The Effects of Economic Integration on the Financial Characteristics of EU Manufacturing Firms: 1990-2004

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Abstract

In this paper, we study the effects of EU economic integration on the financial characteristics of French, German, and U.K. manufacturing firms by using the MANOVA (Multivariate Analysis of Variance) technique. Our cross-sectional test results for the December 31, 1990-December 31, 1994 and December 31, 2000-December 31, 2004 periods indicate that the differences between the financial characteristics of manufacturing firms in different EU member countries are decreasing. The asset and equity returns of manufacturing firms in different member countries are becoming similar due to economic integration and increased competition over time.

I. Introduction

Comparing the financial characteristics of different groups of firms with financial ratios has long been a popular research methodology in the finance literature. Altman (1968), Edmister (1972), and Dambolena and Khoury (1980) predict bankruptcy by comparing the financial ratios of bankrupt and healthy firms. Stevens (1973), Belkaoui (1978), and Rege (1984) use financial ratios to identify the financial characteristics of companies, which become the target of corporate takeover. Hutchinson et al. (1988) use financial ratios to identify the financial characteristics of companies, which achieve stock market quotation. Meric et al. (2000) compare the financial characteristics of Japanese *kieretsu*-affiliated and independent firms with financial ratios.

Although a number of studies have also compared the financial characteristics of firms in different countries [see, e.g., Meric and Meric (1994) and Meric et al. (2002)] with financial ratios, the effects of economic integration on the financial characteristics of manufacturing firms in a common market have not been sufficiently studied. Empirical studies show that the removal of barriers to trade and the free cross-border flow of capital increase economic integration between countries, and firms in different countries tend to have similar financial characteristics with increased integration [see: Stulz (1981) and Gultekin et al. (1989)]. France, Germany, and the U.K. are members of the EU and they have integrated economies. In this paper, we study if the similarity of the financial characteristics of French, German, and U.K. manufacturing firms has increased due to increased integration during the December 31, 1990-December 31, 2004 period.

The paper is organized as follows. In Section I, we explain the motivation for our study. Section II describes our sample and variables, and explains our statistical methodology. In Section III, we present the results of the cross-sectional MANOVA tests. Section IV summarizes and concludes.

II. Data and Methodology

The data of the study are drawn from the Disclosure/Worldscope database. The study covers all manufacturing industries with the double-digit SIC code 20 through 39. All manufacturing firms that existed during the study period with complete data in the database are included in the study. For a meaningful comparison, firms that have changed their SIC codes due to a merger or a change in the main line of business during the study period are excluded from the sample. The numbers of firms included in the study are presented in Table 1.

Table 1: Research Sample

SIC Code	Manufacturing Industry	Number of Firms in the Sample		
		France	Germany	U.K.
20	Food and kindred Products	12	11	17
22	Textile Mill Products	2	3	7
23	Apparel and Other Textile Products	1	5	2
24	Lumber and Wood Products	-	1	-
25	Furniture and Fixtures	2	-	2
26	Paper and Allied Products	1	1	5
27	Printing and Publishing	-	1	7
28	Chemicals and Allied Products	5	12	9
29	Petroleum and Coal Products	2	1	1
30	Rubber and Miscellaneous Plastic Products	1	5	3
31	Leather and Leather Products	1	1	3
32	Stone, Clay, and Glass Products	3	10	7
33	Primary Metal Industries	5	4	7
34	Fabricated Metal Products	5	2	9
35	Industrial Machinery and Equipment	4	23	10
36	Electronic and Other Electric Equip.	5	12	8
37	Transportation Equipment	5	8	11
38	Instruments and Related Products	2	4	6
39	Miscellaneous Manufacturing Industries	5	1	3
	Total:	61	105	117

Financial ratio values tend to fluctuate from year to year. The financial ratios of a firm computed with data for a single year may be influenced by some temporary unusual circumstances occurring in that year and they may not represent the true financial characteristics of the firm. Therefore, the financial ratios used in this study are five-year averages. Nine well-known financial ratios are used in the study as measures of various financial characteristics of firms such as liquidity, financial leverage (indebtedness), profitability, and growth. The financial ratios used in the analysis are presented in Table 2.

