fifteen old and the twelve new EU member states. This paper addresses the differences and similarities between today's twenty-five EU member states and the two candidate countries, and is based on a secondary analysis of the original 2000-2001 EU data described above.

We summarise our research questions as follows.

- 1 What are the relative positions of the various European countries on the work environment indicators and how large are the differences and similarities between the twenty-seven countries?
- 2 Which EU member states and candidate countries cluster together, in other words which ones are similar and which ones differ?

3 Is there a north-south differentiation between the European countries on work environment, with the northern countries in a better position?

Method

Data collection

The Third Survey on the work environment in the fifteen EU member states was carried out in March and April 2000. The sample included 21,500 employees and self-employed people (1,500 in each country with the exception of Luxembourg where data were collected from 500 workers). The fieldwork for the twelve acceding and candidate countries was done in May and July 2001. The samples in the twelve countries included 11,500 employees and self-employed people (1,000 in each country with the exception of Malta and Cyprus, where data were collected from 500 workers). The samples are representative of the work force distribution in each country by occupation, gender, age, sector and company size. The workers

were interviewed face-to-face at home. The questionnaires were developed by experts from various countries and representatives of trade unions and employer organisations at the EU level. Both the questionnaires (Paoli and Merlié 2001; Paoli and Thirion 2003) include the same questions on age, gender, marital status, activities at home, country, branch of industry and company size as well as questions on the work environment (such as physical and climatic working conditions, job demands, job control, working with a computer, working hours etc).

Data analysis

For reasons of comparability, all the self-employed people and all the workers above the age of 65 are excluded from the dataset analysed here. This means the 32,760 workers in the 27-country sample have been reduced to 27,043 employees aged 15-64. Table 1 gives a description of the sixteen indicators used in the analysis.

Firstly, there are four employment indicators. The first three variables are dummy vari-

Table 1 Descriptive Statistics

	<i>N</i>	<i>Mean</i>	<i>Standard Deviation</i>
1 Working in agriculture, hunting, forestry, fishing (no-yes)	26925	6.4	24.4
2 Working in industry (mining, quarrying, manufacturing) (no-yes)	26925	23.7	42.5
3 Working in the commercial service sector (no-yes)	26925	9.2	28.8
4 Organisational size: number of people working in the local unit of company *	25917	4.5	1.9
5 Working week: hours usually worked a week	26765	38.7	11.6
6 Weekend work: number of times a month works on Saturday or Sunday	26687	0.96	1.2
7 Working shifts (no-yes)	26590	22.2	41.5
8 Job complexity: learning new things, complex tasks, solving problems etc. (no-yes)	26553	75.2	43.2
9 Job autonomy: in order of tasks, work method, work speed (no-yes)	26878	64.7	47.8
10 Job involves repetitive tasks of 5 seconds, 30 seconds or 1 min. (no-yes)	25770	14.3	35.0
11 Work pressure: work at very high speed to tight deadlines **	26403	3.4	1.8
12 Job hazards: exposed to vibrations, noise, heat, cold, chemicals **	26979	1.9	1.2
13 Heavy work: exposed to tiring repetitive heavy work **	26985	2.9	1.6
14 Working with a computer **	26914	2.7	2.2
15 Work-related stress, fatigue, headaches, sleeping problems etc. (no-yes)	27043	14.0	34.7
16 Work-related pains in the back, shoulder, neck, upper and lower limbs (no-yes)	27043	23.8	42.6

* 1 = works alone, 2 = 2-4 persons, 3 = 5-9 persons, 4 = 10-49 persons, 5 = 50-99 persons, 6 = 100-249 persons, 7 = 250-499 persons, 8 = 500 and over

** 1 = never, 2 = almost never, 3 = 1/4 of the time, 4 = 1/2 the time, 5 = 3/4 of the time, 6 = almost all the time, 7 = all the time

ables derived from a question on the main activity of the organisation where the worker is employed. The first is on 'employment in agriculture, hunting, forestry or fishing', the second is on 'employment in industry' (mining, quarrying, manufacturing), and the third is on 'employment in the commercial service sector' (financial intermediation, real estate and business activities). They cover 39% of the work force in the twenty-seven countries. These three dummy variables are expected to express the employment range or the work force distribution over the branches of industry in the various European countries. As a macro working life indicator, we also distinguish the size of the organisations where people work. Organisational size is the answer to the question *How many people work in the local unit of your company?* and is categorised from 1 = works alone, to 8 = 500 and over.

Three working hour indicators are also included in the study.

