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Global Finance Journal

Global Finance Journal 16 (2005) 26–47

Country and size effects in financial ratios: A European perspective☆

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Received 1 January 2003; received in revised form 1 February 2004; accepted 5 November 2004
Available online 14 June 2005

Abstract

Harmonised aggregate financial statements are published by the European Commission in the BACH database. This information is organised by country, size of firm, and year. Financial ratios obtained from this database are analysed using multivariate statistical techniques in order to explore country and size effects. The data relates to three size groups, eleven countries, fourteen years, and fifteen financial and economic ratios. It is found that ratios reflect the size of the firm, but that the way in which this is reflected varies between the different countries. It is also found that there are no significant size related differences in financial profitability, but that such differences appear when countries are compared.

JEL classification: M4; F360; G320
Keywords: BACH database; Firm size; Financial ratios; Central balance sheet; Three-way scaling; INDSCAL; Financial statement analysis

☆ The work reported in this paper was supported by grant 2FD97-2091 of the European Regional Development Fund (ERDF) under the title "Financial analysis of diversification and similarity of productive structures in the European Union"; and the SEC2001-1798 administered by the University of Saragossa, Spain.
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doi:10.1016/j.gfj.2005.05.003

1. Introduction

Does size matter? Small firms have long been found to differ from large firms in many respects. The study of size effects and the way these are reflected in the financial structure of the firm, has a long pedigree; Hall (1987). Size effects have been found in capital markets; Rees (1995), Cooke (1992); and in bankruptcy prediction; Ohlson (1980), Peel, Peel, and Pope (1986). Small firms have higher probability of failure than large firms. In the small-firm sector approximately 50% of firms can be expected to fail in a five year period; Storey, Keasey, Watson, and Wynarczyk (1987). Chung (1993) studied the debt structure of small and large firms. The relationship between size and export behaviour has been studied by Calof (1994) and Pierre-Andre (1997). Archer and Faerber (1966) study the relationship between firm size and cost of equity. The financial structure of manufacturing companies in relation to size is studied by Gupta (1969). Small firms have limited access to debt markets, something that does not happen to large firms, which can resort to issuing bonds or equity. Banks restrict the credit available to small firms to a larger extent that they restrict credit to large firms; Gatward and Sharpe (1996).

A way of acknowledging the importance of size, and to control for it, is to work with ratios. This is done in the present paper. Ratio analysis relies on the principle of proportionality. There has been much debate about proportionality in the literature; Lev and Sunder (1979), Whittington (1980), McLeay and Fieldsend (1987), and Fieldsend, Longford, and McLeay (1987). If proportionality applies, no size effect should be found when working with ratios. However, it will be shown that size is important in the financial structure of European firms. But it will be shown that, in Europe, a country effect exists, and that the effect of size can only be understood in the framework of data for individual countries.

This paper studies size effects in European firms, as reflected in the BACH database. Other studies of financial structure of European firms, which also use this database are Rivaud-Danset, Salais, and Dubocage (2001), Serrano-Cinca, Mar-Molinero, and Gallizo (2001, 2002), and Gallizo and Salvador (2002). The main issues are very well discussed in Rivaud-Danset et al. (2001) who give a review of the literature since 1990 (page 10). They point out that different results have been found by different researchers, and explain this by the fact that studies which concentrate on size effects tend to ignore country effects, while those studies that study country effects tend to ignore the different proportions of large and small enterprises that exist in the various countries. In conclusion, the study of firm size in Europe cannot be divorced from country effects.

The Directorate General for Economic and Financial Affairs of the European Commission collects and harmonises annual company accounts statistics for European countries. This is published in the BACH (Bank for the Accounts of Companies Harmonised) database. Data for BACH is provided by the institutions that form part of the European Committee of Central Balance Sheet Data Offices (ECCB); European Commission (2000). A list of these institutions can be seen in Table 1. The BACH database is a very rich data source, freely available through the Internet. It contains information by year, country, industrial sector, and size. From the original data, 15

Table 1
List of institutions that contribute data to the BACH database

Countries	Data Source
Austria	Oestereichische Nationalbank
Belgium	Banque Nationale de Belgique/Nationale Bank van België
Denmark	Statistics Denmark
Finland	Tilastokeskus/Statistics Finland
France	Banque de France
Germany	Deutsche Bundesbank
Italy	Centrale dei Bilanci S.r.l.
Netherlands	Centraal Bureau voor de Statistiek
Portugal	Banco de Portugal
Spain	Banco de España
Sweden	Statistiska Centralbyrån/Statistics Sweden
Japan	Ministry of Finance
United States	Department of Commerce

financial and economic ratios were computed. Table 2 shows the list of ratios and their definition according to BACH conventions. These are the same ratios used by the European Commission (1997, 1998, 2001), and the same ratios on which previous studies were based. These are ratios of means and not means of ratios, since firm level data is not available; McLeay (1986). The ratios cover profitability, margin, staff productivity, capital structure, debt structure, apparent rate of interest, and provisions. A further ratio, not used in earlier studies, R_{16}, that measures rotation, was calculated from the data in BACH and added to the dataset in order to inform later discussion on the components of profitability.

Data was available for 14 years—1986 to 1999—, 11 countries, 3 size groups, 15 financial ratios, and 19 industrial sectors. Only the Netherlands provide data from consolidated statements. The sector with the highest number of observations is manufacturing, accounting for 67% of the total. This study, in order to control for homogeneity, is based on manufacturing data only. In total, and taking into account that there are missing observations, there were 6428 data items.

Size can be measured in a variety of ways; e.g., number of employees, turnover, total asset value. The European Commission recommendation 96/280/CE gives priority to number of employees in the definition of size. However, there is general agreement that, for the purposes of economic research, turnover captures best the effect of size; Ozkan (1996), Titman and Wessels (1988), Rajan and Zingales (1995). BACH uses turnover as an indication of size and contemplates three size groups: small enterprises, defined as having a turnover smaller than 7 million EUR; large enterprises, with a turnover of 40 million EUR or more; and medium sized enterprises, which contains the in-between group. A further group, containing all firms, a weighted average of the previous data set, is also available in BACH.