Table 2: Variables Used in the Study

Variable Name	Variable Definition*
Liquidity	
Current Ratio	Current Assets / Current Liabilities
Quick Ratio	(Current Assets - Inventories) / Current Liabilities
Asset Management	
Inventory Turnover	Sales / Year-end Inventory
Financial Leverage (Indebtedness)	
Equity Ratio	Common Equity / Total Assets
Profitability	
Operating Profit Margin	Operating Profit / Sales
Return on Assets	Net Income / Total Assets
Return on Equity	Net Income / Common Equity
Growth	
Sales Growth Rate	Annual Sales Growth Rate
Employee Growth rate	Annual Employee Growth Rate

* All variables are five-year averages.

Multiple Discriminant Analysis (MDA) and Multivariate Analysis of Variance (MANOVA) are the two statistical methods most commonly used in previous studies to compare the financial characteristics of different groups of firms. In this study, we use the MANOVA method to compare the financial characteristics of French, German, and U.K. manufacturing firms. A detailed description of the MANOVA method is available in Marascuilo and Levin (1983).

III. MANOVA Tests

We compare the financial characteristics of French, German, and U.K. manufacturing firms with cross-sectional analysis with data for the December 31, 1990-December 31, 1994 and December 31, 2000-December 31, 2004 periods to determine if the financial characteristics of the firms have become similar due to increased integration over time from the former period to the latter period.

Cross-Sectional Tests for the December 31, 1990-December 31, 1994 Period

The MANOVA test statistics for the December 31, 1990-December 31, 1994 period are presented in Table 3. The multivariate F statistic is used to test the null hypothesis that the mean ratio/variable vector for a country is not significantly different from the mean ratio/variable vector for another country. The multivariate F statistics indicate that the alternative hypothesis should be accepted at the one-percent level of significance, i.e., the overall financial characteristics of French, German, and U.K. manufacturing firms are significantly different.

Table 3: Cross-Sectional Comparison of the Financial Characteristics of French, German, and U.K. Manufacturing Firms in the December 31, 1990-December 31, 1994 Period

Financial Ratios	Mean and Std. Deviation[1]			Univariate Test Statistics[2]		
	France	Ger.	U.K.	Fra vs. Ger	Fra vs. UK	Ger vs. UK
				F-value	F-value	F-value
Liquidity						
Current Ratio	1.75 (0.61)	2.53 (1.43)	1.61 (0.53)	16.51*	2.59	42.42*
Quick Ratio	1.14 (0.48)	1.35 (1.17)	0.96 (0.47)	1.78	6.13*	11.30*
Asset Management						
Inventory Turnover	7.81 (11.6)	5.17 (3.9)	6.67 (7.7)	4.57**	0.62	3.18
Financial Leverage (Indebtedness)						
Equity Ratio	39.2% (16.8%)	30.3% (12.1%)	48.8% (13.2%)	15.54*	17.52*	117.1*
Profitability						
Oper. Profit Margin	4.94% (5.21%)	0.92% (5.14%)	8.64% (5.51%)	23.39*	18.67*	115.5*
Return on Assets	7.83% (10.9%)	4.26% (3.72%)	8.24% (4.78%)	9.33*	0.12	47.07*
Return on Equity	13.8% (15.3%)	7.43% (13.3%)	14.5% (11.8%)	7.86*	0.11	17.46*
Growth Rate						
Sales Growth	7.21% (9.8%)	5.99% (10.2%)	6.28% (12.0%)	0.57	0.27	0.04
Employee Growth	5.58% (14.0%)	2.94% (9.00%)	0.45% (10.2%)	2.18	7.82*	3.71**
Multivariate Test Statistics[3]:				15.41*	9.40*	51.60*

[1]The figures in parentheses are the standard deviations.
[2] The univariate F statistic is used to test the null hypothesis that the mean ratio for a country is equal to the mean ratio for another country.
[3]The multivariate F statistic is used to test the null hypothesis that the mean ratio vector is not significantly different in two countries.
*Significant at the one-percent level.
**Significant at the five-percent level.

The multivariate F statistic for the comparison between German firms and U.K. firms is 51.598. The multivariate F statistic for the comparison between French firms and German firms is 15.408. The multivariate F statistic for the comparison between French firms and U.K. firms is 9.399. These multivariate test statistics indicate that the most

significant overall difference is between German firms and U.K. firms and the least significant overall difference is between French firms and U.K. firms.