- The working week is measured by the number of hours one usually works a week.
- Weekend work is the mean score of two questions, *How many times a month do you work on Saturday?* and *How many times a month do you work on Sunday?*
- Shift work is measured by asking *Do you work shifts?* (no or yes).

Seven work environment indicators are distinguished.

- Job complexity is the mean score on five questions: *Does the job involve complex tasks?* *Does the job involve learning new things?* *Does the job involve solving unforeseen problems?* *Does the job involve assessing the quality of your own work?* and *Does the job involve meeting precise quality standards?* They all have no-yes answer categories.¹
- Work autonomy (or Job Control) is the mean of three questions: *Are you able to choose or change the order of your tasks?* *Are you able to choose or change the method of your work?* and *Are you able to choose or change the speed or rate of your work?* They all have no-yes answer categories.²
- Repetitive tasks is the mean score on three questions: *Does your job involve repetitive tasks of less than 5 seconds?* *Does your job in-*

volve repetitive tasks of less than 30 seconds? and *Does your job involve repetitive tasks of less than 1 minute?* They all have no-yes answer categories. Cronbach's alpha is 0.81.

- Work pressure is measured by taking the mean score of two questions: *Does your job involve working at a very high speed?* and *Does your job involve working to tight deadlines?* There are seven possible responses to both questions: 1 = never, 2 = almost never, 3 = 1/4 of the time, 4 = 1/2 the time, 5 = 3/4 of the time, 6 = almost all the time, 7 = all the time.³
- Job hazards is the mean score on six questions: *Are you exposed to vibrations from hand tools or machinery?* *Are you exposed to noise so loud that you have to raise your voice?* *Are you exposed to temperatures that make you perspire even when you are not working?* *Are you exposed to low temperatures indoors or outdoors?* *Are you exposed to breathing vapours, fumes dust, or dangerous substances?* and *Are you exposed to handling or touching dangerous products or substances?* The answers can be chosen from a seven-point scale as described above.⁴
- Heavy work is the mean score on three questions: *Does your job involve carrying or moving heavy loads?* *Does your job involve painful or tiring positions?* and *Does your job involve repetitive hand or arm movements?* All three are measured with the seven-point scale described above.⁵
- Computer work is measured by one question: *Does your job involve working with a computer?* It is also measured with a seven-point scale.

Lastly, two work-related health indicators are included.

- Work-related stress and fatigue is the mean score on six questions. Does your job cause (1) stress, (2) overall fatigue, (3) headaches, (4) sleeping problems, (5) anxiety, (6) irritability?⁶
- Work-related pain in the back, shoulders and limbs is the mean score on four questions: Does your job cause (1) backaches, (2) muscular pains in the shoulders and neck, (3) muscular pains in the upper limbs, (4) muscular pains in the lower limbs?⁷