The research questions are as follows. Taking all the data into account, in what sense is the structure of financial ratios different between companies that belong to the different size groups? Which financial ratios best reflect the differences? In which countries are the differences more accentuated? Questions can also be asked about the relationship between

Table 2
Ratios used in the study, and their definitions according to BACH conventions

Definitions of ratios used	BACH items
R1. Gross profit ratio	
Ratio of gross operating profit or loss to net turnover	U/1
R2. Net Profit Ratio	
Ratio of net profit or loss for the year to net turnover	21/1
R3. Return on equity	
Ratio of net profit or loss for the year to equity capital	21/L–A
R4. Relative share of purchases of goods and services	
Ratio of consumption of goods and services to net turnover	5/1
R5. Value added ratio	
Ratio of BACH value added to net turnover	T/1
R6. Relative share of staff costs	
Ratio of staff costs to net turnover	6/1
R7. Staff costs relative to value added	
Ratio of staff costs to BACH value added	6/T
R8. Relative share of financial charges	
Ratio of interest charges to net turnover	13/1
R9. Apparent rate of interest on financial debt	
Ratio of interest charges to debt owed to credit institutions	13/F2+I
R10. Ratio of financial result	
Financial result on net turnover	W/1
R11. Own funds ratio	
Ratio of own funds less unpaid share capital to balance sheet total	L-A/FL
R12. Overall debt ratio	
Ratio of debt with a remaining period to maturity of more than one year+debt with a remaining period to maturity of less than one year to balance sheet total	F+I/FL
R13. Ratio of financial indebtedness	
Ratio of financial indebtedness balance sheet total	F2+I2/FL
R14. Debt Structure	
Ratio of debt with a remaining period of maturity of more than one year to debt with a remaining period of maturity of more than one year+debt with a remaining period of maturity of less than one year	I/I+F
R15. Ratio of provisions for liabilities and charges	
Provisions for liabilities and charges to balance sheet total	J/FL
R16. Asset rotation	
Net turnover to total assets	U/AE

size and country of origin. Is it possible to find country effects in the financial ratio structure of firms of a given size? Is the financial structure of small Italian firms closer to the financial structure of large Italian firms, than to the financial structure of small Spanish firms?

To address the above questions, a series of analyses were performed. First, differences between ratios for the different size groups are explored by means of univariate ANOVA. This is done in Section 2. Second, a three-group Linear Discriminant Analysis (LDA), in Section 3, highlights the classification ability of the ratios. The main body of the paper is formed by a three-way scaling analysis of the data using the INDSCAL model of Carroll and Chang (1970a, 1970b)). Section 4 discusses this model and its relevance to the present situation. Hierarchical cluster analysis of the original data attempts to further explore similarities and differences between size and country. The paper is completed with a conclusion section.

2. Initial data analysis of the financial ratios

The first step in the analysis was to explore up to what point there are differences between financial ratios for firms in the different size groups. In order to do this, the mean and standard deviation of each ratio was calculated for each size group. The results for the complete data set are shown in Table 3. This exercise was repeated for each country and each year, although the results are not reported here. It was clear that there are differences. The largest differences appear to be related to R_{12} (overall debt ratio), R_6 (relative share of staff costs), and R_7 (staff costs relative to value added). Wide differences between large firms and the rest are also apparent in ratio R_{16} (rotation). Simple visual examination of Table 3 suggests that R_3 (return on equity), R_8 (relative share of financial charges), and R_{14} (debt structure) have lower discriminatory power.

On average, large firms show higher values for the apparent rate of interest on debt, R_9, in Table 3. This appears to be counter-intuitive. The explanation could be related to the different way in which large and small firms finance their debts in each country. European Commission (2001) finds two groups of countries in Europe. SMEs firms in the first group—Sweden, Portugal, Germany, Italy, Denmark, Spain, and Austria—face higher values of R_9 than LEs. The situation is reversed in the second group of countries—France, Netherlands, Belgium, and Finland—where LEs have higher values of R_9 than SMEs. European Commission (2001) attributes this difference to the emphasis put on bond issues or on to short-term loans by different size firms in the various countries, since interest on bonds tends to be higher than interest on short term loans during the period under

Table 3
Descriptive statistics: means and standard deviations

	Small firms		Medium firms		Large firms		TOTAL	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
R_1	0.095	0.027	0.099	0.038	0.108	0.048	0.101	0.039
R_2	0.019	0.072	0.022	0.036	0.031	0.048	0.024	0.054
R_3	0.078	0.287	0.077	0.158	0.074	0.257	0.076	0.239
R_4	0.603	0.113	0.636	0.101	0.638	0.161	0.627	0.129
R_5	0.362	0.062	0.331	0.063	0.316	0.074	0.335	0.069
R_6	0.268	0.059	0.232	0.063	0.208	0.063	0.235	0.066
R_7	0.735	0.078	0.696	0.133	0.657	0.119	0.695	0.118
R_8	0.034	0.039	0.031	0.018	0.032	0.022	0.032	0.027
R_9	0.134	0.083	0.143	0.063	0.159	0.149	0.146	0.106
R_{10}	−0.020	0.052	−0.017	0.018	−0.008	0.029	−0.015	0.036
R_{11}	0.295	0.108	0.333	0.094	0.360	0.118	0.330	0.110
R_{12}	0.637	0.095	0.581	0.085	0.524	0.122	0.579	0.111
R_{13}	0.170	0.104	0.181	0.099	0.139	0.100	0.163	0.103
R_{14}	0.290	0.114	0.275	0.103	0.295	0.127	0.287	0.115
R_{15}	0.053	0.046	0.070	0.058	0.102	0.091	0.075	0.071
R_{16}	1.248	0.381	1.250	0.319	1.102	0.335	1.178	0.344

Table 4
Univariate ANOVA

	Austria F (2:632)	Belgium F (2:360)	Denmark F (2:525)	Finland F (2:129)	France F (2:525)	Germany F (2:360)	Italy F (2:591)	Netherlands F (2:458)	Portugal F (2:301)	Spain F (2:558)	Sweden F (2:261)	TOTAL F (2:4730)
R_1	0.020	14.053	3.114	16.073	59.028	7.755	6.879	0.427	27.574	0.787	9.834	46.695
	(0.980)*	(0.000)	(0.045)	(0.000)	(0.000)	(0.001)	(0.001)	(0.653)*	(0.000)	(0.456)*	(0.000)	(0.000)
R_2	4.970	10.656	25.210	3.367	6.888	19.355	18.991	11.007	15.446	2.417	8.619	22.994
	(0.007)	(0.000)	(0.000)	(0.038)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.090)*	(0.000)	(0.000)
R_3	9.503	7.519	1.129	5.410	0.917	11.205	1.560	4.011	28.985	3.800	1.290	0.094
	(0.000)	(0.001)	(0.324)*	(0.006)	(0.400)*	(0.000)	(0.211)*	(0.019)	(0.000)	(0.023)	(0.277)*	(0.910)*
R_4	17.485	6.445	33.114	36.507	65.122	23.101	8.404	76.733	3.952	15.000	11.088	37.197
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.020)	(0.000)	(0.000)	(0.000)
R_5	57.418	1.637	54.681	31.714	50.669	20.676	10.278	76.733	9.864	9.491	14.226	196.130
	(0.000)	(0.196)*	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R_6	69.660	15.779	71.639	67.194	140.920	36.474	33.602	80.081	120.080	12.579	28.048	367.905
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R_7	21.969	36.413	19.645	46.189	360.392	35.315	44.840	13.375	92.206	2.143	15.799	182.224
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.118)*	(0.000)	(0.000)
R_8	385.716	25.141	20.325	16.948	11.740	3.072	22.767	78.041	4.850	6.696	24.915	4.009
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.048)	(0.000)	(0.000)	(0.008)	(0.001)	(0.000)	(0.018)
R_9	797.166	27.504	3.028	6.839	2.248	135.528	9.652	27.574	3.287	6.225	3.991	22.686
	(0.000)	(0.000)	(0.049)	(0.002)	(0.107)*	(0.000)	(0.000)	(0.000)	(0.039)	(0.002)	(0.020)	(0.000)
R_{10}	50.220	4.904	165.374	3.040	13.901	141.111	120.956	33.731	29.875	0.968	4.409	51.380
	(0.000)	(0.008)	(0.000)	(0.051)*	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.380)*	(0.013)	(0.000)
R_{11}	150.177	5.980	79.319	2.188	1.199	457.398	6.312	34.113	108.630	1.390	5.459	141.674
	(0.000)	(0.003)	(0.000)	(0.116)	(0.302)*	(0.000)	(0.002)	(0.000)	(0.000)	(0.250)*	(0.005)	(0.000)
R_{12}	332.647	1.992	90.652	7.714	21.947	1012.984	25.898	10.531	185.730	6.501	37.188	477.967
	(0.000)	(0.138)*	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
R_{13}	48.575	36.140	–	28.491	33.934	711.928	17.283	268.429	11.271	12.610	5.258	75.085
	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)
R_{14}	7.764	22.739	28.789	7.986	22.052	57.201	25.741	26.413	0.938	16.701	4.168	13.407
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.393)*	(0.000)	(0.017)	(0.000)
R_{15}	247.665	84.054	19.742	22.776	209.987	467.898	118.129	222.435	88.780	110.061	160.961	209.729
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R_{16}	24.338	6.297	40.249	46.591	94.167	113.885	28.869	34.853	0.391	13.281	9.871	81.986
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.676)*	(0.000)	(0.000)	(0.000)