The mean value statistics show that German firms have the highest and U.K. firms have the lowest liquidity as measured by the Current and Quick ratios. The univariate F statistic is used to test the null hypothesis that the mean values of a given ratio/variable in two countries are not significantly different. The univariate F statistics indicate that the German mean current ratio is significantly higher than the French and U.K. mean current ratios at the one-percent level. Both German and French mean quick ratios are significantly higher than the U.K. mean quick ratio at the one-percent level.

The mean value statistics indicate that French firms have the highest and German firms have the lowest inventory turnover. It implies that German firms have the largest and French firms have the smallest average inventory levels as a percentage of sales. The univariate F statistics show that the French inventory turnover rate is significantly higher than the German inventory turnover rate at the five-percent level. However, the difference between French firms and U.K. firms and between German firms and U.K. firms is not statistically significant.

The mean value statistics indicate that U.K. firms have the highest equity ratios (i.e., the lowest financial leverage) and German firms have the lowest equity ratios (i.e., the highest financial leverage). The univariate F statistics show that the U.K. mean equity ratio is significantly higher than the French and German mean equity ratios, and the French mean equity ratio is significantly higher than the German mean equity ratio at the one-percent level. A low equity ratio (i.e., a high financial leverage level) implies a high level of financial risk. The mean equity ratio statistics imply that German firms have significantly higher financial risk compared with French and U.K. firms.

U.K. firms have the highest and German firms have the lowest mean profitability ratios. The univariate F statistics indicate that all three mean profitability ratios are significantly higher in French and U.K. firms compared with German firms at the one-percent level. The U.K. mean operating-profit-margin ratio is also significantly higher than the French mean operating-profit-margin ratio at the one-percent level. However, the difference between U.K. firms and French firms is not statistically significant in terms of the mean return-on-assets ratio and the mean return-on-equity ratio.

Among the three countries, French firms appear to have the highest mean sales and employee growth rates. German firms have the lowest mean sales growth rate and U.K. firms have the lowest mean employee growth rate. The univariate F statistics indicate that the differences between the three countries are not statistically significant in terms of the mean sales growth rates. However, the French mean employee growth rate is significantly higher than the U.K. mean employee growth rate at the one-percent level and the German mean employee growth rate is significantly higher than the U.K. mean employee growth rate at the five-percent level.

Cross-Sectional Tests for the December 31, 2000-December 31, 2004 Period

The MANOVA test statistics for the December 31, 2000-December 31, 2004 period are presented in Table 4. The multivariate F statistic is used to test the null hypothesis that the mean ratio/variable vector for a country is not significantly different from the mean ratio/variable vector for another country. As in the case of the December 31, 1990-December 31, 1994 period, the multivariate F statistics indicate that the overall financial characteristics of French, German, and U.K. manufacturing firms are significantly different at the one-percent level. The test statistics again indicate that the most significant overall difference is between German firms and U.K. firms and the least significant overall difference is between French firms and U.K. firms.

Table 4: Cross-Sectional Comparison of the Financial Characteristics of French, German, and U.K. Manufacturing Firms in the December 31, 2000-December 31, 2004 Period

Financial Ratios	Mean and Std. Deviation[1]			Univariate Test Statistics[2]		
	France	Ger.	U.K.	Fra vs. Ger	Fra vs. UK	Ger vs. UK
				F-value	F-value	F-value
Liquidity						
Current Ratio	1.80 (1.24)	2.40 (1.67)	1.62 (0.99)	6.12*	1.02	18.43*
Quick Ratio	1.26 (1.20)	1.37 (1.21)	1.01 (0.87)	0.35	2.54	6.75*
Asset Management						
Inventory Turnover	6.40 (5.17)	5.41 (3.64)	7.01 (7.34)	2.10	0.34	4.12**
Financial Leverage (Indebtedness)						
Equity Ratio	40.6% (15.1%)	30.5% (14.5%)	46.5% (16.9%)	17.95*	5.25**	56.42*
Profitability						
Oper. Profit Margin	4.96% (6.97%)	1.02% (5.64%)	6.80% (6.19%)	15.83*	3.23	52.52*
Return on Assets	4.24% (5.88%)	4.00% (5.01%)	4.73% (6.12%)	0.08	0.26	0.95
Return on Equity	8.01% (14.3%)	7.83% (14.5%)	9.28% (14.0%)	0.01	0.32	0.57
Growth Rate						
Sales Growth	1.70% (12.6%)	1.31% (10.4%)	3.21% (10.9%)	0.05	0.69	1.74
Employee Growth	1.05% (14.3%)	-1.32% (10.5%)	-1.78% (11.8%)	1.50	1.98	0.09
Multivariate Test Statistics[3]:				12.45*	3.16*	28.40*