Table 2 Country Means on Indicators for Working Hours and Work Environment

<i>Country</i>	<i>length of working week in hours</i>	<i>hours of weekend work a month</i>	<i>% shift work</i>	<i>% complex work</i>	<i>% auto-nomous work</i>	<i>% repetitive tasks</i>	<i>work pressure (1-7)</i>	<i>exposed to job hazards (1-7)</i>	<i>heavy work (1-7)</i>	<i>computer work (1-7)</i>
Austria	37.7	0.84	15.6	80.7 (6)	64.9	12.6	3.61 (9)	1.82	2.78	2.70
Belgium	35.3	0.76	23.7	79.6 (9)	62.9	11.6	3.06	1.76	2.77	3.29 (4)
Denmark	35.4	0.75	9.0	91.5 (1)	81.1 (3)	14.7 (8)	3.24	1.66	2.65	2.80 (10)
Finland	39.2	0.88	22.9	87.4 (3)	74.0 (5)	27.6 (2)	3.88 (4)	2.01	3.14 (8)	3.20 (5)
France	36.5	0.95	21.4	80.1 (7)	67.4 (9)	18.5 (5)	3.26	1.99	3.46 (3)	2.95 (9)
Germany	36.3	0.79	22.2	75.9	66.0	14.3 (10)	3.55 (10)	1.84	2.71	2.55
Greece	38.7	1.35 (1)	24.9 (10)	53.1	44.6	19.7 (4)	3.62 (7)	2.19 (4)	3.53 (1)	2.15
Ireland	37.6	0.99 (10)	20.6	71.1	56.8	20.4 (3)	3.37	1.95	2.84	3.10 (7)
Italy	37.7	1.25 (4)	26.3 (7)	68.7	63.5	11.1	3.20	1.83	2.83	2.62
Luxembourg	37.9	0.97	17.9	73.1	66.2	11.7	3.16	1.86	2.76	3.15 (6)
Netherlands	32.5	0.75	12.5	87.8 (2)	82.6 (2)	14.7 (9)	3.64 (6)	1.71	2.87	3.78 (1)
Portugal	39.6	0.81	10.4	63.3	53.8	16.6 (6)	2.75	1.94	3.20 (5)	2.31
Spain	38.5	0.93	26.8 (5)	70.8	54.2	31.0 (1)	2.83	2.27 (2)	3.50 (2)	2.42
Sweden	37.5	0.77	18.6	83.0 (4)	80.6 (4)	13.3	3.99 (2)	1.80	3.16 (7)	3.02 (8)
United Kingdom	36.8	1.08 (8)	25.5 (8)	81.7 (5)	69.2 (8)	15.8 (7)	3.62 (7)	1.86	2.84	3.52 (2)
Cyprus	41.1 (9)	0.89	11.2	67.5	61.3	12.2	4.32 (1)	2.43 (1)	3.38 (4)	2.64
Czech Republic	41.3 (8)	0.80	27.2 (4)	72.4	71.0 (7)	13.0	3.32	1.90	2.66	2.75
Estonia	41.9 (5)	1.17 (6)	21.5	79.7 (8)	74.0 (6)	11.9	3.07	2.15 (6)	2.90	2.41
Hungary	41.9 (5)	0.79	22.5	68.4	67.1 (10)	7.2	3.54	2.07 (9)	3.18 (6)	2.64
Latvia	43.6 (2)	1.25 (3)	21.9	61.4	60.7	10.1	2.68	2.07 (10)	2.79	1.99
Lithuania	41.4 (7)	1.02 (9)	21.5	55.0	59.7	13.6	2.53	1.85	2.74	1.89
Malta	39.3	1.21 (5)	22.4	72.5	92.9 (1)	7.0	3.89 (3)	2.11 (8)	3.03 (9)	2.49
Poland	41.0 (10)	1.09 (7)	27.8 (3)	70.1	58.0	8.6	3.40	1.86	2.61	2.26
Slovak Republic	42.3 (4)	0.71	25.4 (9)	67.9	60.8	7.8	3.26	2.21 (3)	3.00	2.42
Slovenia	39.5	0.90	26.7 (6)	79.4 (10)	65.0	6.9	2.33	2.05	2.42	3.32 (3)
Bulgaria	42.4 (3)	0.98	31.0 (2)	58.6	53.3	11.2	3.44	2.18 (5)	3.03 (10)	2.05
Romania	44.4 (1)	1.32 (2)	31.2 (1)	75.0	55.1	5.9	3.82 (5)	2.13 (7)	2.98	1.76
All 27 countries	38.7	0.96	22.2	75.2	64.7	14.3	3.42	1.93	2.94	2.69
Significance of differences between all the countries	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

The rank numbers of the ten highest scoring countries on each indicator are in parentheses.

The sample data are corrected using a weighting procedure.⁸ In all the countries, sex, age, occupation, sector of activity and region are used in the weighting procedure. As regards the work environment, it is not possible to check the validity of the questionnaire since there are no comparable *objective* data from observations or non-obtrusive sources. The questions on the gender distribution and division of employment over the economic sectors can be checked using official objective Eurostat data. According to the data (Franco and Jouhette 2003), in 2002, 55% of the work force were male and 45% female. In this survey the figures are also 55% and 45%. Again according to official data, 9% of the total European work force (acceding and candidate countries included) are employed in agriculture, 29% in industry, and 62% in the service industry (EC/Eurostat 2003). In this survey the figures are 6%, 32% and 62% respectively. The figures allow us to have confidence in the data collected for this study.

A final comment should be made on the relations between the sixteen indicators. The strongest correlations among the sixteen indicators in the analysis are between heavy work and job hazards ($r = .51$), heavy work and work-related pains in the back, shoulders and limbs ($r = .42$), heavy work and work pressure ($r = .33$), and shift work and weekend work ($r = .30$). Almost all the other relations are below .20. This means the sixteen indicators are relatively independent of each other and no indicators measure almost the same concept.

Results

Now it is time to go back to our first question: What is the relative position of the various European countries on the work environment indicators? In other words: what work environment indicators do the various EU member states score high and low on?

The differences between the European countries are examined using ANOVA's and are strongly significant ($p < .0001$) on all sixteen characteristics.