F values for each country and p–values.

* Significant at the 0.05 level.

examination. Clearly, if one only looks at firm size and ignores the country effect, average values will be determined by the relative presence of firms of different sizes and different countries in the data. Rivaud-Danset et al. (2001) warn against results such as this one that could be dependent on the sample studied.

Are the observed differences significant or just the result of random variation? This question was addressed by means of univariate ANOVA analysis. The discriminatory power of the ratios can be assessed by the value of the F statistic. Results for the complete data set and for individual countries are summarised in Table 4. For the complete data set, the last column in Table 4, and taking financial ratios one at a time, an F test on Wilk's lambda finds that, with the exception of R_3 (return on equity), all ratios have discriminatory power. It can be seen that the ratios without discrimination power vary from country to country, suggesting that there are country effects in the structure of different sized firms in the different countries. R_3, when acting on its own, does not have discriminatory power in four out of the eleven countries. This issue will be further explored below.

3. Three-group linear discriminant analysis

The previous section has demonstrated that most ratios have ability to discriminate between the different size populations, and that this is true of all the countries. Here we use linear functions made up by linear combinations of financial ratios as discrimination tools. Since the objective of the exercise is to discriminate between three populations, two LDAs are needed. LDA has many limitations when applied to financial data; Eisenbeis (1977). Despite this, it has been widely used in financial and accounting research; Altman, Avery, and Eisenbeis (1981).

Three-group discriminant analyses were performed for every country and for the complete data set. Model selection was based on a stepwise procedure based on Wilk's lambda, as implemented in the computer package SPSS. Model selection involves an element of data reduction. If two ratios are highly correlated, only one of them will form part of the final discrimination function. Thus, it is possible for two discriminant functions to appear to be different when in reality they use interchangeable ratios.

The results are seen in Table 5. This table shows, for each country and for the total data set, the variables that enter in the discriminant functions. These variables are ordered by classification importance (by their impact on Wilk's lambda). Therefore, when a long list of variables is given, the variables that come towards the end of the list have little impact on the classification function. It is usual to use discriminant functions with few variables, but in this case two discriminant functions are involved in each data set, because three groups are being discriminated, and the same variable may have different impact in each function. It can be seen in Table 5 that ratios R_{12}, R_6, and R_{16} appear often in discriminant functions, in line with the results of the univariate exploratory analysis. R_3 appears to have very little discriminatory power with respect to size. This result is also coherent with the findings of the univariate analysis. Discriminant analysis shows that it is possible to classify firms into groups according to financial ratios, and indirectly indicates that the proportionality

Table 5
Three-way discriminant analysis

Ratios in discriminant functions		Accuracy (%)			
		Small	Medium	Large	TOTAL
Austria	R9 R11 R13 R12 R8 R6 R10 R16 R7 R4 R2	100	95.5	77.9	90.9
Belgium	R15 R9 R14 R11 R6 R2 R8 R4 R13 R16	86.0	84.3	90.9	87.1
Denmark	R10 R5 R16 R14 R12 R11 R9 R8	86.0	83.9	74.8	81.6
Finland	R6 R16 R13 R4 R15 R14	90.9	68.2	84.1	81.1
France	R7 R15 R16 R14 R4 R1 R9 R8 R10 R2 R11 R12 R13	83.8	89.6	85.7	86.4
Germany	R12 R4 R11 R2 R13 R7 R16 R1 R5 R8 R9 R14	96.7	95.9	100	97.5
Italy	R10 R8 R6 R15 R4 R16 R14 R11	84.4	86.4	90.3	87.0
Netherlands	R15 R13 R6 R12 R8 R7 R10	100	82.7	72.4	81.8
Portugal	R12 R6 R15 R13 R14 R16 R7 R4	85.8	81.1	84.8	83.9
Spain	R6 R16 R14 R4 R5 R13 R11 R12 R8 R10	78.6	81.8	79.2	79.9
Sweden	R15 R16 R06 R14 R4 R3 R8	84.1	88.6	78.4	83.7
TOTAL	R12 R6 R15 R16 R11 R13 R2 R4 R7 R1 R14	58.9	56.7	69.4	61.7

Ratios in order of discrimination importance and correct classification ratios for each group.

assumption in ratio analysis does not hold, but it does not explain the rationale of the classification; i.e., in what sense are the ratios of small firms different from the ratios of large firms? This is an issue whose answer will be sought with the help of scaling and clustering models.

The classificatory power of the various discriminant functions is also shown in Table 5. The last four columns in this table contain the percentage of firms that have been correctly classified by the discriminant functions. Of these, the first three columns give the percentage of correctly classified cases by size, while the last column shows the overall classification accuracy. As far as individual countries are concerned, the overall percentages vary between 76.6% for Spain and 97.5% for Germany. Clearly, the highest the classification accuracy, the more different are the financial structures of the differently sized firms.

The last row in Table 5 deserves special attention. The group named "Total" is made up of all the firms without taking into account country of origin. Classification accuracy is much lower, both overall and for the different size groups. This suggests that information of country of origin is of great importance, and that there is a country effect. This may result in apparently different discrimination functions being used for different country data. In other words, there may be differences between small and large firms in France, and there may be differences between small and large firms in the Netherlands, but the differences between large and small firms, in terms of financial structure, are not the same in both countries. This will also be explored below.