[1]The figures in parentheses are the standard deviations.
[2]The univariate F statistic is used to test the null hypothesis that the mean ratio for a country is equal to the mean ratio for another country.
[3]The multivariate F statistic is used to test the null hypothesis that the mean ratio vector is not significantly different in two countries.
*Significant at the one-percent level.
**Significant at the five-percent level.

All three multivariate F statistics are considerably smaller for the December 31, 2000-December 31, 2004 period than for the December 31, 1990-December 31, 1994 period. This indicates that the differences between the overall financial characteristics of firms in the three EU member countries decreased and the degree of similarity between them increased considerably over time during the December 31, 1990-December 31,

2004 period. The most pronounced increase in similarity is between French firms and U.K. firms. The multivariate F statistic between the two countries for the December 31, 2000-December 31, 2004 period is about one-third of that for the December 31, 1990-December 31, 1994 period (3.163 vs. 9.399). These findings imply that increased economic integration is resulting in increased similarity in the financial characteristics of firms in different EU member countries over time.

The univariate F statistic is used to test the null hypothesis that the mean values of a given ratio/variable in two countries are equal. A comparison of the univariate F statistics in Tables 3 and 4 indicates that the relative liquidity, inventory turnover, and financial leverage characteristics of firms in the three countries did not change substantially from the December 31, 1990-December 31, 1994 period to the December 31, 2000-December 31, 2004 period. However, the degree of similarity of the profitability ratios has increased considerably.

In the December 31, 1990-December 31, 1994 period, the mean values of all three German profitability ratios are significantly lower than the mean values of the French and U.K. profitability ratios at the one-percent level. In the December 31, 2000-December 31, 2004 period, the mean values of the German operating-profit-margin ratios are still significantly lower than the mean values of the French and U.K. operating-profit-margin ratios at the one-percent level. However, the mean values of the German return-on-assets and return-on-equity ratios are no longer significantly different from the mean values of the French and U.K. return-on-assets and return-on-equity ratios. This may be attributed to increased competition within the EU as a result of increased integration.

In the December 31, 1990-December 31, 1994 period, there are no significant differences between the mean values of the sales growth rates in the three countries. In the December 31, 2000-December 31, 2004 period, the mean values of the sales growth rates of the three countries are still similar. However, the mean values of the sales growth rates of all three countries are considerably lower in the December 31, 2000-December 31, 2004 period compared with the December 31, 1990-December 31, 1994 period. Similarly, the mean values of the employee growth rates of all three countries also fell considerably from the December 31, 1990-December 31, 1994 period to the December 31, 2000-December 31, 2004 period. This may be interpreted as sales and employee growth rates decreasing in the EU over time, i.e., the benefits of economic integration may be decreasing over time.

The French and German mean employee growth rates are significantly higher than the U.K. mean employee growth rate in the December 31, 1990-December 31, 1994 period. However, they are no longer significantly different in the December 31, 2000-December 31, 2004 period. This is an additional evidence that shows that similarity between the financial characteristics of firms in different EU member countries is increasing over time.

IV. Summary and Conclusions

In this paper, we have studied the effects of EU economic integration on the financial characteristics of French, German, and U.K. manufacturing firms by using the MANOVA (Multivariate Analysis of Variance) technique. Our cross-sectional test results for the December 31, 1990-December 31, 1994 and December 31, 2000-December 31, 2004 periods indicate that the differences between the financial characteristics of manufacturing firms in different EU member countries are decreasing over time with integration and increased competition.

The findings indicate that the asset and equity returns and the sales and employee growth rates of EU member countries have decreased considerably, but the similarity

between them has increased significantly coinciding with integration and increased competition during the December 31, 1990-December 31, 2004 period.

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