Table 2 shows the mean scores of the twenty-seven European countries on the indicators representing working hours and the work environment and makes it possible to

- draw the following more general conclusions:
- Long working hours and non-standard working hours are mainly found in the more agriculture-oriented and new central and southern countries.
 - Complex, computerised and autonomous work is mainly found in the richer western and northern member states Finland, Sweden, Denmark, the Netherlands, France and the United Kingdom.
 - Perhaps contrary to the expectations, repetitive work is mainly found in the western countries, especially the ones where there is still ample industrialised and heavy work.
 - Work pressure is highest in the older and richer EU member states such as Sweden, Finland and the Netherlands, though there are some exceptions (Cyprus and Malta score very high on work pressure).
 - Heavy work and job hazards are mainly found in the new central and southern countries such as Romania, Bulgaria, the Slovak Republic, Hungary, Cyprus, and Malta, but also in Greece and Spain.

The second goal of this analysis is to find out which countries bear similarities when all sixteen work indicators are taken into account. To find the similarities and differences, a cluster analysis has been carried out on the mean country scores. Cluster analysis is the search for relatively homogeneous groups of cases or in this case countries. A cluster analysis is in essence a factor analysis in which variables and cases or countries are exchanged. The technique minimises the differences in the country clusters and maximises the ones among the country clusters (SPSS, 2002).⁹ Small distances between countries indicate that fairly homogeneous countries are merged. Large distances indicate that dissimilar countries are combined.

One way to visually represent the steps in the hierarchical clustering solution is by using a dendrogram (figure 1). It does not show the actual distances but the rescaled distances to numbers between 0 and 25. The ratio of the distances between the steps is preserved. The figure shows the clusters being combined and the values of the coefficients (squared Euclidean distance between two cases) at each step. The distances between the cases or clusters can be used to decide how many clusters are needed to represent the

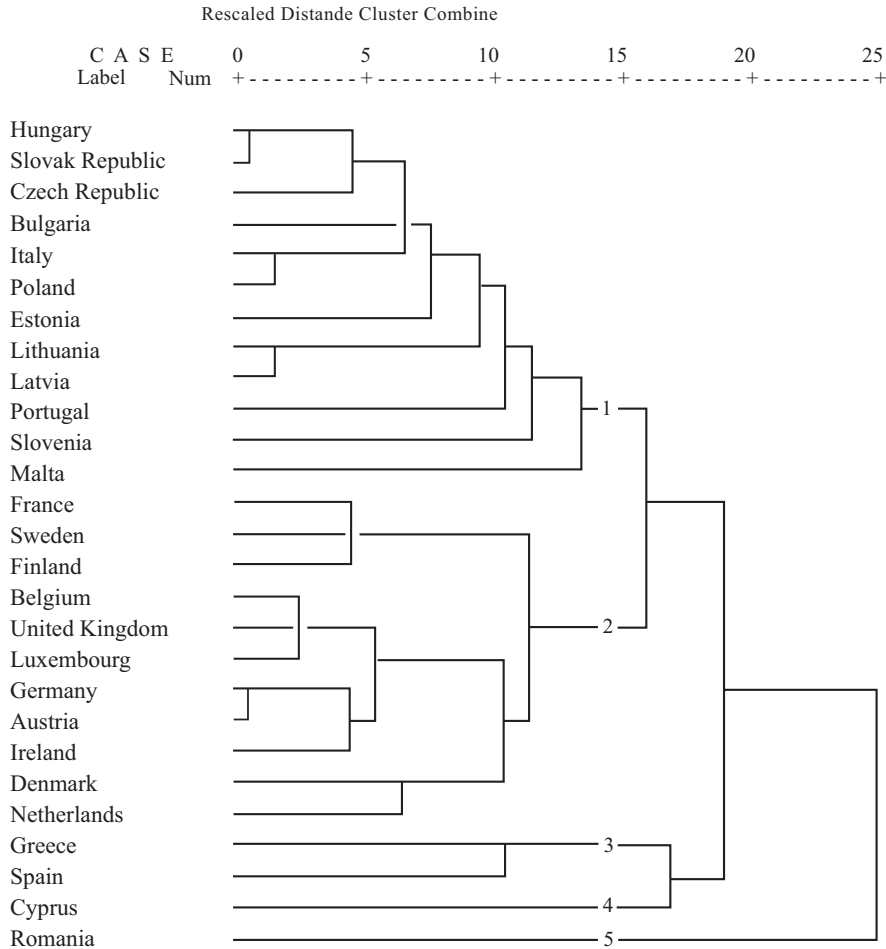


Figure 1 Results of Hierarchical Cluster Analysis with 16 Standardised Indicators Using Euclidean Distance Measure and Average Linkage between the 27 Countries

data. The agglomerating is usually stopped as soon as the increase between two adjacent steps becomes relatively large.