4. A global image and its local features

This section attempts to visualise the main characteristics of the data set in order to provide a global image of its main features. In order to clarify the exposition, it will be divided into several subsections. It will start with a summary description of the model. The next subsection will concentrate on time invariant characteristics of the data. Cluster analysis, and a discussion of its results, will form the last subsection.

4.1. Three-way scaling models

Scaling models are members of the class of multivariate statistical methods. They have the peculiarity of attempting to visualise the main characteristics in the data, so that any relationship that may exist between the different data items is revealed in a statistical map. This way of proceeding has the advantage of making the results of the analysis explicit to the non-specialist, although understanding the mathematical basis of the methods requires strong technical knowledge. Scaling models have long been used in finance, accounting and management; Green and Maheshwar (1969), Moriarity and Barron (1976), Belkaoui and Cousineau (1977), Rockness and Nikolai (1977), Frank (1979), Libby (1979), Belkaoui (1980), Brown (1981), Emery, Barron, and Messier (1982), Bailey, Bylinsky, and Shields (1983), Mar Molinero and Ezzamel (1991), Mar Molinero, Apellániz, and Serrano-Cinca (1996), Mar Molinero and Serrano-Cinca (2001) and Serrano-Cinca et al. (2001, 2002).

Scaling models start from a measure of distance between two data items of interest. This is known as a measure of dissimilarity. If there is little difference between two items of data, the dissimilarity measure will be small; if the two items of data are very different, the dissimilarity measure will be large. Next, statistical maps, or configurations, are built in such a way that each data item is represented in the configuration by a point. If the dissimilarity between two data items is small, these two points are placed near each other in the space; if the measure of dissimilarity is large, these points are placed far away in the space. There are statistical tests that can be used to assess the quality of the representation, and special techniques are available to add meaning to the results.

The data set that is being analysed is four way: country, size, year, financial ratios. We want to explore how size and country effects are reflected in yearly accounts. The fifteen financial ratios will be treated as variables. An observation will be the value of such financial ratios for firms of a given size, in a specific country, during a given year.

Financial ratios have been chosen in such a way that each captures a different aspect of the firm, but they can be highly correlated. This is particularly true when two ratios share a common numerator or denominator. This is a much debated matter since the origins of modern statistics; Aldrich (1995). In Econometrics, correlation between explanatory variables gives raise to the problem of multicollinearity. Davidson, Hendry, Srba, and Yeo (1978) discuss this subject within an econometric context. They argue that correlated variables should be left in the data set unless the correlation is perfect. If the correlation is not one, a variable has a message that is not contained in the other variable, and this message will be lost if the variable is removed. In our case, we have followed a pragmatic approach by performing the analysis using scaling techniques, since they automatically perform data reduction, leaving out what is redundant in the data set.

There are various scaling models that can represent three way data. Examples are Tucker's (1966) extension of Factor Analysis; the PARAFAC model of Harshman (1970); and Ramsay's (1982) MULTISCALE. Three way scaling models have been reviewed by Kiers (1998). The approach chosen in this particular piece of research, is the Individual

Differences model of Carroll and Chang (1970a, 1970b), or INDSCAL. INDSCAL produces two kinds of output, a common map that summarises what remains invariant over the various data sets that form the input to the model, and a series of weights, which show the way in which the various data sets differ from each other; Coxon (1982), and Kruskal and Wish (1978).

The mathematical expression of the INDSCAL model is:

$$\partial_{ij}^{k} = \sqrt{\sum_{d} \left(x_{di} - x_{dj}\right)^{2} w_{d}^{k}} + \varepsilon_{ij}^{k}$$

where, ∂_{ij}^{k}, is the dissimilarity measure between cases i and j for year k, x_{di} is the coordinate in dimension d of case i in the common map, x_{dj} is the coordinate in dimension d of case j in the common map, w_{d}^{k} is the weight associated with dimension d during year k, ε_{ij}^{k} is a residual term.

The estimation algorithm is described in detail in Carroll and Chang (1970a, 1970b). An improved algorithm was developed by Pruzansky (1975).

Before proceeding any further, it is important to realise that each financial ratio has its own specific units of measurement. This would make the results data dependent. To avoid it, ratios were standardised to zero mean and unit variance. The measure of dissimilarity is the Euclidean distance between standardised ratios.

Similarities were obtained between combinations of country and size. For example, a measure of dissimilarity was calculated between small French firms and large German firms. There was a similarity matrix for each year, making a total of 14 similarity matrices. All countries and sizes were involved in each matrix, as was the group 0, or summary for the country. There are eleven countries, and four group sizes in each country, which results in dissimilarity matrices with 44 rows and 44 columns. As an example, a section of the matrix of dissimilarities for 1998, is given in Table 6. A cell in the dissimilarity matrix reflects how different the financial structure of the companies in the country and group size at the beginning of the row is from the financial structure of the companies in the country and group at the beginning of the column. In common with previous studies and with the studies of the European Commission, and in order to maintain comparability, the common map has been constructed using the first fifteen ratios; i.e., excluding R_{16}. R_{16} was added to the results as "external information". However, the common map was also calculated using all sixteen ratios, and it was found that the addition of the extra ratio did not change the position of the points.

Table 6
Example of a segment of the distance matrix for the year 1998

1998	Nl0	Nl1	Nl2	Nl3	Be0	Be1	BeE2	Be3
Nl0	.000	.	.	.	.	.	.	.
Nl1	6.116	.000	.	.	.	.	.	.
Nl2	4.251	3.760	.000	.	.	.	.	.
Nl3	1.092	6.695	4.346	.000	.	.	.	.
Be0	4.290	5.062	3.110	4.499	.000	.	.	.
Be1	5.874	4.649	3.147	6.038	2.231	.000	.	.
Be2	5.609	5.157	3.652	5.765	1.717	1.599	.000	.
Be3	3.789	5.370	3.338	4.015	.810	2.991	2.485	.000

In some cases data was not available. Some countries were slow to join the BACH database, and others did not provide data for a particular ratio. For R_8 and R_9, Austria did not provide data for small firms; these were estimated to be equal to the ratios of the medium-sized firms. This procedure introduces an element of error, but scaling methods are robust to errors in the data, and it was preferred to work with estimated data in a few observations rather than loose observations.

4.2. The common map

The common map, which summarises what has remained invariant during the fourteen years under consideration, contains 44 points, one for each combination of size and country. These are points located in the space. A series of Principal Component Analysis, and the study of the change in the value of stress, as suggested by Kruskal and Wish (1978), suggested that a representation in five or more dimensions was appropriate. Six dimensions is the maximum allowed by the software used, SPSS. The common map was thus built in a six dimensional space.

The results of the estimation were excellent. The overall measure of fit, R^2, was 0.91 indicating that the model captures 91% of the variation in the data. A far as matrices for individual years are concerned, R^2, varied in the range 0.80 to 0.97. INDSCAL has much in common with Principal Components Analysis, and the assessment of the importance of the dimensions is done in the same way. INDSCAL output provides information about "overall importance of each dimension". Dimension 1 accounts for 26% of the variance; Dimension 2, for 20%; Dimension 3, 17%; Dimension 4, 13%; Dimension 5, 10%; and Dimension 6, 5%. These dimensions are uncorrelated, and variances can be added up; the total is the 91% of the variance given as overall goodness of fit statistic.

Unlike other scaling models, the configuration reported by INDSCAL is not invariant to rotation. The axes of coordinates have to be taken as they appear in the output, and no rotated configurations are possible. This appears to be a disadvantage with respect to other more traditional techniques, such as Factor Analysis, but it has long been observed that the axes of coordinates returned by the algorithm can be interpreted, and that the interpretation often has a meaning within the context of the problem under study. This does not exclude, however, that there may be a meaning associated with directions other than the axes. It is, for example, possible that diagonal directions may have meaning; Krzanowski (1988).

A map in a six dimensional space is impossible to represent other than mathematically. A mathematical map is a set of points with the coordinates of such points in the space. In this case, each point is associated with six coordinates. Not all coordinates are relevant to the problem under study, and much is to be gained by visual inspection of the various possible representations on pairs of two dimensions. In this case it was found that the main characteristics of the problem could be observed in the representation in Dimension 1 versus Dimension 3. The projection of the common map on Dimensions 1 and 3 accounts for 43% of the total variance. This projection can be seen in Fig. 1. The points associated with size group 0, the summary for each county, have not been printed in Fig. 1 in order not to clutter the visual impact with information which is neither relevant nor useful in the forthcoming analysis.

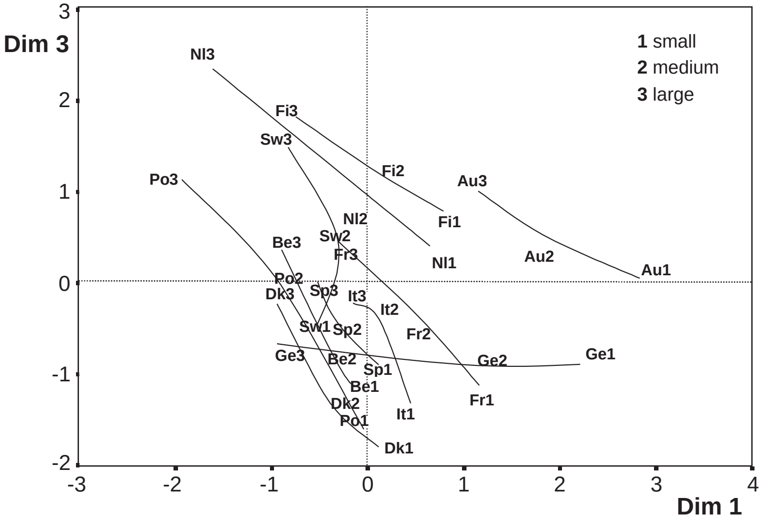

Fig. 1. Common space. Projection on Dimension 1 and Dimension 3.

If, in Fig. 1, we join, for each country, the three points associated with it, starting from small firms and ending with large firms, we will see that, with the exception of Germany and Sweden, the lines are remarkably straight and move from the bottom right hand side towards the top left hand side. The lines associated with the different countries tend not to cross. Starting from the top right hand side, and moving towards the bottom left hand side, countries appear in the following order: Austria, Finland, the Netherlands, Sweden, France, Italy, Spain, Belgium, Portugal, and Denmark. The line representing Germany moves horizontally from right to left. The points associated with small firms are always at the bottom of the line, and the points associated with large firms are always at the top of the line. Thus, two effects appear very clearly in the representation: a country effect and a size effect. The country effect appears in the direction SW to NE, while the size effect appears in the direction SE to NW. The inclination of the lines associated with the different countries changes from country to country. There are two extreme cases: Germany, which produces a horizontal line, and Sweden whose associated line is almost vertical. The length of the line reflects the extent of the differences between small and large firms: the longer the line, the larger the differences. Largest lines, and largest differences between small and large firms, appear in Germany, Portugal and the Netherlands. The shortest lines and the smallest differences are apparent in Spain, Denmark, and Sweden.

Meaning can be attached to the directions in the configuration by means of the technique known as Property Fitting (Pro-Fit). Pro-Fit is a regression-based approach that highlights the way in which a particular characteristic of the data varies through the map; Schiffman, Reynolds, and Young (1981). The idea is that if the level of the characteristic, say profitability, depends on the position on the map, a linear relationship can be established between the level of the characteristic and the position on the map. This produces lines very much like North–South directions in geographical maps. Being a regression based approach, the usual measures of goodness of fit are available to assess the quality of the representation.

Before applying the Pro-Fit algorithm, there is an issue to be addressed. The common map summarises the behaviour of financial ratios over a fourteen year period. Thus, for every financial ratio we have fourteen sets of data, one for each year. Rather than represent fourteen vectors on the common map, something that would make interpretation quite cumbersome, we have worked with average values over the fourteen year period. All financial ratios used to construct the map were taken, one by one, as properties. This is known as "internal analysis". Working with average values for the ratios should introduce an errors-in-variables effect and bias down the correlations. Despite this, results were excellent. The lowest value of adjusted R^2 obtained was 0.731. R_{16}, which was not used to construct the map, was also used as a property in what is known as "external analysis". The R^2 of the regression that included R_{16} was 0.737.

The results of Pro-Fit analysis, for the representation in dimensions 1 and 3 can be seen in Fig. 2. The degree of correlation between ratios is automatically visualized: if the correlation between two ratios is high and positive, the angle between their associated profit lines is small. This is the case, for example, with ratios R_1 and R_2; R_6 and R_7; or R_8 and R_9. But even if the ratios are highly correlated, there still is a story in each ratio which is different from the story told by the other ratio. If the correlation is high but negative, they will appear more or less on the same line but in opposite directions. The statistical results for the Pro-Fit estimation are shown in Table 7.

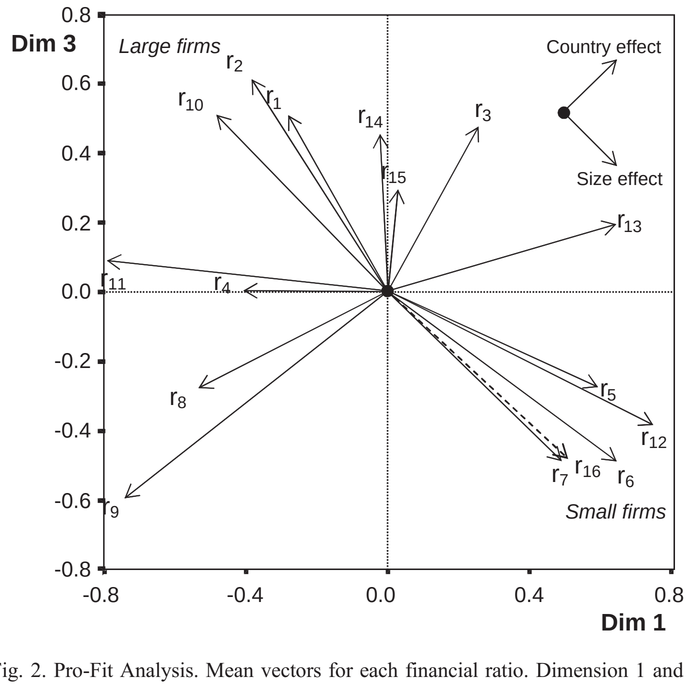

Fig. 2. Pro-Fit Analysis. Mean vectors for each financial ratio. Dimension 1 and 3.