The figure shows that the first two groups of countries taken together are Hungary and the Slovak Republic, and Germany and Austria. They are the most similar of all the countries on the sixteen work indicators. In the second step Lithuania and Latvia, and Italy and Poland are taken together. In the third step, Belgium, Luxembourg and the United Kingdom are combined as a trio, and so forth. Cyprus and Romania are the least similar to the

other countries. They are combined with the other countries in the last steps of the clustering process.

The dendrogram shows that a five-cluster solution is appropriate, since it is easily interpretable and occurs before the distances where the clusters are combined become too large. The five clusters may be labelled as follows:

- 1 Central Europe and Italy and Portugal
- 2 Northern and western Europe
- 3 Greece and Spain
- 4 Cyprus
- 5 Romania

Table 3 Means of 16 Indicators for Clustering Countries and Significance of Differences between Clusters on Indicators

	<i>number of countries</i>	<i>% agriculture</i>	<i>% industry</i>	<i>% comm. service</i>	<i>size of organisation (1-8)</i>	<i>length of working week in hours</i>	<i>amount of weekend work a month</i>	<i>% shift work</i>	<i>% complex work</i>
Central Europe and Italy and Portugal	12	6.0 (2)	27.2 (1)	6.4 (4)	4.2 (2)	41.0 (2)	1.00 (3)	23.7 (3)	68.1 (3)
Northern and western Europe	11	2.1 (5)	20.7 (4)	12.2 (2)	4.7 (1)	36.6 (5)	0.87 (5)	19.1 (4)	81.1 (1)
Greece and Spain	2	2.9 (4)	21.6 (3)	8.4 (3)	4.1 (3)	38.6 (4)	1.14 (2)	25.8 (2)	62.0 (5)
Cyprus	1	3.1 (3)	12.6 (5)	13.1 (1)	3.9 (4)	41.0 (2)	0.89 (4)	11.2 (5)	67.5 (4)
Romania	1	38.9 (1)	24.3 (2)	2.3 (5)	3.5 (5)	44.4 (1)	1.32 (1)	31.2 (1)	75.0 (2)
All 27 countries	27	5.3	23.5	9.0	4.4	39.1	0.96	21.8	73.2
Significance of differences between the 5 clusters		.000	.001	.000	.023	.000	.060	.022	.002

Table 3 (continued)

	<i>number of countries</i>	<i>% autonomous work</i>	<i>% repetitive tasks</i>	<i>work pressure (1-7)</i>	<i>exposed to job hazards (1-7)</i>	<i>heavy work (1-7)</i>	<i>computer work (1-7)</i>	<i>% with work-related stress and fatigue</i>	<i>% with work-related pain in back, shoulders and limbs</i>
Central Europe and Italy and Portugal	12	65.0 (2)	10.4 (4)	3.12 (5)	2.02 (4)	2.87 (5)	2.43 (3)	15.8 (4)	26.0 (3)
Northern and western Europe	11	70.2 (1)	15.9 (2)	3.49 (3)	1.84 (5)	2.91 (4)	3.10 (1)	11.8 (5)	21.9 (5)
Greece and Spain	2	49.4 (5)	25.3 (1)	3.23 (4)	2.23 (2)	3.52 (1)	2.28 (4)	21.7 (2)	30.0 (1)
Cyprus	1	61.3 (3)	12.2 (3)	4.33 (1)	2.43 (1)	3.38 (2)	2.64 (2)	26.7 (1)	28.1 (2)
Romania	1	55.1 (4)	5.9 (5)	3.82 (2)	2.13 (3)	2.98 (3)	1.76 (5)	18.6 (3)	22.6 (4)
All 27 countries	27	65.4	13.7	3.35	1.98	2.95	2.67	15.1	24.6
Significance of differences between the 5 clusters		.079	.001	.032	.000	.010	.001	.019	.474

The rank numbers of the clusters on each indicator are in parentheses.

What are the similarities and differences as regards the work environment between the five clusters? Table 3 shows the cluster means on the sixteen work indicators.

The differences between the five clusters on the sixteen work indicators are all significant with the exception of weekend work ($p = .06$), autonomous work ($p = .08$) and work-related pains in the back, shoulders and limbs ($p = .48$). The main characteristics of the five country clusters are presented in table 4.

Using the sixteen standardised work indicators, the twenty-seven countries can be placed in a two-dimensional space (see figure 2).¹⁰ In doing so, as much as possible of the total multi-dimensional distance between the objects (countries) is projected on a two-dimensional space and 66% of the total multi-dimensional distance can be represented or explained by the first two dimensions. The rest of the distances (34%) can only be explained by a third, fourth and so forth dimension.

Next, the two-dimensional figure is rotated in such a way that the extremes on the left-right axis coincide with one of the sixteen indicators (rotation does not change the distances between the twenty-seven countries). In order of strength, the best fitting indicators for this horizontal axis are agricultural work, length of working week, service work (nega-

tively), computer work (negatively), organisational size (negatively), complex work (negatively), exposure to job hazards, shift work, weekend work, and work-related stress and fatigue. Denmark and The Netherlands and Romania score the lowest and highest respectively on this horizontal axis. Figure 2 depicts the twenty-seven countries on the two axes.

The vertical axis can best be labelled the *heavy work axis*. The two work indicators repetitive tasks and work-related pains in the back, shoulders and limbs also coincide strongly with this second axis. Greece, Cyprus and Spain score highest and Malta, Slovenia and Ireland score lowest on this axis (see figure 2). The five clusters identified in the cluster analysis are shown in figure 2, which demonstrates that the differences or distances between the countries are rather gradual. For example, the cluster analysis includes Italy and Portugal in the central European cluster, although Italy is close to the northern-western cluster and the Portuguese work environment is close to that of Spain and Greece. Figure 2 also makes it clear that the industrial-agricultural work environments of Bulgaria, the Slovak Republic and the Baltic States resemble the work environment of Romania. It should also be noted that the distances within a cluster are sometimes larger than those between the clus-

Table 4 Main Characteristics of the Five Clusters

Clusters	Main cluster characteristics
Central Europe and Italy and Portugal	high on industry and agriculture long working weeks
Northern and western Europe	low on agriculture and high on commercial service short working weeks high on job complexity, job autonomy, and computer work low on physical job hazards
Greece and Spain	high on weekend work low on job complexity and job autonomy high on repetitive tasks, physical job hazards and heavy work high on work-related stress and fatigue
Cyprus	high on commercial service, low on industry high on work pressure, physical job hazards and heavy work high on work-related stress and fatigue
Romania	high on agriculture, low on commercial service long working weeks with weekend and shift work low on computer work and repetitive tasks high on work pressure