Table 7
Pro-fit Analysis

	Directional cosines						F	Adj R square
	γ_1	γ_2	γ_3	γ_4	γ_5	γ_6		
R_1	−0.23 (−3.736)*	0.30 (4.738)*	0.49 (7.995)**	−0.76 (−12.665)**	−0.20 (−3.360)	0.00 (1.028)	52.32	0.877
R_2	−0.38 (−4.422)*	0.44 (5.028)*	0.60 (7.180)**	0.14 (1.734)	−0.53 (−6.567)**	0.06 (0.828)	40.14	0.845
R_3	0.27 (2.509)	0.72 (6.556)**	0.47 (4.423)*	0.43 (4.206)*	−0.09 (−6.508)**	0.02 (0.220)	37.98	0.838
R_4	−0.40 (−5.328)*	−0.91 (−11.832)*	0.01 (0.172)	−0.12 (−1.633)	−0.04 (−0.580)	0.00 (0.014)	45.97	0.863
R_5	0.61 (10.869)**	0.69 (12.073)**	−0.27 (−4.943)*	0.00 (0.028)	−0.29 (−5.566)*	−0.01 (−0.170)	88.52	0.924
R_6	0.65 (11.416)**	0.52 (8.937)**	−0.44 (−7.867)**	0.29 (5.346)*	−0.19 (−3.630)*	−0.03 (−0.600)	93.07	0.928
R_7	0.53 (0.442)	0.13 (0.112)	−0.56 (−0.471)	0.62 (0.524)	−0.02 (−0.018)	−0.03 (−0.028)	73.75	0.910
R_8	−0.55 (−5.406)*	−0.05 (−0.442)	−0.30 (−3.013)	−0.41 (−4.229)*	−0.13 (−1.318)	0.66 (7.166)**	20.48	0.731
R_9	−0.69 (−16.505)**	0.26 (6.239)**	−0.60 (−14.704)**	0.10 (2.447)	0.29 (7.277)**	0.05 (1.215)	75.29	0.912
R_{10}	−0.46 (−4.440)*	0.14 (1.289)	0.47 (4.579)*	0.70 (7.117)**	−0.21 (−2.164)	−0.10 (−1.092)	23.74	0.760
R_{11}	−0.81 (−13.096)**	−0.01 (−0.147)	0.08 (1.350)	−0.27 (−4.602)*	−0.25 (−4.208)*	−0.45 (−8.124)**	61.24	0.894
R_{12}	0.74 (10.565)**	−0.42 (−5.958)*	−0.38 (−5.576)*	−0.17 (−2.569)	−0.32 (−4.856)*	0.07 (1.185)	38.59	0.840
R_{13}	0.62 (9.270)**	−0.18 (−2.695)	0.20 (3.080)	−0.64 (−10.176)**	0.36 (5.720)*	0.00 (0.073)	41.12	0.848
R_{14}	−0.04 (−0.512)	0.31 (3.984)*	0.50 (6.743)**	−0.14 (−1.929)	−0.68 (−9.527)**	0.41 (5.914)*	44.45	0.858
R_{15}	0.02 (0.544)	0.43 (9.638)**	0.28 (6.528)**	0.53 (12.675)**	0.65 (15.627)**	0.15 (3.672)*	95.89	0.930
R_{16}	0.11 (4.957)**	0.03 (1.200)	−0.11 (−5.306)**	0.03 (1.578)	0.05 (2.196)	−0.10 (−4.933)**	21.08	0.737

Regression results for average financial ratios
* Significant at the 0.05 level (two-tailed test).
** Significant at the 0.01 level (two-tailed test).

Fig. 2 is the compass that helps to interpret Fig. 1. Remembering that the size effect is associated with the direction NW–SE, one should look for vectors in Fig. 2 that are oriented in this direction. R_{12} (overall debt), R_6 (relative share of staff costs), R_7 (staff costs relative to value added), and R_{16} (rotation) the ones which were found by univariate ANOVA analysis to be most associated with size, point precisely in this direction. R_6 (staff cost to net turnover) and R_7 (staff cost to value added) measure staff productivity, indicating that large firms are more labour productive than small firms, something that is consistent with large firms being more capital intensive than small firms; European Commission (1998, 2001). Thus, it could be argued that small firms are more in debt than large firms; that small firms have higher staff costs both in terms of turnover and of value added.

Also in the NW–SE direction but with opposite orientation, are R_1 (gross operating profit plus financial charges to turnover), R_2 (net profit to net turnover), and R_{10} (financial results to net turnover). Since ratios R_1, R_2, and R_{10} relate to margins, this suggests that, in the European manufacturing sector, large firms operate with larger margins than small firms. It is the moment to remember that R_3 (financial profitability) was not strongly associated with size (Table 3). In Fig. 2, the vector representing R_3 is perpendicular, in most countries, to the NW–SE directions related to size, indicating that size and financial profitability are largely independent. But if both small and large firms are achieving similar levels of financial profitability, and they have different margins on sales and different cost structures, particularly staff costs, we are finding differences in corporate strategy. Differences in the financial structure of small and large European companies were also reported by Rivaud-Danset et al. (2001), this subject was also studied by the European Commission (1997, 1998, 2001). Firms of different sizes reach the same financial profitability travelling along different paths. This subject will now be further explored.

Results indicate that financial profitability has more to do with the country effect that with size. This is apparent both in the univariate study as in the multivariate study. To see how small and large firms can achieve the same financial profitability following different paths we can decompose financial profitability (profit to equity) into margin (profit to sales), assets turnover ratio (sales to assets) and an equity multiplier (assets to equity):

$$\frac{\text{profit}}{\text{equity}} = \frac{\text{profit}}{\text{sales}} * \frac{\text{sales}}{\text{assets}} * \frac{\text{assets}}{\text{equity}}.$$

We use return on equity (R_3) as a financial profitability measure—profit/equity—; two margin ratios (R_1 and R_2)—profit/sales—; and a rotation ratio (R_{16})—sales/assets. The equity multiplier is closely related to leverage ratios, as debt accounts for the difference between assets and equity. Our data includes a leverage ratio (R_{12})—debts/assets. This decomposition suggests that the same level of financial profitability can be achieved with different margins, different asset turnover ratios, or different level of leverage. We find that the value of R_3 does not depend on size (the vector associated with R_3 points towards the NE) from which it follows that different-sized firms could be working with different margins, or with different asset rotation values, or with different leverage ratios. Larger firms are indeed associated with higher margins; we see in Fig. 2 that R_1 and R_2 point towards the NW. Furthermore, small firms tend to resort more to borrowing than large firms, as R_{12} points towards the SE in Fig. 2. Finally, the rotation ratio R_{16} also points towards the SE, indicating that small firms have higher asset rotations than large firms.