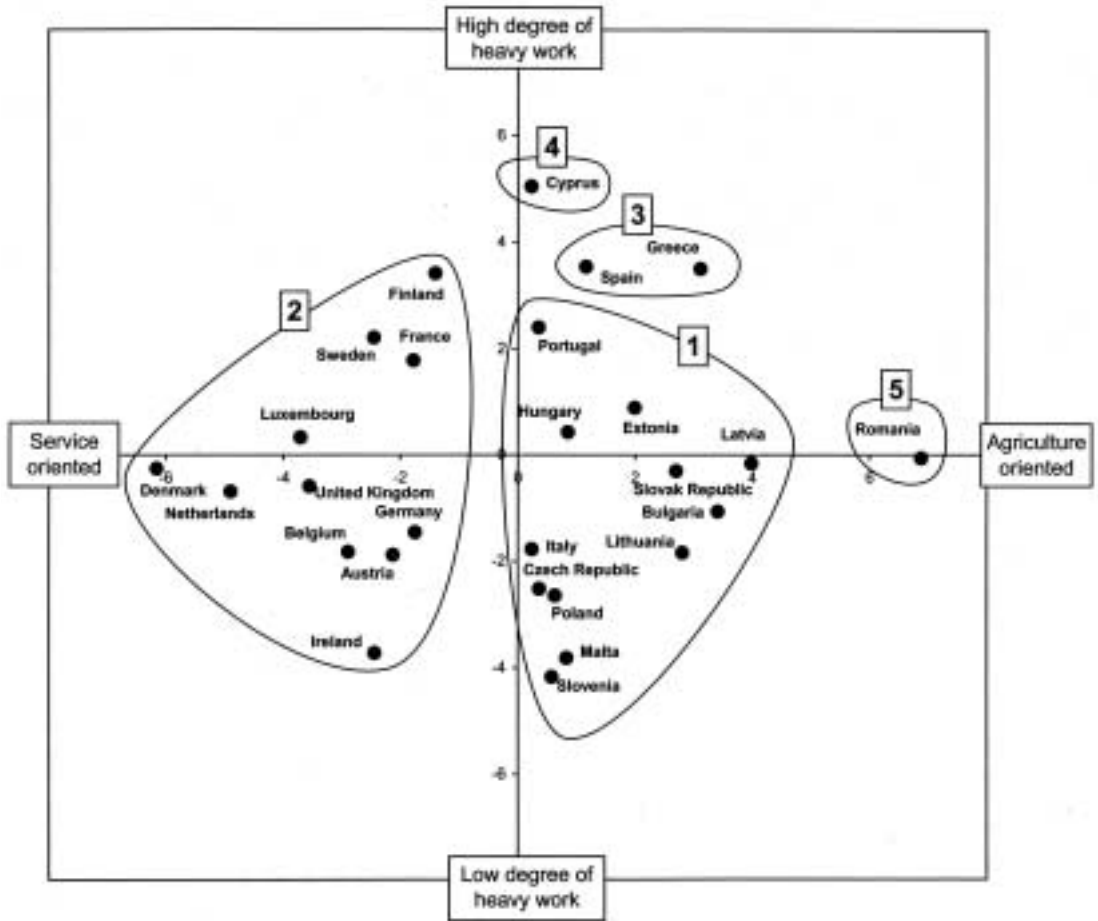


Figure 2 Two-dimensional Description of Distances between the 27 European Countries based on 16 Standardised Scores and Euclidean Distances

ters. In short, the graphic representation of differences between the countries in figures 1 and 2 may make it easier to understand the real situation, but should not be taken as the absolute truth.

Our third research question pertains to the north-south hypothesis regarding the work environment in European countries. Based on the division of the work forces over the farming, industrial and service sectors, a north-west versus south-east differentiation is very plausible. Only Cyprus with a high degree of service work and Portugal with a low level of service work do not fit into this differentiation. Long working hours and non-standard working hours are mainly found in the more

agriculture-oriented central and southern European countries. Heavy work and job hazards are also mainly found in the new central and southern European countries. What is more, complex, computerised and autonomous work is mainly found in the northern and western countries.

But does this mean the best work environments are found in the north-west part of the European Union? It does not seem to be the case, especially since repetitive work is mainly found in the western countries where there is still ample industrialised and heavy work. And work pressure is highest in the older and richer countries such as Sweden, Finland and the Netherlands, though there are some excep-

tions (Cyprus and Malta score very high on work pressure). If we examine the health effects of the work environment, we see that Finland, Sweden, Denmark and France score high on work-related stress and fatigue and work-related musculo-skeletal pain (see figure 3). So we can only partly confirm the north-south hypothesis with respect to the work environments of countries.

Conclusion

Before summarising the main results of this study, some of its strong and weak points should be noted. One strong point is that never before has such a large representative survey on the work environment in Europe been carried out among a representative sample of work forces. The study does however have a number of limitations. Conceptually, the lack of information on some important working life aspects such as pay, promotion, benefits and work security can be argued to be a weak aspect of the study. The survey mainly focuses on job contents, working conditions and working hours. It is not possible to check the validity of the work environment questionnaire, since there are no comparable objective data from observations or non-obtrusive

sources. Nor is it possible to check whether the results of this study are biased by cultural factors (work values, beliefs or opinions on the importance of work). However, the question on the economic sector has been checked using official objective Eurostat data that give us confidence in the research data. Lastly, the country samples (1,500 workers for the older EU member states, 1,000 for the newcomers and 500 for Luxembourg, Cyprus and Malta) can be argued to be relatively small, so that one should consider the possibility of sample limitations in the results.

Riordan and Vandenberg (1994) argue that workers from various countries might use different conceptual frames of reference in responding to constructs such as organisational commitment, leadership style or job satisfaction. Simply translating a measurement instrument into another language is no guarantee of the same conceptual frame of reference as in the original country. We should be cautious in accepting the idea that measures truly operationalize constructs in the same way in different countries. No rigorous testing has been conducted so far of the cultural independence of measurement instruments.

We summarise the main findings of our study as follows.