In summary, small and medium enterprises (SMEs) operate with smaller margins, have a higher asset rotation than large enterprises (LEs) and are more geared than large firms. The combination of these effects results in financial profitability being largely independent on size, as observed in the analysis, although slightly higher in larger than in smaller firms, as Table 3 indicates.

We also have to remember that these results represent an average over the 14 years. Time has an important role in this case. It is true that there have been years when small firms have been more profitable than large firms, but the trend changed in later years. Large firms have become more profitable. The financial profitability of SMEs exceeded that of LEs until 1994. This changed after 1995. Except for 1996, in later years LEs have enjoyed larger financial profitability than SMEs. This reversal can be attributed to a series of factors, such as the increasing use of outsourcing on the part of LEs, and the policy of debt reduction, also on the part of LEs. LEs used to raise capital by means of the relative expensive way of issuing bonds but in later times the low rates of interest have encouraged companies to retain earnings, or to borrow short term; European Commission (2001).

We now turn our attention to the country effect. The direction SW–NE, on which the country effect is found, is related, on the positive side, to R_3 (financial profitability); and, on the negative side, to R_8 (relative share of interest charges), and R_9 (apparent rate of interest on financial debt). Clearly, the higher the interest rates are, the higher is the value of R_8 and R_9, and the lower the profitability. The highest financial profitability is found in Austria, Finland and the Netherlands, and the lowest financial profitability is found in Denmark, Portugal and Belgium. The reverse is true of relative share of interest charges and apparent rate of interest on financial debt. In this last case, the lowest values are found in Austria, Finland and the Netherlands, while the highest values are found in Denmark, Portugal and Belgium.

We find that R_9 is strongly associated with the country effect, as can be seen in Fig. 2. This strong association is explained by differences in interest rates during the period studied. For example, before 1986, prior to the 1992 Maastricht Treaty, long term nominal interest rates were 27.7% in Portugal, 14.3% in Spain, 7.3% in Austria and 6.4% in the Netherlands. Ten years later, in 1996, in line with the provisions of the Maastricht Treaty, the differences had narrowed down considerably, this interest rate was 8.9% in Portugal, 9.5% in Italy, 9% in Spain, 6.3% in the Netherlands, and 6.4% in Austria. It is clear that the apparent rate of interest paid by firms had an impact on their profitability, particularly on ratio R_9 and, indirectly, on ratio R_3. Since our study summarises these 14 years, it captures the high average interest rates of Portugal by placing it low down on the left hand side of Fig. 1, and it reflects the low interest rates in Austria by placing it on the right hand side, in the upper part of Fig. 1. The country effect on R_9 is slowly being eroded by interest rate convergence as a consequence of the adoption of the single European currency, the Euro in 1999.

Country effects, such as they have been discussed up to now, describe the pattern of firms in most European countries, but there are two countries that deserve further discussion: Germany and Sweden. We can see in Fig. 1 that the line associated with Germany is parallel to the horizontal axis, while the line associated with Sweden is parallel to the vertical axis. We, therefore, need to examine the ratios that are associated with Dimension 1 and Dimension 3, the E–W and the N–S directions.

The ratios associated with Dimension 1 are, on the positive side, R_{13} (financial indebtedness) and R_5 (valued added to net turnover); and, on the negative side, R_4 (relative share of purchases of goods and services) and R_{11} (own funds ratio). Since German large firms are situated towards the W of the map, and German small firms are situated towards the E of the map, the map supports the view that, in Germany, large firms purchase more goods and services in relation to turnover, have higher own funds ratios, have lower financial indebtedness, have lower value added to net turnover than small firms.

To understand the Swedish case we need to discuss dimension 3. The ratios associated with Dimension 3 are R_{14} (long term debt to total debt), and R_{15} (provisions for liabilities to balance sheet total). The higher up in Dimension 3, the higher the value of both ratios. Since large firms tend to be situated towards the top of Dimension 3, this is consistent with large firms having more long term debt and more provisions for liabilities than small firms. This is accentuated in the case of Sweden.

In summary, three patterns have been identified: the Swedish case, the German case, and the rest of Europe. Differences between small and large firms in Swedish firms relate mainly to ratios R_{14} and R_{15}. Differences between large and small German firms relate mainly to ratios R_4, R_5, R_{11}, and R_{13}. Differences between large and small firms in the rest of the countries relate mainly to ratios R_{12}, R_6, R_7, R_1, R_2, R_5 and R_{10}. It is to be noticed that this is coherent with the findings of LDA analysis, as reported in Table 5.

4.3. Cluster analysis

It has been argued that in European manufacturing firms there are both size and country effects. It has also been argued that some of the differences are related to different financial and economic patterns. Are the ratios of, say, small Italian firms more similar to the ratios of large Italian firms than to the ratios of small Portuguese firms?

This issue will be addressed by means of hierarchical cluster analysis. Up to now we have been working with the projection of a six dimensional map on two dimensions, and this is necessarily a simplification that may hide important features of the data. A way of revealing such features is to complement a scaling exercise with cluster analysis, as recommended by Arabie, Carroll, and DeSarbo (1987), and Chatfield and Collins (1980).

Average values for the first 15 financial ratios for the fourteen years have been calculated for each country and size group, in the same way as was done earlier on when applying Pro-Fit analysis. Combinations of country and size were taken as cases, and standardised ratios as variables. Clusters were calculated using Ward's approach as implemented in SPSS. This approach maximises within group homogeneity and between group heterogeneity, and has been found to be productive in other similar studies; Blashfield (1976), Cool and Schendel (1987).

The dendrogram that was obtained is shown in Fig. 3. In it, three main clusters can be observed. The differences between the clusters are related to country, not to size. A large cluster contains Spain (all sizes), Italy (all sizes), Portugal (all sizes), Belgium (all sizes), and France (medium and large firms). A second cluster is formed by Scandinavian

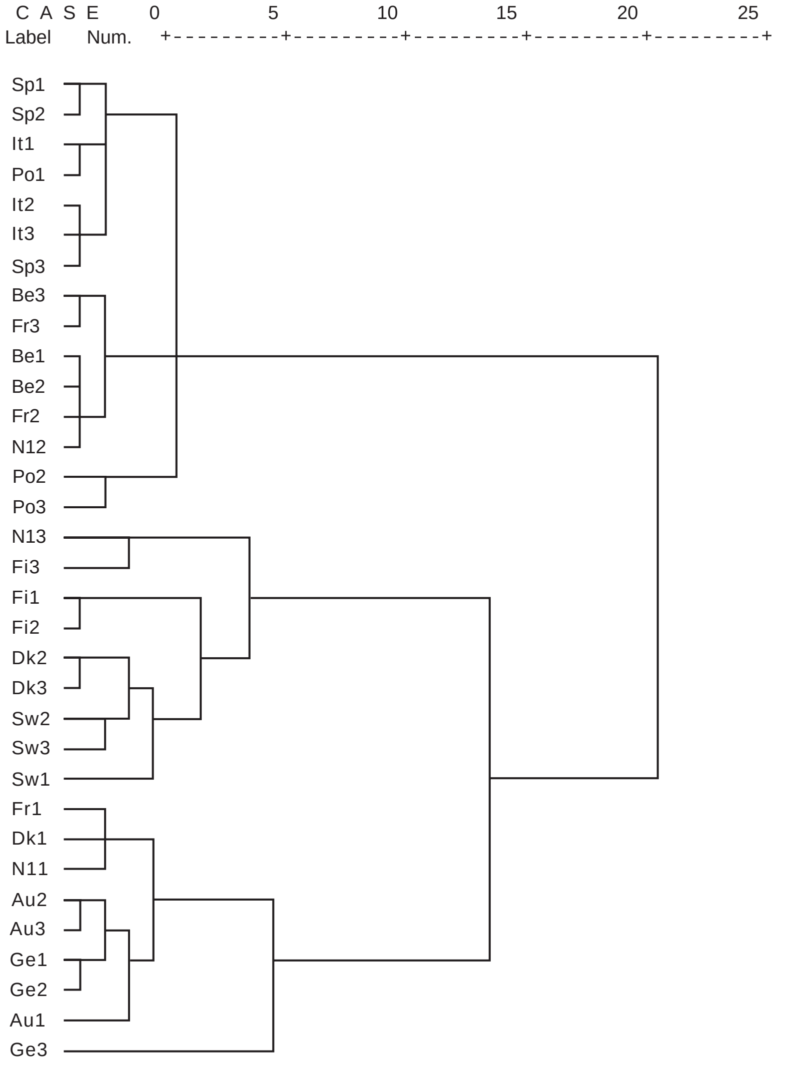

Fig. 3. Dendrogram. Ward's clustering method.

countries: Finland (all sizes), Denmark (medium and large firms), and Sweden (all sizes). The last cluster contains Austria (all sizes) and Germany (all sizes). It is difficult not to think of cultural differences, the first cluster could be labelled "Latin", the second cluster could be labelled "Scandinavian", and the last cluster could be labelled "Germanic". It is to be noticed than no cultural variables have been entered in the data, and the clusters are based solely on financial and economic ratios. There appear to be three ways of organising manufacturing companies, a Latin one, a Scandinavian one, and a Germanic one. Similar findings were obtained in a previous piece of research, in which the clusters were related to financial ratios and to the macro-economic environment; Serrano-Cinca et al. (2002).

There were, however, exceptions to the general pattern: the Netherlands does not appear to sit easily in any of the groups, small French companies and small Danish companies appear together in the Germanic group.

In Fig. 1, the Germanic cluster appears on the East of the configuration, the Scandinavian cluster appears on the NW of the configuration, and the Latin cluster appears on the SW of the configuration. Taking into account the orientation of the directional vectors in Fig. 2, the Germanic cluster appears to be associated with higher than average profitability, high value added, and high staff costs. The Scandinavian cluster is characterised by high values of profit to turnover. The Latin cluster has a high ratio of interest charges to net turnover, and a high apparent rate of interest on financial debt.

If size effect had been more dominant, in Fig. 1 we would have found areas where small firms concentrated, areas where medium-sized firms concentrated, and areas where large firms concentrated. Something similar would have been found in Cluster Analysis where size effect would have been more evident than it is. We would have found clusters with small firms, irrespective of the country, and so on. In the European case we find that the differences are clearly dominated by the country effect. Perhaps if we were to repeat the analysis with data pertaining only to the period after convergence had been achieved, country effects might found to be less marked. Clearly, the continuing existence of the BACH database, now freely available through the Internet, is going to be of great help to study the evolution of European industrial structure.

5. Conclusions

In this paper we have studied the financial structure of small, medium sized, and large firms in eleven European countries over a fourteen year period. The data was obtained from the BACH database, which is not at the level of industrial firm, but aggregated by sectors. The main themes of the research have been the presence of size and country effects on financial ratio structure.

Initial data analysis, based on univariate ANOVA, found significant differences related to size in most ratios, the exception being profitability. This suggests that, given a particular country, the differences between small, medium, and large firms do not relate to profitability, but to the way in which a given level of profitability is obtained.

The existence of financial ratio differences between small, medium, and large companies was confirmed by three-group linear discriminant analysis. For each country, high levels of classification accuracy were found. But the discriminant functions were found to differ between countries, suggesting country effects in financial ratio structure.

Both country and size effects became apparent when three-way scaling methods were used. Size effects were found to be associated with ratios R_{12} (overall debt), R_6 (relative share of staff costs), R_7 (staff costs relative to value added), R_1 (gross operating profit plus financial charges to turnover), R_2 (net profit to net turnover), R_{16} (turnover to assets) and R_{10} (financial results to net turnover), meaning that small firms are more in debt than large firms; that small firms have higher staff costs both in terms of turnover and of value added, that large firms operate with larger margins than small firms, and that small firms turn over assets faster than larger firms. In general, the differences are not in profitability, but on the way in which profitability is achieved. Thus, for a given country, there are size related differences in costs and balance sheet structure.

A country effect was found, and it was found to be related to ratios R_3 (financial profitability), R_8 (relative share of interest charges), and R_9 (apparent rate of interest on financial debt). The highest financial profitability and the lowest relative share of interest charges and apparent rate of interest on financial debt were found in Austria, Finland and the Netherlands; the reverse being true of Denmark, Portugal and Belgium.

Three patterns relating to country and size combinations were identified: the Swedish case, the German case, and the rest of Europe. Differences between small and large firms in Swedish firms were found to be related to ratios R_{14} (debt structure) and R_{15} (ratio of provisions for liabilities and charges). Differences between large and small German firms were found to be related to ratios R_4 (relative share of purchases of goods and services), R_5 (value added ratio), R_{11} (own funds ratio), and R_{13} (ratio of financial indebtedness). Differences between large and small firms in the rest of the countries were found to be related to ratios R_{12} (overall debt ratio), R_6 (relative share of staff costs), R_7 (staff costs relative to value added), R_1 (gross profit ratio), R_2 (net profit ratio), and R_{10} (ratio of financial result).

The question of whether a small Italian firm is more similar to a large Italian or to a small Finish firm was also pursued. It was found that clusters exist, and these are mainly related to country and not to size. Three clusters are clearly apparent: a Latin cluster, a Scandinavian cluster, and a Germanic cluster. On average, over the period studied, the Germanic cluster appears to have been associated with higher financial profitability (R_3) and lower apparent interest rates (R_9). It has also been argued that Maastricht convergence and the single European currency should make such differences a thing of the past and allow firms in all European countries the opportunity to compete on equal terms.

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