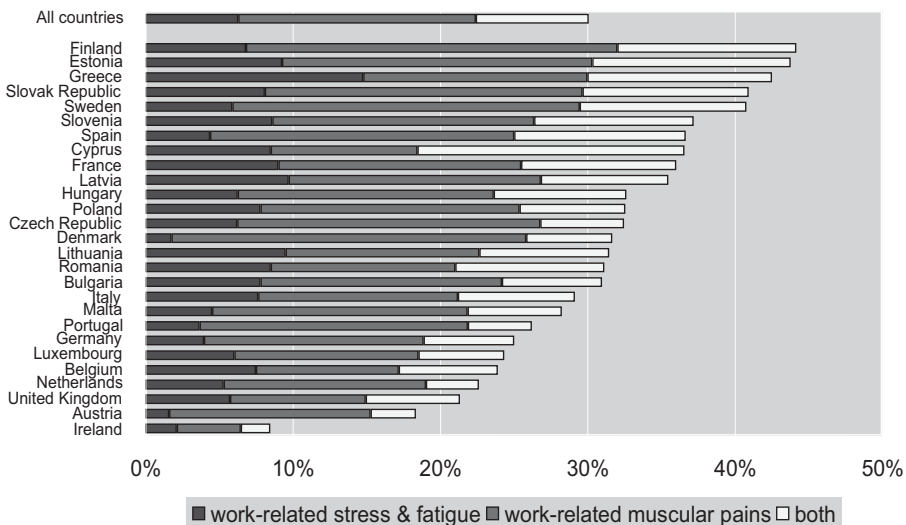


Figure 3 Work-related stress & fatigue and Work-related skeletal pains, by country

- Complex, computerised and autonomous work as well as repetitive work are mainly found in the western and northern European countries.
- Work pressure is also highest in the service-oriented northern and western European countries such as Sweden, Finland and the Netherlands, though the southern islands Cyprus and Malta also score very high on work pressure.
- Long working hours, non-standard working hours, heavy work and job hazards are mainly found in the new central and southern members as well, though they are also found in the old ones Greece and Spain.
- Work-related stress and fatigue and musculo-skeletal pains are more prevalent in the southern and central European countries, but countries like Finland, Sweden, Denmark and France also score relatively high on these health effects

For policy reasons, it is important to add that our data indicate that work-related stress and fatigue are strongly related to work pressure, job hazards, heavy work, long working hours and non-standard working hours such as weekend and shift work. Our data also show that work-related pains in the back, shoulders and limbs are strongly related to heavy work, job hazards, work pressure and the length of the working week. All of this means the new EU member states in particular should devote attention to reducing heavy work and job hazards (noise, vibrations, temperature, chemicals). In the older member states, reducing work pressure is the main way to keep health problems within acceptable limits. Lastly, the positive relation between long working hours and work-related health problems gives a new impulse to the European debate on the length of the working week.

To a certain extent, the analysis in this article supports the hypothesis of a north-south divide, or more precisely a north-west versus a south-east divide as regards the work environment in Europe. An interesting question is what causes this differentiation. Are the differences triggered by cultural differences or economic ones? Although it would require a different analysis to answer this question, a clue might be found by correlating the sixteen work indicators in the analysis with the GDP per capita for each of the twenty-seven countries.

The GDP per capita turns out to correlate positively with commercial service work, computer work, organisational size and job complexity, and negatively with the length of the working week, industrial work, agricultural work, job hazards, shift work and work-related stress and fatigue, leading to the conclusion that in the wealthier European countries, work is more complex, less hazardous, healthier and requires fewer working hours than work in the poorer countries. However, this does not exclude the possibility of cultural factors also explaining part of the difference between the quality of the work environments in the European countries.

Notes

- 1 Cronbach's alpha reliability coefficient of the five questions is 0.63.
- 2 Cronbach's alpha is 0.77.
- 3 Cronbach's alpha is 0.67.
- 4 Cronbach's alpha is 0.80.
- 5 Cronbach's alpha is 0.69.
- 6 Cronbach's alpha is 0.71.
- 7 Cronbach's alpha is 0.76.
- 8 A national weighting procedure has been carried out for each country using marginal and inter-cellular weighting. The description of the universe is derived from Eurostat Labor Force Survey. National weighting procedures are carried out based on this universe description.
- 9 The distance between the countries is expressed in the Euclidean distance, which is the sum of the differences over all the sixteen country scores. Since these country scores include dichotomies, 7-point scales, age (15-64) as well as working hours a week, the country scores are standardized before introducing them into the cluster analysis.
- 10 This is done by introducing the Proximity Matrix produced by the cluster analysis and displaying the distances or proximity between the countries into Excel. The Solver Excel module made by Frontline Systems, Inc. is programmed to search for the coordinates of each country in such a way that the total residual distance is minimized.

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